

**COMPARISON OF A SLANTED-TOOTH SEE-THROUGH LABYRINTH
SEAL TO A STRAIGHT-TOOTH SEE-THROUGH LABYRINTH SEAL
FOR ROTORDYNAMIC COEFFICIENTS AND LEAKAGE**

A Thesis

by

NAITIK JAYANT MEHTA

Submitted to the office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2012

Major Subject: Mechanical Engineering

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Approved by:

Chair of Committee,
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Dara W. Childs
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ABSTRACT

Comparison of a Slanted-Tooth See-Through Labyrinth Seal to a Straight-Tooth See-Through Labyrinth Seal for Rotordynamic Coefficients and Leakage.

(May 2012)

Naitik Jayant Mehta, B.E., Osmania University, India

Chair of Advisory Committee: Dr. Dara W. Childs

This research compares the leakage and rotordynamic characteristics of a slanted-tooth labyrinth seal to a conventional straight-tooth labyrinth. Detailed results comparing the rotordynamic coefficients and leakage parameters of a slanted-tooth see-through labyrinth seal and a straight-tooth see-through labyrinth seal are presented. The straight-tooth labyrinth seal used in this research was originally tested by Arthur Picardo. The slanted-tooth labyrinth seal was designed and fabricated to be identical to the straight-tooth labyrinth seal in terms of pitch, depth, and the number of teeth. The angle of inclination of the teeth in the slanted-tooth labyrinth seal was chosen to be 65° from the normal axis. The seals were tested at an inlet pressure of 70 bar-a (1015 psi-a), pressure ratios of 0.4, 0.5, and 0.6, rotor speeds of 10,200, 15,350, and 20,200 rpm, and a radial clearance of 0.2 mm (8 mils). The experiments were carried out at zero, medium, and high inlet preswirl ratios.

The experimental results show only minute differences in the rotordynamic coefficients between the two seals. But, the slanted-tooth labyrinth seal leaked approximately 10% less than the straight-tooth labyrinth seal. A study of prediction versus experimental data was done. XLlaby was used for prediction. XLlaby was developed for a straight-tooth labyrinth seal design and did not do a good job in predicting the rotordynamic coefficients and the leakage rate.

This research work is dedicated to my parents, Jayant M. Mehta and Beena J. Mehta

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TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
TEST RIG DESCRIPTION.....	6
Fluid preswirl.....	9
Seal leakage.....	10
Test seals.....	11
Test conditions.....	14
Stiffeners.....	14
EXPERIMENTAL PROCEDURE.....	16
Baseline data.....	16
Static uncertainty.....	16
Dynamic repeatability.....	17
Parameter identification.....	17
Sensitivity of changes in stator masses on rotordynamic coefficients.....	22
Rotordynamic coefficients.....	24
DISCUSSION OF RESULTS.....	25
Direct stiffness.....	25
Cross-coupled stiffness.....	27
Direct damping.....	27
Cross-coupled damping.....	27
Effective stiffness.....	31
Effective damping.....	33
Whirl Frequency Ratio (WFR).....	35
Seal Leakage.....	35
PREDICTION VERSUS MEASUREMENTS.....	38
SUMMARY AND CONCLUSIONS.....	41
REFERENCES.....	42
APPENDIX A.....	44
VITA.....	72

LIST OF FIGURES

	Page
Figure 1. Schematic diagram showing the tooth profile of the two test seals	2
Figure 2. Cross-sectional view of the Annular Gas Seal Test Stand (AGSTS).....	6
Figure 3. Stator assembly	7
Figure 4: Exploded sectional view of the stator assembly	7
Figure 5. Isometric view of the swirl brake	8
Figure 6. Detailed diagram of the swirl rings	9
Figure 7. Preswirl measurement and preswirl ring	10
Figure 8. Dimensions for the slanted-tooth labyrinth seal.....	12
Figure 9. Dimensions for the straight-tooth labyrinth seal	12
Figure 10. Horizontal stiffener	15
Figure 11. Vertical stiffener.....	15
Figure 12. Coordinate systems on the AGSTS viewed from NDE	18
Figure 13. Baseline data at 500 psi exit pressure (0.5 PR) and 10,200 rpm.....	20
Figure 14. Dynamic data for slanted-tooth labyrinth seal before subtracting the baseline data...	21
Figure 15. Dynamic data for slanted-tooth labyrinth seal after subtracting the baseline data.....	22
Figure 16. Variation of $\text{Re}(\mathbf{H}_{xx})$ with the stator masses	23
Figure 17. Variation of $\text{Re}(\mathbf{H}_{yy})$ with the stator masses	23
Figure 18. Direct stiffness versus inlet preswirl	26
Figure 19. Cross-coupled stiffness versus inlet preswirl	28
Figure 20. Direct damping versus inlet preswirl	29
Figure 21. Cross-coupled damping versus inlet preswirl	30
Figure 22. Reaction forces developed by an orbiting labyrinth seal	31
Figure 23. Effective stiffness versus inlet preswirl	32
Figure 24. Effective damping versus inlet preswirl.....	34
Figure 25. Whirl Frequency Ratio (WFR) versus inlet preswirl	36
Figure 26. Seal leakage versus inlet preswirl	37

	Page
Figure 27. Snapshot of the input data used for prediction	38
Figure 28. Prediction versus measurements of K , k , C , and c at 20,200 rpm and 0.5 PR	39
Figure 29. Prediction versus measurements for K_{eff} and C_{eff} at 20,200 rpm and 0.5 PR	39
Figure 30. Prediction of whirl frequency ratio (WFR) at 20,200 rpm and 0.5 PR	40
Figure 31. Prediction versus measurements of leakage rate (\dot{m}) at 20,200 rpm and 0.5 PR	40

LIST OF TABLES

	Page
Table 1. I.D. measurements of the slanted-tooth labyrinth seals.....	13
Table 2. I.D. measurements of the straight-tooth labyrinth seals	13
Table 3. Seal Test Matrix	14
Table 4. Static measurement uncertainty.....	16
Table 5. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.4 PR and zero preswirl	44
Table 6. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.4 PR and zero preswirl	45
Table 7. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.4 PR and zero preswirl	45
Table 8. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR and zero preswirl	46
Table 9. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.5 PR and zero preswirl	46
Table 10. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.5 PR and zero preswirl	47
Table 11. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.6 PR and zero preswirl	47
Table 12. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.6 PR and zero preswirl	48
Table 13. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.6 PR and zero preswirl	48
Table 14. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.4 PR, medium preswirl....	49
Table 15. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.4 PR, medium preswirl....	49
Table 16. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.4 PR, medium preswirl....	50
Table 17. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR, medium preswirl....	50
Table 18. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.5 PR, medium preswirl....	51
Table 19. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.5 PR, medium preswirl....	51
Table 20. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.6 PR, medium preswirl....	52
Table 21. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.6 PR, medium preswirl....	52
Table 22. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.6 PR, medium preswirl....	53
Table 23. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.4 PR and high preswirl....	53
Table 24. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.4 PR and high preswirl	54
Table 25. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.4 PR and high preswirl	54
Table 26. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR and high preswirl	55
Table 27. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.5 PR and high preswirl	55
Table 28. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.5 PR and high preswirl	56
Table 29. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.6 PR and high preswirl	56

Page

Table 30. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.6 PR and high preswirl....	57
Table 31. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.6 PR and high preswirl....	57
Table 32. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.4 PR and zero preswirl....	58
Table 33. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.4 PR and zero preswirl....	58
Table 34. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.4 PR and zero preswirl....	59
Table 35. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.5 PR and zero preswirl....	59
Table 36. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.5 PR and zero preswirl....	60
Table 37. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.5 PR and zero preswirl....	60
Table 38. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.6 PR and zero preswirl....	61
Table 39. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.6 PR and zero preswirl....	61
Table 40. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.6 PR and zero preswirl....	62
Table 41. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.4 PR, medium preswirl ...	62
Table 42. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.4 PR, medium preswirl ...	63
Table 43. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.4 PR, medium preswirl ...	63
Table 44. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.5 PR, medium preswirl ...	64
Table 45. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.5 PR, medium preswirl ...	64
Table 46. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.5 PR, medium preswirl ...	65
Table 47. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.6 PR, medium preswirl ...	65
Table 48. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.6 PR, medium preswirl ...	66
Table 49. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.6 PR, medium preswirl ...	66
Table 50. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.4 PR and high preswirl ...	67
Table 51. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.4 PR and high preswirl ...	67
Table 52. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.4 PR and high preswirl ...	68
Table 53. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.5 PR and high preswirl ...	68
Table 54. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.5 PR and high preswirl ...	69
Table 55. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.5 PR and high preswirl ...	69
Table 56. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.6 PR and high preswirl ...	70
Table 57. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.6 PR and high preswirl ...	70
Table 58. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.6 PR and high preswirl ...	71

NOMENCLATURE

a_s	-	Stator acceleration	[L/T ²]
A_{ij}	-	FFT of stator acceleration	[L/T ²]
C_{XX}	-	Direct damping	[FT/L]
c_{XY}	-	Cross-coupled damping	[FT/L]
D_{ij}	-	FFT of relative displacement	[L]
D_r	-	Diameter of the rotor	[L]
f_e	-	Excitation force	[F]
F_{ij}	-	FFT of force	[F]
f_s	-	Seal reaction force	[F]
H_{ij}	-	FFT of dynamic stiffness	[F/L]
j	-	$\sqrt{-1}$	[-]
K_{XX}	-	Direct stiffness	[F/L]
k_{XY}	-	Cross-coupled stiffness	[F/L]
\dot{m}	-	Mass flow rate	[M/T]
M_s	-	Stator mass	[M]
N	-	Revolutions per minute	[1/T]
P_{calib}	-	Calibration pressure	[F/L ²]
P_{test}	-	Test pressure	[F/L ²]
PR	-	Pressure ratio	[-]
\ddot{R}	-	Stator acceleration vector	[L/T ²]
s	-	Stator displacement vector	[L]
T_{calib}	-	Calibration temperature	[T]
T_{test}	-	Test temperature	[T]
U	-	Relative rotor-stator motion	[L]
V_t	-	Inlet tangential velocity	[L/T]
WFR	-	Whirl frequency ratio	[-]
ω	-	Rotor speed	[1/T]
Ω	-	Excitation frequency	[1/T]

INTRODUCTION

Labyrinth annular seals are used in a variety of turbomachinery applications like shaft seals, balance piston seals, and eye packing seals in centrifugal compressors, to reduce leakage and in turn, increase the efficiency of the machine.

In general, there are three types of labyrinth seal configurations; namely, (1) tooth-on-stator (TOS) labyrinth seals with smooth rotor, (2) tooth-on-rotor (TOR) labyrinth seals with smooth stator, and (3) interlocking labyrinth seals. In this research, tooth-on-stator (TOS) configuration was used.

A comparative study was carried out of a slanted-tooth see-through labyrinth seal and straight-tooth see-through labyrinth seal for rotordynamic coefficients and leakage parameters. The number of teeth, the pitch, and the depth were made similar in both the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal. The angle of inclination of the teeth on the slanted-tooth labyrinth seal was chosen to be 65° from the normal axis. The straight-tooth labyrinth seals used in this research was originally tested by Arthur Picardo for his research [1] and were re-made and re-tested for better comparison of the results.

Figure 1 shows a schematic of the tooth profiles of the two kinds of labyrinth seals under investigation. The flanged side of the seal is the inlet, and the other side is the outlet of the seal. The slanted-tooth labyrinth seals have teeth leaning towards the inlet of the seal. A detailed diagram with all the dimensions is shown later.

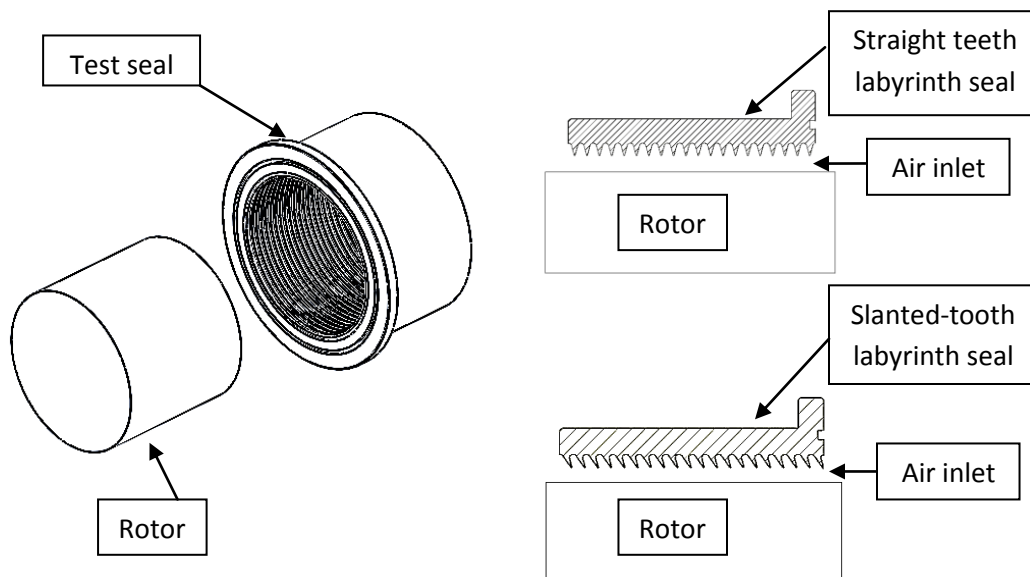


Figure 1. Schematic diagram showing the tooth profile of the two test seals

In 1975, Meyer and Lowrie [2] tested the leakage characteristics of a variety of see-through labyrinth seals with straight and slanted teeth at five different clearances of 0.127 mm (0.005 in), 0.254 mm (0.010 in), 0.508 mm (0.020 in), 1.016 mm (0.040 in), and 2.032 mm (0.080 in). Four straight-tooth labyrinth seals and three slanted-tooth labyrinth seals were tested. The rotor was not spun in any of the cases. Data are presented for pressure ratios ranging from 0 to 1.0 (exit pressure/inlet pressure) in steps of 0.1. The inlet pressure data are not provided. Results show about 10 to 12 percent decrease in the leakage flow rate from a labyrinth seal with slanted-tooth when compared to the leakage flow rate from a labyrinth seal with straight teeth.

In 1977, Stocker et al. [3] at Detroit Diesel Allison did a comparative study of leakage in labyrinth seals. A stepped labyrinth seal with inclined teeth was designed that they called “Advanced Design Labyrinth Seal.” Experiments were carried out on both 2-D (flat plate) and 3-D (circular seal) test rigs. Results are shown at three clearances of 0.125 mm (0.005 in), 0.25 mm (0.010 in), and 0.5 mm (0.020 in), pressure ratios of 2.0 and 3.0 (inlet pressure/exit pressure) and in variations of knife (tooth) clearance, knife pitch, knife height, number of knives, step height, and axial clearance. The experiments were carried out at inlet pressures of up to 508 cm-Hg A

(6.75 bar-a) on the 2-D test rig and 200 cm-Hg A (2.66 bar-a) on the 3-D test rig. The rotor was spun to result in three tip speeds of 80 m/s (261 ft/s), 159 m/s (523 ft/s), and 239 m/s (785 ft/s). Results show a 26.9% decrease in leakage from the Advanced Design Labyrinth Seal when compared to the leakage from the conventional straight-tooth stepped labyrinth seal.

The seal reaction force components are modeled by

$$-\begin{Bmatrix} F_{sX} \\ F_{sY} \end{Bmatrix} = \begin{bmatrix} K_{XX} & K_{XY} \\ K_{YX} & K_{YY} \end{bmatrix} \begin{Bmatrix} X \\ Y \end{Bmatrix} + \begin{bmatrix} C_{XX} & C_{XY} \\ C_{YX} & C_{YY} \end{bmatrix} \begin{Bmatrix} \dot{X} \\ \dot{Y} \end{Bmatrix} \quad (1)$$

where, (X, Y) are relative displacements of the stator with respect to the rotor. F_{sX} , F_{sY} are the reaction forces of the seal acting on the rotor, K_{XX} , K_{YY} are the direct stiffness coefficients, K_{XY} , K_{YX} are the cross-couples stiffness coefficients, C_{XX} , C_{YY} are the direct damping coefficients, and C_{XY} , C_{YX} are the cross-coupled damping coefficients.

In 1980, Benckert and Wachter [4] carried out experiments on straight TOS labyrinth seals at 1.423 bar-a (20 psi-a) inlet pressure and a variety of pressure ratios, ranging from 0.32 to 0.79. Four labyrinth seals with 3, 7, 12, and 17 cavities were tested with a stationary rotor. The results show that these seals have negative direct stiffness and that the stator eccentricity has no effect on the direct stiffness. Also, the cross-coupled stiffness is directly proportional to the inlet swirl velocity of the gas flow, and the cross-coupled stiffness becomes positive (destabilizing) for positive preswirl (in the direction of shaft rotation). They showed that the cross-coupled stiffness can be reduced by using swirl brakes.

In 1986, Tipton et al. [5] at Allison Gas turbine did an extensive study on the leakage characteristics of labyrinth seals. They carried out 2-D (flat plate) and 3-D (circular seal) tests to extend the geometric parameters in the data base to develop their design model. In the 2-D testing, the effects of the number of teeth, clearance, teeth height, teeth pitch, step height, and the axial clearance on the leakage flow rate were studied. In the 3-D testing, seals having a maximum diameter of 152.4 mm (6.0 in.) that can be run at rotational speeds up to 30,000 rpm were used. The TOR configuration was used in the 3-D testing. All the tests were carried out over a range of pressure ratios. The inlet pressure for the 2-D testing was 8 bar (116 psi). The inlet pressure used in the 3-D testing is not stated. The results show that the labyrinth seals with smooth land (tip surface) and forward leaning teeth leak less than the labyrinth seals with smooth

land and vertical teeth. But, labyrinth seals with honeycomb land and forward leaning teeth could leak more or less than labyrinth seals with honeycomb land and vertical teeth depending on the honeycomb cell size, clearance, and tip speed. Also, as the knife (teeth) angle increases more than 90° (i.e. lean backward), the leakage increases.

In 1986, Childs and Scharrer [6] tested and presented rotordynamic coefficient and leakage data for TOS and TOR labyrinth seals at inlet pressures ranging from 3.08 bars and 8.22 bars and at excitation frequencies of 56.8 Hz and 74.6 Hz. The rotor speeds varied from 3000 rpm to 16000 rpm and three clearances of 0.33 mm, 0.4 mm, and 0.5 mm were tested. These results compare well with predictions from Scharrer's two-control volume theory [7].

In 1996 and 2001, Wagner [8,9] tested both long and short straight see-through labyrinth seals on a magnetic-bearing test rig. These tests were carried out at inlet pressures ranging up to 70 bar-a and pressure ratios of 0.4, 0.6, and 0.8. No information on the seal geometry is provided and only a few rotordynamic coefficient values are given. In 2009, Wagner [10] modified the test rig to measure the rotordynamic coefficients using dynamic pressure measurements at up to 400 Hz. The motivation of his research was to measure the residual uncertainty which is important in investigating short impeller-eye seals. Tests were carried out on a stepped-labyrinth seals with four straight teeth. Rotational speed of 15,000 rpm, and static inlet pressure of 20 bar (290.1 psi) with nitrogen as the test fluid were used. The pressure ratio data are not given. The results reveal the existence of gas inertia forces in the impeller-eye seals.

In 2003, Picardo [1] tested the straight-tooth labyrinth seal used in this research at inlet pressures of 70 bar-a and 52 bar-a, radial clearances of 0.2 mm (0.008 in) and 0.1 mm (0.004 in), rotor speeds of 10,200 rpm, 15,200 rpm, and 20,200 rpm, and pressure ratios of 16%, 36%, and 52%. A comparison of experimental results to predictions is also given. Results show negative direct stiffness and low direct damping. For the frequency range of 20 to 150 Hz, the rotordynamic coefficients are shown to be frequency independent. The two models used to predict the rotordynamic coefficients namely, one-control volume (1CVM) given by Childs and Scharrer [11], and two-control volume (2CVM) given by Scharrer [7] consistently under-predicted the cross-coupled stiffness, direct damping and leakage.

Vannini et al. [12] set up a test rig to measure the rotordynamic coefficients of labyrinth seals used in centrifugal compressors. The test rig can test seals at inlet pressure up to 500 bar.

The rotor can be spun to 15,000 rpm. Tests were carried out on a 14-tooth TOS labyrinth seal with straight teeth at inlet pressures of 50 bar, 100 bar, and 200 bar, and rotor speed of 10,000 rpm. The inlet preswirl was estimated to be 0.85 at 10,000 rpm. The pressure ratio values are not provided. The results confirm the slight dependence of the labyrinth seal coefficients on the excitation frequency. They also compared the experimental results to prediction from XLlaby, and the results showed that the prediction for cross-coupled stiffness and direct damping agreed with the experimental data within 15%.

TEST RIG DESCRIPTION

The test rig was originally designed to test high-speed hydrostatic bearings (HBR), Childs and Hale [13]. Later, this rig was modified to test gas seals at pressures up to 17.2 bar (250 psi) as described by Dawson et al [14]. Further modifications were made by Weatherwax and Childs [15] to allow higher supply pressures (up to 84 bar i.e., 1235 psi) for testing the gas seals. A 93 kW (125 hp) motor coupled to a Lufkin step-up gear box with 6.96:1 gear ratio can spin the rotor up to 29,000 RPM. A schematic of the test rig is shown in Figure 2.

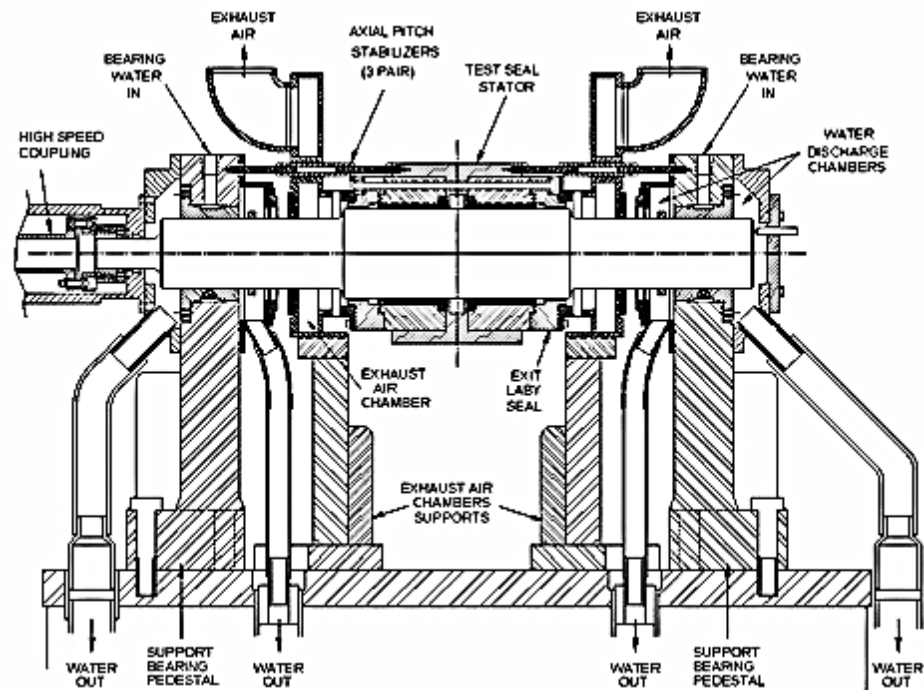


Figure 2. Cross-sectional view of the Annular Gas Seal Test Stand (AGSTS)

Two hydrostatic bearings that are supplied with water at 69 bar-a (1000 psi-a) are used to support the rotor. The test section of the rotor has a diameter of 114.3 mm (4.500 in). The internal diameters of the seals are made depending on the required clearance.

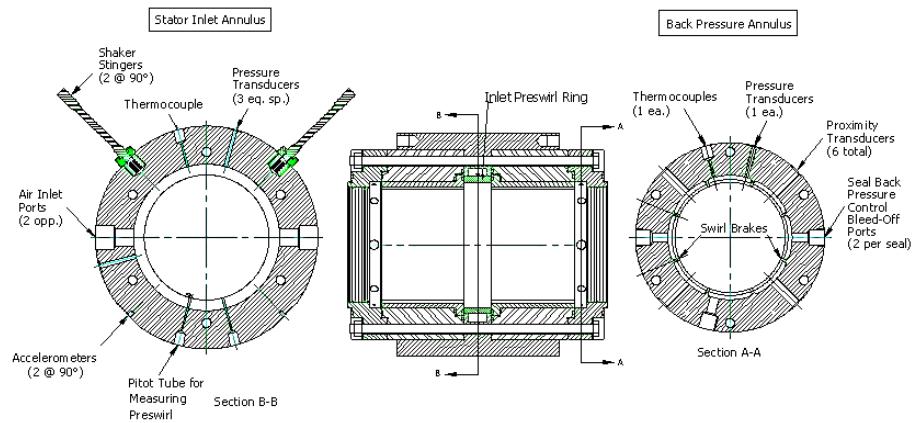


Figure 3. Stator assembly

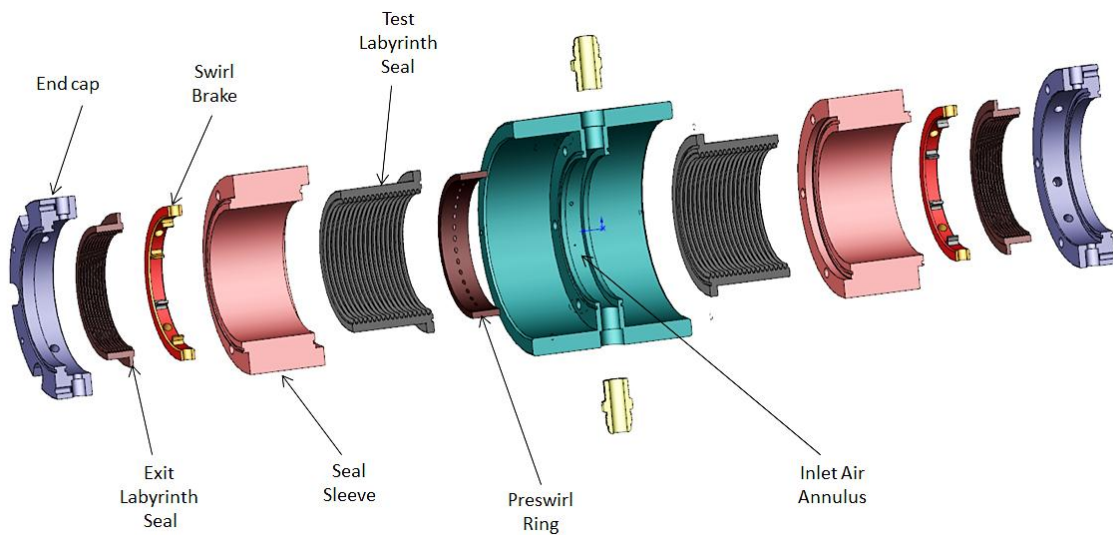


Figure 4: Exploded sectional view of the stator assembly

Figure 3 shows the stator assembly, and Figure 4 shows the exploded sectional view of the stator assembly. The seals are press-fitted into seal sleeves which are then placed in the stator with the inlet side of the seals facing the center of the stator. Two end caps with exit labyrinth

seals and swirl brakes are attached to the ends of the stator. The whole assembly is then held together with six long bolts.

Unlike seals in actual machines, the stator is softly supported. The stator is attached to two orthogonal hydraulic shakers with the help of shaker stingers as shown in Figure 3. These shakers allow the operator to control the position of the stator (seals) around the rotor and also excite the stator at frequencies ranging from 10 Hz to 350 Hz. The force being exerted on the stator is measured with force transducers that are attached in series to the hydraulic shakers. Accelerometers are attached 180° from each stinger to measure the acceleration of the stator in the two orthogonal directions in which the stator is excited.

To adjust the pitch of the stator with respect to the rotor, three pitch stabilizers are used on each side of the stator as shown in Figure 2. The pitch stabilizers are made in three pieces and are attached between the stator and the hydrostatic bearing pedestals. The pitch of the stator can be adjusted by turning the turn buckles on the pitch stabilizers.

Figure 5 shows a 3D model of the swirl brakes. Labyrinth seals produce destabilizing cross-coupled rotordynamic terms in the presence of high velocity fluid flow in the circumferential direction. Swirl brakes are a series of vanes that are meant to diminish the circumferential flow. These are used at the entry of the exit labyrinth seals to diminish their destabilizing cross-coupled terms.



Figure 5. Isometric view of the swirl brake

High pressure air is supplied to the stator through the ports at the center of the stator. This air is distributed evenly inside the stator by swirl rings shown in Figure 6. The air then passes through the test seals, swirl brakes, and the exit labyrinth seals before exiting through the exhaust piping. A throttling valve is connected to the exhaust bleed-off ports upstream to the stator exit labyrinth seals shown in Figure 3 to adjust exhaust back pressure (or pressure drop across the test seals). Closing this valve increases the exhaust back pressure by forcing more air through the exit labyrinth seals. This in turn reduces the pressure drop across the test seals. This valve allows us to achieve pressure ratios (defined as a ratio of exit to inlet pressures) ranging from 10% to 70% depending on the leakage of the seals.

Pressure transducers and thermocouples are used at several locations to measure the inlet and exit air pressures and temperatures. Circumferential velocity of the air is measured at the inlet as described below.

Fluid preswirl

The inlet air supplied enters through the channel at the center of the stator as shown in Figure 3 and then passes through a preswirl ring. Figure 6 shows the cross-sectional views of the three different preswirl rings. These rings have a series of nozzles that direct the flow of the inlet air. The zero preswirl ring has the nozzles pointing radially towards the center of the stator, whereas the medium and the high preswirl rings have nozzles that are inclined at an angle. The fluid preswirl increases as the angle of the orifices increase. Three separate stators with each preswirl ring attached at the inlet to the test seals are used.

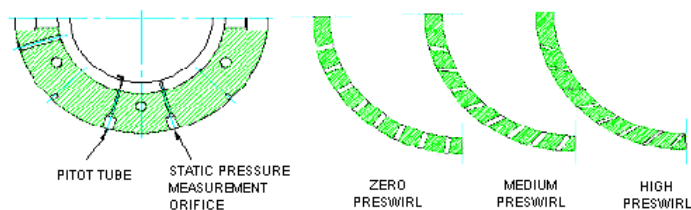


Figure 6. Detailed diagram of the swirl rings

Fluid preswirl ratio is defined as the ratio of the circumferential velocity of the fluid to the surface speed of the rotor as shown in Eq. (2).

$$preswirl = \frac{V_{\theta} 60}{\pi D_r N} \quad (2)$$

where, V_{θ} is the circumferential velocity of the fluid. N is the speed of the rotor in RPM. D_r is the diameter of the rotor.

Eq. (2) shows:

- If the speed of the fluid at the inlet of the seal is equal to the surface speed of the rotor, the preswirl ratio equals to 1.0.
- If the fluid enters the seals in the direction in which the rotor spins, the preswirl value will be positive (+).
- If the fluid enters the seals in the direction opposite to the direction in which the rotor spins, the preswirl value will be negative (-).

A pitot tube attached to the preswirl ring as shown in Figure 7 is used to measure the circumferential fluid velocity at the inlet of the seals. The circumferential velocity of the fluid is then calculated using the pressure differential measured by the pitot tube.

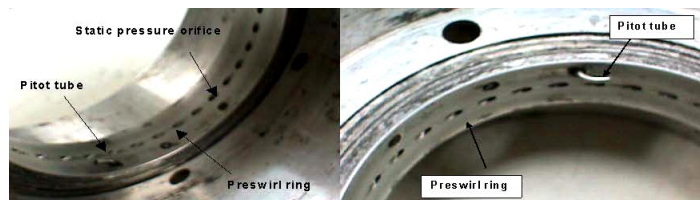


Figure 7. Preswirl measurement and preswirl ring

Seal leakage

The leakage flow rate depends mainly on the pressure differential across the seal, the length of the seal, the radial clearance between the seal and the rotor, the surface roughness of

the seal, and the speed of the rotor. A turbine type flow meter calibrated at 70 bar-a is attached between the inlet air control valve and the stator inlet. The leakage from each seal is calculated as follows:

$$\dot{m} = \frac{Q}{2} \cdot \frac{\rho}{(35.3146).60} \quad (3)$$

where, \dot{m} is the mass flow rate (kg/s). Q is the volumetric flow rate (SCFM). And, ρ is the density of air at the flowmeter which is calculated with the help of pressure and temperature measured at the flowmeter.

Since the two test seals are closely matched, the leakage is assumed to be equal in both seals, and the measured leakage rate is halved. The difference in temperatures and pressures between the calibration and the test conditions is taken care of as follows:

$$\dot{m} = \frac{Q}{3598.02} \cdot \left(\frac{T_{calib} + 273.15}{T_{test} + 273.15} \right) \cdot \frac{P_{test}}{P_{calib}} \quad (4)$$

where, T_{calib} is the calibration temperature ($^{\circ}\text{C}$). T_{test} is the test temperature ($^{\circ}\text{C}$). P_{calib} is the calibration pressure (70 bar-a). And P_{test} is the test pressure.

The volumetric flow rate, the temperature, and the inlet pressure are recorded in a steady state condition before and after each shake. Average values obtained from the four readings are used to calculate the leakage flow rate.

Test seals

The labyrinth seals were machined with high precision from 6061 aluminum. The detailed dimensions of the teeth on the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal are given in Figure 8 and Figure 9, respectively.

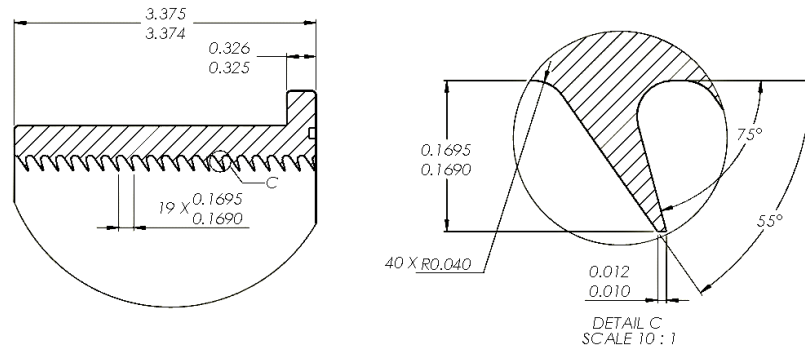


Figure 8. Dimensions for the slanted-tooth labyrinth seal

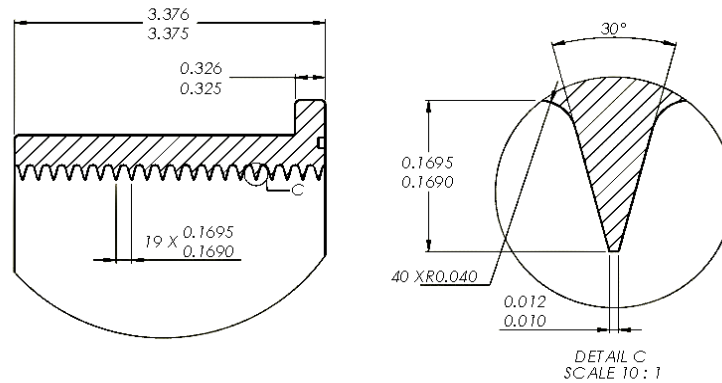


Figure 9. Dimensions for the straight-tooth labyrinth seal

The bore diameters of the seals were measured using a three-leg bore gauge with a least count of 0.00508 mm (0.0002 in) before the test. Three measurements on each side of the seals were taken 30° apart. Table 1 shows the inlet and outlet bore diameters of the slanted-tooth labyrinth seals, and Table 2 shows the inlet and outlet bore diameters of the straight-tooth labyrinth seals. As shown in Figure 1, the inlet of the seal is the flanged side of the seal, and the outlet is the other end of the seal.

Table 1. I.D. measurements of the slanted-tooth labyrinth seals

Slanted-tooth See-Through Labyrinth Seals		
Seal A	Inlet Clearance mm (in)	Outlet Clearance mm (in)
Reading 1	114.726 (4.5168)	114.737 (4.5172)
Reading 2	114.732 (4.5170)	114.732 (4.5170)
Reading 3	114.732 (4.5170)	114.732 (4.5170)
Average	114.730 (4.5169)	114.734 (4.5171)
Seal B		
Seal B	Inlet Clearance mm (in)	Outlet Clearance mm (in)
Reading 1	114.737 (4.5172)	114.732 (4.5170)
Reading 2	114.742 (4.5174)	114.737 (4.5172)
Reading 3	114.737 (4.5172)	114.737 (4.5172)
Average	114.739 (4.5173)	114.735 (4.5171)

Table 2. I.D. measurements of the straight-tooth labyrinth seals

Straight-tooth See-Through Labyrinth Seals		
Seal A	Inlet Clearance mm (in)	Outlet Clearance mm (in)
Reading 1	114.732 (4.5170)	114.726 (4.5168)
Reading 2	114.726 (4.5168)	114.737 (4.5172)
Reading 3	114.732 (4.5170)	114.732 (4.5170)
Average	114.730 (4.5169)	114.732 (4.5170)
Seal B		
Seal B	Inlet Clearance mm (in)	Outlet Clearance mm (in)
Reading 1	114.726 (4.5168)	114.726 (4.5168)
Reading 2	114.737 (4.5172)	114.726 (4.5168)
Reading 3	114.726 (4.5168)	114.732 (4.5170)
Average	114.730 (4.5169)	114.728 (4.5168)

Test conditions

Each pair of seals was tested at 27 different test conditions; being, three pressure ratios, three rotor speeds, and three inlet preswirls. Table 3 shows the test matrix for both slanted-tooth and straight-tooth labyrinth seals. The inlet air pressure was kept constant at 70 bar (1015 psi) for all test conditions. Note that all the experimental data presented in this thesis are from a compressible flow.

Table 3. Seal Test Matrix

Radial Seal Clearance	Rotor Speed	Pressure Ratio
(mm)	(rpm)	(-)
0.2	10200	0.4
	15350	
	20200	
	10200	0.5
	15350	
	20200	
	10200	0.6
	15350	
	20200	

Stiffeners

Since the stator is softly supported, there have been static instability problems with the seals that have negative static direct stiffness. Briefly, at zero speed, as the supply pressure is increased, the stator moves radially towards the rotor. To overcome this problem, vertical and horizontal stiffeners as shown in Figure 10 and Figure 11, respectively, were attached to the stator. The stiffeners were made to have almost equal stiffness values. These stiffeners increased the total static stiffness of the test rig and hence reduced the possibility of static instability. The horizontal stiffeners were previously added by Picardo [1] to eliminate dynamic instability of the

stator by introducing support stiffness orthotropy, Childs [16]. The vertical stiffeners have been added to the test rig recently to deal with static instability, and they did not exist when Picardo [1] tested the straight-tooth see-through labyrinth seals.

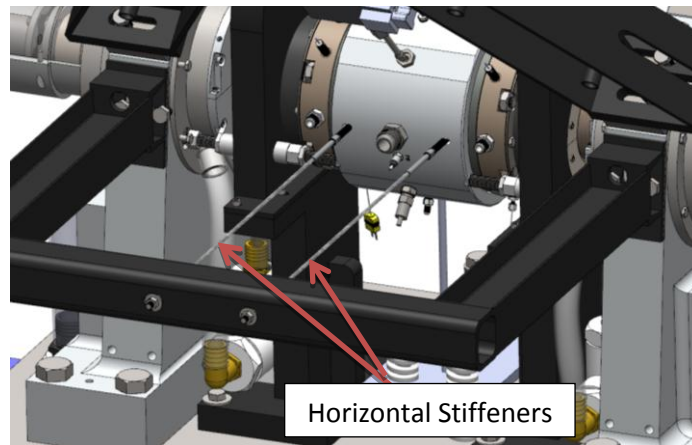


Figure 10. Horizontal stiffener

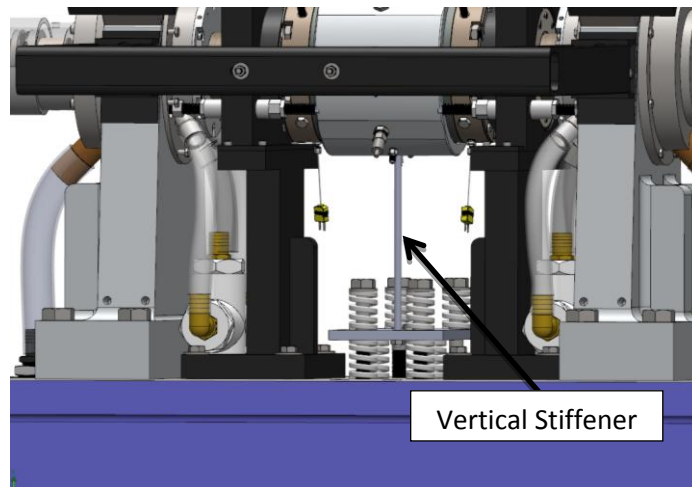


Figure 11. Vertical stiffener

EXPERIMENTAL PROCEDURE

Baseline data

The rotordynamic forces obtained during the tests include the reactions from all the components in the test rig including the test seals. To account for the rotordynamic coefficients that are not produced by the test seals, baseline data are measured. To obtain the baseline data, the test rig is assembled without the test seals in the stator, and dynamic testing is done. During the baseline test, the stator is pressurized such that the pressure at the inlet of the exit labyrinth seals is the same as during a normal test case with the seals installed inside the stator. The rotor is spun at the desired speed, the stator is excited, and dynamic data are recorded. The data measured during this test represent the rotordynamic coefficients from everything but the test seals. The baseline data are subtracted from the data obtained with the seals installed inside the stator.

Static uncertainty

The static measurements taken during the experiments come with some uncertainty due to the uncertainties from each instrument. The uncertainty analysis on the instruments used in this test rig (when used as a hydrostatic bearing tester) was carried out by Kurtin et al. [16]. Table 4 shows the uncertainty data for the instrumentation used in present testing.

Table 4. Static measurement uncertainty

Stator Pressure	Pressure across flowmeter	Temperatures	Pitot tube differential pressures	Volumetric flow rate	Rotor speed
0.838 psi	5.004 psi	5.613 °F	1.276 in-H ₂ O	0.547 ACFM	2.807 rpm

Dynamic repeatability

The repeatability of the dynamic data is measured to assess the consistency of the data. During each test, a simultaneous excitation through an ensemble of pseudo-random frequencies [17] ranging from 10 Hz to 320 Hz in increments of 10 Hz is applied. The test frequencies are multiplied by a factor of 1000/1024 in order to remove certain frequencies from electrical noise (such as, 60/120/180 Hz). The dynamic waveform takes less than a second to execute and is applied continuously for a considerably long period of time along each X and Y directions. The measurements in each direction are then broken into five groups (because it provides a decent resolution from the FFT, while also providing a significant number of averages). Then, each of the five groups of data in one direction is combined with each of the five groups in the other direction resulting in a total of 25 complex dynamic stiffness matrices. The standard deviation from these 25 matrices gives the dynamic repeatability data.

Repeatability is calculated for both baseline tests and seal tests. These are added to each other to show the total repeatability of the test data.

Parameter identification

Prior to adding the vertical stiffener of Figure 11, for small motions due to stator excitation at any arbitrary position, eccentric or centered, the equation of motion for the stator mass is given by

$$\mathbf{F} - M_s \ddot{\mathbf{R}} = \mathbf{F}_s \quad (5)$$

where, \mathbf{F}_s is the seal reaction force given by Eq. (1), \mathbf{F} is the measured excitation force, $\ddot{\mathbf{R}}$ is the acceleration vector of the stator, and M_s is the mass of the stator.

As discussed by Picardo [1], estimated direct dynamic stiffness coefficients are sensitive to the assumed stator mass value M_s . As shown in Eq. (5), Picardo [1] used the same mass M_s for motion in the X and Y axes (excitation axes) to identify the test dynamic coefficients. Because of the recent introduction of the vertical stiffener assembly to the stator, two different stator masses in the horizontal and vertical directions (in the directions of the stiffeners) were needed in the identification process. To account for the different masses in the vertical and horizontal directions, the following analysis was done by Wilkes [18].

Figure 12 shows two coordinate systems, where X_0 - Y_0 is the test coordinate system with the two axes representing the hydraulic shakers (measurements are taken in this coordinate system). The coordinate system X_1 - Y_1 represents the directions for the horizontal and vertical stiffeners. The unit vectors (i_0, j_0) represent the X_0 - Y_0 coordinate system, and the unit vectors (i_1, j_1) represent the X_1 - Y_1 coordinate system.

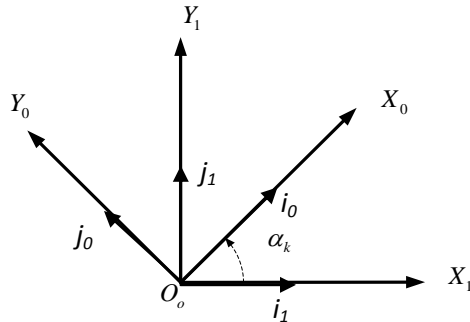


Figure 12. Coordinate systems on the AGSTS viewed from NDE

The vectors in the two coordinate systems are related by the direction cosine matrix $[A]$

$$\begin{Bmatrix} s_{X1} \\ s_{Y1} \end{Bmatrix} = \begin{bmatrix} \cos(\alpha_k) & \sin(\alpha_k) \\ -\sin(\alpha_k) & \cos(\alpha_k) \end{bmatrix} \begin{Bmatrix} s_{X0} \\ s_{Y0} \end{Bmatrix} = [A] \begin{Bmatrix} s_{X0} \\ s_{Y0} \end{Bmatrix} \quad (6)$$

where, $\alpha_k = -45^\circ$ is the angle between the two coordinate systems and since the rotation has to be done in the counter-clockwise direction, the (-) sign is used.

To estimate the rotordynamic coefficients with different masses in the horizontal and vertical directions (X_1 - Y_1), the stator is modeled by

$$\begin{bmatrix} M_{sX1} & 0 \\ 0 & M_{sY1} \end{bmatrix} \begin{Bmatrix} a_{sX1} \\ a_{sY1} \end{Bmatrix} - \begin{Bmatrix} f_{sX1} \\ f_{sY1} \end{Bmatrix} = \begin{Bmatrix} f_{eX1} \\ f_{eY1} \end{Bmatrix} \quad (7)$$

where, a_{sX1} and a_{sY1} are the stator acceleration components, f_{eX1} and f_{eY1} are the excitation force components, and f_{sX1} and f_{sY1} are the seal reaction force components, M_{sX1} and M_{sY1} are

the effective stator masses in the horizontal (X_I) and vertical (Y_I) directions, respectively. Rewriting Eq. (7) as

$$[M_{1s}](a_s)_{iI} - (f_s)_{iI} = (f_e)_{iI} \quad (8)$$

Applying coordinate transformation from X_I - Y_I to X_0 - Y_0 , to Eq. (8) gives,

$$[M_{0s}][A](a_s)_{i0} - [A](f_s)_{i0} = [A](f_e)_{i0} \quad (9)$$

Multiplying Eq. (9) with $[A]^T$ gives

$$[M_{0s}](a_s)_{i0} - (f_s)_{i0} = (f_e)_{i0} \quad (10)$$

where,

$$[M_{0s}] = \frac{1}{2} \begin{bmatrix} (M_{sX1} + M_{sY1}) & (M_{sY1} - M_{sX1}) \\ (M_{sY1} - M_{sX1}) & (M_{sX1} + M_{sY1}) \end{bmatrix} \quad (11)$$

Following Childs and Hale [13], Eq. (10) can be transformed using the Fourier Transformation into the frequency domain as,

$$\begin{Bmatrix} \mathbf{F}_{XX} \\ \mathbf{F}_{XY} \end{Bmatrix} - [M_{0s}] \begin{Bmatrix} \ddot{\mathbf{R}}_{XX} \\ \ddot{\mathbf{R}}_{XY} \end{Bmatrix} = \begin{bmatrix} \mathbf{H}_{XX}(\Omega) & \mathbf{H}_{XY}(\Omega) \\ \mathbf{H}_{YX}(\Omega) & \mathbf{H}_{YY}(\Omega) \end{bmatrix} \begin{Bmatrix} \mathbf{D}_{XX} \\ \mathbf{D}_{XY} \end{Bmatrix} \quad (12)$$

The dynamic stiffnesses are given by,

$$\mathbf{H}_{ij} = K_{ij} + \mathbf{j}(\Omega C_{ij}) - \Omega^2 M_{ij} \quad (13)$$

where, Ω is the excitation frequency.

The four unknowns in Eq. (12) are solved using excitation in X and Y directions to obtain,

$$\begin{bmatrix} \mathbf{F}_{XX} & \mathbf{F}_{XY} \\ \mathbf{F}_{YX} & \mathbf{F}_{YY} \end{bmatrix} - [M_{0s}] \begin{bmatrix} \ddot{\mathbf{R}}_{XX} & \ddot{\mathbf{R}}_{XY} \\ \ddot{\mathbf{R}}_{YX} & \ddot{\mathbf{R}}_{YY} \end{bmatrix} = \begin{bmatrix} \mathbf{H}_{XX}(\Omega) & \mathbf{H}_{XY}(\Omega) \\ \mathbf{H}_{YX}(\Omega) & \mathbf{H}_{YY}(\Omega) \end{bmatrix} \begin{bmatrix} \mathbf{D}_{XX} & \mathbf{D}_{XY} \\ \mathbf{D}_{YX} & \mathbf{D}_{YY} \end{bmatrix} \quad (14)$$

Further, \mathbf{D}_{ij} are the relative displacements of the stator with respect to the rotor, $\ddot{\mathbf{R}}_{ij}$ are the stator accelerations, \mathbf{F}_{ij} are the excitation forces, $[M_{0s}]$ is the stator mass matrix given by Eq. (11) and i,j are subscripts that denote the direction of the excitation force and the reaction force, respectively.

Figure 13 shows the plots for the real and imaginary parts of the dynamic stiffness coefficients with respect to frequency of excitation for the baseline data. The data are presented for the frequency range of 10-225 Hz. Data at frequencies above 225 Hz have been truncated because of the erratic trend. Trend lines are fitted to the data and the “goodness of fit” is between 75% and 95%, which is not bad.

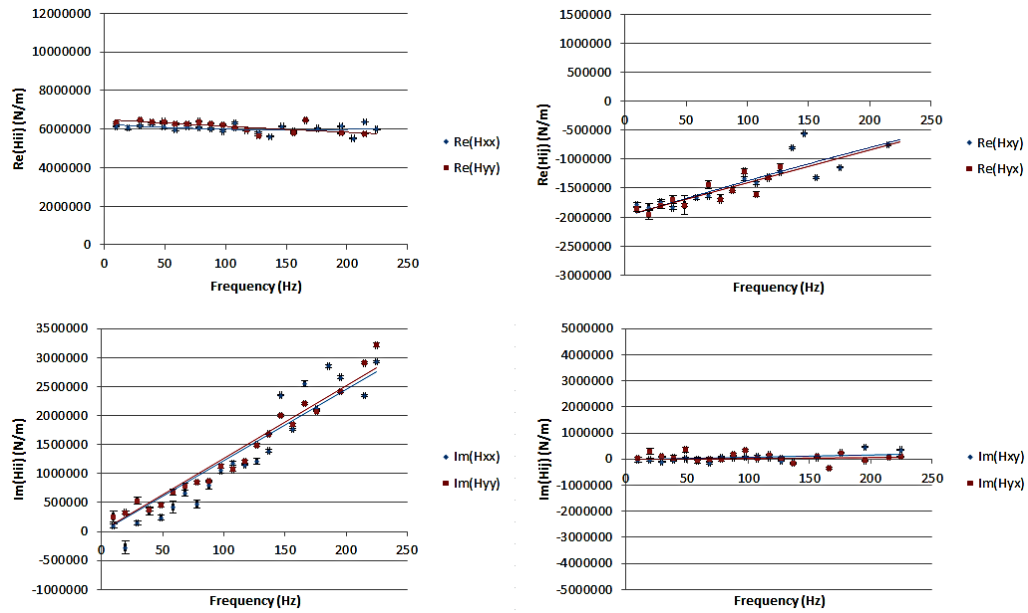


Figure 13. Baseline data at 500 psi exit pressure (0.5 PR) and 10,200 rpm

Figure 14 shows the plots for real and imaginary parts of the dynamic stiffness coefficients with respect to frequency of excitation for the test seals (slanted-tooth labyrinth seal) at 10,200 rpm, 0.5 PR, and high inlet preswirl, without subtracting the baseline data. Again, trend lines are fitted to the data and the “goodness of fit” is between 75% and 95%. Note that $\text{Re}(H_{XY})$ and $-\text{Re}(H_{YX})$ are not equal.

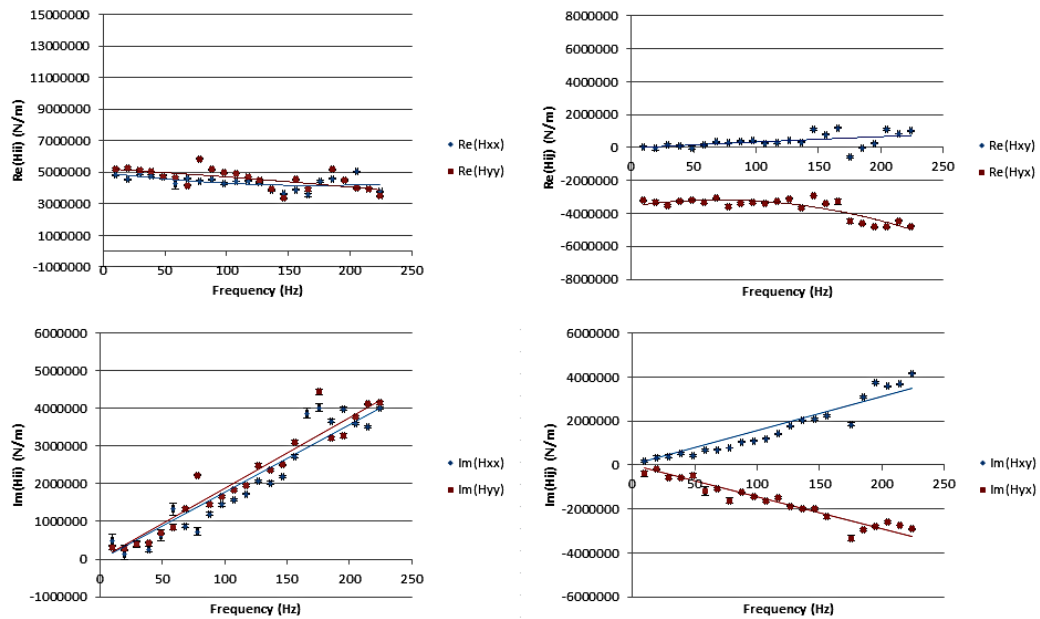


Figure 14. Dynamic data for slanted-tooth labyrinth seal before subtracting the baseline data

Figure 15 shows the plots for real and imaginary part of dynamic stiffness data with respect to frequency of excitation for the test seals (slanted-tooth labyrinth seal) at 10,200 rpm, 0.5 PR, and high inlet preswirl after the baseline data are subtracted. The trend lines are fitted to the data with “goodness of fit” between 75% and 95%. Note that $\text{Re}(H_{XY})$ and $-\text{Re}(H_{YX})$ are approximately equal.

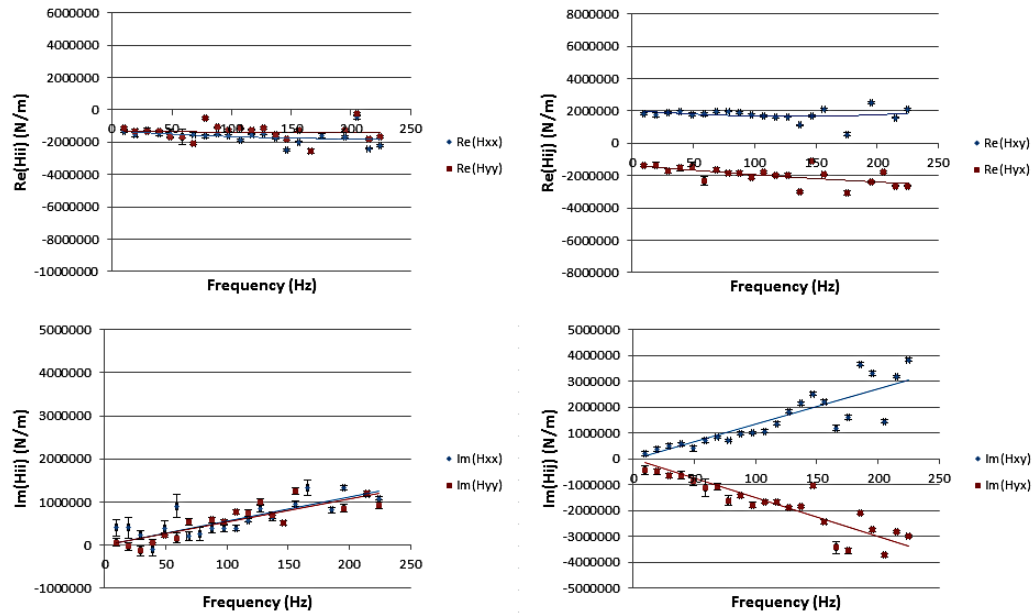


Figure 15. Dynamic data for slanted-tooth labyrinth seal after subtracting the baseline data

Sensitivity of changes in stator masses on rotordynamic coefficients

The effect of stator mass on the frequency dependency of rotordynamic coefficients was studied. The stator masses in the horizontal and vertical directions were chosen to minimize the frequency dependency of the direct dynamic stiffness coefficients.

To demonstrate the effect of stator mass on the direct dynamic stiffness coefficients, three cases with differing horizontal and vertical stator masses were chosen: Case 1 ($M_{\text{horizontal}} = 41.3$ kg and $M_{\text{vertical}} = 44.9$ kg), Case 2 ($M_{\text{horizontal}} = 43.5$ kg and $M_{\text{vertical}} = 47.2$ kg), and Case 3 ($M_{\text{horizontal}} = 45.8$ kg and $M_{\text{vertical}} = 49.4$ kg). Figure 16 shows $\text{Re}(\mathbf{H}_{XX})$ vs. frequency for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR, and high inlet preswirl and Figure 17 shows $\text{Re}(\mathbf{H}_{YY})$ vs. frequency for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR, and high inlet preswirl. The stator masses in both horizontal and vertical directions were adjusted until frequency independent $\text{Re}(\mathbf{H}_{XX})$ and $\text{Re}(\mathbf{H}_{YY})$ were obtained. As seen in Figure 16 and Figure 17, since the stator masses in Case 2 produced frequency independent $\text{Re}(\mathbf{H}_{XX})$ and $\text{Re}(\mathbf{H}_{YY})$,

these masses were chosen. This process of selecting stator masses was done for each stator assembly.

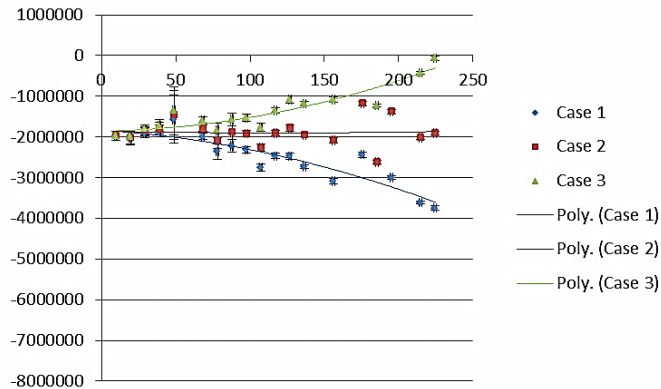


Figure 16. Variation of $\text{Re}(H_{XX})$ with the stator masses

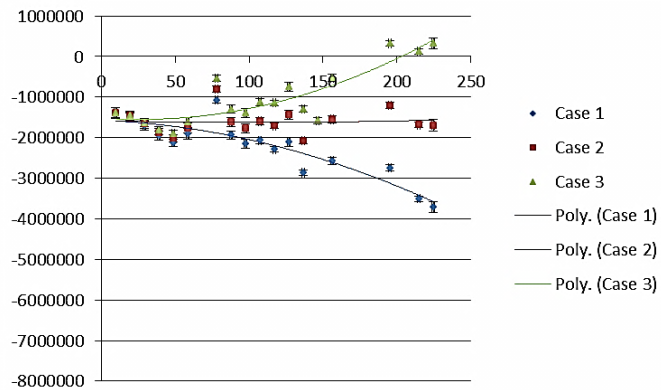


Figure 17. Variation of $\text{Re}(H_{YY})$ with the stator masses

Though not shown, the effect of changes in stator mass had negligible effect on the other rotordynamic coefficients. Note that the stator assembly without the air hoses was weighed to be 40 kg (stator mass in the horizontal direction) and the mass of the stator plus moving parts of the vertical stiffener was weighed to be 44.7 kg (stator mass in the vertical direction). Adding the

mass of the air hoses would result in the horizontal and vertical stator masses that are approximately equal to the masses in Case 2.

Rotordynamic coefficients

The direct and cross-coupled stiffness coefficients are given by the static intercept of a second order curve fitted to $\text{Re}[\mathbf{H}_{ii}]$ and $\text{Re}[\mathbf{H}_{ij}]$, respectively. The direct and cross-coupled damping coefficients are given by the slope of a linear trend line passing through the origin and fitted to $\text{Im}[\mathbf{H}_{ii}]$ and $\text{Im}[\mathbf{H}_{ij}]$ respectively. The rotordynamic stiffness and damping coefficients are determined as follows

$$K_{ii} = \text{Re}[\mathbf{H}_{ii}] \quad (15)$$

$$K_{ij} = \text{Re}[\mathbf{H}_{ij}] \quad (16)$$

$$C_{ii} = \frac{\text{Im}[\mathbf{H}_{ii}]}{\Omega} \quad (17)$$

$$C_{ij} = \frac{\text{Im}[\mathbf{H}_{ij}]}{\Omega} \quad (18)$$

where, Ω is the rotor speed in rad/s.

For a small motion about a centered position, $K_{xx} = K_{yy}$, $K_{xy} = -K_{yx}$, and so on. Hence, the average values of the stiffness and damping coefficients are:

$$K = \left(\frac{K_{xx} + K_{yy}}{2} \right) \quad (19)$$

$$k = \left(\frac{K_{xy} - K_{yx}}{2} \right) \quad (20)$$

$$C = \left(\frac{C_{xx} + C_{yy}}{2} \right) \quad (21)$$

$$c = \left(\frac{C_{xy} - C_{yx}}{2} \right) \quad (22)$$

where, K is the averaged direct stiffness, k is the averaged cross-coupled stiffness, C is the direct damping, and c is the cross-coupled damping.

DISCUSSION OF RESULTS

Tests were carried out according to the test matrix shown in Table 3 to observe the changes in the rotordynamic coefficients and the leakage of the test seals due to the changes in pressure ratio, inlet preswirl, and rotor speed. In the graphical representation, the columns show the results at three rotor speeds of 10200 rpm, 15350 rpm, and 20200 rpm, and the rows show the results at three pressure ratios of 0.4, 0.5, and 0.6. Note that the pressure drop, ΔP decreases with increasing PR, and the density ρ increases with increasing PR.

Direct stiffness

The direct stiffness is calculated using Eq. (19). Figure 18 compares measured K values for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to the inlet preswirl, ω , and PR. Note that the inlet preswirl ratios vary with the rotor speed. The lowest value is the zero preswirl case, the highest value is the high preswirl case and the middle value is the medium preswirl case. K is negative, and it decreases (becomes more negative) slightly with the increasing rotor speed. It increases (becomes less negative) with the increase in the pressure ratio. The plots show that both the seals behave similarly at zero and medium inlet preswirl ratios, but they differ at high inlet preswirl. However, the difference in the coefficient values is not significant.

For the straight-tooth labyrinth seal, K increases (becomes less negative) as the inlet preswirl increases from medium to high, contrary to the results from Picardo [1] where K increases with the increase in inlet preswirl.

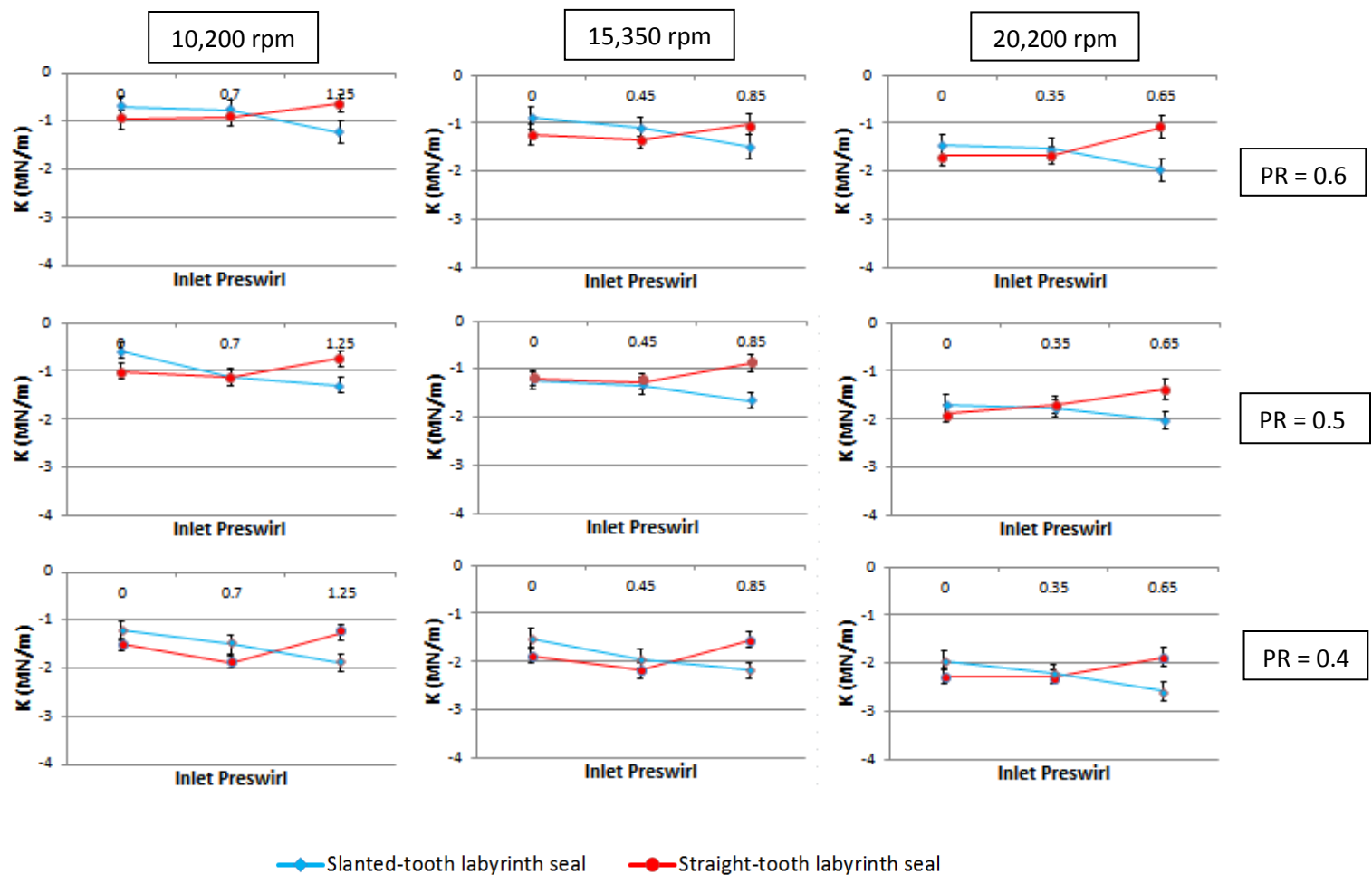


Figure 18. Direct stiffness versus inlet preswirl

Cross-coupled stiffness

The cross-coupled stiffness coefficients are calculated using Eq. (20). On page 28, Figure 19 compares measured k values for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to the inlet preswirl, ω , and PR. k increases almost linearly with the inlet preswirl. But, the effect of changing the PR and the ω is almost negligible. At zero and medium inlet preswirls, both seals have very similar k values, but at high inlet preswirl, the slanted-tooth labyrinth seal has lower k than the straight-tooth labyrinth seal. This means that the slanted-tooth labyrinth seal has lower destabilizing forces than the straight-tooth labyrinth at high inlet preswirls. Note that the magnitude of k can be negative at zero preswirl which confirms the results of Picardo [1] and Benckert and Wachter [4].

Direct damping

The direct damping coefficients are calculated using Eq. (21). On page 29, Figure 20 compares measured C values for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to inlet preswirl, ω , and PR. The results show that C increases with the increase in inlet preswirl. C decreases with an increase in PR. At zero inlet preswirl, both the seals have very similar C values, but as the inlet preswirl increases, the slanted-tooth labyrinth seal C becomes less than the straight-tooth labyrinth seal.

Cross-coupled damping

The cross-coupled damping coefficients are calculated using Eq. (22). The cross-coupled damping adds to the direct stiffness creating K_{eff} as will be shown in Eq. (24).

On page 30, Figure 21 compares measured c values for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to inlet preswirl, ω , and PR. The plots show that the c increases with increasing inlet preswirl, PR, and ω . At all conditions, both seals have very similar c values.

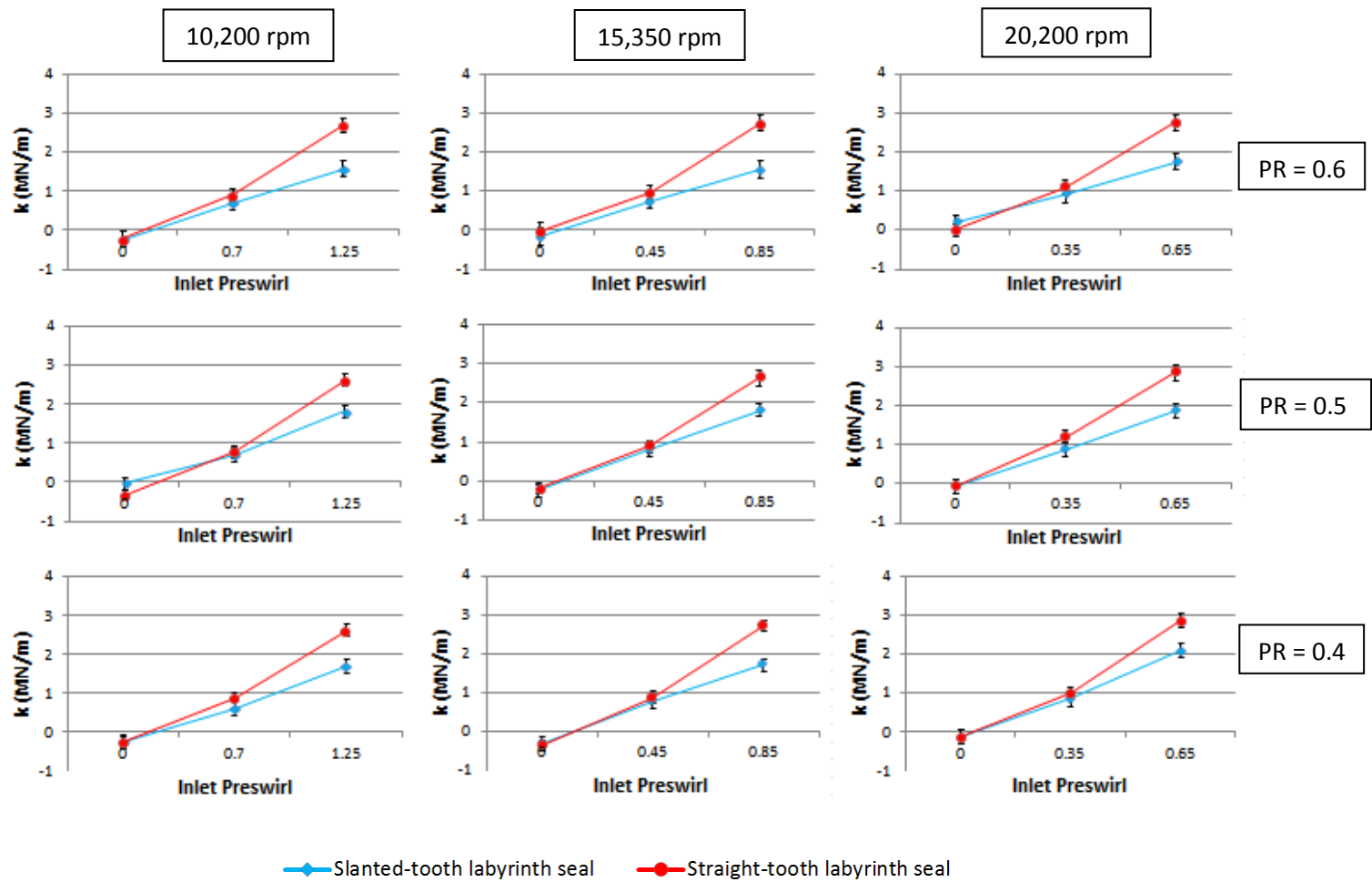


Figure 19. Cross-coupled stiffness versus inlet preswirl

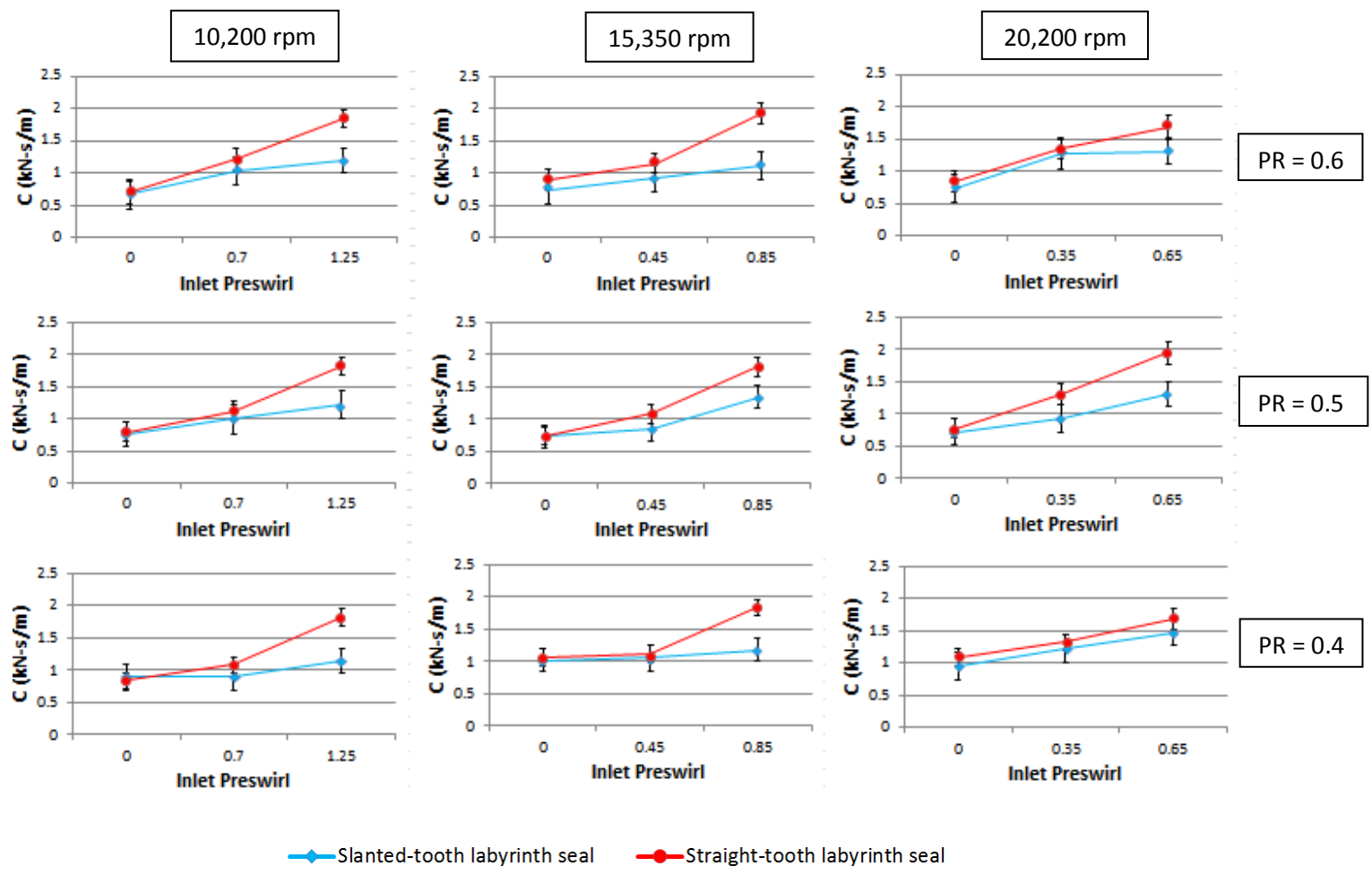


Figure 20. Direct damping versus inlet preswirl

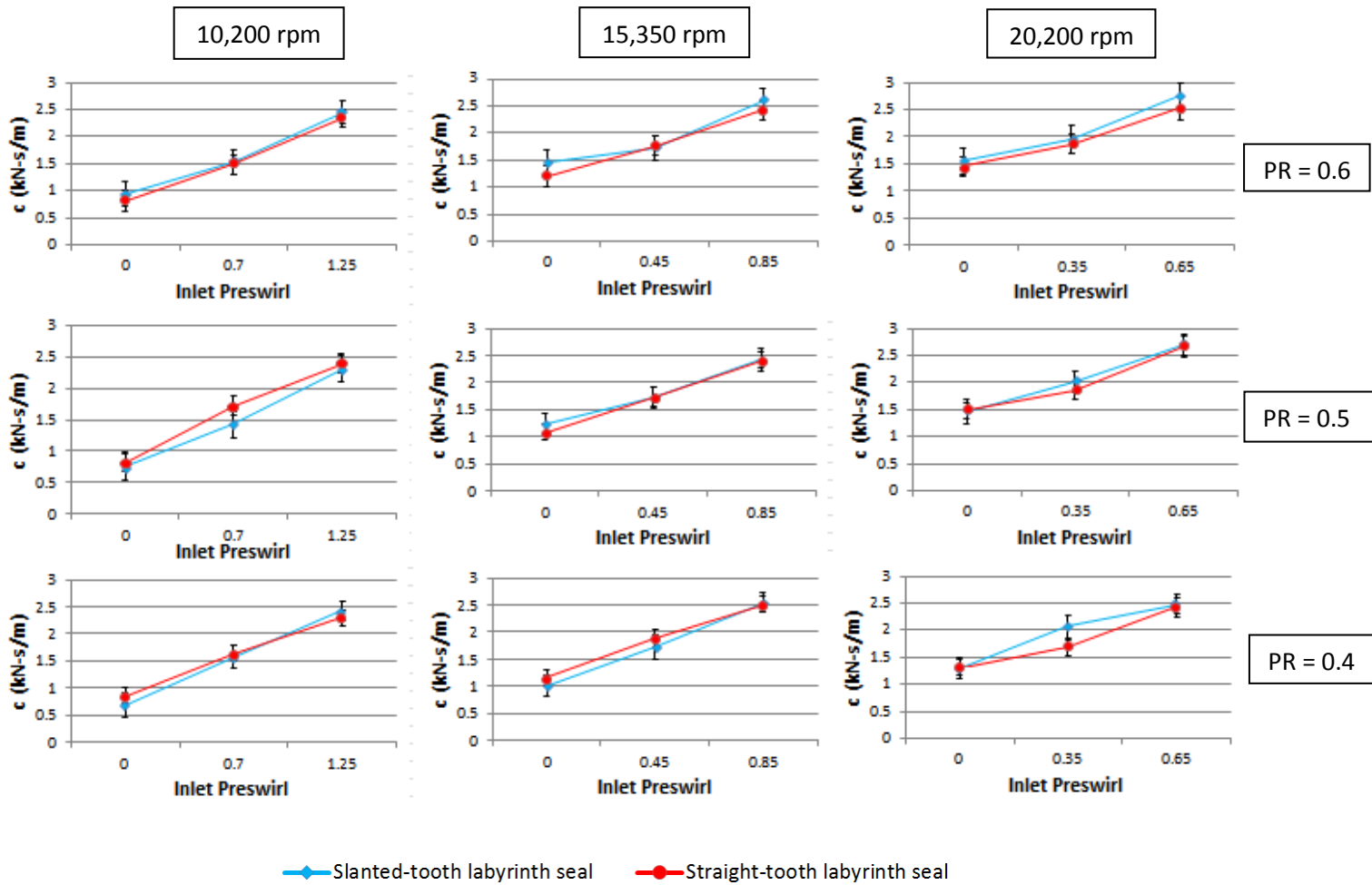


Figure 21. Cross-coupled damping versus inlet preswirl

Effective stiffness

Figure 22 shows the reaction forces developed by synchronously orbiting labyrinth seal. A is the amplitude of excitation, ω is the excitation frequency, and ωt is the precession angle.

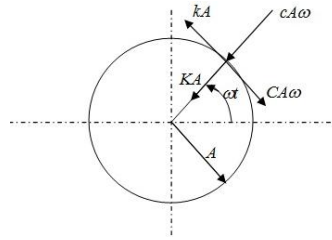


Figure 22. Reaction forces developed by an orbiting labyrinth seal

Effective stiffness can be defined from the net centering force of a system. The radial reaction force can be expressed from the above figure as

$$f_r = K_{eff} A = KA + cA\omega \quad (23)$$

Dividing Eq. (23) by A gives

$$K_{eff} = K + c\omega \quad (24)$$

where, ω is the rotor speed in rad/s.

Figure 23 compares K_{eff} measured for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to the inlet preswirl, ω , and PR. Note that K_{eff} increases almost linearly with the increase in inlet preswirl and ω . The effect of increases in PR is almost negligible. K_{eff} is negative at zero inlet preswirl, 10,200 rpm and 0.4 PR. At 10,200 rpm, zero preswirl and PRs of 0.4 and 0.5, the effective stiffness is very close to zero. The two seals follow similar trends at all the test cases, and their K_{eff} values are very similar. Note that K_{eff} is significantly greater than K which is because of the greater c values.

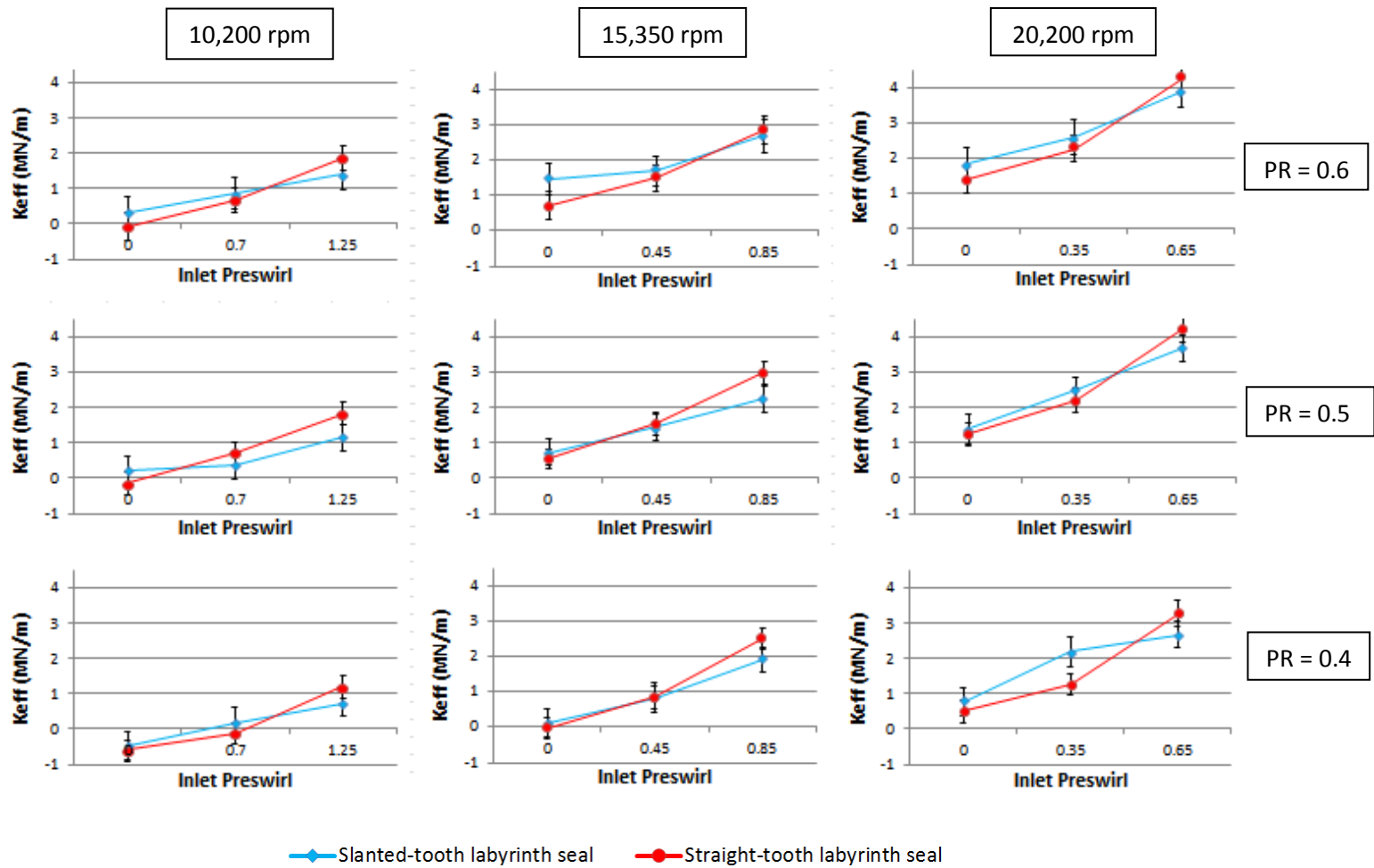


Figure 23. Effective stiffness versus inlet preswirl

Effective damping

Effective damping is important in comparing the stabilizing characteristics of annular gas seals. From Figure 22, the effective damping force is

$$f_{\theta} = C_{eff} A\omega = CA\omega - kA \quad (25)$$

Dividing Eq. (25) by $A\omega$ gives the effective damping.

$$C_{eff} = C - \frac{k}{\omega} \quad (26)$$

A high positive effective damping value is desirable to ensure a stable system. Negative C_{eff} means that k/ω (destabilizing component) is higher than C (stabilizing component) which will make the seals destabilizing.

Figure 24 compares measured C_{eff} values for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to the inlet preswirl, ω , and PR. The results show that C_{eff} decreases with increasing inlet preswirl. The trend is not clear for C_{eff} with respect to the ω , but the negative slope of C_{eff} decreases with the increase in ω , which means that the stability increases with the increasing rotor speed. Note that C_{eff} is negative at high inlet preswirl and 10,200 rpm cases. But, an inlet preswirl of 1.25 is not seen in practical applications. The results from both the test seals match very closely.

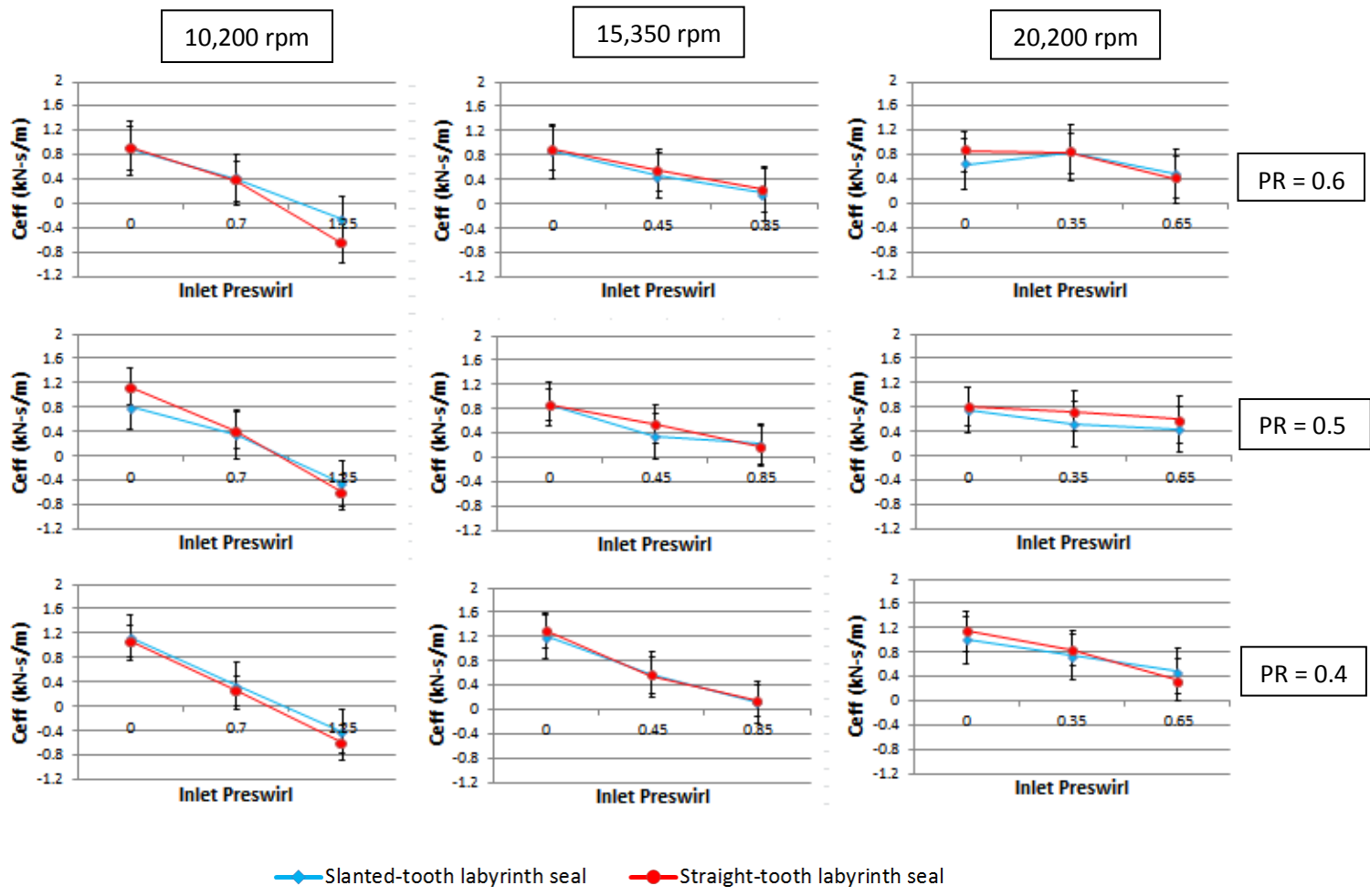


Figure 24. Effective damping versus inlet preswirl

Whirl Frequency Ratio (WFR)

WFR is calculated using

$$WFR = \frac{k}{C\omega} \quad (27)$$

where, ω is the rotor speed in rad/s, k is the cross-coupled stiffness, and C is the direct damping.

For fixed-arc journal bearings, WFR is approximately equal to 0.5, and for tilting-pad bearings it is zero. WFR is very useful in comparing the stability characteristics of hydrodynamic bearings but of little or no value for comparing annular gas seals.

On page 36, Figure 25 compares measured WFR values for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to the inlet preswirl, ω , and PR. Note that WFR is approximately equal to the inlet preswirl ratio for all cases even for these comparatively long seals. Also note that calculated values for k and C should follow this trend.

Seal leakage

On page 37, Figure 26 compares the measured leakage rates for the slanted-tooth labyrinth seal and the straight-tooth labyrinth seal with respect to inlet preswirl, ω , and PR. Note that the slanted-tooth labyrinth seal consistently leaks approximately 10% less than the straight-tooth labyrinth seal at all conditions, which confirms the experimental results of Meyer and Lowrie [2]. Also note that the leakage hardly changes as the inlet preswirl changes from zero to medium, but as the inlet preswirl increases from medium to high, the leakage decreases by almost 5%. The leakage decreases slightly as the rotor speed increases.

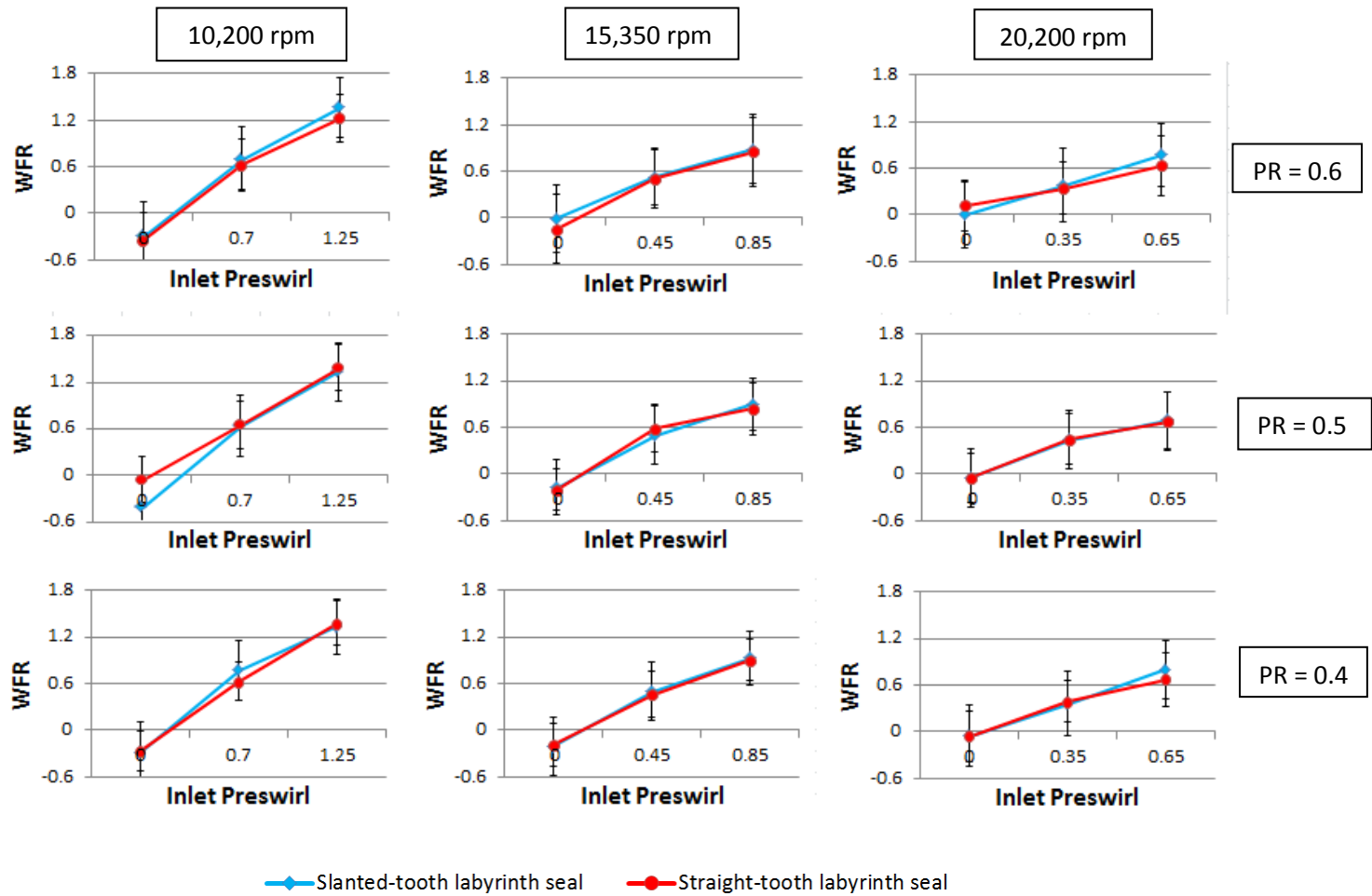


Figure 25. Whirl Frequency Ratio (WFR) versus inlet preswirl

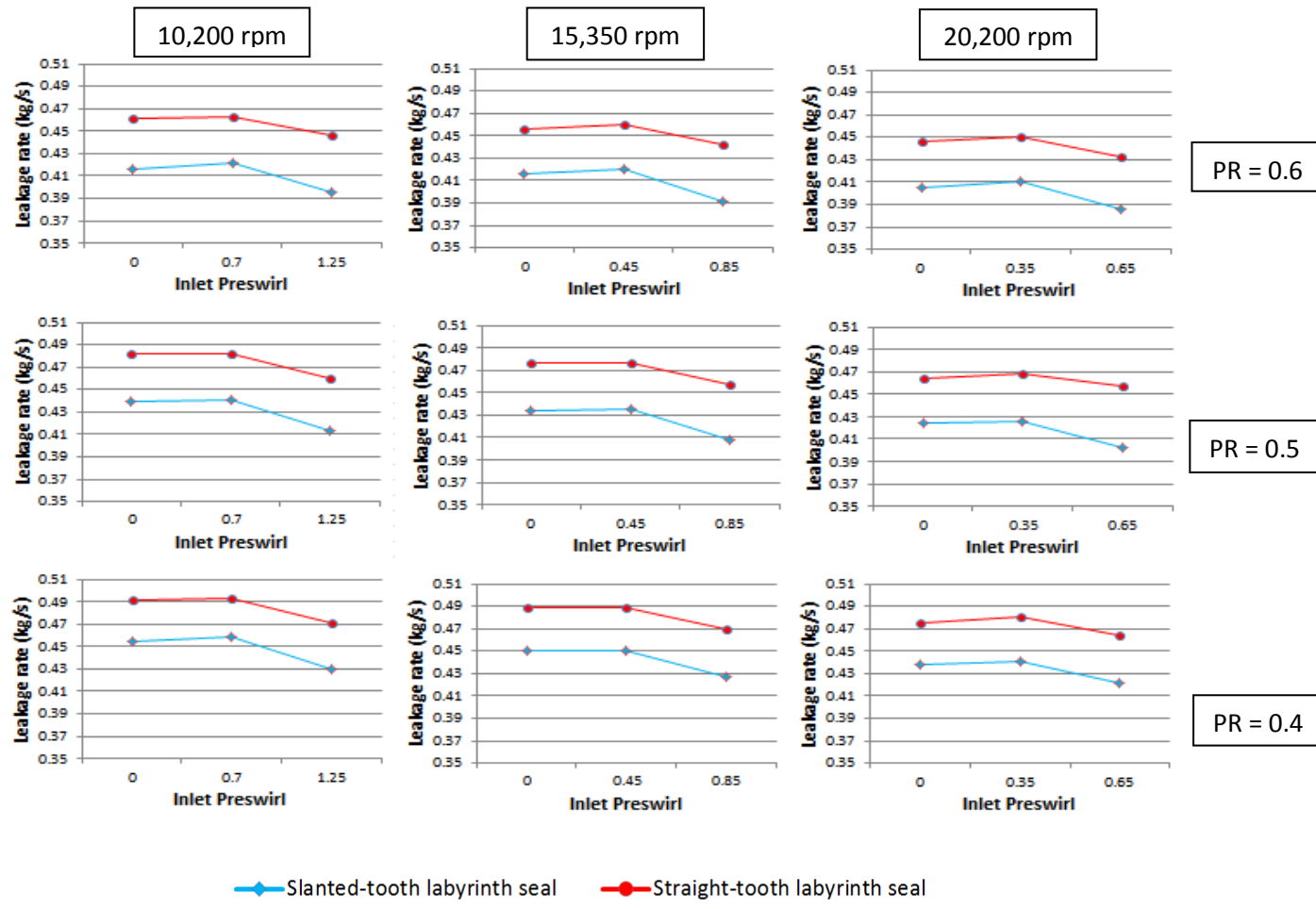


Figure 26. Seal leakage versus inlet preswirl

PREDICTION VERSUS MEASUREMENTS

The rotordynamic coefficients and the leakage rate were predicted using XLlaby based on 1CVM by Childs and Scharrer [10]. Note that XLlaby was developed for labyrinth seals with straight teeth, and not for labyrinth seals with slanted teeth, but the prediction was still carried out. Figure 27 shows the snapshot of the input data used for prediction at zero inlet preswirl and 0.5 PR conditions. The assumptions made during the prediction are: (1) The test fluid (air) is an ideal gas, (2) The temperature and viscosity of the test fluid remain constant throughout the test, and (3) The rotor test surface is smooth.

Select units	SI Units				
Select Leakage Model	Gamal Model				
Use High Mach number	<input checked="" type="checkbox"/>				
Seal Radius	57.3532	mm	Ratio of Specific Heats	1.4	--
Tooth Location	Stator	--	Gas Constant	286.9	J/kg/K
Number of Teeth	20	--	Compressibility Factor	1	--
Axial Cavity Length	4.2926	mm	Kinematic Viscosity	1.51E-05	m ² /s
Tooth Height	4.2926	mm	Reservoir Temperature	288	K
Stator Friction Constant	0.079	--	Reservoir Pressure	70	bar
Stator Friction Exponent	-0.25	--	Sump Pressure	35	bar
Rotor Friction Constant	0.079	--	Inlet Tangential Velocity Ratio	0	--
Rotor Friction Exponent	-0.25	--	Use Correction Factors?	No	--
			Whirl Speed	2000	rpm

Figure 27. Snapshot of the input data used for prediction

For the sake of simplicity, only the test cases with 0.5 pressure ratio and 20,200 rpm rotor speed are presented. Figure 28 shows the plots for prediction versus the experimental data for K , k , C , and c . XLlaby over-predicts (less negative stiffness) K and under-predicts the other three coefficients. The predictions of k , C , and c at zero inlet preswirl are adequate, but as the inlet preswirl increases, the predictions get worse.

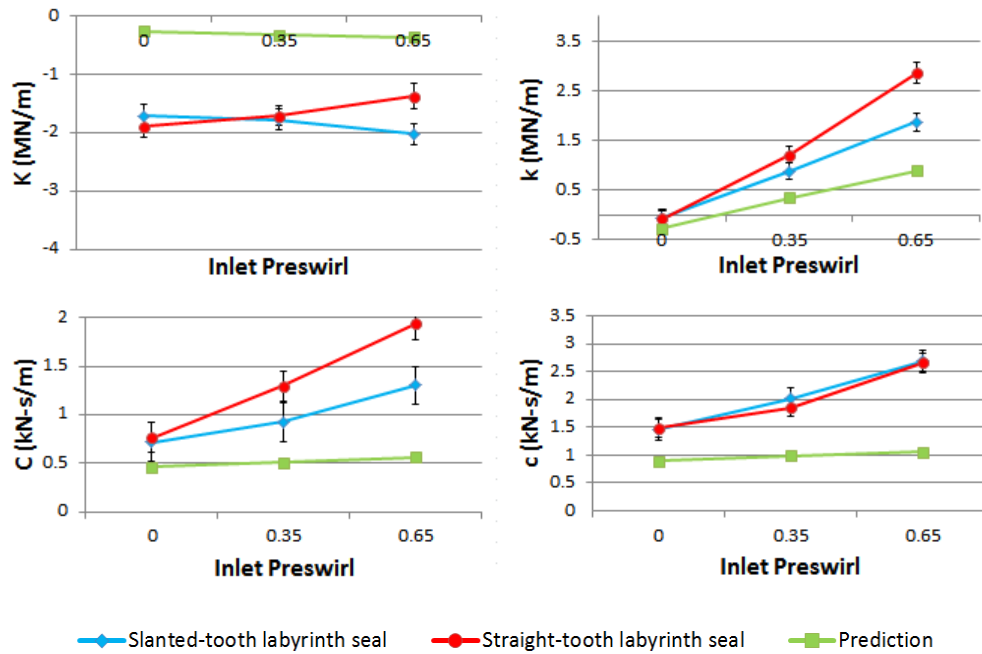


Figure 28. Prediction versus measurements of K , k , C , and c at 20,200 rpm and 0.5 PR

Figure 29 shows predictions versus measurements for K_{eff} and C_{eff} . XLlaby predicts K_{eff} fairly well at zero and medium preswirl, but under-predicts at high preswirl. For C_{eff} , XLlaby under-predicts the coefficients at all the inlet preswirls, but the predictions get worse with increasing inlet preswirl. The seals are more stabilizing (higher C_{eff}) than predicted.

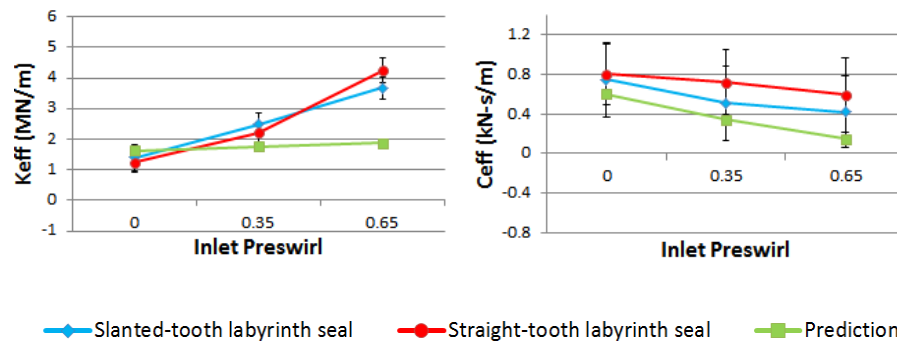


Figure 29. Prediction versus measurements for K_{eff} and C_{eff} at 20,200 rpm and 0.5 PR

Figure 30 shows predictions versus measurements for WFR. The WFR prediction gets better with increasing inlet preswirl. XLlaby under-predicts the whirl frequency ratio at zero and medium inlet preswirls.

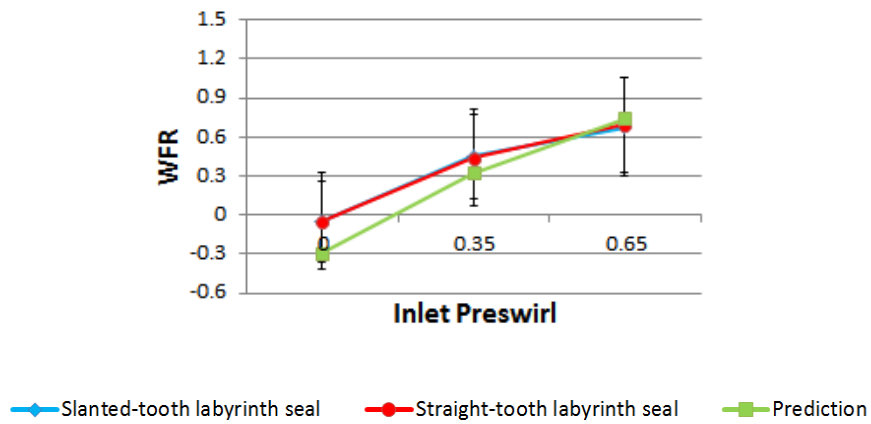


Figure 30. Prediction of whirl frequency ratio (WFR) at 20,200 rpm and 0.5 PR

Figure 31 shows the prediction of leakage rate, \dot{m} . \dot{m} is grossly under-predicted, and the code does not predict changes in the leakage rate due to changes in inlet preswirl.

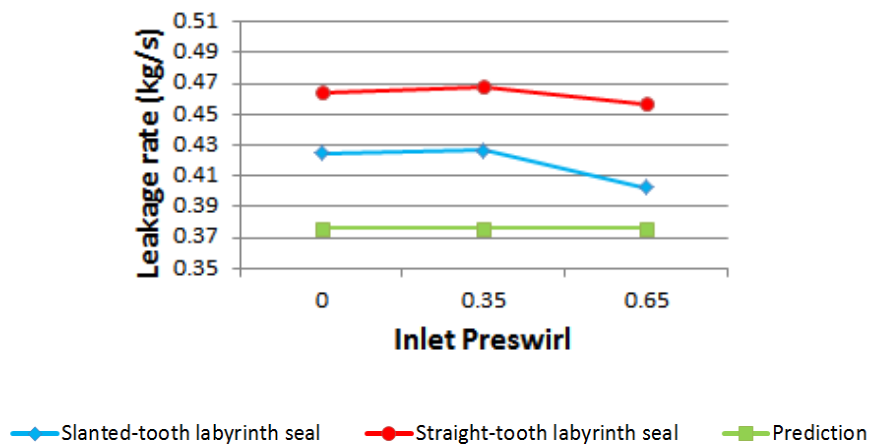


Figure 31. Prediction versus measurements of leakage rate (\dot{m}) at 20,200 rpm and 0.5 PR

SUMMARY AND CONCLUSIONS

The experimental results show that both test seals have similar direct stiffness and direct damping coefficients at zero and medium inlet preswirls, but at high inlet preswirls, the slanted-tooth labyrinth seal has higher direct stiffness and direct damping coefficients. However, the differences are not significant. The two seals have fairly similar cross-coupled stiffness, cross-coupled damping, effective stiffness, effective damping coefficients, and whirl frequency ratios at all inlet preswirls.

The slanted-tooth labyrinth seals consistently leaked approximately 10% less than the straight-tooth labyrinth seals at all the test conditions. Since the slanted-tooth labyrinth seals reduce the leakage rate by a considerable amount without compromising any rotordynamic coefficients or the effective damping, they can be a good replacement for the conventional straight-tooth labyrinth seals that are used in centrifugal compressors.

The XLlaby code used to predict the rotordynamic coefficients and the leakage rate for a 20-teeth straight labyrinth seal does not do a good job in predicting the data. XLlaby under-predicted direct stiffness, cross-coupled stiffness, direct damping, cross-coupled damping, effective stiffness, and effective damping. The predictions were marginally good at zero inlet preswirl but they became worse with the increasing inlet preswirl. The leakage rate was grossly under-predicted at all conditions.

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APPENDIX A

The measured dynamic stiffnesses are given in the following tables. The inlet preswirl ratios are mentioned as zero, medium and high. As mentioned earlier, the least values on the X-axes of all the plots shown in the results section represent zero inlet preswirl ratios, the highest values on represent high inlet preswirl ratios and the middle values represent the medium preswirl ratios. Since all the testing was done at 70 bar-a, the pressure values are not mentioned.

Table 5. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.4 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.2E+06	-2.5E+05	4.1E+05	-1.2E+06	1.0E+05	-1.8E+04	-1.3E+05	1.2E+05	-1.4E+05	-1.3E+05	-9.1E+04	-1.3E+05	-1.5E+05	-1.2E+05	-1.1E+05	-4.8E+04
2.0E+01	-1.4E+06	-1.9E+05	5.2E+05	-1.1E+06	1.0E+05	1.3E+05	-3.2E+05	-9.7E+03	-2.6E+05	-1.3E+05	-1.7E+05	-9.8E+04	-1.9E+05	-1.0E+05	-2.0E+05	-7.7E+04
2.9E+01	-1.3E+06	-3.1E+04	2.4E+05	-1.3E+06	9.7E+03	1.1E+05	-2.0E+05	2.0E+04	-6.0E+04	-1.0E+05	-1.0E+05	-1.7E+05	-7.0E+04	-1.1E+05	-7.0E+04	-1.0E+05
3.9E+01	-1.3E+06	-2.9E+05	6.9E+04	-1.2E+06	-4.6E+04	2.0E+05	-2.9E+05	1.1E+05	-2.3E+05	-8.4E+04	-1.8E+05	-6.7E+04	-2.0E+05	-1.2E+05	-1.7E+05	-1.1E+05
4.9E+01	-7.8E+05	-4.3E+05	5.5E+05	-1.2E+06	1.5E+05	1.3E+05	-4.4E+05	1.1E+05	-1.8E+05	-1.3E+05	-1.3E+05	-8.1E+04	-1.5E+05	-9.6E+04	-1.4E+05	-1.1E+05
5.9E+01	-1.7E+06	-2.0E+05	2.8E+05	-1.2E+06	3.3E+05	2.4E+05	-1.8E+05	2.2E+05	-1.1E+05	-7.9E+04	-1.5E+05	-6.9E+04	-1.6E+05	-6.3E+04	-2.5E+05	-1.2E+05
6.8E+01	-1.4E+06	-3.4E+05	4.2E+05	-1.2E+06	4.0E+05	4.4E+05	-4.0E+05	1.3E+05	-1.0E+05	-7.9E+04	-9.5E+04	-1.1E+05	-9.1E+04	-1.1E+05	-1.0E+05	-5.0E+04
7.8E+01	-1.2E+06	-2.5E+05	4.6E+05	-1.2E+06	5.4E+05	2.1E+05	-4.8E+05	3.6E+05	-2.6E+05	-7.9E+04	-1.1E+05	-9.5E+04	-1.9E+05	-7.9E+04	-3.4E+05	-8.3E+04
8.8E+01	-1.2E+06	-4.2E+05	4.7E+05	-1.3E+06	5.8E+05	3.0E+05	-4.1E+05	4.2E+05	-8.4E+04	-6.1E+04	-9.3E+04	-7.1E+04	-1.1E+05	-7.4E+04	-1.4E+05	-7.2E+04
9.8E+01	-1.2E+06	-3.9E+05	1.0E+05	-1.5E+06	1.1E+04	3.6E+05	-7.9E+05	4.1E+05	-8.0E+04	-3.5E+04	-1.1E+05	-9.5E+04	-9.1E+04	-8.4E+04	-1.3E+05	-4.2E+04
1.1E+02	-1.5E+06	-4.1E+05	5.1E+05	-1.4E+06	6.0E+05	3.9E+05	-6.5E+05	7.0E+05	-6.9E+04	-6.3E+04	-1.1E+05	-9.7E+04	-5.8E+04	-5.1E+04	-8.0E+04	-6.8E+04
1.2E+02	-1.3E+06	-3.5E+05	3.1E+05	-1.4E+06	6.2E+05	3.7E+05	-6.7E+05	6.2E+05	-6.5E+04	-6.9E+04	-5.2E+04	-7.1E+04	-6.0E+04	-6.5E+04	-8.2E+04	-6.2E+04
1.3E+02	-1.3E+06	-2.7E+05	5.0E+05	-1.7E+06	9.3E+05	5.3E+05	-7.3E+05	5.9E+05	-7.3E+04	-5.2E+04	-9.4E+04	-6.8E+04	-3.1E+04	-5.3E+04	-8.7E+04	-5.4E+04
1.4E+02	-2.3E+06	-1.0E+06	2.7E+05	-1.4E+06	3.6E+06	-2.3E+06	-4.2E+06	4.3E+06	-6.9E+04	-9.8E+04	-6.8E+04	-9.8E+04	-6.9E+04	-1.1E+05	-6.8E+04	-8.0E+04
1.5E+02	-7.6E+05	-4.4E+05	1.5E+06	-2.7E+05	3.4E+05	1.1E+06	-4.6E+05	6.0E+05	-8.0E+04	-8.5E+04	-4.1E+04	-8.2E+04	-8.1E+04	-6.1E+04	-5.5E+04	-5.7E+04
1.6E+02	-1.5E+06	1.1E+06	1.5E+06	-2.6E+06	1.4E+06	-4.1E+04	-1.6E+06	2.2E+06	-6.9E+04	-1.2E+05	-8.2E+04	-7.9E+04	-6.6E+04	-8.9E+04	-9.4E+04	-9.9E+04
1.7E+02	-3.1E+06	8.8E+05	1.5E+06	-1.6E+06	2.1E+06	-8.6E+05	-3.1E+06	4.0E+06	-3.1E+05	-2.6E+05	-4.1E+05	-2.9E+05	-3.6E+05	-2.2E+05	-4.9E+05	-3.7E+05
1.8E+02	1.6E+05	-2.1E+06	-1.6E+06	2.1E+06	1.1E+06	6.1E+05	-1.3E+06	1.4E+06	-1.6E+05	-1.8E+05	-1.0E+05	-1.6E+05	-1.9E+05	-1.5E+05	-1.5E+05	-1.2E+05
1.9E+02	-1.9E+06	1.3E+06	2.0E+06	-4.0E+06	3.8E+05	1.7E+06	-4.9E+05	-5.6E+04	-6.0E+04	-7.0E+04	-5.4E+04	-7.7E+04	-6.7E+04	-8.8E+04	-7.1E+04	-5.3E+04
2.0E+02	-4.4E+05	-2.0E+05	-2.5E+05	-9.3E+05	5.8E+05	1.1E+06	-9.0E+05	6.1E+05	-6.5E+04	-8.4E+04	-6.7E+04	-8.6E+04	-4.9E+04	-6.3E+04	-8.0E+04	-7.0E+04
2.1E+02	3.2E+05	1.3E+06	9.7E+05	4.6E+05	-1.2E+06	-7.3E+05	-2.1E+06	-3.6E+05	-8.3E+04	-7.0E+04	-7.6E+04	-8.1E+04	-6.0E+04	-7.2E+04	-6.3E+04	-5.3E+04
2.1E+02	-1.3E+06	-1.4E+06	-5.8E+05	-1.3E+06	1.1E+06	1.1E+06	-1.0E+06	9.0E+05	-2.5E+04	-6.2E+04	-2.4E+04	-7.6E+04	-2.6E+04	-7.3E+04	-3.3E+04	-7.2E+04
2.2E+02	-1.1E+06	-1.4E+06	-2.6E+05	-1.1E+06	8.8E+05	1.6E+06	-8.9E+05	8.8E+05	-4.4E+04	-6.4E+04	-5.7E+04	-8.8E+04	-4.4E+04	-5.8E+04	-5.3E+04	-8.3E+04

Table 6. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.4 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.5E+06	-5.7E+05	5.4E+05	-1.4E+06	-8.8E+04	-3.3E+02	-2.6E+04	1.8E+05	-8.2E+04	-1.3E+05	-6.3E+04	-9.8E+04	-9.7E+04	-1.2E+05	-6.5E+04	-8.2E+04
2.0E+01	-1.5E+06	-3.0E+05	6.8E+05	-1.6E+06	1.2E+05	3.2E+05	-3.2E+05	-1.3E+04	-2.3E+05	-9.2E+04	-1.9E+05	-9.1E+04	-1.7E+05	-9.2E+04	-1.7E+05	-6.3E+04
2.9E+01	-1.7E+06	-4.6E+05	4.0E+05	-1.5E+06	1.0E+05	4.0E+05	-4.2E+05	5.0E+02	-4.0E+04	-8.7E+04	-9.0E+04	-9.9E+04	-6.9E+04	-8.0E+04	-5.7E+04	-5.5E+04
3.9E+01	-1.6E+06	-2.0E+05	4.0E+05	-1.6E+06	-1.4E+05	4.4E+05	-5.4E+05	1.1E+05	-1.9E+05	-9.9E+04	-2.4E+05	-1.2E+05	-1.5E+05	-7.5E+04	-1.3E+05	-8.8E+04
4.9E+01	-1.8E+06	-1.2E+05	4.4E+05	-1.6E+06	4.0E+04	3.5E+05	-7.3E+05	2.5E+04	-1.6E+05	-9.8E+04	-1.7E+05	-8.4E+04	-2.1E+05	-7.1E+04	-1.9E+05	-8.5E+04
5.9E+01	-1.8E+06	-2.9E+05	9.3E+04	-1.6E+06	1.8E+05	3.3E+05	-5.3E+05	8.8E+04	-1.6E+05	-9.1E+04	-9.1E+04	-1.2E+05	-1.3E+05	-8.4E+04	-2.2E+05	-9.4E+04
6.8E+01	-1.7E+06	-2.0E+05	2.7E+05	-1.6E+06	3.0E+05	5.6E+05	-7.2E+05	-6.8E+03	-8.9E+04	-6.0E+04	-8.0E+04	-9.3E+04	-7.9E+04	-5.4E+04	-6.1E+04	-6.7E+04
7.8E+01	-1.7E+06	-2.7E+05	5.5E+05	-1.8E+06	3.9E+05	4.9E+05	-6.7E+05	2.4E+05	-1.3E+05	-4.9E+04	-1.5E+05	-8.0E+04	-2.1E+05	-8.9E+04	-1.5E+05	-7.2E+04
8.8E+01	-1.6E+06	-3.9E+05	4.4E+05	-1.9E+06	4.5E+05	4.1E+05	-8.8E+05	3.8E+05	-7.6E+04	-6.7E+04	-6.0E+04	-7.3E+04	-8.0E+04	-5.7E+04	-1.1E+05	-6.0E+04
9.8E+01	-1.8E+06	-4.4E+05	1.8E+05	-2.0E+06	1.4E+05	3.8E+05	-1.1E+06	4.5E+05	-7.6E+04	-6.0E+04	-8.4E+04	-5.9E+04	-1.1E+05	-5.3E+04	-1.3E+05	-4.5E+04
1.1E+02	-2.2E+06	-4.8E+05	3.1E+05	-1.8E+06	5.4E+05	5.7E+05	-1.0E+06	7.1E+05	-6.4E+04	-7.9E+04	-4.7E+04	-6.7E+04	-7.5E+04	-8.0E+04	-7.9E+04	-5.4E+04
1.2E+02	-1.8E+06	-4.2E+05	2.3E+05	-1.9E+06	5.7E+05	8.3E+05	-1.1E+06	6.4E+05	-6.6E+04	-5.7E+04	-5.6E+04	-7.4E+04	-6.1E+04	-6.5E+04	-5.6E+04	-5.2E+04
1.3E+02	-1.9E+06	-3.6E+05	4.6E+05	-2.2E+06	1.2E+06	7.9E+05	-1.2E+06	6.6E+05	-4.0E+04	-7.4E+04	-4.7E+04	-7.9E+04	-7.8E+04	-6.0E+04	-5.8E+04	-5.7E+04
1.4E+02	-2.4E+06	-1.6E+06	-2.0E+04	-1.3E+06	3.7E+06	-1.8E+06	-4.6E+06	4.2E+06	-1.0E+05	-8.9E+04	-1.2E+05	-1.6E+05	-7.0E+04	-1.0E+05	-6.8E+04	-1.2E+05
1.5E+02	-1.1E+06	-5.3E+05	1.3E+06	-5.0E+05	3.5E+05	1.7E+06	-8.7E+05	5.7E+05	-4.7E+04	-5.1E+04	-3.3E+04	-6.3E+04	-3.9E+04	-6.4E+04	-4.8E+04	-4.6E+04
1.6E+02	-1.9E+06	1.1E+06	1.4E+06	-3.1E+06	1.2E+06	6.5E+05	-1.9E+06	2.0E+06	-4.2E+04	-9.0E+04	-6.3E+04	-8.0E+04	-4.0E+04	-6.8E+04	-7.0E+04	-6.0E+04
1.7E+02	-4.1E+06	2.6E+06	2.3E+06	-4.2E+06	9.2E+04	-2.3E+06	3.4E+06	-1.0E+05	-6.3E+04	-9.2E+04	-1.3E+05	-9.0E+04	-9.1E+04	-1.0E+05	-8.9E+04	-9.8E+04
1.8E+02	1.4E+05	-2.6E+06	-2.1E+06	2.4E+06	1.5E+06	1.4E+06	-2.4E+06	1.1E+06	-6.4E+04	-4.4E+04	-5.0E+04	-9.0E+04	-5.0E+04	-7.3E+04	-6.4E+04	-6.0E+04
1.9E+02	-2.3E+06	1.3E+06	1.8E+06	-4.3E+06	5.5E+05	2.4E+06	-1.2E+06	-2.9E+05	-4.5E+04	-5.8E+04	-4.3E+04	-6.2E+04	-5.6E+04	-6.3E+04	-5.5E+04	-4.9E+04
2.0E+02	-9.4E+05	3.0E+04	-4.0E+05	-1.3E+06	7.8E+05	1.7E+06	-1.6E+06	6.2E+05	-5.8E+04	-8.4E+04	-4.0E+04	-6.1E+04	-7.0E+04	-9.2E+04	-5.3E+04	-4.5E+04
2.1E+02	-2.3E+05	1.4E+06	8.1E+05	-1.4E+04	-9.4E+05	-6.2E+04	-2.9E+06	-4.2E+05	-7.8E+04	-7.6E+04	-7.5E+04	-7.8E+04	-4.8E+04	-5.7E+04	-6.2E+04	-5.2E+04
2.1E+02	-1.9E+06	-1.3E+06	-8.1E+05	-2.0E+06	1.3E+06	1.8E+06	-1.7E+06	1.0E+06	-4.2E+04	-5.0E+04	-3.2E+04	-1.0E+05	-4.4E+04	-9.3E+04	-6.4E+04	-7.3E+04
2.2E+02	-1.7E+06	-1.3E+06	-4.8E+05	-1.6E+06	1.0E+06	2.3E+06	-1.6E+06	9.3E+05	-4.9E+04	-5.5E+04	-3.0E+04	-7.9E+04	-5.2E+04	-1.0E+05	-3.9E+04	-6.5E+04

Table 7. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.4 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	-5.5E+04	3.5E+05	-1.7E+06	1.2E+05	3.8E+04	-2.2E+05	-2.6E+04	-1.1E+05	-1.7E+05	-6.1E+04	-1.2E+05	-9.7E+04	-1.2E+05	-6.4E+04	-7.6E+04
2.0E+01	-1.9E+06	-1.1E+05	6.3E+05	-1.8E+06	-6.2E+03	2.7E+05	-2.3E+05	-1.2E+05	-1.4E+05	-1.0E+05	-1.0E+05	-1.0E+05	-2.5E+05	-7.8E+04	-1.4E+05	-6.0E+04
2.9E+01	-2.0E+06	6.3E+03	7.8E+04	-1.7E+06	7.7E+04	2.3E+05	-4.7E+05	1.5E+04	-5.9E+04	-1.4E+05	-7.4E+04	-1.0E+05	-1.1E+05	-8.9E+04	-3.4E+04	-8.9E+04
3.9E+01	-2.1E+06	-8.9E+04	1.7E+05	-1.9E+06	-5.4E+04	5.2E+05	-5.4E+05	-6.7E+04	-2.1E+05	-9.4E+04	-1.4E+05	-8.9E+04	-1.7E+05	-9.9E+04	-7.2E+04	-6.8E+04
4.9E+01	-2.0E+06	8.6E+04	2.5E+04	-2.0E+06	4.1E+05	3.6E+05	-3.2E+05	-3.6E+04	-8.3E+05	-3.0E+05	-2.4E+05	-1.2E+05	-9.2E+05	-3.5E+05	-3.8E+05	-8.3E+04
5.9E+01	-2.1E+06	1.6E+03	-2.2E+04	-1.9E+06	1.6E+05	6.6E+05	-9.7E+05	-6.9E+03	-1.2E+05	-8.7E+04	-1.5E+05	-7.2E+04	-1.6E+05	-6.8E+04	-1.8E+05	-7.1E+04
6.8E+01	-2.3E+06	3.5E+04	8.4E+04	-2.1E+06	1.5E+05	6.8E+05	-8.3E+05	-1.2E+05	-7.6E+04	-5.3E+04	-1.0E+05	-6.0E+04	-4.2E+04	-8.8E+04	-6.7E+04	-6.3E+04
7.8E+01	-2.1E+06	6.0E+04	1.8E+05	-2.2E+06	2.0E+05	6.8E+05	-8.8E+05	1.1E+05	-1.5E+05	-5.6E+04	-8.2E+04	-8.1E+04	-1.2E+05	-6.3E+04	-2.0E+05	-6.4E+04
8.8E+01	-2.2E+06	2.2E+03	-4.1E+04	-2.4E+06	4.1E+05	5.9E+05	-9.7E+05	2.8E+05	-6.6E+04	-5.2E+04	-6.8E+04	-6.6E+04	-8.3E+04	-5.5E+04	-8.8E+04	-4.9E+04
9.8E+01	-2.3E+06	-3.5E+04	-1.6E+05	-2.5E+06	9.9E+04	6.2E+05	-1.2E+06	3.4E+05	-2.4E+05	-1.6E+05	-7.4E+04	-8.2E+04	-1.9E+05	-1.3E+05	-1.1E+05	-6.7E+04
1.1E+02	-2.7E+06	-1.0E+05	1.8E+05	-2.5E+06	5.0E+05	6.2E+05	-1.1E+06	5.8E+05	-7.2E+04	-5.0E+04	-7.2E+04	-7.7E+04	-5.4E+04	-5.9E+04	-7.3E+04	-5.8E+04
1.2E+02	-2.5E+06	-1.5E+05	1.1E+05	-2.5E+06	5.4E+05	8.5E+05	-1.1E+06	7.0E+05	-7.1E+04	-4.7E+04	-4.5E+04	-7.2E+04	-5.5E+04	-6.9E+04	-5.3E+04	-5.0E+04
1.3E+02	-2.3E+06	-4.8E+04	2.0E+05	-2.7E+06	1.1E+06	1.0E+06	-1.4E+06	8.2E+05	-5.7E+04	-4.6E+04	-5.2E+04	-7.5E+04	-6.3E+04	-5.5E+04	-9.2E+04	-5.3E+04
1.4E+02	-1.5E+06	-2.5E+06	-1.8E+06	-6.8E+05	4.1E+06	-1.5E+06	-5.0E+06	4.1E+06	-1.4E+05	-1.0E+05	-1.4E+05	-1.4E+05	-8.0E+04	-1.2E+05	-7.9E+04	-1.4E+05
1.5E+02	-1.5E+06	-2.6E+05	1.3E+06	-1.1E+06	4.7E+05	2.0E+06	-1.2E+06	7.1E+05	-4.3E+04	-8.5E+04	-5.4E+04	-8.2E+04	-5.6E+04	-6.9E+04	-7.0E+04	-6.9E+04
1.6E+02	-2.3E+06	1.0E+06	1.2E+06	-3.4E+06	1.6E+06	5.0E+05	-2.7E+06	2.5E+06	-5.7E+04	-6.4E+04	-4.4E+04	-7.2E+04	-4.7E+04	-6.6E+04	-7.1E+04	-8.5E+04
1.7E+02	-4.7E+06	2.8E+06	2.3E+06	-4.8E+06	1.5E+06	-1.6E+05	-3.0E+06	4.1E+06	-8.1E+04	-8.0E+04	-1.0E+05	-1.2E+05	-6.5E+04	-9.3E+04	-9.0E+04	-7.6E+04
1.8E+02	-5.0E+05	-2.2E+06	-2.1E+06	1.8E+06	1.5E+06	1.8E+06	-2.7E+06	1.2E+06	-5.4E+04	-6.8E+04	-4.8E+04	-7.0E+04	-7.3E+04	-6.2E+04	-4.9E+04	-6.0E+04
1.9E+02	-2.9E+06	1.5E+06	1.6E+06	-4.8E+06	6.1E+05	2.8E+06	-1.7E+06	-1.4E+04	-3.6E+04	-5.3E+04	-4.6E+04	-6.5E+04	-4.8E+04	-5.8E+04	-5.3E+04	-4.5E+04
2.0E+02	-1.5E+06	1.8E+05	-4.9E+05	-1.8E+06	1.0E+06	2.3E+06	-2.0E+06	8.0E+05	-6.9E+04	-6.2E+04	-4.8E+04	-7.7E+04	-5.8E+04	-6.7E+04	-7.4E+04	-8.0E+04
2.1E+02	-7.2E+05	1.6E+06	5.7E+05	-5.8E+05	-8.3E+05	3.3E+05	-3.5E+06	-2.0E+05	-6.1E+04	-5.8E+04	-4.4E+04	-6.8E+04	-4.7E+04	-7.3E+04	-4.0E+04	-3.7E+04
2.1E+02	-2.4E+06	-1.2E+06	-9.2E+05	-2.4E+06	1.2E+06	2.2E+06	-2.3E+06	1.1E+06	-3.3E+04	-4.6E+04	-2.8E+04	-7.1E+04	-3.4E+04	-6.3E+04	-5.1E+04	-7.6E+04
2.2E+02	-2.3E+06	-1.1E+06	-6.7E+05	-2.2E+06	1.1E+06	2.8E+06	-2.3E+06	1.1E+06	-3.9E+04	-4.4E+04	-3.2E+04	-8.3E+04	-4.1E+04	-7.0E+04	-4.3E+04	-7.2E+04

Table 8. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-5.7E+05	-4.4E+05	2.5E+05	-5.3E+05	9.9E+04	1.3E+05	-5.4E+04	-6.4E+04	-6.6E+04	-8.8E+04	-9.3E+04	-5.2E+04	-8.3E+04	-1.1E+05	-6.6E+04	-9.1E+04
2.0E+01	-8.2E+05	-3.3E+05	6.5E+05	-8.4E+05	3.1E+05	1.6E+05	-4.0E+05	2.4E+04	-2.8E+05	-7.7E+04	-1.6E+05	-8.4E+04	-2.2E+05	-1.4E+05	-2.1E+05	-1.1E+05
2.9E+01	-7.9E+05	-2.1E+05	1.9E+05	-1.0E+06	8.4E+04	2.3E+05	-4.0E+05	-1.5E+05	-9.6E+04	-7.7E+04	-9.2E+04	-8.0E+04	-1.2E+05	-7.9E+04	-7.0E+04	-1.1E+05
3.9E+01	-8.5E+05	-4.9E+04	2.9E+05	-9.9E+05	-7.6E+03	2.5E+05	-2.2E+05	-9.2E+02	-1.8E+05	-6.2E+04	-1.5E+05	-8.9E+04	-1.8E+05	-8.5E+04	-1.8E+05	-1.1E+05
4.9E+01	-9.9E+05	-1.5E+05	4.1E+05	-1.0E+06	7.5E+04	1.9E+05	-3.0E+05	1.5E+04	-2.1E+05	-1.1E+05	-3.7E+05	-7.7E+04	-1.6E+05	-1.5E+05	-2.4E+05	-9.9E+04
5.9E+01	-9.0E+05	-2.4E+05	-5.4E+04	-1.0E+06	1.5E+05	3.3E+05	-4.9E+05	2.0E+05	-2.2E+05	-4.3E+04	-2.2E+05	-9.4E+04	-2.4E+05	-9.2E+04	-2.5E+05	-1.2E+05
6.8E+01	-9.6E+05	-2.6E+05	2.4E+05	-8.6E+05	3.5E+05	3.7E+05	-3.9E+05	1.4E+05	-1.4E+05	-6.0E+04	-1.2E+05	-6.7E+04	-1.3E+05	-8.1E+04	-1.4E+05	-6.7E+04
7.8E+01	-6.9E+05	-1.4E+05	5.1E+05	-1.2E+06	2.2E+05	2.2E+05	-4.8E+05	2.9E+05	-2.9E+05	-8.6E+04	-1.9E+05	-7.8E+04	-2.0E+05	-5.5E+04	-1.8E+05	-8.6E+04
8.8E+01	-8.4E+05	-2.6E+05	1.6E+05	-1.2E+06	3.5E+05	3.3E+05	-5.2E+05	2.8E+05	-1.1E+05	-5.8E+04	-1.0E+05	-7.3E+04	-1.2E+05	-4.9E+04	-1.3E+05	-8.7E+04
9.8E+01	-9.4E+05	-4.0E+05	1.8E+03	-1.3E+06	1.6E+05	3.8E+05	-7.7E+05	2.6E+05	-1.1E+05	-8.2E+04	-1.0E+05	-4.7E+04	-9.0E+04	-7.0E+04	-6.6E+04	-6.7E+04
1.1E+02	-1.5E+06	-3.3E+05	3.4E+05	-1.3E+06	4.9E+05	3.3E+05	-5.7E+05	5.6E+05	-1.0E+05	-7.0E+04	-9.4E+04	-5.7E+04	-8.8E+04	-6.4E+04	-8.8E+04	-7.7E+04
1.2E+02	-1.1E+06	-2.7E+05	2.4E+05	-1.3E+06	5.5E+05	5.0E+05	-6.0E+05	5.4E+05	-8.3E+04	-4.4E+04	-7.7E+04	-5.6E+04	-3.5E+04	-5.7E+04	-7.3E+04	-5.8E+04
1.3E+02	-1.0E+06	-1.2E+05	3.5E+05	-1.6E+06	9.9E+05	5.9E+05	-7.5E+05	5.4E+05	-7.9E+04	-6.3E+04	-8.8E+04	-6.0E+04	-1.0E+05	-7.1E+04	-6.1E+04	-7.0E+04
1.4E+02	1.3E+05	-2.4E+06	-2.2E+06	5.5E+05	3.6E+06	-2.0E+06	-4.3E+06	3.9E+06	-1.2E+05	-6.7E+04	-1.9E+05	-8.7E+04	-1.8E+05	-1.4E+05	-1.6E+05	-1.6E+05
1.5E+02	-5.4E+05	-2.5E+05	1.4E+06	-8.7E+04	1.6E+05	1.3E+06	-5.1E+05	4.6E+05	-4.6E+04	-5.0E+04	-3.4E+04	-3.9E+04	-7.6E+04	-4.7E+04	-5.1E+04	-5.4E+04
1.6E+02	-1.3E+06	1.0E+06	1.6E+06	-2.5E+06	1.2E+06	-1.4E+05	-1.7E+06	2.3E+06	-4.2E+04	-3.0E+04	-4.0E+04	-4.4E+04	-4.3E+04	-6.2E+04	-6.3E+04	-9.8E+04
1.7E+02	-3.4E+06	1.6E+06	2.1E+06	-2.0E+06	2.3E+06	-1.3E+06	-3.5E+06	4.5E+06	-1.1E+05	-8.0E+04	-1.2E+05	-8.8E+04	-1.9E+05	-1.0E+05	-1.1E+05	-8.1E+04
1.8E+02	4.9E+05	-2.0E+06	-1.6E+06	2.3E+06	1.0E+06	8.1E+05	-1.1E+06	1.2E+06	-4.8E+04	-6.4E+04	-5.0E+04	-7.9E+04	-5.9E+04	-5.7E+04	-7.7E+04	-6.9E+04
1.9E+02	-1.7E+06	1.7E+06	2.0E+06	-4.1E+06	7.4E+03	1.9E+06	-1.1E+04	-2.2E+05	-7.3E+04	-5.2E+04	-7.6E+04	-5.7E+04	-5.5E+04	-5.3E+04	-5.3E+04	-6.1E+04
2.0E+02	-1.7E+05	6.8E+04	-2.0E+05	-7.2E+05	6.4E+05	1.2E+06	-8.6E+05	8.0E+05	-4.1E+04	-6.2E+04	-5.8E+04	-6.6E+04	-8.6E+04	-7.4E+04	-4.6E+04	-5.7E+04
2.1E+02	5.0E+05	1.5E+06	1.1E+06	6.5E+05	-1.2E+06	-6.6E+05	-2.1E+06	-3.9E+05	-8.4E+04	-5.1E+04	-5.8E+04	-4.4E+04	-8.5E+04	-5.2E+04	-5.1E+04	-6.2E+04
2.1E+02	-1.2E+06	-1.4E+06	-4.6E+05	-1.1E+06	1.0E+06	1.3E+06	-1.1E+06	8.5E+05	-3.2E+04	-3.8E+04	-2.3E+04	-3.5E+04	-3.2E+04	-3.8E+04	-2.2E+04	-5.0E+04
2.2E+02	-9.1E+05	-1.1E+06	-3.1E+05	-9.4E+05	8.0E+05	1.6E+06	-9.3E+05	7.2E+05	-3.7E+04	-5.6E+04	-3.7E+04	-6.7E+04	-4.3E+04	-6.3E+04	-3.8E+04	-5.6E+04

Table 9. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.5 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.2E+06	-5.4E+05	2.5E+05	-1.1E+06	4.2E+04	2.3E+05	-4.3E+04	-1.6E+05	-6.6E+04	-1.3E+05	-8.5E+04	-5.9E+04	-7.2E+04	-9.9E+04	-7.7E+04	-7.1E+04
2.0E+01	-1.3E+06	-3.0E+05	5.3E+05	-1.6E+06	2.6E+05	1.0E+05	-3.5E+05	-9.2E+04	-1.9E+05	-7.5E+04	-1.5E+05	-4.8E+04	-1.8E+05	-6.2E+04	-1.9E+05	-6.5E+04
2.9E+01	-1.3E+06	-4.2E+05	2.6E+05	-1.5E+06	3.3E+04	5.6E+05	-3.9E+05	-7.2E+04	-1.1E+05	-1.1E+05	-1.1E+05	-5.1E+04	-9.1E+04	-1.1E+05	-4.8E+04	-8.2E+04
3.9E+01	-1.2E+06	-9.3E+04	3.0E+05	-1.5E+06	7.2E+04	3.8E+05	-4.0E+05	4.7E+04	-2.0E+05	-7.8E+04	-1.5E+05	-9.7E+04	-1.7E+05	-8.1E+04	-2.1E+05	-8.9E+04
4.9E+01	-1.3E+06	-2.4E+05	4.6E+05	-1.6E+06	1.3E+05	4.9E+05	-6.0E+05	5.3E+04	-1.8E+05	-5.1E+04	-2.0E+05	-6.3E+04	-9.8E+04	-8.3E+04	-1.9E+05	-8.2E+04
5.9E+01	-1.3E+06	-1.2E+05	-4.0E+05	-1.6E+06	3.2E+05	4.4E+05	-4.1E+05	1.6E+05	-1.9E+05	-5.1E+04	-2.3E+05	-7.4E+04	-1.6E+05	-5.1E+04	-1.6E+05	-6.8E+04
6.8E+01	-1.5E+06	-8.9E+04	2.0E+05	-1.5E+06	3.2E+05	7.0E+05	-6.3E+05	1.1E+05	-8.6E+04	-5.0E+04	-9.6E+04	-6.5E+04	-6.4E+04	-4.0E+04	-1.1E+05	-1.0E+05
7.8E+01	-1.1E+06	-1.3E+05	5.8E+05	-1.8E+06	4.3E+05	4.3E+05	-8.0E+05	3.2E+05	-9.3E+04	-7.9E+04	-1.2E+05	-5.4E+04	-1.6E+05	-5.6E+04	-1.7E+05	-8.5E+04
8.8E+01	-1.5E+06	-1.9E+05	9.1E+04	-1.8E+06	2.8E+05	5.1E+05	-7.2E+05	3.3E+05	-1.1E+05	-6.7E+04	-1.1E+05	-4.2E+04	-1.6E+05	-7.4E+04	-1.1E+05	-7.2E+04
9.8E+01	-1.5E+06	-3.4E+05	-3.6E+04	-1.8E+06	2.3E+05	5.9E+05	-1.1E+06	4.3E+05	-1.0E+05	-8.5E+04	-1.1E+05	-5.2E+04	-8.3E+04	-4.4E+04	-1.3E+05	-7.2E+04
1.1E+02	-1.8E+06	-2.1E+05	4.0E+05	-1.7E+06	5.7E+05	6.3E+05	-8.4E+05	6.8E+05	-1.1E+05	-5.4E+04	-7.9E+04	-4.9E+04	-6.0E+04	-5.5E+04	-6.6E+04	-7.1E+04
1.2E+02	-1.6E+06	-1.7E+05	1.5E+05	-1.8E+06	5.4E+05	8.2E+05	-1.1E+06	6.6E+05	-4.2E+04	-4.2E+04	-6.7E+04	-6.9E+04	-2.3E+04	-4.7E+04	-4.6E+04	-6.7E+04
1.3E+02	-1.4E+06	-9.2E+04	3.4E+05	-2.1E+06	8.9E+05	9.6E+05	-1.1E+06	6.9E+05	-7.2E+04	-3.9E+04	-9.6E+04	-5.8E+04	-9.0E+04	-5.9E+04	-7.5E+04	-5.6E+04
1.4E+02	3.2E+05	-2.8E+06	-3.0E+06	4.3E+05	1.7E+06	2.7E+05	-2.2E+06	1.6E+06	-6.9E+04	-8.5E+04	-8.2E+04	-1.1E+05	-7.7E+04	-7.0E+04	-9.6E+04	-1.0E+05
1.5E+02	-7.4E+05	-2.9E+05	9.7E+05	-5.2E+05	3.2E+05	1.7E+06	-7.5E+05	4.6E+05	-4.6E+04	-5.4E+04	-7.4E+04	-4.3E+04	-1.9E+04	-4.3E+04	-4.1E+04	-5.9E+04
1.6E+02	-1.7E+06	8.6E+05	1.3E+06	-2.6E+06	1.6E+06	-3.5E+04	-2.6E+06	2.8E+06	-5.2E+04	-5.3E+04	-7.6E+04	-1.1E+05	-5.9E+04	-8.3E+04	-4.4E+04	-7.4E+04
1.7E+02	-4.3E+06	2.9E+06	2.7E+06	-4.3E+06	1.2E+06	-2.6E+05	-2.5E+06	3.9E+06	-6.7E+04	-5.2E+04	-1.1E+05	-9.3E+04	-8.5E+04	-5.3E+04	-6.3E+04	-9.8E+04
1.8E+02	2.3E+05	-2.3E+06	-2.0E+06	2.3E+06	1.3E+06	1.4E+06	-2.0E+06	1.1E+06	-3.7E+04	-4.8E+04	-5.7E+04	-4.8E+04	-3.8E+04	-4.3E+04	-4.2E+04	-7.2E+04
1.9E+02	-2.1E+06	1.7E+06	1.7E+06	-4.5E+06	1.7E+05	2.6E+06	-7.5E+05	-4.4E+05	-8.7E+04	-4.3E+04	-7.0E+04	-4.1E+04	-5.1E+04	-7.2E+04	-4.7E+04	-6.3E+04
2.0E+02	-7.6E+05	1.5E+05	-3.5E+05	-1.2E+06	8.0E+05	1.9E+06	-1.5E+06	8.4E+05	-3.9E+04	-5.5E+04	-5.8E+04	-5.2E+04	-6.3E+04	-1.0E+05	-4.1E+04	-6.4E+04
2.1E+02	-3.7E+04	1.6E+06	7.7E+05	9.7E+04	-8.6E+05	1.0E+05	-2.9E+06	-3.8E+05	-6.9E+04	-6.0E+04	-6.4E+04	-4.5E+04	-6.0E+04	-8.2E+04	-7.1E+04	-7.4E+04
2.1E+02	-1.7E+06	-1.1E+06	-6.4E+05	-1.7E+06	8.2E+05	1.9E+06	-1.5E+06	9.6E+05	-3.7E+04	-3.3E+04	-3.1E+04	-3.8E+04	-3.9E+04	-5.9E+04	-4.0E+04	-8.9E+04
2.2E+02	-1.5E+06	-9.6E+05	-5.4E+05	-1.5E+06	9.9E+05	2.5E+06	-1.6E+06	8.9E+05	-4.8E+04	-7.6E+04	-3.6E+04	-5.7E+04	-4.5E+04	-1.0E+05	-4.2E+04	-8.2E+04

Table 10. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.5 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.7E+06	-1.0E+05	7.6E+04	-1.7E+06	-9.6E+04	1.3E+05	-2.4E+04	-9.3E+04	-6.3E+04	-1.2E+05	-1.0E+05	-8.9E+04	-8.0E+04	-1.0E+05	-8.1E+04	-7.6E+04
2.0E+01	-1.8E+06	-7.3E+04	2.9E+05	-1.8E+06	3.1E+05	1.5E+05	-4.2E+05	-2.0E+05	-1.8E+05	-3.7E+04	-1.1E+05	-1.0E+05	-1.7E+05	-4.3E+04	-2.2E+05	-1.0E+05
2.9E+01	-1.9E+06	-1.9E+04	9.3E+04	-1.8E+06	1.7E+05	3.7E+05	-3.0E+05	-2.8E+05	-1.2E+05	-5.8E+04	-1.0E+05	-8.1E+04	-8.6E+04	-1.2E+05	-7.6E+04	-9.0E+04
3.9E+01	-2.0E+06	1.7E+04	6.8E+04	-1.8E+06	1.9E+05	4.2E+05	-3.0E+05	-3.2E+04	-1.7E+05	-4.6E+04	-1.6E+05	-5.5E+04	-1.1E+05	-5.8E+04	-1.9E+05	-9.4E+04
4.9E+01	-1.3E+06	5.6E+04	6.0E+03	-1.9E+06	3.1E+05	4.5E+05	-5.7E+05	8.6E+03	-7.0E+05	-3.5E+05	-3.0E+05	-1.3E+05	-8.0E+05	-3.0E+05	-2.6E+05	-1.0E+05
5.9E+01	-1.6E+06	1.6E+03	-6.7E+05	-2.0E+06	2.5E+05	5.9E+05	-7.3E+05	5.8E+04	-2.6E+05	-9.2E+04	-2.0E+05	-5.7E+04	-1.7E+05	-1.1E+05	-2.9E+05	-8.5E+04
6.8E+01	-1.9E+06	1.6E+05	-2.1E+05	-2.1E+06	2.7E+05	6.8E+05	-5.7E+05	-3.6E+04	-8.9E+04	-6.1E+04	-1.2E+05	-6.5E+04	-7.1E+04	-6.1E+04	-1.2E+05	-6.8E+04
7.8E+01	-1.6E+06	8.0E+04	-1.4E+05	-2.3E+06	2.9E+05	6.3E+05	-7.2E+05	3.1E+05	-1.2E+05	-3.9E+04	-1.4E+05	-5.3E+04	-1.5E+05	-6.3E+04	-1.2E+05	-8.3E+04
8.8E+01	-1.9E+06	8.5E+04	-5.0E+03	-2.4E+06	4.6E+05	7.5E+05	-1.0E+06	3.9E+05	-1.3E+05	-7.2E+04	-1.3E+05	-6.2E+04	-1.5E+05	-6.5E+04	-1.1E+05	-9.7E+04
9.8E+01	-1.7E+06	-5.2E+04	-2.4E+05	-2.3E+06	4.6E+05	8.6E+05	-1.4E+06	5.3E+05	-2.2E+05	-6.9E+04	-1.3E+05	-1.1E+05	-9.8E+04	-1.2E+05	-1.4E+05	-9.9E+04
1.1E+02	-2.5E+06	1.6E+05	5.1E+04	-2.4E+06	5.7E+05	7.9E+05	-1.0E+06	6.0E+05	-8.0E+04	-5.9E+04	-9.7E+04	-4.8E+04	-9.2E+04	-6.0E+04	-6.5E+04	-6.0E+04
1.2E+02	-2.1E+06	7.0E+04	-7.9E+04	-2.5E+06	6.6E+05	9.8E+05	-1.2E+06	7.9E+05	-7.7E+04	-4.0E+04	-4.7E+04	-4.8E+04	-4.0E+04	-6.2E+04	-3.1E+04	-6.0E+04
1.3E+02	-2.1E+06	2.3E+05	2.1E+05	-2.8E+06	1.0E+06	1.2E+06	-1.2E+06	8.2E+05	-9.9E+04	-4.4E+04	-9.8E+04	-5.0E+04	-7.1E+04	-4.3E+04	-7.1E+04	-8.6E+04
1.4E+02	-5.1E+05	-2.3E+06	-2.6E+06	-5.2E+05	1.3E+06	9.9E+05	-1.7E+06	1.3E+06	-6.9E+04	-1.0E+05	-5.6E+04	-6.0E+04	-6.7E+04	-6.0E+04	-6.7E+04	-8.3E+04
1.5E+02	-1.4E+06	-1.4E+04	8.0E+05	-1.1E+06	3.4E+05	2.0E+06	-8.7E+05	6.2E+05	-5.2E+04	-4.5E+04	-4.6E+04	-4.5E+04	-6.1E+04	-5.0E+04	-4.4E+04	-5.3E+04
1.6E+02	-1.8E+06	4.6E+05	4.8E+05	-2.3E+06	1.9E+06	1.8E+05	-3.1E+06	3.1E+06	-6.0E+04	-9.0E+04	-9.4E+04	-1.1E+05	-1.0E+05	-1.2E+05	-5.5E+04	-7.0E+04
1.7E+02	-4.7E+06	2.9E+06	2.3E+06	-4.5E+06	1.7E+06	-5.4E+05	-3.3E+06	5.0E+06	-1.0E+05	-8.2E+04	-8.0E+04	-8.9E+04	-8.6E+04	-7.8E+04	-1.0E+05	-7.9E+04
1.8E+02	-3.9E+05	-2.0E+06	-2.0E+06	1.7E+06	1.4E+06	2.0E+06	-2.4E+06	1.2E+06	-5.8E+04	-4.9E+04	-4.9E+04	-4.9E+04	-4.3E+04	-6.6E+04	-4.0E+04	-6.2E+04
1.9E+02	-2.7E+06	1.8E+06	1.5E+06	-5.0E+06	3.9E+05	3.1E+06	-1.3E+06	-2.6E+05	-8.0E+04	-4.4E+04	-6.7E+04	-3.6E+04	-4.8E+04	-4.5E+04	-4.5E+04	-6.2E+04
2.0E+02	-1.2E+06	3.7E+05	-6.0E+05	-1.8E+06	1.1E+06	2.6E+06	-2.0E+06	1.1E+06	-4.0E+04	-4.6E+04	-4.2E+04	-4.1E+04	-3.2E+04	-4.3E+04	-4.6E+04	-6.5E+04
2.1E+02	-5.6E+05	1.8E+06	4.7E+05	-5.3E+05	-5.1E+05	8.0E+05	-3.5E+06	-1.4E+05	-6.7E+04	-5.5E+04	-5.6E+04	-3.9E+04	-6.0E+04	-5.8E+04	-5.0E+04	-5.2E+04
2.1E+02	-2.2E+06	-8.5E+05	-8.7E+05	-2.4E+06	1.0E+06	2.6E+06	-2.1E+06	1.2E+06	-3.5E+04	-5.3E+04	-5.6E+04	-5.5E+04	-3.2E+04	-5.2E+04	-3.2E+04	-6.9E+04
2.2E+02	-2.0E+06	-5.7E+05	-7.2E+05	-2.1E+06	1.2E+06	3.2E+06	-2.1E+06	1.3E+06	-4.3E+04	-7.1E+04	-5.1E+04	-5.8E+04	-5.4E+04	-6.0E+04	-3.8E+04	-1.1E+05

Table 11. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.6 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-6.9E+05	-6.3E+05	5.1E+05	-5.1E+05	-7.0E+04	1.5E+05	-5.0E+04	-1.2E+05	-1.7E+05	-8.4E+04	-8.8E+04	-1.4E+05	-1.1E+05	-1.5E+05	-7.3E+04	-1.6E+05
2.0E+01	-5.7E+05	-3.2E+05	2.4E+05	-6.8E+05	1.9E+05	2.3E+05	-2.1E+05	-3.1E+05	-2.0E+05	-1.4E+05	-1.9E+05	-1.1E+05	-1.8E+05	-1.3E+05	-1.5E+05	-1.1E+05
2.9E+01	-6.0E+05	-2.5E+05	2.6E+05	-6.8E+05	7.5E+04	2.2E+05	-2.2E+05	-3.0E+05	-1.0E+05	-1.2E+05	-1.4E+05	-1.3E+05	-1.2E+05	-1.4E+05	-6.1E+04	-1.2E+05
3.9E+01	-5.3E+05	-2.5E+05	5.7E+04	-9.2E+05	-1.2E+05	4.8E+05	-1.7E+05	-4.3E+04	-2.4E+05	-1.5E+05	-1.0E+05	-1.6E+05	-1.5E+05	-1.0E+05	-1.6E+05	-7.0E+04
4.9E+01	-7.0E+05	-3.3E+05	2.8E+05	-8.3E+05	-1.8E+05	1.9E+05	3.0E+04	-2.5E+04	-2.0E+05	-9.9E+04	-2.0E+05	-8.5E+04	-1.8E+05	-9.5E+04	-2.3E+05	-6.5E+04
5.9E+01	-8.2E+05	-4.7E+05	4.0E+05	-7.4E+05	6.2E+05	2.6E+05	-8.6E+05	3.4E+05	-2.5E+05	-1.4E+05	-1.7E+05	-1.2E+05	-3.6E+05	-1.0E+05	-2.9E+05	-6.8E+04
6.8E+01	-6.1E+05	-1.9E+05	6.5E+05	-8.4E+05	2.4E+05	3.5E+05	-3.6E+05	2.1E+05	-9.0E+04	-9.5E+04	-1.5E+05	-9.3E+04	-1.3E+05	-9.5E+04	-1.2E+05	-6.5E+04
7.8E+01	-4.9E+05	-3.1E+05	8.9E+05	-9.1E+05	1.1E+05	3.6E+05	-3.2E+05	2.8E+05	-2.2E+05	-8.8E+04	-2.5E+05	-1.0E+05	-2.8E+05	-1.1E+05	-1.8E+05	-8.6E+04
8.8E+01	-6.8E+05	-2.8E+05	3.1E+05	-1.0E+06	1.4E+05	4.7E+05	-5.8E+05	3.1E+05	-1.4E+05	-8.5E+04	-1.2E+05	-9.6E+04	-1.1E+05	-8.7E+04	-1.8E+05	-9.3E+04
9.8E+01	-7.9E+05	-3.0E+05	2.1E+05	-1.2E+06	7.2E+04	3.6E+05	-6.9E+05	2.5E+05	-6.5E+04	-7.6E+04	-6.2E+04	-7.5E+04	-4.8E+04	-8.1E+04	-1.1E+05	-7.4E+04
1.1E+02	-1.2E+06	-1.3E+05	5.8E+05	-1.3E+06	2.9E+05	4.6E+05	-7.1E+05	6.2E+05	-9.7E+04	-6.6E+04	-1.2E+05	-6.8E+04	-1.0E+05	-7.2E+04	-8.0E+04	-7.4E+04
1.2E+02	-1.1E+06	-2.1E+04	4.8E+05	-1.2E+06	3.6E+05	6.0E+05	-6.9E+05	5.6E+05	-6.8E+04	-7.5E+04	-9.2E+04	-8.3E+04	-8.0E+04	-8.0E+04	-8.6E+04	-8.3E+04
1.3E+02	-1.1E+06	2.6E+05	7.2E+05	-1.8E+06	6.7E+05	7.4E+05	-7.3E+05	4.8E+05	-7.1E+04	-9.1E+04	-7.4E+04	-7.7E+04	-6.0E+04	-1.1E+05	-7.0E+04	-4.7E+04
1.4E+02	8.8E+04	-2.1E+06	-1.7E+06	1.1E+05	6.9E+05	7.2E+05	-8.2E+05	5.6E+05	-6.7E+04	-1.0E+05	-6.5E+04	-9.8E+04	-8.6E+04	-1.1E+05	-6.6E+04	-6.6E+04
1.5E+02	-3.6E+05	5.4E+04	1.3E+06	-4.0E+05	-1.1E+04	1.4E+06	-2.0E+05	4.7E+05	-7.7E+04	-8.7E+04	-6.6E+04	-1.0E+05	-6.8E+04	-1.0E+05	-8.4E+04	-6.3E+04
1.6E+02	-6.0E+05	2.6E+05	6.0E+05	-9.4E+05	1.8E+06	-4.4E+05	-2.5E+06	2.7E+06	-1.2E+05	-1.3E+05	-9.6E+04	-1.8E+05	-9.8E+04	-1.0E+05	-1.4E+05	-1.4E+05
1.7E+02	-1.7E+06	2.5E+05	-2.2E+05	2.8E+05	2.1E+06	-9.8E+05	-3.6E+06	4.2E+06	-5.3E+05	-3.4E+05	-6.8E+05	-5.2E+05	-3.3E+05	-3.7E+05	-5.4E+05	-4.2E+05
1.8E+02	3.8E+05	-1.5E+06	-1.3E+06	1.9E+06	6.1E+05	9.9E+05	-9.1E+05	1.0E+06	-1.5E+05	-2.3E+05	-2.2E+05	-1.3E+05	-2.5E+05	-1.8E+05	-1.0E+05	-2.0E+05
1.9E+02	-1.3E+06	1.3E+06	1.7E+06	-3.2E+06	1.2E+05	1.9E+06	-3.6E+05	7.2E+04	-7.9E+04	-1.0E+05	-5.8E+04	-8.4E+04	-8.0E+04	-1.1E+05	-6.9E+04	-6.8E+04
2.0E+02	-2.0E+05	2.3E+05	-8.2E+03	-5.8E+05	5.6E+05	1.5E+06	-7.3E+05	7.5E+05	-6.1E+04	-1.3E+05	-9.0E+04	-1.1E+05	-1.0E+05	-1.2E+05	-6.0E+04	-7.1E+04
2.1E+02	6.4E+05	1.7E+06	9.1E+05	5.6E+05	-8.9E+05	-8.6E+04	-2.2E+06	-4.6E+05	-7.3E+04	-8.1E+04	-6.3E+04	-7.7E+04	-7.5E+04	-8.4E+04	-4.6E+04	-5.2E+04
2.1E+02	-1.0E+06	-8.9E+05	-3.4E+05	-1.1E+06	6.7E+05	1.5E+06	-8.6E+05	7.8E+05	-3.9E+04	-7.7E+04	-2.7E+04	-7.1E+04	-5.0E+04	-9.3E+04	-2.7E+04	-6.1E+04
2.2E+02	-7.7E+05	-7.8E+05	-6.5E+04	-1.0E+06	7.7E+05	1.9E+06	-8.6E+05	8.1E+05	-3.8E+04	-7.3E+04	-4.2E+04	-8.0E+04	-3.7E+04	-8.3E+04	-2.5E+04	-5.9E+04

Table 12. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.6 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyy	
9.8E+00	-8.9E+05	-5.1E+05	3.6E+05	-9.4E+05	1.7E+05	8.6E+04	-1.3E+05	7.7E+02	-1.1E+05	-1.4E+05	-8.7E+04	-1.1E+05	-1.2E+05	-1.0E+05	-8.2E+04	-1.0E+05
2.0E+01	-8.6E+05	-2.5E+05	1.6E+05	-1.0E+06	3.2E+05	3.1E+05	-3.9E+05	-2.0E+05	-1.8E+05	-1.3E+05	-1.9E+05	-8.6E+04	-2.6E+05	-1.2E+05	-2.2E+05	-5.5E+04
2.9E+01	-1.0E+06	-3.1E+05	1.8E+05	-1.1E+06	5.5E+04	2.8E+05	-4.0E+05	-1.1E+05	-8.6E+04	-9.5E+04	-1.2E+05	-8.0E+04	-1.2E+05	-1.1E+05	-1.2E+05	-1.1E+05
3.9E+01	-7.9E+05	-3.6E+05	2.3E+05	-1.3E+06	-6.9E+03	3.9E+05	-4.3E+05	6.8E+04	-1.3E+05	-9.2E+04	-6.1E+04	-1.3E+05	-1.1E+05	-9.1E+04	-1.0E+05	-9.1E+04
4.9E+01	-8.9E+05	-1.8E+05	-1.0E+05	-1.2E+06	-3.6E+05	3.7E+05	-9.5E+04	4.1E+04	-1.8E+05	-1.0E+05	-1.9E+05	-9.3E+04	-2.3E+05	-8.1E+04	-2.6E+05	-7.7E+04
5.9E+01	-1.1E+06	-1.8E+05	-9.3E+04	-1.1E+06	1.5E+05	5.4E+05	-8.0E+05	7.5E+04	-2.9E+05	-1.3E+05	-1.8E+05	-1.1E+05	-2.6E+05	-1.2E+05	-1.9E+05	-6.8E+04
6.8E+01	-1.1E+06	-9.6E+04	4.0E+05	-1.3E+06	1.5E+05	6.3E+05	-4.1E+05	1.0E+05	-1.0E+05	-8.3E+04	-1.3E+05	-8.6E+04	-1.2E+05	-9.5E+04	-1.4E+05	-6.0E+04
7.8E+01	-9.9E+05	-1.5E+05	2.6E+05	-1.4E+06	-1.4E+05	6.6E+05	-6.3E+05	2.4E+05	-2.0E+05	-1.1E+05	-1.7E+05	-7.6E+04	-2.6E+05	-1.1E+05	-1.6E+05	-6.6E+04
8.8E+01	-1.1E+06	1.8E+03	1.3E+05	-1.6E+06	8.2E+04	7.7E+05	-6.4E+05	3.3E+05	-1.3E+05	-9.1E+04	-1.2E+05	-9.6E+04	-1.2E+05	-9.0E+04	-1.1E+05	-6.1E+04
9.8E+01	-1.3E+06	-2.3E+05	1.0E+05	-1.7E+06	1.5E+05	7.1E+05	-9.2E+05	4.7E+05	-6.9E+04	-7.3E+04	-7.2E+04	-6.8E+04	-7.0E+04	-9.7E+04	-1.1E+05	-6.9E+04
1.1E+02	-1.6E+06	-6.7E+04	4.1E+05	-1.7E+06	3.3E+05	8.1E+05	-8.6E+05	7.6E+05	-7.6E+04	-7.2E+04	-1.1E+05	-8.5E+04	-8.8E+04	-8.9E+04	-8.7E+04	-6.9E+04
1.2E+02	-1.4E+06	2.9E+04	3.1E+05	-1.6E+06	5.0E+05	9.6E+05	-1.2E+06	7.6E+05	-6.4E+04	-7.5E+04	-5.6E+04	-6.1E+04	-7.9E+04	-8.4E+04	-7.6E+04	-5.8E+04
1.3E+02	-1.4E+06	2.9E+05	6.5E+05	-2.2E+06	8.1E+05	1.1E+06	-1.1E+06	7.2E+05	-7.8E+04	-7.5E+04	-8.2E+04	-6.5E+04	-6.6E+04	-7.8E+04	-6.2E+04	-5.8E+04
1.4E+02	-2.4E+05	-2.0E+06	-1.9E+06	-1.6E+05	7.7E+05	1.2E+06	-1.2E+06	6.6E+05	-3.2E+04	-6.8E+04	-5.8E+04	-7.4E+04	-5.4E+04	-4.6E+04	-4.6E+04	-7.2E+04
1.5E+02	-7.2E+05	1.2E+03	1.1E+06	-6.8E+05	-1.3E+04	1.9E+06	-5.0E+05	4.9E+05	-6.9E+04	-8.3E+04	-5.8E+04	-6.0E+04	-5.7E+04	-9.4E+04	-6.9E+04	-5.7E+04
1.6E+02	-8.5E+05	1.7E+05	4.5E+05	-1.3E+06	1.7E+06	1.8E+05	-2.8E+06	2.6E+06	-8.5E+04	-1.3E+05	-7.3E+04	-1.0E+05	-8.5E+04	-7.5E+04	-7.6E+04	-9.7E+04
1.7E+02	-4.0E+06	2.6E+06	2.5E+06	-3.6E+06	1.8E+06	-9.5E+05	-3.1E+06	5.0E+06	-1.0E+05	-1.2E+05	-8.0E+04	-1.3E+05	-6.3E+04	-1.0E+05	-8.1E+04	-5.9E+04
1.8E+02	4.2E+05	-2.1E+06	-1.9E+06	2.3E+06	1.1E+06	1.7E+06	-1.8E+06	1.0E+06	-6.3E+04	-8.3E+04	-4.5E+04	-6.8E+04	-6.1E+04	-8.5E+04	-3.9E+04	-4.9E+04
1.9E+02	-1.6E+06	1.3E+06	1.3E+06	-3.5E+06	2.3E+05	2.6E+06	-9.5E+05	6.6E+03	-6.7E+04	-8.4E+04	-5.7E+04	-7.8E+04	-5.3E+04	-9.7E+04	-6.1E+04	-4.6E+04
2.0E+02	-6.2E+05	4.0E+05	-3.2E+05	-1.1E+06	6.7E+05	2.2E+06	-1.4E+06	8.2E+05	-5.7E+04	-1.1E+05	-3.7E+04	-8.9E+04	-8.8E+04	-1.3E+05	-6.6E+04	-6.3E+04
2.1E+02	6.8E+04	1.8E+06	6.1E+05	8.4E+04	-8.8E+05	5.4E+05	-2.8E+06	-1.8E+05	-6.1E+04	-8.2E+04	-7.9E+04	-9.9E+04	-1.1E+05	-1.3E+05	-6.4E+04	-7.1E+04
2.1E+02	-1.5E+06	-7.4E+05	-5.8E+05	-1.7E+06	7.8E+05	2.2E+06	-1.4E+06	1.0E+06	-2.8E+04	-7.1E+04	-3.4E+04	-7.2E+04	-7.4E+04	-9.5E+04	-4.9E+04	-5.5E+04
2.2E+02	-1.3E+06	-6.4E+05	-3.5E+05	-1.5E+06	9.9E+05	2.7E+06	-1.5E+06	1.1E+06	-7.7E+04	-9.5E+04	-6.2E+04	-8.1E+04	-3.4E+04	-1.3E+05	-4.5E+04	-8.4E+04

Table 13. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.6 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyy	
9.8E+00	-1.4E+06	8.0E+04	2.2E+05	-1.4E+06	-1.7E+05	1.6E+05	-1.8E+05	-1.2E+05	-1.2E+05	-1.3E+05	-8.0E+04	-1.1E+05	-9.8E+04	-1.7E+05	-9.3E+04	-1.2E+05
2.0E+01	-1.2E+06	1.1E+05	-2.2E+05	-1.4E+06	4.4E+05	3.0E+05	-3.4E+05	-2.0E+05	-2.0E+05	-1.0E+05	-1.9E+05	-8.5E+04	-1.7E+05	-1.6E+05	-1.9E+05	-9.7E+04
2.9E+01	-1.5E+06	1.9E+05	2.8E+04	-1.6E+06	1.2E+05	4.0E+05	-4.6E+05	-3.6E+05	-1.3E+05	-1.6E+05	-7.0E+04	-9.7E+04	-6.3E+04	-9.2E+04	-8.4E+04	-9.1E+04
3.9E+01	-1.6E+06	1.4E+05	3.7E+04	-1.8E+06	6.4E+04	4.6E+05	-6.6E+05	5.3E+04	-1.7E+05	-1.1E+05	-1.2E+05	-9.0E+04	-1.6E+05	-1.5E+05	-1.4E+05	-8.0E+04
4.9E+01	-1.7E+06	1.4E+05	-3.6E+05	-2.0E+06	1.7E+06	1.2E+06	-3.1E+05	8.9E+04	-8.8E+05	-3.9E+05	-2.6E+05	-8.3E+04	-5.5E+05	-1.5E+05	-3.5E+05	-1.1E+05
5.9E+01	-1.6E+06	7.1E+04	-5.1E+05	-1.7E+06	3.1E+05	6.6E+05	-1.1E+06	7.4E+04	-2.3E+05	-8.2E+04	-1.2E+05	-1.2E+05	-2.2E+05	-9.8E+04	-2.1E+05	-7.8E+04
6.8E+01	-1.4E+06	2.0E+05	1.5E+05	-1.8E+06	4.2E+05	6.3E+05	-7.8E+05	2.6E+05	-9.9E+04	-8.9E+04	-1.4E+05	-6.4E+04	-1.2E+05	-7.4E+04	-1.2E+05	-6.1E+04
7.8E+01	-1.4E+06	1.9E+05	-1.3E+05	-2.0E+06	2.0E+05	7.9E+05	-1.0E+06	3.7E+05	-2.1E+05	-8.6E+04	-2.0E+05	-9.8E+04	-2.8E+05	-1.2E+05	-1.4E+05	-8.9E+04
8.8E+01	-1.5E+06	2.1E+05	-1.3E+05	-2.1E+06	4.0E+05	8.0E+05	-1.0E+06	4.4E+05	-1.5E+05	-8.0E+04	-9.1E+04	-8.2E+04	-6.7E+04	-1.0E+05	-1.0E+05	-6.8E+04
9.8E+01	-1.9E+06	7.3E+04	-2.8E+05	-2.2E+06	2.5E+05	7.6E+05	-1.2E+06	5.2E+05	-1.1E+05	-1.7E+05	-9.4E+04	-8.5E+04	-3.0E+05	-1.7E+05	-1.4E+05	-8.3E+04
1.1E+02	-2.1E+06	1.8E+05	1.6E+04	-2.3E+06	5.7E+05	8.2E+05	-1.1E+06	8.1E+05	-9.9E+04	-8.8E+04	-1.4E+05	-6.8E+04	-1.1E+05	-1.0E+05	-7.8E+04	-4.8E+04
1.2E+02	-2.0E+06	2.5E+05	3.1E+04	-2.2E+06	7.1E+05	1.0E+06	-1.3E+06	8.1E+05	-3.6E+04	-7.0E+04	-7.9E+04	-6.0E+04	-6.3E+04	-7.8E+04	-8.1E+04	-5.7E+04
1.3E+02	-2.1E+06	6.1E+05	2.7E+05	-2.8E+06	9.2E+05	1.2E+06	-1.3E+06	8.0E+05	-5.7E+04	-9.6E+04	-8.5E+04	-7.8E+04	-6.4E+04	-7.7E+04	-5.5E+04	-8.2E+04
1.4E+02	-7.7E+05	-1.8E+06	-2.1E+06	-8.7E+05	9.8E+05	1.4E+06	-1.3E+06	8.5E+05	-5.6E+04	-8.0E+04	-9.2E+04	-8.4E+04	-6.7E+04	-9.9E+04	-5.3E+04	-7.2E+04
1.5E+02	-1.1E+06	1.7E+05	8.9E+05	-1.2E+06	1.9E+05	2.2E+06	-7.7E+05	6.9E+05	-8.2E+04	-6.7E+04	-7.4E+04	-9.4E+04	-9.0E+04	-7.8E+04	-9.8E+04	-6.2E+04
1.6E+02	-1.3E+06	2.4E+05	-6.4E+04	-1.8E+06	1.7E+06	6.6E+05	-3.0E+06	2.8E+06	-8.0E+04	-1.0E+05	-7.1E+04	-1.2E+05	-9.6E+04	-1.2E+05	-8.0E+04	-1.3E+05
1.7E+02	-4.4E+06	2.6E+06	2.4E+06	-3.9E+06	2.2E+06	-1.1E+06	-3.7E+06	5.8E+06	-1.1E+05	-1.1E+05	-1.2E+05	-1.5E+05	-1.3E+05	-1.1E+05	-1.1E+05	-8.2E+04
1.8E+02	-6.4E+04	-1.7E+06	-2.1E+06	1.7E+06	1.3E+06	2.2E+06	-2.3E+06	1.2E+06	-5.6E+04	-7.0E+04	-4.9E+04	-7.3E+04	-4.7E+04	-7.8E+04	-4.2E+04	-5.1E+04
1.9E+02	-2.1E+06	1.6E+06	1.1E+06	-4.1E+06	6.0E+05	3.0E+06	-1.6E+06	2.9E+05	-4.7E+04	-6.6E+04	-5.5E+04	-6.2E+04	-4.8E+04	-8.1E+04	-5.1E+04	-5.5E+04
2.0E+02	-1.0E+06	6.5E+05	-5.0E+05	-1.6E+06	1.1E+06	2.8E+06	-2.0E+06	1.1E+06	-5.6E+04	-1.0E+05	-4.3E+04	-8.5E+04	-5.8E+04	-9.2E+04	-5.0E+04	-9.2E+04
2.1E+02	-3.3E+05	2.1E+06	2.0E+05	-5.6E+05	-5.3E+05	1.0E+06	-3.4E+06	1.7E+05	-6.6E+04	-6.5E+04	-4.9E+04	-6.1E+04	-5.7E+04	-1.1E+05	-4.8E+04	-5.5E+04
2.1E+02	-1.9E+06	-4.6E+05	-9.8E+05	-2.2E+06	1.1E+06	2.7E+06	-2.1E+06	1.5E+06	-3.5E+04	-7.3E+04	-4.5E+04	-7.5E+04	-5.9E+04	-9.9E+04	-3.8E+04	-5.8E+04
2.2E+02	-1.8E+06	-4.2E+05	-8.0E+05	-1.9E+06	1.3E+06	3.4E+06	-2.1E+06	1.6E+06	-4.5E+04	-1.2E+05	-4.7E+04	-1.1E+05	-5.9E+04	-9.8E+04	-7.7E+04	-1.1E+05

Table 14. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.4 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.5E+06	5.2E+05	-9.2E+05	-1.2E+06	1.3E+05	-2.4E+05	-1.7E+05	2.8E+05	-1.0E+05	-1.5E+05	-7.8E+04	-1.7E+05	-1.3E+05	-1.1E+05	-1.1E+05	-9.6E+04
2.0E+01	-1.4E+06	6.7E+05	-1.2E+06	-1.1E+06	8.1E+04	2.6E+05	-2.1E+05	7.8E+04	-2.1E+05	-1.1E+05	-8.7E+04	-9.0E+04	-2.2E+05	-8.3E+04	-2.6E+05	-7.9E+04
2.9E+01	-1.6E+06	6.0E+05	-1.2E+06	-1.2E+06	6.0E+04	1.5E+05	-3.6E+05	8.1E+04	-8.0E+04	-2.1E+05	-1.0E+05	-1.1E+05	-8.9E+04	-1.1E+05	-4.8E+04	-1.4E+05
3.9E+01	-1.2E+06	7.8E+05	-1.3E+06	-1.4E+06	-1.5E+05	5.1E+05	-4.0E+05	1.0E+05	-3.2E+05	-7.8E+04	-1.9E+05	-9.9E+04	-1.3E+05	-6.9E+04	-1.1E+05	-5.3E+04
4.9E+01	-1.5E+06	7.6E+05	-1.3E+06	-1.5E+06	3.3E+05	4.2E+05	-5.7E+05	6.8E+04	-1.5E+05	-5.1E+04	-1.9E+05	-8.0E+04	-2.9E+05	-8.0E+04	-2.1E+05	-1.1E+05
5.9E+01	-1.6E+06	7.3E+05	-1.2E+06	-1.4E+06	1.1E+05	6.5E+05	-4.9E+05	1.7E+05	-1.9E+05	-7.5E+04	-1.3E+05	-1.2E+05	-1.9E+05	-9.6E+04	-3.0E+05	-8.4E+04
6.8E+01	-1.6E+06	7.2E+05	-1.1E+06	-1.4E+06	2.8E+05	6.2E+05	-6.7E+05	1.6E+05	-1.0E+05	-6.8E+04	-9.4E+04	-9.0E+04	-1.1E+05	-6.4E+04	-9.5E+04	-7.3E+04
7.8E+01	-1.6E+06	6.3E+05	-1.1E+06	-1.3E+06	4.4E+04	8.8E+05	-5.6E+05	2.0E+05	-1.4E+05	-4.9E+04	-1.8E+05	-8.1E+04	-1.6E+05	-7.4E+04	-1.9E+05	-4.8E+04
8.8E+01	-1.6E+06	5.9E+05	-9.9E+05	-1.4E+06	6.1E+05	8.0E+05	-1.1E+06	3.4E+05	-8.9E+04	-6.6E+04	-5.2E+04	-7.7E+04	-9.2E+04	-4.2E+04	-1.2E+05	-5.0E+04
9.8E+01	-1.6E+06	6.3E+05	-1.0E+06	-1.6E+06	3.6E+05	7.6E+05	-1.2E+06	3.2E+05	-7.9E+04	-3.6E+04	-7.0E+04	-6.7E+04	-1.3E+05	-6.6E+04	-1.5E+05	-5.2E+04
1.1E+02	-1.5E+06	5.4E+05	-8.9E+05	-1.4E+06	5.0E+05	9.1E+05	-1.2E+06	6.0E+05	-6.2E+04	-6.3E+04	-7.2E+04	-7.6E+04	-6.9E+04	-8.6E+04	-4.4E+04	-6.9E+04
1.2E+02	-1.4E+06	4.1E+05	-1.0E+06	-1.3E+06	5.8E+05	1.0E+06	-1.2E+06	6.1E+05	-7.2E+04	-6.5E+04	-6.9E+04	-7.3E+04	-5.8E+04	-5.9E+04	-8.0E+04	-5.2E+04
1.3E+02	-1.2E+06	3.8E+05	-9.9E+05	-1.1E+06	7.0E+05	1.2E+06	-1.5E+06	6.1E+05	-4.5E+04	-5.4E+04	-7.2E+04	-1.0E+05	-6.4E+04	-9.2E+04	-1.0E+05	-8.9E+04
1.4E+02	-1.1E+06	8.9E+05	-1.0E+06	-1.9E+06	1.4E+06	1.7E+06	-1.0E+06	1.3E+06	-6.6E+04	-8.2E+04	-6.5E+04	-1.0E+05	-1.0E+05	-1.0E+05	-5.0E+04	-6.2E+04
1.5E+02	-8.7E+05	-2.7E+05	-1.2E+06	-5.9E+05	2.5E+05	1.5E+06	-1.0E+06	7.7E+05	-8.0E+04	-9.0E+04	-4.3E+04	-7.6E+04	-6.5E+04	-7.8E+04	-7.6E+04	-5.1E+04
1.6E+02	-1.1E+06	5.0E+05	-9.3E+05	-1.3E+06	6.3E+05	1.9E+06	-1.4E+06	5.4E+05	-1.1E+05	-1.3E+05	-7.5E+04	-1.1E+05	-8.6E+04	-1.1E+05	-9.4E+04	-9.8E+04
1.7E+02	-3.3E+06	1.3E+06	6.1E+05	-1.2E+06	8.1E+05	1.4E+06	-2.5E+06	2.4E+06	-3.0E+05	-1.9E+05	-2.5E+05	-2.8E+05	-2.5E+05	-2.1E+05	-4.4E+05	-2.3E+05
1.8E+02	-1.4E+06	5.0E+04	-1.3E+06	1.1E+05	8.1E+05	2.0E+06	-2.0E+06	7.6E+05	-1.7E+05	-1.3E+05	-1.1E+05	-1.3E+05	-1.2E+05	-1.3E+05	-1.4E+05	-2.2E+05
1.9E+02	-2.7E+06	3.1E+06	2.0E+06	-5.0E+06	4.3E+05	2.7E+06	-1.8E+06	-1.2E+05	-7.2E+04	-6.7E+04	-6.6E+04	-8.1E+04	-7.6E+04	-8.8E+04	-6.8E+04	-6.4E+04
2.0E+02	-1.2E+06	1.4E+06	-2.2E+05	-1.6E+06	8.4E+05	2.2E+06	-2.5E+06	5.5E+05	-8.6E+04	-1.0E+05	-6.3E+04	-9.1E+04	-7.6E+04	-6.5E+04	-4.7E+04	-7.3E+04
2.1E+02	-3.8E+05	2.7E+06	9.0E+04	-1.5E+05	-1.0E+06	4.2E+05	-3.8E+06	-1.4E+05	-7.5E+04	-6.3E+04	-7.2E+04	-9.6E+04	-1.2E+05	-7.7E+04	-6.7E+04	-4.9E+04
2.1E+02	-2.2E+06	-1.7E+05	-1.2E+06	-2.1E+06	1.0E+06	2.1E+06	-2.6E+06	9.7E+05	-4.1E+04	-7.4E+04	-2.9E+04	-7.9E+04	-4.9E+04	-8.0E+04	-3.1E+04	-4.9E+04
2.2E+02	-2.0E+06	6.4E+04	-8.9E+05	-1.6E+06	1.1E+06	2.7E+06	-2.7E+06	1.1E+06	-4.9E+04	-5.5E+04	-3.7E+04	-1.0E+05	-4.2E+04	-8.5E+04	-4.3E+04	-7.3E+04

Table 15. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.4 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	7.6E+05	-9.4E+05	-1.6E+06	6.5E+04	-2.8E+04	-1.9E+05	1.8E+05	-1.0E+05	-1.4E+05	-8.5E+04	-1.7E+05	-1.4E+05	-1.8E+05	-7.4E+04	-1.1E+05
2.0E+01	-2.0E+06	7.8E+05	-8.0E+05	-1.7E+06	2.7E+05	2.1E+05	-3.9E+05	-9.1E+04	-2.5E+05	-5.4E+04	-1.1E+05	-1.4E+05	-1.4E+05	-1.7E+05	-1.7E+05	-8.4E+04
2.9E+01	-1.9E+06	5.7E+05	-1.1E+06	-1.6E+06	1.1E+05	3.4E+05	-3.5E+05	2.0E+04	-6.2E+04	-9.0E+04	-7.5E+04	-9.5E+04	-9.5E+04	-1.1E+05	-8.5E+04	-8.9E+04
3.9E+01	-2.0E+06	8.3E+05	-1.0E+06	-1.7E+06	4.5E+04	6.7E+05	-3.8E+05	-8.8E+04	-2.2E+05	-9.8E+04	-1.3E+05	-1.0E+05	-1.2E+05	-9.3E+04	-1.6E+05	-8.4E+04
4.9E+01	-2.0E+06	8.4E+05	-8.7E+05	-1.8E+06	8.1E+04	4.9E+05	-5.8E+05	4.3E+04	-2.7E+05	-6.3E+04	-1.4E+05	-7.4E+04	-1.5E+05	-9.2E+04	-1.8E+05	-7.2E+04
5.9E+01	-2.1E+06	7.3E+05	-1.2E+06	-1.6E+06	3.1E+05	7.2E+05	-7.5E+05	-4.9E+03	-1.9E+05	-6.6E+04	-1.4E+05	-8.2E+04	-2.5E+05	-1.1E+05	-1.6E+05	-8.5E+04
6.8E+01	-2.1E+06	8.5E+05	-1.1E+06	-1.9E+06	3.5E+05	7.9E+05	-7.9E+05	4.3E+04	-1.2E+05	-9.2E+04	-8.1E+04	-1.1E+05	-5.9E+04	-8.0E+04	-8.1E+04	-9.5E+04
7.8E+01	-1.9E+06	7.6E+05	-1.1E+06	-1.9E+06	1.5E+05	8.4E+05	-5.5E+05	1.9E+05	-1.4E+05	-7.1E+04	-2.1E+05	-7.6E+04	-2.9E+05	-9.1E+04	-1.6E+05	-8.4E+04
8.8E+01	-2.0E+06	6.8E+05	-9.8E+05	-2.0E+06	4.5E+05	8.1E+05	-1.1E+06	3.6E+05	-1.1E+05	-7.3E+04	-7.2E+04	-8.1E+04	-1.3E+05	-1.0E+05	-1.6E+05	-9.8E+04
9.8E+01	-1.9E+06	5.9E+05	-1.2E+06	-2.0E+06	3.9E+05	7.9E+05	-1.4E+06	4.0E+05	-8.9E+04	-4.8E+04	-1.2E+05	-1.0E+05	-1.0E+05	-7.2E+04	-1.3E+05	-6.1E+04
1.1E+02	-2.0E+06	3.9E+05	-9.3E+05	-1.8E+06	6.8E+05	8.9E+05	-1.4E+06	8.2E+05	-7.9E+04	-6.6E+04	-8.1E+04	-8.7E+04	-5.9E+04	-5.8E+04	-7.1E+04	-7.2E+04
1.2E+02	-1.8E+06	4.6E+05	-1.1E+06	-1.6E+06	7.2E+05	1.1E+06	-1.4E+06	7.3E+05	-6.6E+04	-5.0E+04	-3.2E+04	-8.8E+04	-5.2E+04	-7.0E+04	-5.5E+04	-5.1E+04
1.3E+02	-1.7E+06	3.9E+05	-1.0E+06	-1.5E+06	7.2E+05	1.4E+06	-1.6E+06	6.1E+05	-3.2E+04	-5.7E+04	-7.3E+04	-5.2E+04	-5.7E+04	-9.2E+04	-7.8E+04	-6.5E+04
1.4E+02	-1.6E+06	9.6E+05	-9.3E+05	-2.3E+06	1.3E+06	1.8E+06	-1.3E+06	1.8E+06	-6.0E+04	-7.5E+04	-4.3E+04	-8.2E+04	-4.8E+04	-5.3E+04	-7.2E+04	-6.2E+04
1.5E+02	-1.4E+06	-3.4E+05	-1.3E+06	-7.9E+05	1.6E+05	1.9E+06	-1.2E+06	8.1E+05	-4.1E+04	-5.8E+04	-4.7E+04	-6.5E+04	-4.9E+04	-6.0E+04	-4.6E+04	-6.2E+04
1.6E+02	-1.6E+06	5.7E+05	-8.6E+05	-1.6E+06	8.4E+05	2.1E+06	-1.9E+06	7.5E+05	-5.0E+04	-5.5E+04	-7.9E+04	-1.1E+05	-6.2E+04	-8.9E+04	-6.3E+04	-7.8E+04
1.7E+02	-3.8E+06	1.9E+06	4.2E+05	-2.2E+06	-2.9E+05	1.4E+06	-9.4E+05	2.8E+06	-6.9E+04	-6.2E+04	-8.9E+04	-1.0E+05	-6.8E+04	-6.7E+04	-8.8E+04	-7.5E+04
1.8E+02	-1.8E+06	7.2E+04	-1.4E+06	-2.6E+05	1.0E+06	2.4E+06	-2.4E+06	8.1E+05	-4.8E+04	-4.6E+04	-4.0E+04	-7.0E+04	-5.0E+04	-5.4E+04	-4.9E+04	-5.0E+04
1.9E+02	-3.1E+06	3.1E+06	2.0E+06	-5.4E+06	5.3E+05	3.1E+06	-2.2E+06	-2.5E+04	-4.6E+04	-5.8E+04	-5.3E+04	-6.1E+04	-5.2E+04	-6.6E+04	-6.1E+04	-5.7E+04
2.0E+02	-1.6E+06	1.3E+06	-2.6E+05	-2.0E+06	9.7E+05	2.6E+06	-3.0E+06	6.1E+05	-5.8E+04	-5.2E+04	-4.5E+04	-7.8E+04	-3.9E+04	-6.9E+04	-5.3E+04	-5.3E+04
2.1E+02	-6.7E+05	2.7E+06	-9.0E+04	-6.3E+05	-8.8E+05	6.9E+05	-4.3E+06	2.9E+04	-1.1E+05	-5.5E+04	-5.8E+04	-6.9E+04	-7.0E+04	-6.8E+04	-6.3E+04	-6.3E+04
2.1E+02	-2.7E+06	-2.5E+05	-1.3E+06	-2.6E+06	1.2E+06	2.6E+06	-3.0E+06	1.1E+06	-2.3E+04	-4.6E+04	-2.3E+04	-6.1E+04	-3.6E+04	-5.7E+04	-3.2E+04	-4.7E+04
2.2E+02	-2.4E+06	7.7E+04	-8.6E+05	-2.0E+06	1.3E+06	3.2E+06	-3.1E+06	1.2E+06	-4.1E+04	-8.8E+04	-4.3E+04	-1.2E+05	-3.3E+04	-1.0E+05	-4.3E+04	-6.4E+04

Table 16. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.4 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.2E+06	4.7E+05	-1.1E+06	-2.0E+06	6.6E+04	2.7E+05	-1.6E+05	-1.3E+04	-8.2E+04	-2.3E+05	-4.1E+04	-1.5E+05	-1.2E+05	-1.0E+05	-8.7E+04	-7.4E+04
2.0E+01	-2.6E+06	6.9E+05	-9.7E+05	-2.0E+06	-5.9E+04	4.3E+05	-1.7E+05	-1.3E+05	-1.4E+05	-1.1E+05	-1.6E+05	-9.5E+04	-1.6E+05	-1.3E+05	-1.7E+05	-9.4E+04
2.9E+01	-2.3E+06	7.5E+05	-1.3E+06	-1.9E+06	1.6E+05	5.5E+05	-4.2E+05	-5.6E+04	-4.5E+04	-9.9E+04	-9.7E+04	-1.1E+05	-8.8E+04	-1.2E+05	-6.2E+04	-8.9E+04
3.9E+01	-2.6E+06	8.5E+05	-1.2E+06	-2.0E+06	2.3E+05	6.8E+05	-6.0E+05	-1.6E+05	-2.2E+05	-4.1E+04	-1.5E+05	-8.7E+04	-1.6E+05	-7.1E+04	-1.2E+05	-5.7E+04
4.9E+01	-2.6E+06	1.1E+06	-1.2E+06	-2.1E+06	4.6E+05	6.5E+05	-7.3E+05	-4.2E+04	-7.1E+05	-2.9E+05	-2.0E+05	-1.1E+05	-9.0E+05	-3.1E+05	-2.6E+05	-1.1E+05
5.9E+01	-2.5E+06	9.0E+05	-1.5E+06	-2.1E+06	1.9E+05	8.4E+05	-8.6E+05	-8.0E+04	-1.2E+05	-5.6E+04	-1.5E+05	-8.3E+04	-2.0E+05	-5.7E+04	-2.6E+05	-6.4E+04
6.8E+01	-2.5E+06	7.7E+05	-1.2E+06	-2.3E+06	2.1E+05	1.1E+06	-7.9E+05	-1.2E+05	-8.1E+04	-4.4E+04	-1.1E+05	-8.5E+04	-1.2E+05	-4.4E+04	-6.5E+04	-6.2E+04
7.8E+01	-2.5E+06	7.9E+05	-1.1E+06	-2.4E+06	2.6E+05	9.9E+05	-5.6E+05	7.6E+04	-1.6E+05	-7.5E+04	-1.0E+05	-6.8E+04	-2.2E+05	-8.0E+04	-1.4E+05	-4.5E+04
8.8E+01	-2.4E+06	7.7E+05	-1.2E+06	-2.3E+06	4.6E+05	1.0E+06	-1.1E+06	3.1E+05	-6.2E+04	-6.1E+04	-3.6E+04	-6.9E+04	-9.9E+04	-5.5E+04	-1.1E+05	-5.7E+04
9.8E+01	-2.5E+06	7.3E+05	-1.3E+06	-2.6E+06	1.4E+05	9.5E+05	-1.4E+06	4.5E+05	-1.7E+05	-1.1E+05	-1.2E+05	-9.8E+04	-2.2E+05	-1.2E+05	-1.7E+05	-6.9E+04
1.1E+02	-2.7E+06	7.2E+05	-8.9E+05	-2.3E+06	6.1E+05	1.2E+06	-1.3E+06	6.8E+05	-6.0E+04	-5.8E+04	-6.7E+04	-9.8E+04	-6.2E+04	-8.2E+04	-8.1E+04	-4.3E+04
1.2E+02	-2.3E+06	4.8E+05	-1.0E+06	-2.2E+06	8.5E+05	1.3E+06	-1.5E+06	8.0E+05	-3.7E+04	-7.1E+04	-4.6E+04	-8.6E+04	-4.8E+04	-7.2E+04	-6.7E+04	-4.3E+04
1.3E+02	-2.1E+06	2.7E+05	-9.3E+05	-1.8E+06	9.3E+05	1.6E+06	-1.8E+06	8.1E+05	-8.2E+04	-8.9E+04	-8.3E+04	-1.1E+05	-5.3E+04	-9.0E+04	-6.1E+04	-5.4E+04
1.4E+02	-2.0E+06	1.0E+06	-8.8E+05	-2.6E+06	1.5E+06	1.7E+06	-1.7E+06	2.3E+06	-6.7E+04	-4.9E+04	-9.7E+04	-9.8E+04	-7.7E+04	-9.1E+04	-6.8E+04	-4.2E+04
1.5E+02	-1.8E+06	-1.5E+05	-1.2E+06	-1.3E+06	1.4E+05	2.1E+06	-1.2E+06	8.7E+05	-5.3E+04	-5.4E+04	-5.7E+04	-9.3E+04	-6.5E+04	-1.0E+05	-5.0E+04	-5.1E+04
1.6E+02	-2.1E+06	6.7E+05	-7.8E+05	-2.1E+06	1.0E+06	2.3E+06	-2.2E+06	7.5E+05	-6.2E+04	-7.8E+04	-7.4E+04	-9.3E+04	-5.9E+04	-8.4E+04	-5.7E+04	-6.4E+04
1.7E+02	-4.6E+06	9.2E+05	1.1E+06	-1.1E+06	8.3E+05	1.8E+06	-2.7E+06	3.0E+06	-7.2E+04	-7.0E+04	-6.2E+04	-9.3E+04	-9.2E+04	-7.5E+04	-9.3E+04	-7.1E+04
1.8E+02	-2.3E+06	2.1E+05	-1.4E+06	-7.1E+05	1.1E+06	2.7E+06	-2.8E+06	8.2E+05	-3.6E+04	-4.9E+04	-4.2E+04	-6.7E+04	-6.5E+04	-5.9E+04	-4.5E+04	-5.1E+04
1.9E+02	-3.6E+06	3.1E+06	1.8E+06	-5.9E+06	7.0E+05	3.4E+06	-2.5E+06	4.6E+04	-5.3E+04	-5.8E+04	-4.9E+04	-6.2E+04	-4.7E+04	-6.5E+04	-6.4E+04	-5.4E+04
2.0E+02	-2.1E+06	1.5E+06	-4.5E+05	-2.5E+06	1.1E+06	2.9E+06	-3.3E+06	7.7E+05	-8.0E+04	-5.9E+04	-4.9E+04	-7.8E+04	-7.8E+04	-8.2E+04	-5.4E+04	-6.7E+04
2.1E+02	-1.1E+06	3.0E+06	-2.0E+05	-1.2E+06	-6.4E+05	1.1E+06	-4.7E+06	7.5E+04	-7.3E+04	-7.3E+04	-9.1E+04	-6.4E+04	-6.0E+04	-6.6E+04	-6.1E+04	-6.1E+04
2.1E+02	-3.1E+06	-3.7E+04	-1.4E+06	-3.1E+06	1.4E+06	3.0E+06	-3.3E+06	1.4E+06	-3.4E+04	-4.0E+04	-2.8E+04	-5.8E+04	-3.8E+04	-5.9E+04	-2.5E+04	-4.9E+04
2.2E+02	-2.8E+06	3.4E+05	-9.8E+05	-2.6E+06	1.5E+06	3.6E+06	-3.5E+06	1.5E+06	-6.9E+04	-7.3E+04	-4.4E+04	-7.2E+04	-4.1E+04	-1.1E+05	-3.9E+04	-6.6E+04

Table 17. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.1E+06	4.7E+05	-8.0E+05	-5.2E+05	3.3E+04	2.1E+05	1.3E+04	-1.7E+03	-8.6E+04	-1.2E+05	-9.4E+04	-1.5E+05	-1.0E+05	-1.6E+05	-8.7E+04	-2.0E+05
2.0E+01	-1.2E+06	5.4E+05	-6.5E+05	-9.6E+05	9.2E+05	2.4E+05	-4.9E+05	-1.6E+05	-2.5E+05	-1.3E+05	-2.2E+05	-7.5E+04	-2.5E+05	-9.6E+04	-1.6E+05	-1.1E+05
2.9E+01	-1.2E+06	5.6E+05	-8.7E+05	-1.0E+06	1.3E+05	3.9E+05	-3.2E+05	-6.4E+04	-7.6E+04	-7.7E+04	-9.7E+04	-6.2E+04	-1.1E+05	-8.6E+04	-1.1E+05	-7.1E+04
3.9E+01	-1.2E+06	6.9E+05	-6.1E+05	-9.2E+05	-5.8E+04	4.5E+05	-9.7E+05	-7.2E+02	-1.7E+05	-7.6E+04	-1.2E+05	-6.6E+04	-1.5E+05	-5.3E+04	-2.2E+05	-9.4E+04
4.9E+01	-1.2E+06	7.1E+05	-8.2E+05	-1.2E+06	-1.3E+04	5.4E+05	-8.1E+05	4.3E+03	-2.8E+05	-5.2E+04	-3.1E+05	-7.8E+04	-2.1E+05	-8.2E+04	-1.8E+05	-9.1E+04
5.9E+01	-1.1E+06	7.4E+05	-1.3E+06	-1.0E+06	3.8E+05	6.7E+05	-5.7E+05	2.1E+05	-1.6E+05	-7.0E+04	-2.6E+05	-1.3E+05	-1.8E+05	-1.0E+05	-2.1E+05	-1.3E+05
6.8E+01	-1.2E+06	9.8E+05	-8.8E+05	-1.3E+06	2.3E+05	7.4E+05	-6.1E+05	3.2E+05	-7.1E+04	-8.9E+04	-8.9E+04	-5.1E+04	-1.1E+05	-6.1E+04	-1.4E+05	-1.1E+05
7.8E+01	-1.3E+06	7.5E+05	-5.7E+05	-6.8E+05	3.7E+05	7.3E+05	-8.3E+05	7.7E+05	-1.9E+05	-6.7E+04	-1.5E+05	-5.4E+04	-1.5E+05	-5.5E+04	-2.1E+05	-7.0E+04
8.8E+01	-1.1E+06	7.2E+05	-8.7E+05	-7.4E+05	3.8E+05	8.0E+05	-1.0E+06	5.1E+05	-1.1E+05	-4.5E+04	-1.2E+05	-6.4E+04	-1.5E+05	-5.2E+04	-1.2E+05	-5.8E+04
9.8E+01	-1.2E+06	6.5E+05	-1.0E+06	-8.6E+05	3.0E+05	9.0E+05	-1.4E+06	4.3E+05	-1.0E+05	-6.4E+04	-9.9E+04	-7.4E+04	-6.3E+04	-7.4E+04	-9.7E+04	-7.8E+04
1.1E+02	-1.4E+06	6.8E+05	-6.9E+05	-6.5E+05	3.7E+05	8.3E+05	-1.2E+06	6.0E+05	-1.1E+05	-5.5E+04	-8.0E+04	-5.6E+04	-6.1E+04	-4.2E+04	-6.5E+04	-9.0E+04
1.2E+02	-9.7E+05	5.6E+05	-9.7E+05	-7.3E+05	7.2E+05	1.0E+06	-1.3E+06	6.3E+05	-3.3E+04	-3.5E+04	-7.6E+04	-4.8E+04	-3.0E+04	-4.2E+04	-5.0E+04	-6.7E+04
1.3E+02	-8.4E+05	3.9E+05	-9.2E+05	-4.9E+05	7.8E+05	1.1E+06	-1.5E+06	7.9E+05	-7.3E+04	-5.9E+04	-8.0E+04	-4.1E+04	-9.8E+04	-5.8E+04	-1.0E+05	-6.6E+04
1.4E+02	-7.9E+05	7.1E+05	-9.2E+05	-4.5E+05	1.3E+06	1.3E+06	-1.5E+06	2.2E+06	-8.3E+04	-5.2E+04	-5.3E+04	-6.0E+04	-5.9E+04	-8.4E+04	-6.4E+04	-9.2E+04
1.5E+02	-8.8E+05	-7.7E+04	-9.8E+05	1.8E+05	1.4E+05	1.3E+06	-7.1E+05	7.0E+05	-7.1E+04	-6.0E+04	-6.7E+04	-8.1E+04	-5.3E+04	-7.9E+04	-5.6E+04	-7.3E+04
1.6E+02	-1.0E+06	9.1E+05	-6.3E+05	-7.0E+05	6.3E+05	1.9E+06	-1.6E+06	5.6E+05	-9.6E+04	-9.5E+04	-1.0E+05	-1.0E+05	-1.0E+05	-9.9E+04	-8.9E+04	-1.0E+05
1.7E+02	-2.8E+06	1.1E+06	-1.9E+05	4.9E+05	6.1E+05	1.7E+06	-2.3E+06	1.9E+06	-3.5E+05	-2.5E+05	-4.1E+05	-3.0E+05	-3.7E+05	-2.4E+05	-4.1E+05	-3.1E+05
1.8E+02	-2.0E+06	3.8E+05	-1.4E+06	7.0E+05	1.4E+06	2.0E+06	-1.6E+06	8.5E+05	-1.5E+05	-1.1E+05	-1.3E+05	-1.0E+05	-1.4E+05	-1.2E+05	-1.1E+05	-1.2E+05
1.9E+02	-2.5E+06	3.4E+06	2.0E+06	-4.7E+06	2.6E+05	2.9E+06	-1.4E+06	-2.2E+05	-1.1E+05	-6.8E+04	-1.0E+05	-6.3E+04	-7.5E+04	-8.3E+04	-7.7E+04	-9.4E+04
2.0E+02	-9.0E+05	1.6E+06	-1.8E+05	-1.0E+06	8.4E+05	2.2E+06	-2.6E+06	8.2E+05	-5.3E+04	-6.2E+04	-6.1E+04	-7.4E+04	-8.6E+04	-7.1E+04	-7.1E+04	-7.6E+04
2.1E+02	6.0E+04	2.9E+06	4.3E+04	4.4E+05	-8.7E+05	4.0E+05	-3.8E+06	-4.0E+04	-6.7E+04	-4.8E+04	-6.1E+04	-4.6E+04	-9.4E+04	-5.5E+04	-8.3E+04	-6.6E+04
2.1E+02	-1.9E+06	-8.5E+04	-9.3E+05	-1.3E+06	1.1E+06	2.2E+06	-2.5E+06	1.2E+06	-3.9E+04	-5.3E+04	-3.5E+04	-5.9E+04	-4.2E+04	-4.1E+04	-4.2E+04	-5.1E+04
2.2E+02	-1.4E+06	3.9E+05	-7.5E+05	-1.0E+06	1.0E+06	2.8E+06	-2.7E+06	1.3E+06	-5.8E+04	-5.2E+04	-4.0E+04	-7.0E+04	-5.1E+04	-4.9E+04	-3.2E+04	-7.9E+04

Table 18. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.5 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.3E+06	6.4E+05	-7.2E+05	-7.4E+05	-1.1E+05	1.4E+05	-5.3E+04	8.7E+04	-1.1E+05	-1.4E+05	-1.0E+05	-8.9E+04	-1.1E+05	-1.3E+05	-7.1E+04	-9.9E+04
2.0E+01	-1.5E+06	7.6E+05	-3.7E+05	-1.3E+06	3.1E+05	2.8E+05	-5.5E+05	-8.3E+04	-2.2E+05	-1.0E+05	-2.1E+05	-7.2E+04	-2.1E+05	-9.9E+04	-1.4E+05	-8.0E+04
2.9E+01	-1.5E+06	8.1E+05	-9.7E+05	-1.2E+06	5.0E+04	2.2E+05	-5.4E+05	1.1E+05	-1.1E+05	-1.0E+05	-9.9E+04	-8.5E+04	-1.2E+05	-4.9E+04	-6.0E+04	-1.2E+05
3.9E+01	-1.5E+06	8.2E+05	-7.6E+05	-1.3E+06	-9.7E+04	3.9E+05	-1.3E+06	-5.6E+04	-2.5E+05	-7.2E+04	-1.9E+05	-8.2E+04	-1.7E+05	-6.7E+04	-1.4E+05	-8.6E+04
4.9E+01	-1.2E+06	8.2E+05	-9.7E+05	-1.5E+06	2.1E+05	5.4E+05	-9.5E+05	-1.0E+04	-2.2E+05	-6.1E+04	-2.4E+05	-6.2E+04	-1.4E+05	-4.8E+04	-1.6E+05	-5.5E+04
5.9E+01	-1.7E+06	7.9E+05	-1.5E+06	-1.3E+06	2.0E+05	6.9E+05	-5.9E+05	1.3E+05	-2.3E+05	-8.2E+04	-2.1E+05	-9.3E+04	-2.2E+05	-6.4E+04	-2.0E+05	-1.0E+05
6.8E+01	-1.5E+06	9.0E+05	-9.6E+05	-1.6E+06	2.2E+05	8.1E+05	-8.5E+05	4.1E+05	-9.9E+04	-5.9E+04	-1.2E+05	-4.3E+04	-7.8E+04	-6.9E+04	-1.5E+05	-8.5E+04
7.8E+01	-1.5E+06	8.3E+05	-9.1E+05	-1.2E+06	1.9E+05	7.8E+05	-1.2E+06	6.4E+05	-1.1E+05	-8.9E+04	-1.1E+05	-5.2E+04	-1.5E+05	-7.7E+04	-2.1E+05	-1.0E+05
8.8E+01	-1.6E+06	8.5E+05	-7.7E+05	-1.3E+06	4.9E+05	7.9E+05	-1.1E+06	5.3E+05	-1.0E+05	-4.8E+04	-7.5E+04	-5.3E+04	-1.3E+05	-6.7E+04	-1.5E+05	-7.6E+04
9.8E+01	-1.6E+06	7.0E+05	-1.1E+06	-1.4E+06	3.4E+05	9.4E+05	-1.5E+06	6.1E+05	-7.4E+04	-5.5E+04	-7.4E+04	-7.6E+04	-8.9E+04	-8.1E+04	-9.4E+04	-8.2E+04
1.1E+02	-1.9E+06	6.5E+05	-7.2E+05	-1.1E+06	5.6E+05	8.7E+05	-1.3E+06	8.0E+05	-1.0E+05	-6.9E+04	-8.2E+04	-8.6E+04	-7.2E+04	-7.9E+04	-8.0E+04	-6.9E+04
1.2E+02	-1.5E+06	5.7E+05	-9.0E+05	-1.1E+06	7.5E+05	1.1E+06	-1.5E+06	7.4E+05	-5.1E+04	-4.0E+04	-7.6E+04	-6.5E+04	-6.6E+04	-6.0E+04	-4.6E+04	-7.5E+04
1.3E+02	-1.3E+06	2.8E+05	-9.1E+05	-8.4E+05	9.6E+05	1.4E+06	-1.7E+06	7.8E+05	-9.6E+04	-6.2E+04	-8.4E+04	-5.6E+04	-1.2E+05	-8.4E+04	-7.6E+04	-1.1E+05
1.4E+02	-1.2E+06	4.7E+05	-1.1E+06	-6.1E+05	1.5E+06	1.5E+06	-1.7E+06	2.1E+06	-5.1E+04	-6.5E+04	-4.1E+04	-5.6E+04	-4.1E+04	-4.6E+04	-5.6E+04	-5.9E+04
1.5E+02	-1.2E+06	-2.4E+05	-1.1E+06	-1.7E+05	-6.0E+04	1.9E+06	-9.7E+05	6.7E+05	-6.2E+04	-5.3E+04	-4.9E+04	-6.7E+04	-3.8E+04	-4.0E+04	-5.3E+04	-6.6E+04
1.6E+02	-1.4E+06	7.5E+05	-6.8E+05	-1.1E+06	7.3E+05	2.1E+06	-1.9E+06	6.2E+05	-5.8E+04	-4.6E+04	-4.4E+04	-5.7E+04	-6.5E+04	-8.3E+04	-6.1E+04	-7.3E+04
1.7E+02	-3.6E+06	8.4E+05	6.6E+05	4.3E+05	8.4E+05	1.7E+06	-2.8E+06	2.7E+06	-5.1E+04	-4.2E+04	-7.2E+04	-6.6E+04	-8.3E+04	-5.9E+04	-8.3E+04	-8.3E+04
1.8E+02	-2.2E+06	4.2E+05	-1.3E+06	4.6E+05	1.8E+06	2.3E+06	-2.0E+06	7.6E+05	-7.3E+04	-6.0E+04	-5.9E+04	-5.3E+04	-7.7E+04	-8.2E+04	-4.6E+04	-6.0E+04
1.9E+02	-2.9E+06	3.4E+06	2.0E+06	-5.1E+06	3.5E+05	3.4E+06	-1.8E+06	-1.7E+05	-7.1E+04	-4.7E+04	-7.0E+04	-4.2E+04	-5.8E+04	-4.6E+04	-5.2E+04	-5.4E+04
2.0E+02	-1.3E+06	1.6E+06	-3.4E+05	-1.5E+06	1.0E+06	2.7E+06	-3.1E+06	8.2E+05	-4.8E+04	-6.5E+04	-6.8E+04	-6.2E+04	-7.0E+04	-5.9E+04	-6.2E+04	-6.9E+04
2.1E+02	-3.1E+05	3.1E+06	-9.3E+04	-4.8E+04	-6.7E+05	9.0E+05	-4.3E+06	7.0E+04	-5.2E+04	-6.3E+04	-4.8E+04	-5.6E+04	-6.0E+04	-4.1E+04	-5.8E+04	-6.7E+04
2.1E+02	-2.3E+06	-1.9E+04	-1.1E+06	-1.9E+06	1.3E+06	2.7E+06	-2.9E+06	1.3E+06	-5.2E+04	-4.9E+04	-3.7E+04	-3.7E+04	-4.0E+04	-4.9E+04	-4.7E+04	-7.3E+04
2.2E+02	-2.0E+06	4.5E+05	-7.8E+05	-1.5E+06	1.3E+06	3.3E+06	-3.1E+06	1.3E+06	-6.4E+04	-4.7E+04	-3.5E+04	-5.0E+04	-6.3E+04	-7.2E+04	-4.3E+04	-8.0E+04

Table 19. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.5 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.8E+06	8.0E+05	-9.7E+05	-1.4E+06	6.0E+04	2.0E+05	-2.4E+05	1.4E+04	-9.5E+04	-2.2E+05	-7.1E+04	-1.1E+05	-8.9E+04	-8.7E+04	-9.0E+04	-1.1E+05
2.0E+01	-2.0E+06	8.8E+05	-7.5E+05	-1.7E+06	2.7E+05	3.9E+05	-4.8E+05	-1.8E+05	-1.6E+05	-6.3E+04	-1.5E+05	-5.8E+04	-2.1E+05	-1.0E+05	-1.2E+05	-8.4E+04
2.9E+01	-2.0E+06	9.6E+05	-1.0E+06	-1.7E+06	6.1E+04	5.4E+05	-4.1E+05	-6.1E+04	-1.0E+05	-1.0E+05	-1.2E+05	-6.7E+04	-8.6E+04	-8.0E+04	-6.3E+04	-1.2E+05
3.9E+01	-2.3E+06	8.2E+05	-5.3E+05	-1.7E+06	4.2E+04	7.0E+05	-8.9E+05	-2.2E+04	-2.0E+05	-5.1E+04	-1.2E+05	-7.2E+04	-1.4E+05	-9.5E+04	-2.1E+05	-8.7E+04
4.9E+01	-1.3E+06	6.5E+05	-9.4E+05	-2.0E+06	-1.3E+05	1.0E+06	-7.2E+05	5.2E+04	-8.1E+05	-3.0E+05	-3.1E+05	-8.3E+04	-5.4E+05	-3.1E+05	-1.9E+05	-1.3E+05
5.9E+01	-2.1E+06	8.4E+05	-1.6E+06	-1.8E+06	4.4E+05	8.0E+05	-6.7E+05	2.2E+05	-1.7E+05	-6.5E+04	-2.4E+05	-6.1E+04	-1.6E+05	-1.1E+05	-1.7E+05	-1.0E+05
6.8E+01	-2.0E+06	9.3E+05	-1.1E+06	-2.1E+06	7.8E+04	1.0E+06	-8.3E+05	4.1E+05	-6.3E+04	-4.3E+04	-1.1E+05	-5.5E+04	-6.6E+04	-6.6E+04	-1.3E+05	-6.9E+04
7.8E+01	-2.1E+06	9.0E+05	-8.8E+05	-1.6E+06	8.3E+04	1.0E+06	-1.2E+06	6.0E+05	-1.4E+05	-5.6E+04	-1.2E+05	-6.6E+04	-2.1E+05	-6.1E+04	-1.1E+05	-8.4E+04
8.8E+01	-2.2E+06	9.7E+05	-9.7E+05	-1.9E+06	5.7E+05	1.1E+06	-1.1E+06	2.7E+05	-1.1E+05	-4.8E+04	-6.7E+04	-3.4E+04	-9.9E+04	-5.0E+04	-7.4E+04	-5.8E+04
9.8E+01	-2.0E+06	8.3E+05	-1.2E+06	-1.8E+06	4.3E+05	1.2E+06	-1.6E+06	4.8E+05	-2.4E+05	-1.4E+05	-1.1E+05	-4.9E+04	-1.8E+05	-1.1E+05	-8.9E+04	-6.8E+04
1.1E+02	-2.4E+06	8.8E+05	-7.3E+05	-1.8E+06	6.2E+05	1.2E+06	-1.2E+06	6.1E+05	-1.0E+05	-6.4E+04	-1.2E+05	-5.0E+04	-6.9E+04	-5.9E+04	-8.0E+04	-8.3E+04
1.2E+02	-1.9E+06	6.4E+05	-7.8E+05	-1.7E+06	1.0E+06	1.3E+06	-1.6E+06	8.3E+05	-7.1E+04	-4.3E+04	-6.0E+04	-6.1E+04	-7.1E+04	-4.7E+04	-5.4E+04	-6.3E+04
1.3E+02	-1.7E+06	5.1E+05	-9.0E+05	-1.4E+06	9.8E+05	1.6E+06	-1.9E+06	8.1E+05	-7.8E+04	-6.7E+04	-9.2E+04	-7.6E+04	-1.1E+05	-5.5E+04	-9.0E+04	-7.5E+04
1.4E+02	-1.7E+06	7.8E+05	-1.1E+06	-1.3E+06	1.6E+06	1.6E+06	-2.0E+06	2.3E+06	-7.3E+04	-5.8E+04	-6.5E+04	-1.0E+05	-8.1E+04	-6.9E+04	-6.9E+04	-5.9E+04
1.5E+02	-1.7E+06	-8.6E+04	-1.0E+06	-5.1E+05	-6.0E+04	2.2E+06	-1.1E+06	6.6E+05	-6.2E+04	-5.4E+04	-6.6E+04	-5.7E+04	-5.2E+04	-7.3E+04	-6.1E+04	-8.4E+04
1.6E+02	-1.8E+06	8.2E+05	-8.1E+05	-1.4E+06	9.2E+05	2.4E+06	-2.2E+06	5.9E+05	-4.9E+04	-6.0E+04	-7.1E+04	-5.7E+04	-7.0E+04	-5.8E+04	-5.2E+04	-7.2E+04
1.7E+02	-3.8E+06	9.1E+05	1.4E+04	7.2E+04	8.1E+05	2.5E+06	-3.1E+06	1.9E+06	-5.8E+04	-4.7E+04	-7.6E+04	-6.8E+04	-8.4E+04	-5.0E+04	-4.5E+04	-6.8E+04
1.8E+02	-2.6E+06	5.6E+05	-1.4E+06	-6.0E+04	1.8E+06	2.6E+06	-2.4E+06	7.9E+05	-7.5E+04	-4.9E+04	-6.4E+04	-4.5E+04	-4.6E+04	-7.3E+04	-4.8E+04	-7.4E+04
1.9E+02	-3.4E+06	3.5E+06	1.9E+06	-5.6E+06	5.4E+05	3.8E+06	-2.3E+06	-9.5E+04	-8.2E+04	-4.5E+04	-6.7E+04	-4.9E+04	-5.0E+04	-5.5E+04	-5.5E+04	-5.3E+04
2.0E+02	-1.7E+06	1.8E+06	-5.9E+05	-2.1E+06	1.2E+06	3.1E+06	-3.6E+06	9.3E+05	-3.9E+04	-4.9E+04	-5.1E+04	-6.7E+04	-6.7E+04	-5.6E+04	-7.8E+04	-6.5E+04
2.1E+02	-7.0E+05	3.2E+06	-4.1E+05	-7.7E+05	-5.7E+05	1.2E+06	-4.6E+06	1.4E+05	-6.1E+04	-5.1E+04	-6.6E+04	-5.0E+04	-8.4E+04	-4.1E+04	-7.4E+04	-6.5E+04
2.1E+02	-2.8E+06	1.8E+05	-1.2E+06	-2.5E+06	1.5E+06	3.1E+06	-3.4E+06	1.4E+06	-5.0E+04	-4.1E+04	-4.3E+04	-6.6E+04	-4.8E+04	-6.4E+04	-4.4E+04	-6.0E+04
2.2E+02	-2.3E+06	7.5E+05	-1.0E+06	-2.2E+06	1.5E+06	3.8E+06	-3.6E+06	1.6E+06	-5.1E+04	-7.0E+04	-4.6E+04	-7.2E+04	-4.3E+04	-7.7E+04	-3.2E+04	-5.9E+04

Table 20. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.6 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-7.5E+05	5.5E+05	-5.9E+05	-4.7E+05	-1.8E+04	4.1E+05	-1.2E+05	-9.2E+04	-1.1E+05	-1.4E+05	-1.2E+05	-9.3E+04	-1.1E+05	-1.6E+05	-5.4E+04	-1.6E+05
2.0E+01	-7.6E+05	6.5E+05	-6.9E+05	-6.0E+05	2.7E+05	3.5E+05	-3.1E+05	-1.6E+05	-2.5E+05	-1.2E+05	-2.9E+05	-8.4E+04	-1.4E+05	-1.0E+05	-2.3E+05	-6.9E+04
2.9E+01	-7.9E+05	8.3E+05	-7.8E+05	-6.2E+05	-5.4E+04	5.9E+05	-2.2E+05	-1.2E+05	-1.4E+05	-1.6E+05	-9.4E+04	-1.2E+05	-8.0E+04	-1.3E+05	-9.2E+04	-8.7E+04
3.9E+01	-9.0E+05	8.6E+05	-8.7E+05	-6.3E+05	3.4E+04	4.8E+05	-5.3E+05	4.0E+02	-1.6E+05	-1.1E+05	-1.6E+05	-1.0E+05	-1.8E+05	-9.7E+04	-1.6E+05	-9.1E+04
4.9E+01	-5.8E+05	6.5E+05	-7.0E+05	-7.0E+05	2.8E+05	4.0E+05	-3.0E+05	2.7E+05	-2.8E+05	-1.3E+05	-2.7E+05	-1.2E+05	-3.5E+05	-1.7E+05	-2.3E+05	-1.2E+05
5.9E+01	-5.4E+05	7.1E+05	-6.5E+05	-5.7E+05	2.4E+05	6.3E+05	-7.8E+05	4.0E+05	-2.7E+05	-1.6E+05	-2.2E+05	-8.7E+04	-2.1E+05	-1.1E+05	-2.5E+05	-7.1E+04
6.8E+01	-7.2E+05	6.9E+05	-6.7E+05	-8.4E+05	1.5E+05	6.2E+05	-4.3E+05	3.9E+05	-1.0E+05	-9.8E+04	-1.3E+05	-1.1E+05	-1.0E+05	-8.5E+04	-9.3E+04	-9.3E+04
7.8E+01	-9.8E+05	8.3E+05	-7.4E+05	1.1E+05	2.1E+05	8.9E+05	-3.5E+05	9.3E+05	-1.9E+05	-1.7E+05	-2.2E+05	-8.7E+04	-2.5E+05	-9.0E+04	-1.6E+05	-8.9E+04
8.8E+01	-7.8E+05	7.6E+05	-4.2E+05	-2.5E+05	5.0E+05	9.1E+05	-9.7E+05	4.9E+05	-1.4E+05	-1.1E+05	-1.4E+05	-1.1E+05	-1.0E+05	-1.0E+05	-1.0E+05	-4.0E+04
9.8E+01	-7.9E+05	6.2E+05	-8.1E+05	-4.9E+05	2.7E+05	7.7E+05	-1.2E+06	4.6E+05	-8.6E+04	-6.9E+04	-5.5E+04	-8.8E+04	-9.1E+04	-8.8E+04	-1.9E+05	-6.5E+04
1.1E+02	-9.1E+05	6.5E+05	-6.5E+05	-4.5E+05	3.5E+05	8.3E+05	-1.1E+06	6.5E+05	-9.1E+04	-7.4E+04	-1.1E+05	-9.9E+04	-1.3E+05	-1.1E+05	-7.5E+04	-8.7E+04
1.2E+02	-6.1E+05	5.3E+05	-8.0E+05	-4.8E+05	6.5E+05	1.0E+06	-1.4E+06	7.2E+05	-4.6E+04	-6.7E+04	-5.1E+04	-7.3E+04	-7.1E+04	-7.8E+04	-8.8E+04	-5.6E+04
1.3E+02	-4.9E+05	4.5E+05	-7.9E+05	-2.2E+05	8.1E+05	1.2E+06	-1.6E+06	8.8E+05	-6.2E+04	-1.0E+05	-9.6E+04	-1.0E+05	-7.0E+04	-1.0E+05	-8.3E+04	-8.1E+04
1.4E+02	-1.8E+05	3.5E+05	-1.2E+06	4.0E+05	1.6E+06	1.3E+06	-1.6E+06	2.1E+06	-5.5E+04	-8.0E+04	-5.6E+04	-8.3E+04	-9.6E+04	-8.0E+04	-5.2E+04	-7.4E+04
1.5E+02	-2.8E+05	-1.9E+05	-9.1E+05	2.6E+05	-3.9E+05	1.8E+06	-4.3E+05	5.2E+05	-7.2E+04	-7.6E+04	-6.7E+04	-1.0E+05	-8.2E+04	-9.5E+04	-8.7E+04	-6.8E+04
1.6E+02	-5.9E+05	8.8E+05	-1.1E+05	-6.1E+05	7.3E+05	1.8E+06	-1.6E+06	6.6E+05	-8.5E+04	-1.3E+05	-5.3E+04	-1.0E+05	-6.5E+04	-8.3E+04	-9.0E+04	-9.8E+04
1.7E+02	-2.0E+06	8.2E+05	-1.1E+05	8.4E+05	8.8E+05	1.9E+06	-2.3E+06	1.5E+06	-1.8E+05	-1.7E+05	-2.1E+05	-1.6E+05	-1.7E+05	-1.7E+05	-1.9E+05	-1.7E+05
1.8E+02	3.1E+05	7.4E+05	-4.6E+04	1.2E+06	1.3E+06	2.2E+06	-1.8E+06	8.7E+05	-1.1E+05	-1.1E+05	-9.4E+04	-9.6E+04	-1.4E+05	-1.4E+05	-6.2E+04	-7.6E+04
1.9E+02	-1.7E+06	2.9E+06	1.9E+06	-3.5E+06	3.7E+05	2.7E+06	-1.6E+06	1.3E+05	-4.5E+04	-7.9E+04	-6.0E+04	-6.8E+04	-6.5E+04	-7.2E+04	-7.0E+04	-6.1E+04
2.0E+02	-3.4E+05	1.7E+06	-2.4E+04	-7.5E+05	8.1E+05	2.3E+06	-2.6E+06	7.4E+05	-3.9E+04	-9.5E+04	-4.3E+04	-9.1E+04	-6.1E+04	-8.5E+04	-5.9E+04	-7.1E+04
2.1E+02	7.0E+05	3.1E+06	2.6E+05	5.5E+05	-8.3E+05	6.2E+05	-3.6E+06	2.1E+05	-8.7E+04	-7.6E+04	-9.9E+04	-7.8E+04	-6.3E+04	-7.4E+04	-5.3E+04	-4.5E+04
2.1E+02	-1.2E+06	1.2E+05	-7.5E+05	-1.1E+06	7.8E+05	2.2E+06	-2.5E+06	1.2E+06	-4.1E+04	-8.1E+04	-3.5E+04	-7.2E+04	-2.6E+04	-7.3E+04	-3.6E+04	-5.1E+04
2.2E+02	-9.6E+05	6.5E+05	-5.1E+05	-8.5E+05	8.4E+05	2.8E+06	-2.7E+06	1.3E+06	-5.7E+04	-8.2E+04	-4.3E+04	-1.1E+05	-4.8E+04	-1.2E+05	-3.0E+04	-6.4E+04

Table 21. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.6 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.1E+06	5.3E+05	-7.2E+05	-8.3E+05	9.1E+03	1.6E+05	-1.4E+05	-1.1E+04	-7.2E+04	-1.1E+05	-8.0E+04	-9.4E+04	-8.2E+04	-1.9E+05	-5.5E+04	-1.2E+05
2.0E+01	-1.2E+06	7.9E+05	-8.2E+05	-7.1E+05	3.5E+05	3.8E+05	-2.6E+05	-2.2E+05	-3.1E+05	-1.2E+05	-2.3E+05	-9.2E+04	-1.4E+05	-9.9E+04	-2.3E+05	-8.6E+04
2.9E+01	-1.1E+06	7.6E+05	-9.5E+05	-7.7E+05	2.2E+05	3.3E+05	-4.8E+05	-1.0E+05	-1.4E+05	-1.1E+05	-8.3E+04	-1.1E+05	-8.7E+04	-1.0E+05	-6.8E+04	-1.2E+05
3.9E+01	-1.3E+06	7.4E+05	-8.3E+05	-1.0E+06	-1.9E+05	5.1E+05	-5.6E+05	6.3E+03	-2.3E+05	-8.5E+04	-2.6E+05	-1.1E+05	-1.0E+05	-1.1E+05	-1.7E+05	-8.2E+04
4.9E+01	-1.1E+06	7.4E+05	-7.7E+05	-1.2E+06	-7.9E+04	5.5E+05	-2.5E+05	1.9E+05	-2.1E+05	-9.5E+04	-2.5E+05	-8.7E+04	-2.4E+05	-1.0E+05	-2.0E+05	-6.5E+04
5.9E+01	-1.2E+06	7.8E+05	-7.8E+05	-8.7E+05	4.8E+05	6.4E+05	-1.1E+06	3.5E+05	-2.8E+05	-1.2E+05	-1.3E+05	-7.7E+04	-2.1E+05	-1.3E+05	-2.4E+05	-8.3E+04
6.8E+01	-9.8E+05	6.3E+05	-6.8E+05	-1.3E+06	1.5E+05	7.3E+05	-6.3E+05	6.0E+05	-9.8E+04	-7.6E+04	-1.5E+05	-1.1E+05	-1.3E+05	-1.1E+05	-1.1E+05	-7.2E+04
7.8E+01	-1.2E+06	7.7E+05	-6.4E+05	-3.1E+05	1.8E+05	1.0E+06	-9.7E+05	8.8E+05	-2.6E+05	-1.3E+05	-1.4E+05	-1.2E+05	-1.8E+05	-9.2E+04	-1.6E+05	-8.7E+04
8.8E+01	-1.0E+06	8.5E+05	-9.1E+05	-7.6E+05	4.9E+05	1.1E+06	-1.1E+06	5.8E+05	-1.2E+05	-6.8E+04	-1.3E+05	-8.5E+04	-8.3E+04	-1.1E+05	-1.3E+05	-7.3E+04
9.8E+01	-1.3E+06	7.1E+05	-8.7E+05	-9.3E+05	3.3E+05	9.9E+05	-1.4E+06	6.7E+05	-5.8E+04	-1.0E+05	-6.9E+04	-7.5E+04	-9.3E+04	-8.5E+04	-1.4E+05	-8.3E+04
1.1E+02	-1.2E+06	6.8E+05	-7.7E+05	-8.5E+05	4.2E+05	1.2E+06	-1.3E+06	9.3E+05	-1.2E+05	-8.3E+04	-1.2E+05	-1.1E+05	-1.1E+05	-8.5E+04	-9.5E+04	-8.2E+04
1.2E+02	-1.0E+06	6.2E+05	-9.6E+05	-6.6E+05	8.4E+05	1.1E+06	-1.5E+06	8.3E+05	-4.0E+04	-6.3E+04	-6.8E+04	-8.6E+04	-7.2E+04	-8.3E+04	-1.0E+05	-4.9E+04
1.3E+02	-8.3E+05	4.5E+05	-8.2E+05	-4.9E+05	9.0E+05	1.4E+06	-1.6E+06	9.7E+05	-8.1E+04	-1.1E+05	-9.0E+04	-1.2E+05	-8.6E+04	-1.1E+05	-5.5E+04	-6.0E+04
1.4E+02	-6.6E+05	3.0E+05	-1.2E+06	1.3E+05	1.8E+06	1.5E+06	-1.9E+06	2.2E+06	-5.7E+04	-7.9E+04	-8.5E+04	-1.1E+05	-1.0E+05	-1.0E+05	-5.5E+04	-1.1E+05
1.5E+02	-6.5E+05	-2.7E+05	-8.5E+05	2.1E+04	-2.0E+05	2.1E+06	-7.1E+05	6.5E+05	-5.6E+04	-6.8E+04	-8.5E+04	-7.7E+04	-6.4E+04	-6.4E+04	-8.0E+04	-7.2E+04
1.6E+02	-1.1E+06	8.7E+05	-5.1E+05	-8.7E+05	7.8E+05	2.2E+06	-2.0E+06	8.1E+05	-7.1E+04	-7.5E+04	-5.6E+04	-1.0E+05	-7.1E+04	-8.4E+04	-5.5E+04	-7.4E+04
1.7E+02	-2.4E+06	4.9E+05	-1.3E+05	9.5E+05	1.2E+06	2.2E+06	-2.7E+06	1.7E+06	-9.5E+04	-9.8E+04	-8.8E+04	-8.5E+04	-9.6E+04	-8.6E+04	-8.0E+04	-8.5E+04
1.8E+02	6.1E+04	7.6E+05	-1.1E+05	8.3E+05	1.6E+06	2.7E+06	-2.1E+06	1.0E+06	-6.0E+04	-8.2E+04	-5.0E+04	-6.8E+04	-6.4E+04	-7.0E+04	-3.9E+04	-4.7E+04
1.9E+02	-2.0E+06	2.9E+06	1.6E+06	-3.9E+06	5.0E+05	3.2E+06	-2.0E+06	3.7E+05	-4.6E+04	-7.2E+04	-5.7E+04	-6.6E+04	-6.5E+04	-8.0E+04	-6.0E+04	-5.2E+04
2.0E+02	-7.6E+05	1.7E+06	-1.7E+05	-1.1E+06	1.0E+06	2.8E+06	-3.0E+06	9.5E+05	-3.9E+04	-7.6E+04	-4.9E+04	-8.4E+04	-5.7E+04	-8.4E+04	-4.9E+04	-6.3E+04
2.1E+02	2.5E+05	3.2E+06	1.8E+04	1.0E+05	-7.6E+05	1.1E+06	-4.1E+06	3.2E+05	-7.1E+04	-8.8E+04	-5.6E+04	-7.6E+04	-6.0E+04	-7.6E+04	-5.6E+04	-6.3E+04
2.1E+02	-1.6E+06	1.9E+05	-9.9E+05	-1.6E+06	1.0E+06	2.8E+06	-3.0E+06	1.3E+06	-2.3E+04	-8.5E+04	-2.5E+04	-8.2E+04	-4.5E+04	-6.9E+04	-2.6E+04	-4.7E+04
2.2E+02	-1.3E+06	7.2E+05	-7.3E+05	-1.2E+06	1.1E+06	3.5E+06	-3.2E+06	1.5E+06	-5.4E+04	-9.9E+04	-6.3E+04	-1.0E+05	-2.9E+04	-7.2E+04	-4.2E+04	-8.3E+04

Table 22. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.6 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.5E+06	7.6E+05	-9.0E+05	-1.1E+06	-1.9E+04	3.0E+05	-1.5E+05	-1.7E+05	-1.2E+05	-1.7E+05	-7.5E+04	-1.0E+05	-1.5E+05	-1.7E+05	-8.4E+04	-1.2E+05
2.0E+01	-1.6E+06	9.2E+05	-1.1E+06	-1.1E+06	2.2E+05	4.4E+05	-7.1E+04	-4.0E+05	-2.3E+05	-9.3E+04	-1.4E+05	-1.1E+05	-1.9E+05	-2.0E+05	-1.8E+05	-1.6E+05
2.9E+01	-1.5E+06	8.3E+05	-1.2E+06	-1.2E+06	1.5E+05	4.3E+05	-3.7E+05	-1.6E+05	-1.2E+05	-1.2E+05	-8.0E+04	-1.1E+05	-6.9E+04	-1.9E+05	-9.6E+04	-7.8E+04
3.9E+01	-1.3E+06	8.8E+05	-1.1E+06	-1.5E+06	-3.0E+04	5.2E+05	-5.3E+05	-9.2E+03	-1.8E+05	-1.5E+05	-1.6E+05	-9.0E+04	-1.5E+05	-1.1E+05	-1.9E+05	-8.2E+04
4.9E+01	-2.0E+06	7.7E+05	-1.2E+06	-1.7E+06	5.4E+04	4.3E+05	-3.7E+05	2.5E+03	-6.8E+05	-3.7E+05	-2.9E+05	-9.5E+04	-8.2E+05	-3.5E+05	-2.8E+05	-8.4E+04
5.9E+01	-1.6E+06	8.8E+05	-9.9E+05	-1.4E+06	6.7E+05	8.2E+05	-1.1E+06	2.5E+05	-2.7E+05	-8.8E+04	-1.8E+05	-1.2E+05	-1.9E+05	-1.1E+05	-2.1E+05	-9.3E+04
6.8E+01	-1.4E+06	9.7E+05	-8.4E+05	-1.8E+06	2.2E+05	8.9E+05	-7.7E+05	4.7E+05	-1.1E+05	-1.0E+05	-1.2E+05	-8.0E+04	-1.1E+05	-1.0E+05	-1.2E+05	-9.9E+04
7.8E+01	-1.7E+06	9.8E+05	-8.9E+05	-9.9E+05	1.1E+05	1.2E+06	-1.1E+06	6.7E+05	-2.5E+05	-1.1E+05	-1.5E+05	-7.7E+04	-2.4E+05	-9.5E+04	-2.1E+05	-7.6E+04
8.8E+01	-1.5E+06	1.0E+06	-1.0E+06	-1.4E+06	4.4E+05	1.1E+06	-1.2E+06	5.3E+05	-1.1E+05	-9.3E+04	-9.0E+04	-8.7E+04	-8.9E+04	-1.0E+05	-1.3E+05	-6.8E+04
9.8E+01	-1.7E+06	9.4E+05	-1.1E+06	-1.5E+06	4.4E+05	1.0E+06	-1.4E+06	6.0E+05	-9.5E+04	-1.2E+05	-6.4E+04	-7.1E+04	-1.1E+05	-1.3E+05	-1.1E+05	-5.9E+04
1.1E+02	-1.8E+06	7.6E+05	-8.8E+05	-1.5E+06	6.1E+05	1.2E+06	-1.2E+06	1.0E+06	-8.6E+04	-8.9E+04	-9.0E+04	-8.9E+04	-9.5E+04	-8.9E+04	-8.2E+04	-7.3E+04
1.2E+02	-1.3E+06	6.7E+05	-9.0E+05	-1.3E+06	9.8E+05	1.3E+06	-1.7E+06	1.1E+06	-5.7E+04	-8.3E+04	-6.1E+04	-1.0E+05	-8.6E+04	-9.6E+04	-1.0E+05	-7.1E+04
1.3E+02	-1.3E+06	7.3E+05	-9.2E+05	-9.6E+05	1.0E+06	1.5E+06	-1.8E+06	1.0E+06	-6.7E+04	-7.5E+04	-6.7E+04	-1.0E+05	-6.8E+04	-9.2E+04	-6.7E+04	-7.9E+04
1.4E+02	-1.1E+06	4.5E+05	-1.4E+06	-5.4E+05	1.9E+06	1.6E+06	-2.0E+06	2.3E+06	-6.7E+04	-9.7E+04	-1.0E+05	-1.1E+05	-1.1E+05	-1.0E+05	-5.0E+04	-6.1E+04
1.5E+02	-1.3E+06	-4.3E+04	-9.1E+05	-5.1E+05	7.2E+04	2.2E+06	-9.7E+05	8.6E+05	-9.4E+04	-8.1E+04	-9.5E+04	-8.8E+04	-8.6E+04	-8.6E+04	-8.0E+04	-7.1E+04
1.6E+02	-1.5E+06	9.1E+05	-4.9E+05	-1.5E+06	1.1E+06	2.4E+06	-2.3E+06	9.8E+05	-8.4E+04	-1.2E+05	-6.1E+04	-1.0E+05	-7.1E+04	-1.2E+05	-5.4E+04	-5.8E+04
1.7E+02	-3.0E+06	9.5E+05	-3.6E+05	1.3E+05	9.1E+05	2.8E+06	-2.7E+06	1.5E+06	-7.1E+04	-8.9E+04	-8.9E+04	-7.1E+04	-8.6E+04	-7.4E+04	-6.7E+04	-7.5E+04
1.8E+02	-2.9E+05	9.4E+05	-1.3E+05	3.2E+05	2.1E+06	3.2E+06	-2.4E+06	1.2E+06	-5.9E+04	-9.0E+04	-7.4E+04	-7.7E+04	-8.4E+04	-8.5E+04	-3.6E+04	-5.9E+04
1.9E+02	-2.5E+06	3.1E+06	1.5E+06	-4.4E+06	8.6E+05	3.5E+06	-2.5E+06	5.3E+05	-4.5E+04	-6.2E+04	-5.9E+04	-8.8E+04	-4.6E+04	-7.8E+04	-8.2E+04	-6.0E+04
2.0E+02	-1.3E+06	1.9E+06	-4.6E+05	-1.6E+06	1.4E+06	3.2E+06	-3.4E+06	1.2E+06	-4.4E+04	-8.3E+04	-3.4E+04	-7.7E+04	-6.6E+04	-8.9E+04	-4.5E+04	-6.9E+04
2.1E+02	-4.2E+04	3.4E+06	-3.3E+05	-5.5E+05	-5.1E+05	1.4E+06	-4.6E+06	5.7E+05	-6.9E+04	-8.4E+04	-8.2E+04	-8.4E+04	-1.0E+05	-9.3E+04	-7.6E+04	-6.5E+04
2.1E+02	-2.1E+06	3.3E+05	-1.3E+06	-2.1E+06	1.3E+06	3.3E+06	-3.4E+06	1.8E+06	-3.3E+04	-7.1E+04	-3.6E+04	-5.9E+04	-5.0E+04	-8.1E+04	-4.9E+04	-6.9E+04
2.2E+02	-1.8E+06	1.1E+06	-9.2E+05	-1.7E+06	1.5E+06	4.0E+06	-3.6E+06	1.9E+06	-5.7E+04	-9.8E+04	-5.2E+04	-8.0E+04	-4.8E+04	-1.3E+05	-4.2E+04	-6.4E+04

Table 23. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.4 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	1.6E+06	-1.5E+06	-1.5E+06	2.6E+04	2.4E+05	-2.3E+05	8.2E+04	-8.4E+04	-1.2E+05	-4.2E+04	-1.3E+05	-1.2E+05	-6.4E+04	-8.1E+04	-5.6E+04
2.0E+01	-2.1E+06	1.9E+06	-1.5E+06	-1.6E+06	3.1E+05	2.7E+05	-4.1E+05	7.3E+04	-1.5E+05	-8.5E+04	-8.7E+04	-1.1E+05	-1.9E+05	-1.1E+05	-1.9E+05	-1.1E+05
2.9E+01	-2.1E+06	1.6E+06	-1.8E+06	-1.5E+06	2.6E+05	2.3E+05	-6.8E+05	2.4E+05	-7.0E+04	-1.3E+05	-1.3E+05	-1.6E+05	-1.2E+05	-1.2E+05	-8.1E+04	-8.9E+04
3.9E+01	-1.9E+06	1.9E+06	-2.2E+06	-1.7E+06	-5.2E+04	6.2E+05	-9.6E+05	5.7E+04	-2.1E+05	-7.5E+04	-1.2E+05	-8.6E+04	-1.9E+05	-8.0E+04	-2.0E+05	-6.2E+04
4.9E+01	-1.8E+06	1.9E+06	-1.8E+06	-1.9E+06	2.7E+05	6.5E+05	-7.7E+05	2.3E+05	-1.8E+05	-5.0E+04	-1.3E+05	-1.2E+05	-2.3E+05	-1.1E+05	-1.9E+05	-6.6E+04
5.9E+01	-2.2E+06	1.8E+06	-2.2E+06	-1.7E+06	-7.2E+04	6.3E+05	-6.9E+05	2.4E+05	-1.6E+05	-5.5E+04	-8.7E+04	-1.1E+05	-2.0E+05	-8.4E+04	-2.3E+05	-7.6E+04
6.8E+01	-2.1E+06	1.9E+06	-1.7E+06	-2.2E+06	3.8E+05	8.2E+05	-1.1E+06	5.4E+05	-1.1E+05	-8.0E+04	-9.7E+04	-9.0E+04	-5.6E+04	-7.3E+04	-6.5E+04	-4.6E+04
7.8E+01	-2.2E+06	1.5E+06	-2.1E+06	-1.1E+06	3.2E+05	9.2E+05	-1.5E+06	1.1E+06	-1.3E+05	-8.7E+04	-1.8E+05	-9.5E+04	-1.2E+05	-7.7E+04	-1.2E+05	-7.0E+04
8.8E+01	-2.0E+06	1.6E+06	-2.1E+06	-1.4E+06	6.1E+05	1.0E+06	-1.4E+06	5.9E+05	-6.5E+04	-4.6E+04	-6.0E+04	-7.4E+04	-9.5E+04	-5.4E+04	-1.0E+05	-6.0E+04
9.8E+01	-2.0E+06	1.5E+06	-2.2E+06	-1.6E+06	3.3E+05	1.1E+06	-1.8E+06	7.2E+05	-5.6E+04	-5.4E+04	-7.6E+04	-8.3E+04	-9.1E+04	-7.9E+04	-1.2E+05	-9.3E+04
1.1E+02	-2.2E+06	1.5E+06	-2.0E+06	-1.3E+06	4.8E+05	1.3E+06	-1.7E+06	7.9E+05	-7.7E+04	-6.0E+04	-7.0E+04	-1.1E+05	-5.2E+04	-7.9E+04	-8.4E+04	-6.1E+04
1.2E+02	-1.9E+06	1.5E+06	-2.3E+06	-1.3E+06	5.9E+05	1.5E+06	-1.8E+06	6.8E+05	-5.9E+04	-6.6E+04	-4.8E+04	-8.2E+04	-7.6E+04	-7.5E+04	-7.9E+04	-7.0E+04
1.3E+02	-1.7E+06	1.5E+06	-2.4E+06	-1.1E+06	9.1E+05	1.9E+06	-1.9E+06	7.8E+05	-7.1E+04	-6.1E+04	-6.1E+04	-8.5E+04	-3.8E+04	-7.7E+04	-5.2E+04	-4.8E+04
1.4E+02	-1.9E+06	7.6E+05	-3.5E+06	-1.7E+06	8.6E+05	2.2E+06	-1.6E+06	5.6E+05	-5.5E+04	-5.1E+04	-6.2E+04	-6.2E+04	-4.8E+04	-7.2E+04	-3.2E+04	-5.8E+04
1.5E+02	-2.5E+06	1.4E+06	-1.7E+06	-1.7E+06	-2.0E+05	2.6E+06	-1.2E+06	5.3E+05	-5.0E+04	-5.1E+04	-6.6E+04	-9.3E+04	-5.8E+04	-5.9E+04	-3.6E+04	-5.8E+04
1.6E+02	-2.0E+06	1.7E+06	-2.7E+06	-9.0E+05	1.0E+06	2.2E+06	-2.4E+06	1.1E+06	-4.2E+04	-7.5E+04	-1.1E+05	-1.1E+05	-9.8E+04	-7.3E+04	-6.6E+04	-6.3E+04
1.7E+02	-4.5E+06	3.5E+06	-1.3E+06	-2.5E+06	8.3E+05	2.0E+06	-2.8E+06	2.2E+06	-1.7E+05	-1.5E+05	-3.3E+05	-1.3E+05	-2.5E+05	-9.5E+04	-1.3E+05	-1.9E+05
1.8E+02	-1.5E+06	6.4E+05	-3.7E+06	9.2E+05	1.6E+06	1.5E+06	-3.3E+06	2.3E+06	-1.0E+05	-1.3E+05	-2.4E+05	-2.0E+05	-2.5E+05	-1.3E+05	-1.5E+05	-8.7E+04
1.9E+02	-3.2E+06	3.5E+06	-1.0E+06	-4.4E+06	1.0E+06	3.3E+06	-2.5E+06	3.0E+05	-7.6E+04	-1.0E+05	-1.1E+05	-7.5E+04	-1.3E+05	-1.1E+05	-6.6E+04	-7.9E+04
2.0E+02	-1.6E+06	1.8E+06	-3.3E+06	-1.1E+06	9.5E+05	3.1E+06	-2.6E+06	8.5E+05	-8.0E+04	-8.5E+04	-5.8E+04	-9.8E+04	-6.2E+04	-1.0E+05	-6.4E+04	-7.4E+04
2.1E+02	-8.4E+05	3.5E+06	-2.5E+06	1.6E+04	-7.4E+05	1.3E+06	-3.5E+06	2.7E+05	-7.1E+04	-8.7E+04	-7.6E+04	-7.9E+04	-1.1E+05	-7.2E+04	-6.3E+04	-6.6E+04
2.1E+02	-2.4E+06	9.5E+05	-3.7E+06	-1.7E+06	1.8E+06	3.3E+06	-2.8E+06	1.4E+06	-4.6E+04	-5.4E+04	-4.4E+04	-7.8E+04	-3.1E+04	-6.7E+04	-3.5E+04	-6.1E+04
2.2E+02	-2.1E+06	1.1E+06	-3.4E+06	-1.4E+06	1.3E+06	3.6E+06	-2.9E+06	1.3E+06	-3.8E+04	-8.8E+04	-4.4E+04	-6.4E+04	-5.0E+04	-6.9E+04	-3.5E+04	-9.5E+04

Table 24. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.4 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.2E+06	1.6E+06	-1.6E+06	-1.7E+06	1.5E+05	2.5E+05	-2.7E+05	5.9E+04	-1.1E+05	-1.0E+05	-9.8E+04	-8.5E+04	-1.2E+05	-1.2E+05	-7.3E+04	-6.2E+04
2.0E+01	-2.5E+06	1.8E+06	-1.4E+06	-1.9E+06	3.6E+05	3.1E+05	-5.5E+05	9.4E+04	-1.5E+05	-5.4E+04	-1.3E+05	-9.5E+04	-1.8E+05	-8.5E+04	-1.5E+05	-6.0E+04
2.9E+01	-2.3E+06	1.7E+06	-1.7E+06	-1.8E+06	3.5E+05	3.5E+05	-8.1E+05	2.9E+05	-8.9E+04	-1.4E+05	-6.6E+04	-1.1E+05	-7.4E+04	-1.1E+05	-6.5E+04	-8.2E+04
3.9E+01	-1.7E+06	1.9E+06	-1.6E+06	-1.9E+06	3.6E+05	6.9E+05	-1.3E+06	1.0E+05	-2.5E+05	-5.2E+04	-2.1E+05	-6.9E+04	-2.5E+05	-1.0E+05	-1.7E+05	-4.9E+04
4.9E+01	-2.1E+06	2.0E+06	-1.8E+06	-2.2E+06	3.7E+05	6.7E+05	-9.6E+05	2.9E+05	-1.5E+05	-6.0E+04	-1.4E+05	-8.5E+04	-1.6E+05	-7.4E+04	-1.2E+05	-5.0E+04
5.9E+01	-2.4E+06	2.0E+06	-2.1E+06	-2.2E+06	-1.0E+04	6.2E+05	-8.1E+05	2.3E+05	-1.2E+05	-9.4E+04	-1.2E+05	-8.7E+04	-1.9E+05	-6.3E+04	-2.3E+05	-1.0E+05
6.8E+01	-2.4E+06	1.8E+06	-1.8E+06	-2.6E+06	3.0E+05	9.3E+05	-1.3E+06	5.9E+05	-9.4E+04	-5.3E+04	-1.1E+05	-9.0E+04	-6.6E+04	-6.1E+04	-4.2E+04	-6.9E+04
7.8E+01	-2.2E+06	1.8E+06	-2.3E+06	-1.2E+06	1.7E+05	9.8E+05	-1.5E+06	1.1E+06	-7.1E+04	-6.4E+04	-9.5E+04	-9.9E+04	-2.1E+05	-7.2E+04	-1.8E+05	-9.7E+04
8.8E+01	-2.4E+06	1.6E+06	-2.1E+06	-1.7E+06	7.3E+05	9.7E+05	-1.5E+06	8.9E+05	-4.8E+04	-6.0E+04	-2.5E+04	-8.5E+04	-9.3E+04	-5.2E+04	-1.2E+05	-5.0E+04
9.8E+01	-2.2E+06	1.5E+06	-2.3E+06	-1.8E+06	4.3E+05	1.2E+06	-1.9E+06	8.9E+05	-5.6E+04	-6.0E+04	-1.1E+05	-7.1E+04	-9.2E+04	-6.5E+04	-1.1E+05	-6.0E+04
1.1E+02	-2.6E+06	1.4E+06	-2.1E+06	-1.5E+06	5.8E+05	1.3E+06	-1.9E+06	1.0E+06	-5.3E+04	-6.2E+04	-5.9E+04	-7.5E+04	-5.5E+04	-6.4E+04	-6.3E+04	-7.9E+04
1.2E+02	-2.2E+06	1.3E+06	-2.2E+06	-1.6E+06	8.3E+05	1.6E+06	-1.8E+06	8.8E+05	-4.2E+04	-6.4E+04	-4.3E+04	-6.2E+04	-5.3E+04	-4.4E+04	-6.3E+04	-5.5E+04
1.3E+02	-2.1E+06	1.3E+06	-2.3E+06	-1.3E+06	9.0E+05	2.0E+06	-1.9E+06	9.4E+05	-3.7E+04	-7.0E+04	-4.4E+04	-6.2E+04	-4.5E+04	-5.7E+04	-4.6E+04	-5.5E+04
1.4E+02	-2.0E+06	9.5E+05	-3.3E+06	-1.7E+06	1.5E+06	3.3E+06	-1.1E+06	1.7E+06	-6.7E+04	-5.9E+04	-8.2E+04	-8.0E+04	-4.0E+04	-6.0E+04	-3.7E+04	-5.5E+04
1.5E+02	-3.0E+06	1.3E+06	-1.7E+06	-1.9E+06	5.4E+03	3.0E+06	-1.2E+06	5.3E+05	-3.5E+04	-4.4E+04	-4.7E+04	-5.4E+04	-4.5E+04	-5.1E+04	-4.7E+04	-5.5E+04
1.6E+02	-2.1E+06	1.6E+06	-2.7E+06	-1.1E+06	1.0E+06	2.6E+06	-2.6E+06	1.3E+06	-5.0E+04	-5.8E+04	-5.9E+04	-7.6E+04	-5.8E+04	-7.4E+04	-6.9E+04	-7.9E+04
1.7E+02	-4.9E+06	4.7E+06	-3.7E+05	-4.3E+06	1.3E+06	2.0E+06	-3.2E+06	2.6E+06	-5.8E+04	-4.7E+04	-7.8E+04	-7.3E+04	-6.8E+04	-7.7E+04	-6.9E+04	-8.8E+04
1.8E+02	-1.3E+06	3.6E+05	-4.3E+06	1.0E+06	2.2E+06	1.4E+06	-4.1E+06	3.2E+06	-9.9E+04	-5.1E+04	-3.1E+04	-7.4E+04	-6.2E+04	-7.0E+04	-6.3E+04	-5.2E+04
1.9E+02	-3.2E+06	3.3E+06	-1.1E+06	-4.4E+06	1.4E+06	3.8E+06	-2.9E+06	1.8E+05	-4.1E+04	-4.8E+04	-5.8E+04	-6.0E+04	-5.7E+04	-5.5E+04	-5.8E+04	-5.2E+04
2.0E+02	-1.7E+06	1.8E+06	-3.1E+06	-1.3E+06	1.3E+06	3.7E+06	-3.0E+06	5.9E+05	-6.2E+04	-6.1E+04	-5.6E+04	-7.8E+04	-5.2E+04	-6.9E+04	-5.1E+04	-7.3E+04
2.1E+02	-7.2E+05	3.6E+06	-2.8E+06	-3.7E+05	-3.8E+05	1.7E+06	-4.0E+06	3.7E+05	-6.2E+04	-6.3E+04	-6.2E+04	-5.9E+04	-7.8E+04	-6.5E+04	-5.6E+04	-6.6E+04
2.1E+02	-2.6E+06	8.0E+05	-3.6E+06	-1.9E+06	1.7E+06	3.5E+06	-3.1E+06	1.5E+06	-2.9E+04	-5.8E+04	-2.2E+04	-7.0E+04	-3.6E+04	-7.4E+04	-3.0E+04	-5.8E+04
2.2E+02	-2.3E+06	1.0E+06	-3.5E+06	-1.5E+06	1.4E+06	4.1E+06	-3.3E+06	1.5E+06	-2.7E+04	-4.4E+04	-4.4E+04	-7.1E+04	-3.8E+04	-5.9E+04	-4.3E+04	-6.4E+04

Table 25. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.4 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.6E+06	1.9E+06	-1.5E+06	-1.9E+06	1.3E+05	2.6E+05	-2.8E+05	-1.5E+04	-1.5E+05	-1.1E+05	-7.9E+04	-1.0E+05	-1.2E+05	-8.2E+04	-8.6E+04	-6.2E+04
2.0E+01	-2.4E+06	1.9E+06	-1.5E+06	-1.9E+06	-1.4E+05	3.6E+05	-4.8E+05	-1.0E+05	-1.6E+05	-5.3E+04	-9.6E+04	-1.0E+05	-1.1E+05	-6.6E+04	-1.4E+05	-5.9E+04
2.9E+01	-2.5E+06	1.8E+06	-1.7E+06	-2.1E+06	2.0E+04	4.8E+05	-6.7E+05	1.4E+05	-1.0E+05	-6.8E+04	-7.6E+04	-8.7E+04	-1.2E+05	-1.1E+05	-5.1E+04	-9.3E+04
3.9E+01	-2.7E+06	2.1E+06	-1.9E+06	-2.0E+06	-3.2E+05	7.4E+05	-6.5E+05	-6.4E+04	-1.7E+05	-1.0E+05	-1.3E+05	-1.1E+05	-1.5E+05	-7.9E+04	-8.3E+04	-5.8E+04
4.9E+01	-2.9E+06	1.9E+06	-1.6E+06	-2.6E+06	5.0E+05	1.1E+06	-8.6E+05	9.4E+04	-5.7E+05	-3.5E+05	-1.9E+05	-1.2E+05	-6.7E+05	-3.1E+05	-2.1E+05	-8.4E+04
5.9E+01	-2.6E+06	2.0E+06	-2.1E+06	-2.3E+06	8.8E+04	8.1E+05	-1.2E+06	-4.3E+04	-1.8E+05	-5.4E+04	-1.2E+05	-1.0E+05	-2.3E+05	-7.8E+04	-2.2E+05	-9.1E+04
6.8E+01	-2.6E+06	2.1E+06	-1.7E+06	-2.8E+06	9.5E+04	1.1E+06	-1.3E+06	2.3E+05	-9.4E+04	-4.9E+04	-7.0E+04	-1.0E+05	-7.1E+04	-5.0E+04	-7.8E+04	-5.7E+04
7.8E+01	-2.6E+06	1.9E+06	-1.9E+06	-1.8E+06	3.4E+05	1.0E+06	-1.5E+06	8.5E+05	-7.6E+04	-7.5E+04	-1.1E+05	-8.0E+04	-1.0E+05	-6.3E+04	-1.8E+05	-9.3E+04
8.8E+01	-2.7E+06	1.8E+06	-2.2E+06	-2.1E+06	6.3E+05	1.1E+06	-1.7E+06	6.0E+05	-5.6E+04	-7.5E+04	-5.5E+04	-7.9E+04	-8.2E+04	-5.5E+04	-1.2E+05	-5.8E+04
9.8E+01	-2.6E+06	1.7E+06	-2.2E+06	-2.4E+06	2.7E+05	1.1E+06	-1.9E+06	6.8E+05	-1.8E+05	-1.7E+05	-1.8E+05	-1.0E+05	-3.2E+05	-1.2E+05	-1.1E+05	-8.1E+04
1.1E+02	-3.0E+06	1.7E+06	-2.0E+06	-2.0E+06	4.0E+05	1.3E+06	-1.8E+06	7.6E+05	-7.3E+04	-6.4E+04	-7.3E+04	-1.2E+05	-8.0E+04	-9.0E+04	-8.3E+04	-7.1E+04
1.2E+02	-2.8E+06	1.4E+06	-2.2E+06	-2.1E+06	7.6E+05	1.5E+06	-1.8E+06	8.4E+05	-6.0E+04	-5.2E+04	-8.3E+04	-8.7E+04	-8.6E+04	-5.6E+04	-5.4E+04	-6.2E+04
1.3E+02	-2.5E+06	1.4E+06	-2.3E+06	-1.9E+06	9.8E+05	2.0E+06	-2.0E+06	9.9E+05	-4.8E+04	-7.4E+04	-5.3E+04	-8.5E+04	-5.3E+04	-6.2E+04	-6.7E+04	-7.6E+04
1.4E+02	-2.8E+06	8.0E+05	-3.4E+06	-2.4E+06	1.0E+06	2.4E+06	-1.9E+06	8.9E+05	-4.7E+04	-5.4E+04	-4.6E+04	-7.9E+04	-5.8E+04	-6.9E+04	-5.5E+04	-6.1E+04
1.5E+02	-3.4E+06	1.3E+06	-1.5E+06	-2.3E+06	2.7E+03	3.0E+06	-1.3E+06	5.7E+05	-5.0E+04	-6.2E+04	-5.0E+04	-6.1E+04	-5.8E+04	-7.3E+04	-6.5E+04	-6.6E+04
1.6E+02	-2.6E+06	1.5E+06	-2.5E+06	-1.6E+06	9.7E+05	2.7E+06	-2.8E+06	1.2E+06	-8.5E+04	-9.5E+04	-4.0E+04	-6.0E+04	-7.0E+04	-8.5E+04	-6.2E+04	-6.5E+04
1.7E+02	-5.4E+06	4.8E+06	-1.0E+06	-4.7E+06	1.3E+06	1.7E+06	-3.7E+06	3.2E+06	-8.6E+04	-7.3E+04	-9.7E+04	-8.3E+04	-6.7E+04	-6.2E+04	-7.2E+04	-8.0E+04
1.8E+02	-1.9E+06	2.5E+05	-4.1E+06	8.7E+05	2.2E+06	1.6E+06	-4.2E+06	3.1E+06	-6.6E+04	-5.5E+04	-6.5E+04	-7.2E+04	-1.0E+05	-8.4E+04	-4.4E+04	-6.5E+04
1.9E+02	-3.6E+06	3.4E+06	-1.1E+06	-4.9E+06	1.5E+06	4.0E+06	-3.2E+06	1.4E+05	-4.9E+04	-6.7E+04	-5.9E+04	-7.2E+04	-6.9E+04	-6.1E+04	-7.2E+04	-5.0E+04
2.0E+02	-2.1E+06	1.9E+06	-3.3E+06	-1.7E+06	1.4E+06	3.9E+06	-3.5E+06	9.2E+05	-6.1E+04	-7.2E+04	-5.0E+04	-6.0E+04	-6.1E+04	-7.4E+04	-5.3E+04	-5.8E+04
2.1E+02	-1.0E+06	3.6E+06	-2.9E+06	-8.4E+05	-3.2E+05	1.9E+06	-4.4E+06	3.8E+05	-7.0E+04	-5.0E+04	-6.2E+04	-8.1E+04	-7.5E+04	-6.8E+04	-5.8E+04	-4.8E+04
2.1E+02	-3.0E+06	8.2E+05	-3.7E+06	-2.3E+06	1.7E+06	3.8E+06	-3.4E+06	1.7E+06	-1.4E+04	-6.0E+04	-2.9E+04	-6.4E+04	-5.0E+04	-5.7E+04	-3.8E+04	-6.1E+04
2.2E+02	-2.7E+06	1.2E+06	-3.6E+06	-2.2E+06	1.4E+06	4.4E+06	-3.7E+06	1.6E+06	-3.8E+04	-5.4E+04	-3.3E+04	-6.7E+04	-4.1E+04	-5.3E+04	-3.7E+04	-6.9E+04

Table 26. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.5 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.3E+06	1.8E+06	-1.4E+06	-1.1E+06	4.0E+05	2.1E+05	-4.2E+05	6.1E+04	-6.8E+04	-4.5E+04	-7.7E+04	-7.7E+04	-2.0E+05	-7.8E+04	-1.7E+05	-9.4E+04
2.0E+01	-1.5E+06	1.8E+06	-1.4E+06	-1.3E+06	4.0E+05	3.7E+05	-5.0E+05	-3.1E+04	-1.4E+05	-1.4E+05	-1.8E+05	-8.6E+04	-2.3E+05	-1.0E+05	-1.3E+05	-9.9E+04
2.9E+01	-1.2E+06	1.9E+06	-1.7E+06	-1.3E+06	2.4E+05	5.0E+05	-6.6E+05	-1.4E+05	-1.4E+05	-7.3E+04	-1.3E+05	-8.4E+04	-9.6E+04	-1.0E+05	-9.1E+04	-1.2E+05
3.9E+01	-1.5E+06	1.9E+06	-1.6E+06	-1.3E+06	-9.9E+04	5.8E+05	-6.3E+05	6.3E+04	-1.5E+05	-8.6E+04	-1.5E+05	-7.0E+04	-1.4E+05	-6.4E+04	-1.5E+05	-6.5E+04
4.9E+01	-1.4E+06	1.7E+06	-1.5E+06	-1.6E+06	4.3E+05	3.8E+05	-8.8E+05	2.5E+05	-2.7E+05	-1.2E+05	-2.3E+05	-8.7E+04	-1.9E+05	-1.0E+05	-2.0E+05	-5.8E+04
5.9E+01	-1.6E+06	1.8E+06	-2.4E+06	-1.6E+06	9.1E+05	7.1E+05	-1.1E+06	1.7E+05	-4.9E+05	-1.0E+05	-2.5E+05	-9.3E+04	-2.7E+05	-8.0E+04	-3.3E+05	-1.1E+05
6.8E+01	-1.4E+06	1.9E+06	-1.7E+06	-2.0E+06	2.1E+05	8.6E+05	-1.1E+06	5.5E+05	-8.7E+04	-5.4E+04	-1.1E+05	-5.5E+04	-9.1E+04	-4.0E+04	-1.2E+05	-8.1E+04
7.8E+01	-1.5E+06	1.9E+06	-2.0E+06	-4.3E+05	2.6E+05	7.2E+05	-1.6E+06	1.4E+06	-8.8E+04	-3.7E+04	-1.2E+05	-7.6E+04	-1.6E+05	-4.5E+04	-1.9E+05	-5.3E+04
8.8E+01	-1.3E+06	1.8E+06	-2.0E+06	-9.8E+05	3.9E+05	9.9E+05	-1.4E+06	5.7E+05	-1.0E+05	-5.6E+04	-1.2E+05	-4.9E+04	-1.2E+05	-5.7E+04	-6.1E+04	-7.1E+04
9.8E+01	-1.5E+06	1.6E+06	-2.3E+06	-1.1E+06	3.9E+05	1.0E+06	-1.8E+06	5.3E+05	-9.1E+04	-6.7E+04	-9.2E+04	-5.7E+04	-7.9E+04	-5.9E+04	-1.0E+05	-5.8E+04
1.1E+02	-1.7E+06	1.5E+06	-1.9E+06	-9.7E+05	4.0E+05	1.1E+06	-1.7E+06	7.7E+05	-8.7E+04	-5.1E+04	-7.0E+04	-4.0E+04	-7.0E+04	-4.6E+04	-5.9E+04	-5.6E+04
1.2E+02	-1.3E+06	1.4E+06	-2.2E+06	-1.0E+06	5.7E+05	1.4E+06	-1.7E+06	7.5E+05	-3.9E+04	-6.5E+04	-7.9E+04	-3.6E+04	-3.3E+04	-4.9E+04	-7.1E+04	-7.0E+04
1.3E+02	-1.2E+06	1.4E+06	-2.2E+06	-9.2E+05	8.6E+05	1.8E+06	-1.9E+06	9.9E+05	-8.6E+04	-4.3E+04	-9.2E+04	-7.4E+04	-8.3E+04	-5.3E+04	-6.8E+04	-7.9E+04
1.4E+02	-1.5E+06	8.6E+05	-3.3E+06	-1.2E+06	6.1E+05	2.2E+06	-1.8E+06	6.6E+05	-4.6E+04	-4.1E+04	-6.6E+04	-4.0E+04	-6.6E+04	-4.0E+04	-4.7E+04	-7.8E+04
1.5E+02	-2.2E+06	1.4E+06	-1.4E+06	-1.5E+06	-1.9E+05	2.5E+06	-1.0E+06	5.1E+05	-6.6E+04	-7.4E+04	-4.4E+04	-5.0E+04	-3.3E+04	-5.6E+04	-6.1E+04	-5.9E+04
1.6E+02	-1.6E+06	1.8E+06	-2.3E+06	-9.1E+05	9.6E+05	2.2E+06	-2.4E+06	1.2E+06	-5.7E+04	-4.9E+04	-4.3E+04	-5.6E+04	-7.1E+04	-8.0E+04	-8.9E+04	-8.5E+04
1.7E+02	-4.3E+06	3.6E+06	-7.6E+05	-2.2E+06	1.3E+06	1.2E+06	-3.4E+06	3.0E+06	-1.3E+05	-8.7E+04	-2.0E+05	-1.5E+05	-1.9E+05	-1.0E+05	-2.3E+05	-1.5E+05
1.8E+02	-1.1E+06	1.3E+05	-3.5E+06	2.0E+06	1.9E+06	1.6E+06	-3.5E+06	2.4E+06	-1.1E+05	-8.9E+04	-1.4E+05	-1.1E+05	-1.2E+05	-9.3E+04	-1.3E+05	-1.0E+05
1.9E+02	-2.5E+06	3.6E+06	-8.1E+05	-4.2E+06	8.0E+05	3.7E+06	-2.1E+06	-1.1E+05	-1.0E+05	-5.9E+04	-8.8E+04	-5.7E+04	-6.8E+04	-6.5E+04	-8.0E+04	-7.3E+04
2.0E+02	-1.0E+06	2.0E+06	-3.0E+06	-7.4E+05	1.3E+06	3.3E+06	-2.7E+06	8.0E+05	-6.5E+04	-6.9E+04	-6.4E+04	-6.0E+04	-6.1E+04	-8.2E+04	-7.4E+04	-8.9E+04
2.1E+02	2.4E+05	3.9E+06	-2.5E+06	3.1E+05	-5.6E+05	1.4E+06	-3.7E+06	5.7E+04	-8.2E+04	-6.7E+04	-6.8E+04	-6.3E+04	-8.0E+04	-7.6E+04	-6.5E+04	-7.4E+04
2.1E+02	-1.8E+06	9.0E+05	-3.3E+06	-1.1E+06	1.1E+06	3.1E+06	-2.8E+06	1.2E+06	-3.9E+04	-3.9E+04	-2.8E+04	-4.7E+04	-3.4E+04	-5.1E+04	-3.2E+04	-5.2E+04
2.2E+02	-1.5E+06	1.4E+06	-3.4E+06	-9.3E+05	1.1E+06	3.8E+06	-3.0E+06	9.3E+05	-4.5E+04	-7.5E+04	-4.1E+04	-7.0E+04	-4.2E+04	-6.7E+04	-4.2E+04	-7.6E+04

Table 27. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.5 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.7E+06	1.7E+06	-1.4E+06	-1.4E+06	2.8E+05	1.8E+05	-1.5E+05	5.2E+04	-1.2E+05	-7.0E+04	-8.4E+04	-8.6E+04	-9.9E+04	-1.3E+05	-8.4E+04	-7.4E+04
2.0E+01	-1.6E+06	1.7E+06	-1.3E+06	-1.6E+06	7.0E+05	2.8E+05	-6.0E+05	4.5E+04	-1.6E+05	-9.0E+04	-1.1E+05	-5.9E+04	-2.0E+05	-8.8E+04	-1.6E+05	-8.1E+04
2.9E+01	-1.6E+06	1.6E+06	-1.5E+06	-1.7E+06	2.0E+05	5.0E+05	-5.8E+05	-1.0E+05	-9.4E+04	-6.3E+04	-1.0E+05	-7.7E+04	-1.0E+05	-1.2E+05	-1.1E+05	-9.7E+04
3.9E+01	-1.8E+06	1.7E+06	-1.3E+06	-1.6E+06	1.9E+05	6.6E+05	-7.5E+05	8.7E+04	-1.5E+05	-9.1E+04	-1.9E+05	-6.7E+04	-1.5E+05	-5.9E+04	-1.6E+05	-7.0E+04
4.9E+01	-1.6E+06	1.7E+06	-1.5E+06	-2.0E+06	1.4E+05	7.1E+05	-1.1E+06	2.7E+05	-1.9E+05	-9.0E+04	-2.5E+05	-5.7E+04	-7.3E+04	-7.5E+04	-2.0E+05	-7.1E+04
5.9E+01	-1.7E+06	1.7E+06	-2.9E+06	-1.6E+06	7.9E+05	9.5E+05	-1.1E+06	2.4E+05	-2.7E+05	-7.8E+04	-4.8E+05	-8.4E+04	-3.6E+05	-7.6E+04	-4.0E+05	-7.8E+04
6.8E+01	-1.7E+06	1.9E+06	-1.8E+06	-2.3E+06	3.1E+05	1.0E+06	-1.2E+06	6.4E+05	-8.3E+04	-5.8E+04	-1.3E+05	-6.9E+04	-6.6E+04	-6.5E+04	-1.1E+05	-6.4E+04
7.8E+01	-1.9E+06	1.8E+06	-1.8E+06	-6.6E+05	5.3E+05	1.0E+06	-1.7E+06	1.3E+06	-1.5E+05	-5.8E+04	-1.5E+05	-7.6E+04	-1.2E+05	-8.7E+04	-2.5E+05	-1.3E+05
8.8E+01	-1.8E+06	1.7E+06	-1.9E+06	-1.3E+06	5.8E+05	1.1E+06	-1.5E+06	7.8E+05	-7.0E+04	-7.8E+04	-8.5E+04	-6.4E+04	-1.1E+05	-4.6E+04	-8.6E+04	-5.7E+04
9.8E+01	-1.7E+06	1.6E+06	-2.2E+06	-1.4E+06	5.1E+05	1.2E+06	-1.9E+06	7.1E+05	-9.1E+04	-4.0E+04	-7.6E+04	-5.4E+04	-7.6E+04	-6.3E+04	-7.1E+04	-7.6E+04
1.1E+02	-2.1E+06	1.6E+06	-2.0E+06	-1.2E+06	4.3E+05	1.3E+06	-1.6E+06	8.2E+05	-9.8E+04	-7.2E+04	-7.7E+04	-5.9E+04	-6.2E+04	-6.3E+04	-7.0E+04	-7.9E+04
1.2E+02	-1.6E+06	1.5E+06	-2.2E+06	-1.3E+06	7.9E+05	1.5E+06	-1.8E+06	7.8E+05	-6.3E+04	-4.2E+04	-7.4E+04	-6.4E+04	-4.2E+04	-4.6E+04	-6.2E+04	-7.3E+04
1.3E+02	-1.5E+06	1.3E+06	-2.2E+06	-1.2E+06	9.3E+05	1.9E+06	-1.9E+06	9.6E+05	-7.2E+04	-5.4E+04	-9.6E+04	-4.8E+04	-9.7E+04	-5.7E+04	-6.6E+04	-6.6E+04
1.4E+02	-1.9E+06	6.6E+05	-3.5E+06	-1.8E+06	1.1E+06	2.9E+06	-1.4E+06	1.4E+06	-5.3E+04	-5.0E+04	-4.6E+04	-5.3E+04	-6.5E+04	-4.4E+04	-8.9E+04	-7.4E+04
1.5E+02	-2.5E+06	1.3E+06	-1.3E+06	-1.8E+06	-1.5E+05	2.8E+06	-1.1E+06	5.5E+05	-7.8E+04	-5.8E+04	-3.2E+04	-3.4E+04	-4.7E+04	-4.9E+04	-5.6E+04	-5.6E+04
1.6E+02	-1.8E+06	1.6E+06	-2.5E+06	-1.1E+06	8.1E+05	2.5E+06	-2.6E+06	1.3E+06	-5.2E+04	-5.2E+04	-4.9E+04	-5.2E+04	-6.8E+04	-4.0E+04	-5.3E+04	-6.4E+04
1.7E+02	-4.5E+06	4.3E+06	-8.3E+05	-3.5E+06	8.7E+05	1.0E+06	-2.9E+06	3.9E+06	-8.2E+04	-6.7E+04	-8.8E+04	-9.1E+04	-9.0E+04	-5.5E+04	-9.0E+04	-6.5E+04
1.8E+02	-9.9E+05	3.3E+03	-3.8E+06	1.9E+06	2.1E+06	1.7E+06	-4.0E+06	2.8E+06	-3.5E+04	-4.2E+04	-6.7E+04	-4.0E+04	-4.0E+04	-4.5E+04	-3.2E+04	-6.3E+04
1.9E+02	-2.8E+06	3.5E+06	-8.4E+05	-4.5E+06	9.0E+05	4.1E+06	-2.3E+06	-1.7E+05	-7.7E+04	-3.9E+04	-8.7E+04	-5.1E+04	-4.8E+04	-4.4E+04	-6.0E+04	-6.2E+04
2.0E+02	-1.2E+06	2.0E+06	-3.0E+06	-9.6E+05	1.3E+06	3.8E+06	-3.0E+06	7.3E+05	-4.2E+04	-6.0E+04	-3.9E+04	-5.5E+04	-5.7E+04	-5.9E+04	-4.5E+04	-5.1E+04
2.1E+02	-1.2E+05	3.9E+06	-2.5E+06	-7.0E+04	-4.5E+05	1.9E+06	-3.9E+06	2.6E+05	-5.9E+04	-5.4E+04	-8.2E+04	-4.2E+04	-7.7E+04	-6.1E+04	-4.4E+04	-5.9E+04
2.1E+02	-2.1E+06	9.6E+05	-3.4E+06	-1.5E+06	1.2E+06	3.5E+06	-3.1E+06	1.4E+06	-4.6E+04	-4.9E+04	-3.9E+04	-5.7E+04	-4.2E+04	-5.7E+04	-4.5E+04	-5.7E+04
2.2E+02	-1.9E+06	1.6E+06	-3.4E+06	-1.4E+06	1.3E+06	4.3E+06	-3.3E+06	1.2E+06	-4.7E+04	-4.8E+04	-3.4E+04	-8.4E+04	-3.4E+04	-6.2E+04	-4.2E+04	-5.8E+04

Table 28. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.5 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyy	
9.8E+00	-2.0E+06	1.6E+06	-1.5E+06	-1.6E+06	8.9E+04	1.4E+05	-1.0E+05	-1.6E+05	-1.0E+05	-5.5E+04	-7.9E+04	-7.4E+04	-9.3E+04	-1.1E+05	-8.3E+04	-9.3E+04
2.0E+01	-2.0E+06	1.7E+06	-1.4E+06	-1.8E+06	4.3E+05	3.1E+05	-5.1E+05	-2.2E+05	-1.6E+05	-1.1E+05	-1.4E+05	-5.6E+04	-1.9E+05	-4.8E+04	-1.3E+05	-1.1E+05
2.9E+01	-2.1E+06	1.5E+06	-1.8E+06	-1.9E+06	3.9E+05	4.5E+05	-6.6E+05	-5.1E+04	-1.4E+05	-8.3E+04	-1.1E+05	-9.7E+04	-1.3E+05	-1.2E+05	-5.3E+04	-8.7E+04
3.9E+01	-2.1E+06	1.8E+06	-1.7E+06	-1.9E+06	4.5E+04	6.5E+05	-8.5E+05	8.4E+04	-1.7E+05	-7.1E+04	-1.2E+05	-9.9E+04	-1.7E+05	-3.6E+04	-1.0E+05	-6.0E+04
4.9E+01	-2.1E+06	1.8E+06	-1.6E+06	-2.3E+06	4.6E+05	7.5E+05	-1.1E+06	2.9E+05	-5.4E+05	-3.4E+05	-2.7E+05	-1.2E+05	-4.3E+05	-2.9E+05	-2.1E+05	-8.7E+04
5.9E+01	-2.3E+06	1.7E+06	-2.6E+06	-2.1E+06	4.3E+05	9.0E+05	-1.1E+06	1.9E+05	-2.2E+05	-5.7E+04	-4.5E+05	-6.8E+04	-2.0E+05	-7.1E+04	-2.8E+05	-8.1E+04
6.8E+01	-2.2E+06	1.8E+06	-1.9E+06	-2.6E+06	3.4E+05	1.1E+06	-1.3E+06	7.8E+05	-9.9E+04	-6.0E+04	-1.2E+05	-5.2E+04	-8.7E+04	-5.6E+04	-1.3E+05	-5.0E+04
7.8E+01	-2.4E+06	1.9E+06	-1.8E+06	-1.4E+06	5.5E+05	9.8E+05	-1.6E+06	1.0E+06	-1.5E+05	-6.8E+04	-1.7E+05	-7.2E+04	-1.9E+05	-5.1E+04	-1.3E+05	-6.0E+04
8.8E+01	-2.1E+06	1.7E+06	-2.0E+06	-1.8E+06	7.9E+05	1.2E+06	-1.7E+06	7.6E+05	-9.8E+04	-4.4E+04	-1.1E+05	-8.4E+04	-1.2E+05	-7.3E+04	-6.0E+04	-5.7E+04
9.8E+01	-2.2E+06	1.6E+06	-2.4E+06	-1.9E+06	3.6E+05	1.4E+06	-1.8E+06	6.2E+05	-1.4E+05	-9.0E+04	-9.0E+04	-8.4E+04	-9.1E+04	-6.1E+04	-9.5E+04	-1.1E+05
1.1E+02	-2.6E+06	1.8E+06	-2.3E+06	-1.8E+06	4.2E+05	1.3E+06	-1.6E+06	7.2E+05	-8.4E+04	-4.9E+04	-7.8E+04	-5.9E+04	-7.0E+04	-5.8E+04	-5.9E+04	-7.9E+04
1.2E+02	-2.0E+06	1.6E+06	-2.3E+06	-1.9E+06	9.0E+05	1.7E+06	-2.0E+06	8.1E+05	-4.3E+04	-4.0E+04	-8.4E+04	-4.6E+04	-4.1E+04	-5.6E+04	-4.6E+04	-7.3E+04
1.3E+02	-2.0E+06	1.5E+06	-2.3E+06	-1.7E+06	1.1E+06	2.1E+06	-1.9E+06	1.1E+06	-7.6E+04	-5.4E+04	-9.2E+04	-4.8E+04	-8.5E+04	-6.0E+04	-8.6E+04	-8.4E+04
1.4E+02	-2.2E+06	8.2E+05	-3.2E+06	-2.1E+06	9.1E+05	2.6E+06	-1.8E+06	8.9E+05	-4.7E+04	-5.4E+04	-6.0E+04	-4.8E+04	-5.4E+04	-6.2E+04	-6.2E+04	-6.8E+04
1.5E+02	-2.9E+06	1.4E+06	-1.2E+06	-2.3E+06	1.4E+05	3.0E+06	-1.4E+06	7.4E+05	-6.4E+04	-6.0E+04	-4.9E+04	-4.5E+04	-3.8E+04	-5.4E+04	-5.6E+04	-5.7E+04
1.6E+02	-2.3E+06	1.8E+06	-2.4E+06	-1.3E+06	1.1E+06	2.9E+06	-2.7E+06	1.5E+06	-4.5E+04	-5.9E+04	-5.4E+04	-4.1E+04	-7.8E+04	-7.5E+04	-5.9E+04	-7.7E+04
1.7E+02	-5.2E+06	4.2E+06	-4.7E+05	-3.6E+06	1.3E+06	1.0E+06	-3.6E+06	4.3E+06	-1.2E+05	-9.7E+04	-9.7E+04	-1.1E+05	-1.0E+05	-4.9E+04	-1.1E+05	-8.0E+04
1.8E+02	-1.4E+06	-2.4E+04	-4.0E+06	1.5E+06	2.3E+06	2.1E+06	-4.2E+06	2.8E+06	-5.3E+04	-3.9E+04	-4.2E+04	-3.7E+04	-4.4E+04	-5.1E+04	-4.2E+04	-6.1E+04
1.9E+02	-3.3E+06	3.7E+06	-8.6E+05	-5.0E+06	1.1E+06	4.5E+06	-2.5E+06	-1.1E+04	-1.0E+05	-5.0E+04	-7.6E+04	-4.0E+04	-5.5E+04	-5.5E+04	-6.2E+04	-6.7E+04
2.0E+02	-1.5E+06	2.1E+06	-3.1E+06	-1.4E+06	1.6E+06	4.1E+06	-3.3E+06	1.1E+06	-6.0E+04	-5.2E+04	-6.1E+04	-4.9E+04	-4.6E+04	-5.6E+04	-5.2E+04	-7.3E+04
2.1E+02	-3.8E+05	4.1E+06	-2.8E+06	-5.9E+05	-3.3E+05	2.1E+06	-4.2E+06	6.1E+05	-6.8E+04	-4.7E+04	-6.8E+04	-6.4E+04	-7.2E+04	-7.2E+04	-8.2E+04	-6.2E+04
2.1E+02	-2.5E+06	9.8E+05	-3.5E+06	-2.0E+06	1.4E+06	3.9E+06	-3.4E+06	1.7E+06	-4.3E+04	-4.6E+04	-3.4E+04	-4.5E+04	-3.5E+04	-6.1E+04	-5.0E+04	-5.9E+04
2.2E+02	-2.2E+06	1.6E+06	-3.6E+06	-2.0E+06	1.3E+06	4.4E+06	-3.6E+06	1.6E+06	-4.6E+04	-5.4E+04	-3.8E+04	-4.4E+04	-4.6E+04	-6.4E+04	-4.4E+04	-7.7E+04

Table 29. Raw data for slanted-tooth labyrinth seal at 10,200 rpm, 0.6 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyy	
9.8E+00	-1.2E+06	1.5E+06	-1.3E+06	-7.4E+05	7.4E+04	1.5E+05	-1.8E+05	-4.3E+04	-1.3E+05	-1.0E+05	-8.8E+04	-8.9E+04	-1.0E+05	-8.6E+04	-9.5E+04	-5.8E+04
2.0E+01	-1.4E+06	1.6E+06	-1.6E+06	-8.9E+05	3.8E+05	3.8E+05	-2.9E+05	-2.5E+05	-1.9E+05	-9.6E+04	-1.8E+05	-9.9E+04	-1.3E+05	-1.0E+05	-1.8E+05	-5.5E+04
2.9E+01	-1.1E+06	1.8E+06	-1.5E+06	-9.5E+05	2.9E+05	3.3E+05	-5.3E+05	-1.0E+05	-1.3E+05	-1.2E+05	-1.2E+05	-1.4E+05	-6.7E+04	-1.4E+05	-8.4E+04	-7.0E+04
3.9E+01	-1.2E+06	1.6E+06	-1.6E+06	-1.2E+06	-1.0E+05	5.9E+05	-5.9E+05	-6.1E+04	-1.1E+05	-1.2E+05	-7.8E+04	-6.7E+04	-1.4E+05	-1.3E+05	-1.3E+05	-1.2E+05
4.9E+01	-9.8E+05	1.7E+06	-1.7E+06	-1.2E+06	8.2E+04	3.4E+05	-3.3E+05	2.9E+05	-2.2E+05	-1.4E+05	-2.2E+05	-7.9E+04	-3.4E+05	-1.5E+05	-1.9E+05	-1.0E+05
5.9E+01	-1.5E+06	1.5E+06	-2.0E+06	-1.1E+06	7.9E+05	7.8E+05	-9.9E+05	1.4E+05	-3.7E+05	-8.5E+04	-1.8E+05	-1.1E+05	-3.7E+05	-7.4E+04	-2.5E+05	-6.1E+04
6.8E+01	-1.0E+06	1.6E+06	-1.4E+06	-1.8E+06	1.6E+05	8.2E+05	-1.0E+06	5.3E+05	-1.1E+05	-1.0E+05	-1.4E+05	-9.9E+04	-9.8E+04	-1.1E+05	-8.7E+04	-5.2E+04
7.8E+01	-1.5E+06	1.5E+06	-1.7E+06	-4.3E+04	8.0E+04	1.0E+06	-1.4E+06	1.1E+06	-2.4E+05	-9.1E+04	-1.2E+05	-8.1E+04	-2.0E+05	-8.3E+04	-1.2E+05	-6.0E+04
8.8E+01	-1.2E+06	1.6E+06	-1.8E+06	-8.6E+05	6.2E+05	1.1E+06	-1.3E+06	5.8E+05	-1.2E+05	-8.4E+04	-1.0E+05	-7.9E+04	-1.0E+05	-8.2E+04	-1.2E+05	-7.4E+04
9.8E+01	-1.2E+06	1.6E+06	-1.9E+06	-9.8E+05	2.5E+05	1.2E+06	-1.8E+06	5.8E+05	-5.2E+04	-8.2E+04	-8.4E+04	-8.0E+04	-6.2E+04	-8.3E+04	-1.5E+05	-7.0E+04
1.1E+02	-1.5E+06	1.4E+06	-1.9E+06	-7.5E+05	3.4E+05	1.4E+06	-1.5E+06	7.1E+05	-9.8E+04	-8.4E+04	-1.1E+05	-8.5E+04	-8.6E+04	-9.3E+04	-8.7E+04	-5.0E+04
1.2E+02	-1.3E+06	1.5E+06	-2.0E+06	-8.8E+05	6.2E+05	1.4E+06	-1.7E+06	6.4E+05	-6.0E+04	-7.4E+04	-5.5E+04	-7.1E+04	-5.6E+04	-6.9E+04	-6.6E+04	-7.2E+04
1.3E+02	-1.0E+06	1.4E+06	-2.2E+06	-6.4E+05	8.2E+05	2.0E+06	-1.7E+06	7.5E+05	-5.6E+04	-8.5E+04	-8.8E+04	-1.1E+05	-9.1E+04	-1.0E+05	-6.0E+04	-5.8E+04
1.4E+02	-1.2E+06	9.5E+05	-3.1E+06	-1.2E+06	6.6E+05	2.2E+06	-1.5E+06	3.6E+05	-6.1E+04	-8.0E+04	-8.0E+04	-8.0E+04	-6.0E+04	-8.0E+04	-5.0E+04	-6.8E+04
1.5E+02	-2.2E+06	1.5E+06	-8.5E+05	-1.7E+06	-2.0E+04	2.6E+06	-1.0E+06	5.0E+05	-7.6E+04	-7.9E+04	-6.7E+04	-6.6E+04	-5.8E+04	-7.8E+04	-7.3E+04	-6.2E+04
1.6E+02	-1.5E+06	2.0E+06	-2.1E+06	-9.2E+05	8.3E+05	2.3E+06	-2.5E+06	1.2E+06	-1.1E+05	-1.4E+05	-6.9E+04	-1.1E+05	-1.3E+05	-1.3E+05	-1.2E+05	-1.2E+05
1.7E+02	-3.4E+06	2.9E+06	-1.3E+06	-1.5E+06	1.6E+06	1.4E+06	-3.2E+06	2.9E+06	-3.0E+05	-1.8E+05	-3.2E+05	-2.3E+05	-2.7E+05	-1.9E+05	-3.7E+05	-2.0E+05
1.8E+02	-5.7E+05	4.2E+05	-3.7E+06	1.5E+06	1.5E+06	2.1E+06	-2.8E+06	1.9E+06	-2.6E+05	-1.8E+05	-2.2E+05	-1.6E+05	-2.1E+05	-1.9E+05	-2.3E+05	-1.8E+05
1.9E+02	-2.1E+06	3.2E+06	-9.8E+05	-3.3E+06	8.3E+05	3.5E+06	-2.0E+06	4.6E+05	-1.2E+05	-1.1E+05	-8.3E+04	-1.1E+05	-1.2E+05	-1.2E+05	-1.1E+05	-6.3E+04
2.0E+02	-7.9E+05	2.1E+06	-2.7E+06	-6.8E+05	1.2E+06	3.4E+06	-2.6E+06	8.1E+05	-9.0E+04	-1.0E+05	-5.9E+04	-8.0E+04	-6.6E+04	-9.4E+04	-9.1E+04	-8.7E+04
2.1E+02	2.4E+05	3.9E+06	-2.4E+06	3.2E+05	-6.7E+05	1.7E+06	-3.2E+06	4.3E+05	-9.8E+04	-7.8E+04	-1.0E+05	-8.8E+04	-7.3E+04	-1.0E+05	-5.6E+04	-6.2E+04
2.1E+02	-1.6E+06	1.1E+06	-3.0E+06	-1.0E+06	1.2E+06	3.3E+06	-2.6E+06	1.3E+06	-4.3E+04	-7.7E+04	-3.8E+04	-9.7E+04	-5.1E+04	-9.7E+04	-3.1E+04	-5.0E+04
2.2E+02	-1.3E+06	1.6E+06	-3.0E+06	-8.3E+05	1.1E+06	3.8E+06	-2.7E+06	1.3E+06	-5.6E+04	-7.8E+04	-6.0E+04	-9.2E+04	-5.1E+04	-9.4E+04	-6.3E+04	-7.0E+04

Table 30. Raw data for slanted-tooth labyrinth seal at 15,350 rpm, 0.6 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.5E+06	1.3E+06	-1.4E+06	-1.0E+06	2.4E+05	1.7E+05	-1.6E+05	-7.5E+04	-1.7E+05	-1.1E+05	-1.1E+05	-1.1E+05	-1.1E+05	-1.1E+05	-1.1E+05	-1.1E+05
2.0E+01	-1.4E+06	1.5E+06	-1.9E+06	-1.0E+06	1.4E+05	5.0E+05	-4.2E+05	-2.4E+05	-1.4E+05	-1.1E+05	-2.0E+05	-1.1E+05	-1.2E+05	-1.1E+05	-1.5E+05	-9.1E+04
2.9E+01	-1.4E+06	1.7E+06	-1.6E+06	-9.9E+05	2.3E+05	5.5E+05	-6.3E+05	-3.4E+05	-1.3E+05	-1.4E+05	-1.2E+05	-2.1E+05	-9.8E+04	-1.7E+05	-1.2E+05	-1.2E+05
3.9E+01	-1.2E+06	1.5E+06	-1.7E+06	-1.5E+06	1.1E+05	6.8E+05	-6.1E+05	3.0E+03	-8.9E+04	-7.9E+04	-9.2E+04	-9.2E+04	-7.2E+04	-1.2E+05	-1.4E+05	-8.9E+04
4.9E+01	-1.4E+06	1.6E+06	-1.9E+06	-1.6E+06	-1.2E+05	8.3E+05	-5.8E+05	2.0E+05	-2.6E+05	-7.8E+04	-1.8E+05	-1.2E+05	-2.3E+05	-1.1E+05	-2.7E+05	-1.0E+05
5.9E+01	-1.7E+06	1.6E+06	-2.0E+06	-1.5E+06	9.2E+05	1.0E+06	-1.2E+06	1.8E+05	-4.3E+05	-9.6E+04	-4.4E+05	-9.3E+04	-4.2E+05	-9.5E+04	-5.3E+05	-7.6E+04
6.8E+01	-1.4E+06	1.6E+06	-1.5E+06	-2.0E+06	1.4E+05	9.5E+05	-1.1E+06	6.2E+05	-1.1E+05	-9.9E+04	-1.7E+05	-7.9E+04	-1.6E+05	-8.6E+04	-1.0E+05	-7.4E+04
7.8E+01	-1.5E+06	1.5E+06	-2.0E+06	-2.6E+05	-2.9E+03	1.2E+06	-1.4E+06	1.1E+06	-2.5E+05	-8.8E+04	-2.7E+05	-9.1E+04	-2.8E+05	-9.9E+04	-1.8E+05	-1.1E+05
8.8E+01	-1.4E+06	1.6E+06	-2.0E+06	-1.2E+06	4.9E+05	1.3E+06	-1.5E+06	6.9E+05	-1.3E+05	-7.4E+04	-9.2E+04	-8.5E+04	-8.5E+04	-1.0E+05	-1.0E+05	-4.7E+04
9.8E+01	-1.5E+06	1.4E+06	-2.0E+06	-1.3E+06	3.7E+05	1.3E+06	-1.8E+06	7.4E+05	-7.9E+04	-8.7E+04	-6.8E+04	-9.7E+04	-8.1E+04	-7.9E+04	-1.6E+05	-4.5E+04
1.1E+02	-1.8E+06	1.5E+06	-1.9E+06	-1.1E+06	4.2E+05	1.6E+06	-1.5E+06	9.2E+05	-7.6E+04	-8.6E+04	-8.8E+04	-7.7E+04	-8.0E+04	-9.7E+04	-8.5E+04	-8.4E+04
1.2E+02	-1.4E+06	1.4E+06	-2.1E+06	-1.1E+06	7.6E+05	1.7E+06	-1.8E+06	7.8E+05	-5.1E+04	-7.2E+04	-5.9E+04	-7.0E+04	-8.8E+04	-7.3E+04	-1.0E+05	-5.4E+04
1.3E+02	-1.3E+06	1.4E+06	-2.2E+06	-8.2E+05	8.3E+05	2.1E+06	-1.8E+06	8.9E+05	-5.7E+04	-8.6E+04	-6.5E+04	-6.9E+04	-6.7E+04	-8.2E+04	-5.6E+04	-6.9E+04
1.4E+02	-1.7E+06	6.1E+05	-3.3E+06	-1.7E+06	9.4E+05	2.8E+06	-1.3E+06	8.8E+05	-5.9E+04	-7.3E+04	-7.5E+04	-8.4E+04	-6.6E+04	-9.0E+04	-5.4E+04	-8.0E+04
1.5E+02	-2.4E+06	1.5E+06	-9.7E+05	-1.9E+06	-1.6E+05	3.0E+06	-1.1E+06	5.9E+05	-8.5E+04	-6.3E+04	-6.2E+04	-6.4E+04	-5.3E+04	-7.5E+04	-5.6E+04	-5.2E+04
1.6E+02	-1.7E+06	1.8E+06	-2.1E+06	-1.1E+06	9.0E+05	2.7E+06	-2.4E+06	1.3E+06	-6.7E+04	-9.0E+04	-4.9E+04	-8.4E+04	-6.1E+04	-9.6E+04	-6.3E+04	-7.1E+04
1.7E+02	-4.2E+06	3.7E+06	-4.1E+05	-2.7E+06	1.5E+06	7.9E+05	-3.3E+06	4.3E+06	-1.1E+05	-8.0E+04	-1.0E+05	-1.1E+05	-7.7E+04	-1.1E+05	-7.6E+04	-8.5E+04
1.8E+02	-1.1E+06	-3.3E+05	-3.4E+06	2.4E+06	2.4E+06	2.0E+06	-4.1E+06	2.7E+06	-6.0E+04	-7.1E+04	-1.1E+05	-9.5E+04	-8.0E+04	-8.6E+04	-6.9E+04	-8.4E+04
1.9E+02	-2.3E+06	3.2E+06	-1.2E+06	-3.5E+06	1.1E+06	4.1E+06	-2.5E+06	2.6E+05	-5.0E+04	-7.2E+04	-6.4E+04	-7.3E+04	-7.4E+04	-7.9E+04	-8.2E+04	-6.2E+04
2.0E+02	-8.8E+05	2.2E+06	-3.0E+06	-8.6E+05	1.2E+06	3.8E+06	-2.8E+06	1.0E+06	-5.3E+04	-7.8E+04	-7.6E+04	-7.8E+04	-7.0E+04	-8.7E+04	-4.3E+04	-9.1E+04
2.1E+02	2.5E+05	4.1E+06	-2.6E+06	-3.6E+04	-4.2E+05	2.0E+06	-3.7E+06	5.8E+05	-9.2E+04	-9.6E+04	-9.6E+04	-9.4E+04	-7.4E+04	-8.8E+04	-8.5E+04	-8.0E+04
2.1E+02	-1.8E+06	1.2E+06	-3.2E+06	-1.3E+06	1.4E+06	3.8E+06	-2.9E+06	1.4E+06	-2.9E+04	-7.8E+04	-3.6E+04	-8.3E+04	-4.6E+04	-7.9E+04	-3.7E+04	-4.9E+04
2.2E+02	-1.6E+06	1.7E+06	-3.2E+06	-1.3E+06	1.3E+06	4.4E+06	-3.0E+06	1.5E+06	-4.7E+04	-1.1E+05	-6.7E+04	-8.0E+04	-5.2E+04	-1.2E+05	-2.5E+04	-6.6E+04

Table 31. Raw data for slanted-tooth labyrinth seal at 20,200 rpm, 0.6 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.0E+06	1.7E+06	-1.5E+06	-1.4E+06	8.1E+04	2.4E+05	-3.2E+05	-1.2E+05	-1.1E+05	-1.3E+05	-9.8E+04	-1.3E+05	-9.1E+04	-7.4E+04	-7.3E+04	-6.5E+04
2.0E+01	-2.0E+06	1.7E+06	-1.8E+06	-1.5E+06	8.8E+04	5.5E+05	-3.1E+05	-2.6E+05	-1.6E+05	-9.4E+04	-1.4E+05	-1.0E+05	-1.4E+05	-1.2E+05	-1.5E+05	-6.9E+04
2.9E+01	-1.9E+06	1.6E+06	-1.7E+06	-1.7E+06	3.1E+05	3.1E+05	-7.1E+05	-4.8E+04	-1.2E+05	-1.0E+05	-1.4E+05	-1.0E+05	-9.1E+04	-2.2E+05	-8.4E+04	-1.0E+05
3.9E+01	-1.8E+06	2.0E+06	-1.8E+06	-1.9E+06	-1.4E+05	7.7E+05	-7.7E+05	-7.1E+03	-1.4E+05	-1.2E+05	-1.2E+05	-1.1E+05	-1.4E+05	-9.4E+04	-1.5E+05	-7.8E+04
4.9E+01	-1.5E+06	1.7E+06	-1.8E+06	-2.0E+06	-2.5E+04	6.2E+05	-8.7E+05	3.1E+05	-5.9E+05	-3.4E+05	-2.1E+05	-9.4E+04	-2.8E+05	-2.6E+05	-3.0E+05	-9.8E+04
5.9E+01	-2.6E+06	1.7E+06	-2.3E+06	-1.8E+06	4.7E+05	9.1E+05	-7.1E+05	2.6E+05	-3.8E+05	-9.2E+04	-4.7E+05	-1.2E+05	-4.7E+05	-9.2E+04	-4.3E+05	-8.0E+04
6.8E+01	-1.8E+06	1.8E+06	-1.8E+06	-2.4E+06	2.0E+05	1.0E+06	-1.1E+06	7.6E+05	-8.3E+04	-7.4E+04	-1.3E+05	-7.5E+04	-1.0E+05	-7.3E+04	-1.2E+05	-1.1E+05
7.8E+01	-2.1E+06	1.6E+06	-1.9E+06	-8.1E+05	3.9E+05	1.2E+06	-1.4E+06	9.1E+05	-1.9E+05	-1.2E+05	-1.3E+05	-8.1E+04	-2.0E+05	-9.1E+04	-1.2E+05	-7.9E+04
8.8E+01	-1.9E+06	1.7E+06	-2.2E+06	-1.6E+06	7.6E+05	1.3E+06	-1.4E+06	6.8E+05	-1.6E+05	-7.3E+04	-1.2E+05	-1.1E+05	-9.0E+04	-9.1E+04	-1.3E+05	-6.1E+04
9.8E+01	-1.9E+06	1.6E+06	-2.4E+06	-1.8E+06	3.4E+05	1.4E+06	-1.7E+06	7.4E+05	-8.3E+04	-8.4E+04	-9.7E+04	-1.1E+05	-9.3E+04	-6.4E+04	-1.0E+05	-9.5E+04
1.1E+02	-2.3E+06	1.7E+06	-2.1E+06	-1.6E+06	5.1E+05	1.5E+06	-1.6E+06	8.1E+05	-9.3E+04	-1.1E+05	-1.3E+05	-8.8E+04	-1.0E+05	-7.7E+04	-6.5E+04	-1.0E+05
1.2E+02	-1.9E+06	1.5E+06	-2.1E+06	-1.7E+06	1.1E+06	1.6E+06	-1.7E+06	8.5E+05	-7.0E+04	-7.2E+04	-7.4E+04	-6.6E+04	-6.6E+04	-7.5E+04	-1.1E+05	-5.0E+04
1.3E+02	-1.8E+06	1.5E+06	-2.3E+06	-1.4E+06	1.1E+06	2.2E+06	-1.7E+06	1.0E+06	-8.0E+04	-9.9E+04	-1.2E+05	-1.1E+05	-1.1E+05	-1.0E+05	-8.8E+04	-7.6E+04
1.4E+02	-2.0E+06	9.1E+05	-3.0E+06	-2.1E+06	9.0E+05	2.6E+06	-1.6E+06	6.8E+05	-5.1E+04	-8.4E+04	-5.1E+04	-7.3E+04	-6.6E+04	-8.7E+04	-5.4E+04	-6.4E+04
1.5E+02	-2.9E+06	1.6E+06	-8.7E+05	-2.5E+06	2.8E+05	3.2E+06	-1.3E+06	8.2E+05	-7.0E+04	-7.6E+04	-6.8E+04	-8.7E+04	-5.4E+04	-7.1E+04	-7.9E+04	-5.2E+04
1.6E+02	-2.1E+06	1.9E+06	-2.0E+06	-1.5E+06	1.3E+06	2.8E+06	-2.9E+06	1.5E+06	-7.1E+04	-8.9E+04	-5.5E+04	-8.7E+04	-9.4E+04	-1.2E+05	-7.2E+04	-8.0E+04
1.7E+02	-4.8E+06	3.5E+06	-4.8E+05	-2.7E+06	1.9E+06	7.4E+05	-3.9E+06	4.9E+06	-9.2E+04	-1.1E+05	-1.0E+05	-1.3E+05	-8.5E+04	-6.4E+04	-1.0E+05	-6.3E+04
1.8E+02	-1.2E+06	-7.9E+04	-3.8E+06	1.9E+06	2.4E+06	2.4E+06	-4.2E+06	2.6E+06	-6.5E+04	-7.1E+04	-8.8E+04	-8.6E+04	-7.6E+04	-9.3E+04	-6.5E+04	-7.6E+04
1.9E+02	-2.6E+06	3.3E+06	-1.3E+06	-4.0E+06	1.3E+06	4.3E+06	-2.8E+06	5.7E+05	-4.0E+04	-6.1E+04	-6.2E+04	-6.6E+04	-4.6E+04	-6.7E+04	-6.4E+04	-5.4E+04
2.0E+02	-1.4E+06	2.2E+06	-3.0E+06	-1.2E+06	1.6E+06	4.2E+06	-3.2E+06	1.3E+06	-5.5E+04	-1.0E+05	-6.9E+04	-7.4E+04	-6.0E+04	-7.2E+04	-5.4E+04	-6.2E+04
2.1E+02	-1.6E+05	4.1E+06	-2.8E+06	-4.5E+05	-1.8E+05	2.4E+06	-4.0E+06	8.5E+05	-9.1E+04	-1.0E+05	-5.3E+04	-7.5E+04	-7.3E+04	-8.4E+04	-5.5E+04	-5.7E+04
2.1E+02	-2.0E+06	1.3E+06	-3.3E+06	-1.7E+06	1.6E+06	4.0E+06	-3.3E+06	1.8E+06	-3.2E+04	-8.0E+04	-4.3E+04	-6.7E+04	-4.8E+04	-7.1E+04	-3.5E+04	-6.7E+04
2.2E+02	-1.9E+06	2.0E+06	-3.4E+06	-1.7E+06	1.6E+06	4.7E+06	-3.4E+06	1.8E+06	-5.2E+04	-1.1E+05	-6.5E+04	-1.4E+05	-5.2E+04	-1.0E+05	-3.6E+04	-6.0E+04

Table 32. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.4 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.5E+06	-2.5E+05	1.2E+05	-1.4E+06	-1.2E+05	-1.3E+03	-6.1E+04	5.4E+04	-9.2E+04	-1.2E+05	-6.3E+04	-1.3E+05	-9.3E+04	-9.5E+04	-7.1E+04	-7.9E+04
2.0E+01	-1.6E+06	-2.1E+05	2.0E+05	-1.6E+06	3.5E+04	1.6E+05	-2.5E+05	2.8E+04	-9.2E+04	-7.9E+04	-5.3E+04	-6.3E+04	-7.6E+04	-9.9E+04	-1.3E+05	-3.7E+04
2.9E+01	-1.6E+06	-3.1E+05	1.0E+05	-1.4E+06	1.2E+05	2.6E+05	-2.5E+05	-1.6E+05	-5.0E+04	-5.7E+04	-5.2E+04	-6.6E+04	-9.5E+04	-6.8E+04	-8.1E+04	-5.2E+04
3.9E+01	-1.7E+06	-1.6E+05	-6.5E+04	-1.5E+06	-1.4E+05	2.0E+05	-5.9E+04	6.2E+04	-1.3E+05	-5.4E+04	-1.0E+05	-6.9E+04	-7.0E+04	-4.6E+04	-4.4E+04	-3.5E+04
4.9E+01	-1.6E+06	-1.4E+05	2.4E+04	-1.6E+06	3.8E+04	3.9E+04	-3.9E+05	1.5E+05	-7.6E+04	-5.8E+04	-1.3E+05	-6.8E+04	-9.0E+04	-5.7E+04	-9.6E+04	-5.8E+04
5.9E+01	-1.7E+06	-3.1E+05	-2.1E+05	-1.3E+06	-1.0E+04	1.3E+05	-2.0E+05	1.5E+05	-1.1E+05	-5.9E+04	-8.3E+04	-7.6E+04	-1.3E+05	-5.2E+04	-1.6E+05	-8.1E+04
6.8E+01	-1.9E+06	-4.3E+05	7.1E+04	-1.6E+06	2.5E+05	1.7E+05	-4.5E+05	2.9E+05	-9.0E+04	-9.8E+04	-8.2E+04	-1.0E+05	-6.9E+04	-7.1E+04	-7.3E+04	-7.3E+04
7.8E+01	-1.6E+06	-4.7E+05	-1.8E+05	-1.3E+06	2.5E+05	2.1E+05	-5.3E+04	2.1E+05	-5.1E+04	-4.1E+04	-4.7E+04	-6.3E+04	-8.4E+04	-5.6E+04	-1.3E+05	-5.4E+04
8.8E+01	-1.6E+06	-5.3E+05	-6.1E+04	-1.4E+06	2.6E+05	1.8E+05	-4.6E+05	1.9E+05	-4.8E+04	-6.3E+04	-2.1E+04	-6.0E+04	-6.9E+04	-6.8E+04	-6.7E+04	-4.0E+04
9.8E+01	-1.6E+06	-6.2E+05	-3.4E+05	-1.5E+06	8.8E+04	1.3E+05	-6.1E+05	6.0E+04	-5.3E+04	-4.0E+04	-7.0E+04	-6.7E+04	-7.4E+04	-6.0E+04	-9.8E+04	-4.4E+04
1.1E+02	-1.7E+06	-3.5E+05	2.4E+04	-1.4E+06	4.8E+05	5.6E+05	-6.0E+05	3.8E+05	-5.8E+04	-4.9E+04	-6.2E+04	-5.9E+04	-6.2E+04	-5.8E+04	-4.3E+04	-5.3E+04
1.2E+02	-1.6E+06	-7.0E+05	-1.9E+05	-1.3E+06	3.6E+05	4.5E+05	-4.7E+05	4.1E+05	-3.5E+04	-3.8E+04	-3.3E+04	-6.7E+04	-4.1E+04	-6.3E+04	-4.6E+04	-4.2E+04
1.3E+02	-1.5E+06	-6.7E+05	-3.4E+05	-1.1E+06	3.5E+05	5.7E+05	-4.7E+05	2.0E+05	-3.1E+04	-6.9E+04	-4.1E+04	-6.7E+04	-3.2E+04	-8.6E+04	-3.4E+04	-6.8E+04
1.4E+02	-1.2E+06	-1.4E+06	-1.2E+06	-9.3E+05	4.1E+05	6.5E+05	-4.6E+05	1.8E+05	-2.9E+04	-4.5E+04	-4.0E+04	-6.1E+04	-3.1E+04	-6.1E+04	-3.8E+04	-4.7E+04
1.5E+02	-1.9E+06	-6.9E+05	7.5E+05	-2.0E+06	3.0E+05	-3.4E+05	-4.7E+05	2.7E+06	-4.6E+04	-5.8E+04	-7.6E+04	-1.2E+05	-5.4E+04	-6.6E+04	-4.4E+04	-7.4E+04
1.6E+02	-2.1E+06	-5.9E+05	-1.9E+05	-1.4E+06	5.1E+05	8.2E+05	-7.0E+05	2.5E+05	-3.6E+04	-5.7E+04	-5.3E+04	-6.7E+04	-3.0E+04	-6.6E+04	-6.7E+04	-5.4E+04
1.7E+02	-8.1E+05	-4.9E+05	-1.3E+06	-1.0E+06	4.7E+06	-2.1E+06	-3.1E+06	2.3E+06	-6.7E+04	-6.9E+04	-9.5E+04	-1.3E+05	-1.5E+05	-1.2E+05	-1.3E+05	-1.1E+05
1.8E+02	-2.6E+06	-7.1E+05	-6.1E+04	-2.6E+05	1.4E+06	8.5E+05	-8.4E+05	3.9E+05	-5.6E+04	-3.8E+04	-3.5E+04	-6.2E+04	-4.5E+04	-6.3E+04	-3.0E+04	-4.3E+04
1.9E+02	-2.5E+06	1.4E+06	1.9E+06	-5.0E+06	3.0E+05	1.7E+06	-2.4E+05	-5.3E+05	-3.5E+04	-4.5E+04	-5.1E+04	-9.7E+04	-4.1E+04	-5.4E+04	-6.8E+04	-4.5E+04
2.0E+02	-1.1E+06	-2.2E+05	-2.1E+05	-1.6E+06	6.8E+05	1.2E+06	-5.9E+05	2.9E+05	-5.1E+04	-6.3E+04	-5.4E+04	-7.0E+04	-7.4E+04	-7.4E+04	-5.6E+04	-5.2E+04
2.1E+02	-5.1E+05	-1.3E+06	5.9E+05	-1.4E+05	-1.1E+06	-7.2E+05	-1.6E+06	-4.5E+05	-6.4E+04	-7.7E+04	-6.3E+04	-1.1E+05	-4.6E+04	-9.0E+04	-6.7E+04	-6.5E+04
2.1E+02	-1.7E+06	-1.7E+06	-8.7E+05	-2.1E+06	7.3E+05	1.1E+06	-5.7E+05	3.2E+05	-4.5E+04	-7.5E+04	-4.3E+04	-5.9E+04	-5.1E+04	-6.8E+04	-3.2E+04	-5.3E+04
2.2E+02	-2.1E+06	-1.6E+06	-2.9E+05	-1.7E+06	6.7E+05	1.5E+06	-8.0E+05	4.1E+05	-5.3E+04	-4.4E+04	-5.4E+04	-6.4E+04	-3.9E+04	-6.7E+04	-5.4E+04	-5.1E+04

Table 33. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.4 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	-3.6E+05	8.4E+04	-1.6E+06	3.7E+04	8.0E+04	-1.3E+05	-5.3E+04	-1.0E+05	-1.3E+05	-5.5E+04	-9.7E+04	-1.1E+05	-1.1E+05	-7.7E+04	-6.8E+04
2.0E+01	-1.9E+06	-2.3E+05	7.2E+04	-1.7E+06	1.2E+04	1.8E+05	-2.5E+05	-1.6E+05	-8.9E+04	-4.7E+04	-4.9E+04	-6.0E+04	-7.5E+04	-7.7E+04	-1.1E+05	-4.0E+04
2.9E+01	-2.0E+06	-2.9E+05	4.1E+02	-1.5E+06	2.0E+05	1.8E+05	-3.1E+05	-3.2E+05	-5.9E+04	-6.2E+04	-9.6E+04	-9.8E+04	-8.5E+04	-7.1E+04	-3.1E+04	-5.7E+04
3.9E+01	-2.1E+06	-1.6E+05	-1.6E+05	-1.7E+06	-5.5E+04	3.1E+05	-8.5E+04	-1.1E+05	-1.2E+05	-4.8E+04	-9.7E+04	-6.5E+04	-6.3E+04	-6.0E+04	-3.6E+04	-4.7E+04
4.9E+01	-1.9E+06	-1.4E+05	6.2E+04	-1.9E+06	9.8E+04	9.7E+04	-4.4E+05	-1.5E+04	-9.9E+04	-4.9E+04	-1.0E+05	-6.1E+04	-1.0E+05	-7.3E+04	-9.2E+04	-5.0E+04
5.9E+01	-2.1E+06	-2.9E+05	-2.2E+05	-1.7E+06	9.1E+04	1.4E+05	-2.9E+05	-2.6E+04	-1.2E+05	-7.5E+04	-6.6E+04	-8.6E+04	-1.3E+05	-6.3E+04	-1.5E+05	-8.1E+04
6.8E+01	-2.4E+06	-4.2E+05	2.7E+04	-2.0E+06	2.4E+05	3.3E+05	-4.3E+05	4.4E+04	-8.0E+04	-7.1E+04	-8.2E+04	-6.9E+04	-5.6E+04	-6.8E+04	-5.2E+04	-8.4E+04
7.8E+01	-2.1E+06	-5.3E+05	-2.2E+05	-1.8E+06	3.4E+05	3.4E+05	-2.0E+05	1.4E+05	-5.5E+04	-5.6E+04	-4.9E+04	-7.7E+04	-7.6E+04	-5.1E+04	-1.0E+05	-5.3E+04
8.8E+01	-2.1E+06	-6.6E+05	-1.1E+05	-1.9E+06	4.3E+05	3.0E+05	-6.2E+05	1.7E+05	-3.2E+04	-4.6E+04	-1.9E+04	-6.3E+04	-5.6E+04	-5.1E+04	-7.8E+04	-3.4E+04
9.8E+01	-2.0E+06	-8.8E+05	-2.7E+05	-2.0E+06	3.4E+05	3.8E+05	-8.3E+05	3.0E+05	-5.4E+04	-4.7E+04	-6.1E+04	-6.6E+04	-5.9E+04	-5.7E+04	-9.7E+04	-4.5E+04
1.1E+02	-2.1E+06	-4.8E+05	1.2E+05	-1.9E+06	9.4E+05	7.3E+05	-8.1E+05	5.2E+05	-5.7E+04	-5.8E+04	-8.2E+04	-7.1E+04	-4.4E+04	-5.0E+04	-5.5E+04	-4.2E+04
1.2E+02	-1.9E+06	-7.9E+05	-2.7E+05	-1.7E+06	6.8E+05	7.5E+05	-7.8E+05	4.8E+05	-4.5E+04	-4.0E+04	-5.9E+04	-6.8E+04	-2.6E+04	-4.0E+04	-4.4E+04	-4.1E+04
1.3E+02	-1.8E+06	-8.6E+05	-3.3E+05	-1.4E+06	7.0E+05	9.1E+05	-8.1E+05	3.5E+05	-3.3E+04	-5.0E+04	-4.1E+04	-6.6E+04	-3.3E+04	-8.2E+04	-3.8E+04	-3.7E+04
1.4E+02	-1.4E+06	-1.6E+06	-1.3E+06	-1.3E+06	7.2E+05	1.1E+06	-8.0E+05	2.2E+05	-4.7E+04	-4.9E+04	-3.9E+04	-6.5E+04	-4.8E+04	-6.1E+04	-2.0E+04	-4.5E+04
1.5E+02	-2.3E+06	-5.3E+05	8.9E+05	-2.7E+06	2.8E+05	9.4E+05	-3.2E+05	1.4E+06	-3.6E+04	-4.7E+04	-2.7E+04	-6.4E+04	-4.0E+04	-7.4E+04	-5.2E+04	-9.6E+04
1.6E+02	-2.3E+06	-6.6E+05	-3.1E+05	-1.8E+06	7.4E+05	1.4E+06	-1.0E+06	3.0E+05	-3.0E+04	-5.3E+04	-6.9E+04	-7.4E+04	-4.3E+04	-4.9E+04	-4.2E+04	-5.1E+04
1.7E+02	-2.5E+06	6.9E+05	-2.1E+05	-2.3E+06	8.5E+06	-3.3E+06	-5.9E+06	3.7E+06	-1.1E+05	-8.7E+04	-1.1E+05	-1.1E+05	-1.6E+05	-1.4E+05	-1.4E+05	-1.1E+05
1.8E+02	-2.6E+06	-8.0E+05	-3.1E+05	-6.8E+05	1.7E+06	1.5E+06	-1.2E+06	5.2E+05	-3.9E+04	-4.2E+04	-4.1E+04	-6.8E+04	-4.5E+04	-5.0E+04	-4.0E+04	-5.7E+04
1.9E+02	-2.7E+06	1.4E+06	1.9E+06	-5.4E+06	6.0E+05	2.4E+06	-7.6E+05	-3.2E+05	-4.3E+04	-5.8E+04	-4.6E+04	-6.5E+04	-3.6E+04	-5.9E+04	-6.2E+04	-5.2E+04
2.0E+02	-1.2E+06	-1.9E+05	-2.9E+05	-2.0E+06	8.3E+05	1.8E+06	-1.2E+06	3.7E+05	-5.0E+04	-5.5E+04	-4.0E+04	-6.5E+04	-5.6E+04	-6.9E+04	-2.9E+04	-5.2E+04
2.1E+02	-6.7E+05	1.1E+06	4.5E+05	-5.1E+05	-8.4E+05	-1.0E+05	-2.3E+06	-5.1E+05	-5.8E+04	-7.2E+04	-5.6E+04	-1.1E+05	-6.7E+04	-1.2E+05	-5.0E+04	-8.3E+04
2.1E+02	-1.9E+06	-1.7E+06	-8.7E+05	-2.4E+06	8.9E+05	1.7E+06	-1.1E+06	5.0E+05	-3.4E+04	-7.7E+04	-3.5E+04	-9.7E+04	-5.4E+04	-5.7E+04	-3.8E+04	-5.6E+04
2.2E+02	-2.3E+06	-1.6E+06	-3.1E+05	-2.0E+06	8.7E+05	2.2E+06	-1.3E+06	7.4E+05	-3.7E+04	-5.2E+04	-4.0E+04	-7.1E+04	-7.2E+04	-8.7E+04	-3.2E+04	-6.3E+04

Table 34. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.4 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.3E+06	-1.2E+05	1.3E+05	-2.1E+06	2.3E+04	1.2E+04	-1.6E+05	-1.6E+05	-8.7E+04	-1.2E+05	-6.2E+04	-8.6E+04	-9.7E+04	-1.0E+05	-6.2E+04	-3.7E+04
2.0E+01	-2.3E+06	7.7E+04	1.5E+05	-2.3E+06	9.4E+04	2.2E+05	-4.3E+05	-4.7E+04	-8.7E+04	-7.0E+04	-6.7E+04	-7.4E+04	-8.9E+04	-5.1E+04	-1.2E+05	-4.1E+04
2.9E+01	-2.4E+06	9.4E+04	5.8E+04	-2.2E+06	1.8E+05	1.9E+05	-4.3E+05	-1.2E+05	-3.8E+04	-6.2E+04	-6.5E+04	-1.0E+05	-8.4E+04	-4.9E+04	-3.0E+04	-5.5E+04
3.9E+01	-2.5E+06	5.5E+04	-1.2E+05	-2.3E+06	4.1E+04	3.2E+05	-3.0E+05	5.7E+04	-1.3E+05	-6.0E+04	-1.1E+05	-5.8E+04	-7.1E+04	-7.7E+04	-4.9E+04	-3.8E+04
4.9E+01	-2.0E+06	1.8E+05	1.3E+05	-2.3E+06	4.4E+05	-1.4E+05	-8.1E+05	1.2E+05	-2.9E+05	-2.6E+05	-1.6E+05	-8.5E+04	-3.2E+05	-2.1E+05	-1.2E+05	-8.9E+04
5.9E+01	-2.4E+06	-4.5E+03	-4.0E+05	-2.2E+06	1.1E+05	3.5E+05	-4.9E+05	2.4E+04	-9.7E+04	-8.1E+04	-8.9E+04	-9.4E+04	-1.2E+05	-9.7E+04	-1.6E+05	-8.7E+04
6.8E+01	-2.7E+06	-1.6E+05	-6.3E+04	-2.5E+06	3.4E+05	3.4E+05	-6.4E+05	9.4E+04	-8.6E+04	-9.2E+04	-7.9E+04	-8.5E+04	-6.2E+04	-8.8E+04	-7.3E+04	-1.0E+05
7.8E+01	-2.3E+06	-2.5E+05	-4.7E+05	-2.1E+06	3.2E+05	4.1E+05	-4.7E+05	2.3E+05	-5.4E+04	-6.6E+04	-4.9E+04	-7.4E+04	-8.6E+04	-4.7E+04	-1.1E+05	-7.2E+04
8.8E+01	-2.4E+06	-4.0E+05	-2.9E+05	-2.3E+06	3.4E+05	3.7E+05	-9.3E+05	2.7E+05	-3.0E+04	-4.6E+04	-2.3E+04	-6.9E+04	-6.1E+04	-4.0E+04	-7.9E+04	-4.4E+04
9.8E+01	-2.5E+06	-5.9E+05	-6.4E+05	-2.5E+06	1.9E+05	3.5E+05	-1.1E+06	2.2E+05	-1.4E+05	-1.7E+05	-1.0E+05	-1.1E+05	-1.8E+05	-1.4E+05	-1.3E+05	-9.9E+04
1.1E+02	-2.6E+06	-2.7E+05	-3.0E+05	-2.2E+06	5.7E+05	7.4E+05	-1.1E+06	4.2E+05	-3.2E+04	-5.5E+04	-6.5E+04	-6.6E+04	-6.2E+04	-4.7E+04	-4.3E+04	-5.4E+04
1.2E+02	-2.5E+06	-7.0E+05	-3.3E+05	-2.1E+06	6.6E+05	7.7E+05	-9.1E+05	7.1E+05	-3.8E+04	-4.1E+04	-1.9E+04	-5.2E+04	-2.7E+04	-4.8E+04	-6.0E+04	-4.4E+04
1.3E+02	-2.4E+06	-7.9E+05	-4.6E+05	-1.8E+06	7.5E+05	1.0E+06	-1.0E+06	4.6E+05	-3.0E+04	-6.5E+04	-4.2E+04	-6.3E+04	-2.9E+04	-6.7E+04	-2.8E+04	-4.7E+04
1.4E+02	-2.0E+06	-1.5E+06	-1.3E+06	-1.7E+06	7.9E+05	1.3E+06	-1.1E+06	4.2E+05	-5.1E+04	-2.9E+04	-5.9E+04	-2.4E+04	-5.1E+04	-3.4E+04	-3.4E+04	-5.2E+04
1.5E+02	-2.4E+06	-1.4E+06	3.3E+05	-1.7E+06	8.9E+05	2.6E+05	-1.5E+06	3.3E+06	-5.6E+04	-9.5E+04	-7.5E+04	-1.6E+05	-5.0E+04	-7.4E+04	-4.1E+04	-5.2E+04
1.6E+02	-2.6E+06	-5.7E+05	-3.5E+05	-2.1E+06	7.5E+05	1.7E+06	-1.5E+06	4.8E+05	-4.3E+04	-5.8E+04	-4.9E+04	-7.5E+04	-6.4E+04	-6.0E+04	-4.1E+04	-1.1E+05
1.7E+02	-3.8E+06	7.1E+05	2.4E+05	-2.6E+06	7.9E+06	-2.6E+06	-5.8E+06	3.5E+06	-2.3E+05	-1.9E+05	-1.1E+05	-1.1E+05	-1.2E+05	-1.3E+05	-1.2E+05	-1.0E+05
1.8E+02	-3.3E+06	-1.0E+06	-4.8E+05	-1.0E+06	1.5E+06	1.9E+06	-1.7E+06	6.8E+05	-4.5E+04	-4.6E+04	-3.3E+04	-6.0E+04	-4.3E+04	-5.8E+04	-2.9E+04	-4.5E+04
1.9E+02	-3.2E+06	1.3E+06	1.8E+06	-5.7E+06	6.9E+05	2.7E+06	-1.3E+06	-2.2E+05	-4.2E+04	-4.9E+04	-4.5E+04	-6.8E+04	-4.0E+04	-6.9E+04	-5.2E+04	-4.8E+04
2.0E+02	-1.7E+06	-1.4E+05	-3.2E+05	-2.4E+06	1.0E+06	2.3E+06	-1.7E+06	6.1E+05	-7.5E+04	-7.4E+04	-5.0E+04	-7.1E+04	-5.5E+04	-6.1E+04	-4.7E+04	-6.2E+04
2.1E+02	-1.1E+06	1.2E+06	2.6E+05	-1.0E+06	-8.1E+05	2.4E+05	-2.9E+06	-1.9E+05	-7.4E+04	-1.2E+05	-5.1E+04	-1.1E+05	-6.7E+04	-1.0E+05	-6.5E+04	-6.7E+04
2.1E+02	-2.3E+06	-1.8E+06	-1.1E+06	-2.8E+06	9.9E+05	2.4E+06	-1.9E+06	6.8E+05	-4.4E+04	-8.3E+04	-3.3E+04	-7.6E+04	-2.9E+04	-7.6E+04	-3.5E+04	-4.4E+04
2.2E+02	-2.8E+06	-1.6E+06	-4.7E+05	-2.4E+06	8.6E+05	2.7E+06	-2.1E+06	7.9E+05	-5.4E+04	-5.1E+04	-3.9E+04	-7.3E+04	-4.7E+04	-5.8E+04	-4.4E+04	-6.5E+04

Table 35. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.5 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.0E+06	-3.0E+05	2.7E+05	-1.3E+06	7.6E+04	-7.8E+03	-1.2E+05	-1.4E+05	-8.5E+04	-6.0E+04	-7.5E+04	-5.9E+04	-7.0E+04	-6.9E+04	-6.2E+04	-7.4E+04
2.0E+01	-9.8E+05	-3.7E+05	3.4E+05	-1.4E+06	4.8E+05	1.8E+05	-3.5E+05	-7.9E+04	-1.4E+05	-4.5E+04	-1.3E+05	-4.5E+04	-1.9E+05	-6.1E+04	-1.5E+05	-6.3E+04
2.9E+01	-1.1E+06	-4.9E+05	9.6E+04	-1.3E+06	1.4E+05	3.3E+05	-2.3E+05	-2.7E+05	-1.3E+05	-7.8E+04	-1.1E+05	-5.2E+04	-6.7E+04	-7.2E+04	-5.1E+04	-8.1E+04
3.9E+01	-1.2E+06	-4.1E+05	5.5E+04	-1.2E+06	1.4E+04	2.3E+05	-1.4E+05	9.8E+04	-1.0E+05	-7.0E+04	-9.6E+04	-4.2E+04	-1.1E+05	-5.1E+04	-1.2E+05	-4.9E+04
4.9E+01	-1.2E+06	-2.0E+05	3.1E+05	-1.4E+06	1.9E+05	2.8E+05	-5.4E+05	7.9E+04	-1.4E+05	-3.5E+04	-2.1E+05	-3.7E+04	-9.4E+04	-6.0E+04	-1.6E+05	-5.8E+04
5.9E+01	-1.2E+06	-2.8E+05	-5.9E+05	-1.2E+06	1.1E+05	2.2E+05	-9.0E+04	1.5E+05	-1.6E+05	-5.0E+04	-2.2E+05	-6.3E+04	-1.4E+05	-7.1E+04	-1.8E+05	-8.2E+04
6.8E+01	-1.4E+06	-4.0E+05	5.4E+04	-1.2E+06	3.2E+05	3.9E+05	-4.6E+05	2.9E+05	-9.9E+04	-7.0E+04	-9.5E+04	-1.1E+05	-7.0E+04	-5.9E+04	-1.2E+05	-9.4E+04
7.8E+01	-1.1E+06	-3.5E+05	6.0E+04	-1.3E+06	4.5E+05	1.4E+05	-3.9E+05	2.4E+05	-5.5E+04	-3.6E+04	-3.7E+04	-5.4E+04	-9.1E+04	-6.9E+04	-9.8E+04	-7.1E+04
8.8E+01	-1.1E+06	-5.5E+05	-1.4E+05	-1.2E+06	1.9E+05	2.2E+05	-5.0E+05	2.4E+05	-4.9E+04	-3.3E+04	-6.6E+04	-5.9E+04	-8.8E+04	-3.1E+04	-4.6E+04	-7.2E+04
9.8E+01	-1.1E+06	-7.7E+05	-3.5E+05	-1.4E+06	2.2E+05	2.5E+05	-7.6E+05	1.8E+05	-7.7E+04	-3.5E+04	-6.2E+04	-4.7E+04	-7.4E+04	-3.4E+04	-6.1E+04	-6.1E+04
1.1E+02	-1.3E+06	-4.2E+05	3.2E+04	-1.2E+06	5.3E+05	5.2E+05	-5.5E+05	4.2E+05	-7.7E+04	-3.6E+04	-6.4E+04	-5.4E+04	-6.8E+04	-4.4E+04	-5.3E+04	-5.3E+04
1.2E+02	-1.1E+06	-6.7E+05	-3.0E+05	-1.1E+06	3.8E+05	6.1E+05	-6.2E+05	5.9E+05	-5.4E+04	-3.6E+04	-6.2E+04	-4.1E+04	-4.2E+04	-4.7E+04	-3.6E+04	-4.7E+04
1.3E+02	-1.1E+06	-6.8E+05	-3.5E+05	-8.3E+05	4.9E+05	6.4E+05	-6.2E+05	3.8E+05	-6.8E+04	-5.3E+04	-7.3E+04	-5.9E+04	-8.6E+04	-5.2E+04	-5.6E+04	-7.3E+04
1.4E+02	-7.6E+05	-1.4E+06	-1.3E+06	-6.4E+05	4.2E+05	7.9E+05	-5.0E+05	2.4E+05	-4.0E+04	-4.2E+04	-3.1E+04	-4.2E+04	-4.9E+04	-4.6E+04	-2.7E+04	-4.2E+04
1.5E+02	-1.7E+06	-3.1E+05	7.7E+05	-1.9E+06	1.4E+05	3.6E+05	-1.2E+05	1.8E+06	-8.1E+04	-8.4E+04	-6.5E+04	-1.0E+05	-2.9E+04	-7.9E+04	-5.7E+04	-1.1E+05
1.6E+02	-1.6E+06	-5.8E+05	-3.0E+05	-1.2E+06	4.0E+05	8.9E+05	-7.4E+05	3.8E+05	-5.8E+04	-5.5E+04	-6.8E+04	-5.5E+04	-6.0E+04	-5.9E+04	-7.9E+04	-6.7E+04
1.7E+02	-5.8E+05	-4.8E+05	-1.3E+06	-5.4E+05	3.9E+06	-1.5E+06	-2.4E+06	2.0E+06	-4.3E+05	-3.2E+05	-3.5E+05	-3.4E+05	-5.1E+05	-5.0E+05	-4.5E+05	-4.2E+05
1.8E+02	-2.5E+06	-6.7E+05	-7.7E+04	-1.4E+05	1.3E+06	8.9E+05	-8.2E+05	5.1E+05	-8.8E+04	-1.1E+05	-7.8E+04	-8.6E+04	-8.9E+04	-1.1E+05	-7.4E+04	-9.6E+04
1.9E+02	-2.1E+06	1.6E+06	2.0E+06	-5.1E+06	1.9E+05	1.9E+06	7.0E+04	-6.1E+05	-8.9E+04	-5.0E+04	-7.0E+04	-5.2E+04	-5.3E+04	-7.2E+04	-5.0E+04	-6.7E+04
2.0E+02	-7.7E+05	-1.4E+05	-2.0E+05	-1.4E+06	5.9E+05	1.2E+06	-6.9E+05	4.9E+05	-4.5E+04	-7.0E+04	-3.7E+04	-7.4E+04	-6.5E+04	-5.8E+04	-6.0E+04	-6.0E+04
2.1E+02	-1.3E+05	1.4E+06	6.3E+05	6.7E+04	-8.7E+05	-5.5E+05	-1.8E+06	-5.1E+05	-8.1E+04	-8.1E+04	-7.6E+04	-7.2E+04	-7.2E+04	-7.2E+04	-5.5E+04	-7.6E+04
2.1E+02	-1.4E+06	-1.7E+06	-8.6E+05	-1.9E+06	6.8E+05	1.3E+06	-6.4E+05	4.8E+05	-4.3E+04	-4.1E+04	-2.7E+04	-5.8E+04	-5.4E+04	-5.4E+04	-3.9E+04	-8.3E+04
2.2E+02	-1.7E+06	-1.3E+06	-3.5E+05	-1.5E+06	5.8E+05	1.6E+06	-8.5E+05	5.9E+05	-5.1E+04	-4.0E+04	-6.5E+04	-7.5E+04	-8.3E+04	-6.7E+04	-4.5E+04	-6.3E+04

Table 36. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.5 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.2E+06	-2.5E+05	1.8E+05	-1.3E+06	-1.0E+04	7.8E+04	-7.0E+04	-2.2E+05	-5.6E+04	-7.9E+04	-5.9E+04	-6.5E+04	-6.9E+04	-7.7E+04	-6.4E+04	-7.8E+04
2.0E+01	-1.1E+06	-1.8E+05	2.8E+05	-1.5E+06	3.9E+05	2.2E+05	-4.2E+05	-1.7E+05	-1.4E+05	-4.0E+04	-1.1E+05	-3.4E+04	-1.5E+05	-3.5E+04	-1.2E+05	-6.3E+04
2.9E+01	-1.4E+06	-2.2E+05	2.1E+05	-1.6E+06	2.0E+04	4.3E+05	-3.3E+05	-3.4E+05	-1.2E+05	-9.1E+04	-1.3E+05	-4.3E+04	-7.2E+04	-6.1E+04	-5.9E+04	-8.5E+04
3.9E+01	-1.6E+06	-6.6E+04	7.4E+04	-1.5E+06	-4.1E+04	2.5E+05	-2.2E+05	-4.9E+04	-1.1E+05	-5.5E+04	-9.1E+04	-4.0E+04	-1.0E+05	-6.8E+04	-1.1E+05	-5.0E+04
4.9E+01	-1.4E+06	-9.9E+04	2.9E+05	-1.6E+06	1.7E+05	3.1E+05	-7.1E+05	5.8E+03	-1.8E+05	-3.0E+04	-1.9E+05	-4.6E+04	-6.0E+04	-5.0E+04	-1.4E+05	-5.4E+04
5.9E+01	-1.3E+06	-1.6E+05	-5.5E+05	-1.4E+06	2.1E+05	2.9E+05	-4.5E+05	8.1E+04	-1.1E+05	-5.2E+04	-2.0E+05	-6.3E+04	-1.3E+05	-6.1E+04	-1.4E+05	-4.9E+04
6.8E+01	-1.7E+06	-3.8E+05	-4.0E+04	-1.6E+06	3.3E+05	2.6E+05	-7.4E+05	2.6E+05	-7.6E+04	-5.1E+04	-1.2E+05	-5.9E+04	-6.8E+04	-6.2E+04	-1.3E+05	-1.0E+05
7.8E+01	-1.5E+06	-1.7E+05	-9.9E+04	-1.7E+06	3.2E+05	3.3E+05	-5.9E+05	-3.1E+04	-4.6E+04	-5.4E+04	-4.3E+04	-7.7E+04	-1.1E+05	-5.0E+04	-1.1E+05	-7.1E+04
8.8E+01	-1.6E+06	-3.6E+05	-1.7E+05	-1.7E+06	2.5E+05	2.9E+05	-8.1E+05	1.5E+05	-5.5E+04	-3.4E+04	-7.1E+04	-6.6E+04	-9.1E+04	-4.1E+04	-6.1E+04	-5.5E+04
9.8E+01	-1.5E+06	-5.1E+05	-3.5E+05	-1.7E+06	3.2E+05	3.9E+05	-1.1E+06	8.7E+04	-6.9E+04	-3.6E+04	-6.8E+04	-4.5E+04	-7.2E+04	-4.8E+04	-8.2E+04	-5.3E+04
1.1E+02	-1.6E+06	-2.3E+05	-4.6E+04	-1.6E+06	5.9E+05	6.4E+05	-9.5E+05	4.2E+05	-9.9E+04	-5.4E+04	-6.8E+04	-4.9E+04	-6.0E+04	-6.1E+04	-3.5E+04	-5.7E+04
1.2E+02	-1.5E+06	-5.7E+05	-4.4E+05	-1.4E+06	4.8E+05	6.4E+05	-9.4E+05	5.6E+05	-3.9E+04	-3.2E+04	-6.7E+04	-3.4E+04	-3.5E+04	-3.7E+04	-5.6E+04	-4.5E+04
1.3E+02	-1.4E+06	-5.8E+05	-5.1E+05	-1.2E+06	5.8E+05	8.5E+05	-9.4E+05	2.6E+05	-5.5E+04	-3.5E+04	-7.0E+04	-5.5E+04	-7.6E+04	-3.9E+04	-6.4E+04	-5.9E+04
1.4E+02	-1.1E+06	-1.4E+06	-1.3E+06	-1.0E+06	4.5E+05	1.0E+06	-8.9E+05	2.7E+05	-3.8E+04	-4.4E+04	-3.9E+04	-4.7E+04	-3.7E+04	-5.0E+04	-2.8E+04	-6.2E+04
1.5E+02	-1.4E+06	-1.5E+06	1.4E+05	-6.8E+05	6.5E+05	-1.2E+06	-1.2E+06	2.9E+06	-6.2E+04	-8.2E+04	-6.6E+04	-1.2E+05	-2.6E+04	-4.3E+04	-6.4E+04	-7.1E+04
1.6E+02	-1.8E+06	-6.1E+05	-4.5E+05	-1.5E+06	5.5E+05	1.2E+06	-1.2E+06	3.8E+05	-6.3E+04	-3.8E+04	-4.3E+04	-4.8E+04	-4.7E+04	-4.9E+04	-5.0E+04	-5.4E+04
1.7E+02	-3.8E+06	1.6E+06	6.6E+05	-2.6E+06	8.1E+06	-3.1E+06	-5.7E+06	3.4E+06	-1.8E+05	-9.5E+04	-1.2E+05	-8.4E+04	-1.4E+05	-1.2E+05	-1.4E+05	-1.5E+05
1.8E+02	-2.2E+06	-7.4E+05	-4.3E+05	-4.8E+05	1.1E+06	1.5E+06	-1.2E+06	5.8E+05	-4.8E+04	-3.9E+04	-4.1E+04	-4.0E+04	-3.2E+04	-5.7E+04	-2.9E+04	-5.8E+04
1.9E+02	-2.3E+06	1.6E+06	1.8E+06	-5.5E+06	2.7E+05	2.4E+06	-5.3E+05	-6.0E+05	-6.2E+04	-5.0E+04	-7.0E+04	-4.6E+04	-5.1E+04	-4.5E+04	-4.8E+04	-6.4E+04
2.0E+02	-9.0E+05	-9.1E+04	-4.6E+05	-2.0E+06	7.0E+05	1.7E+06	-1.2E+06	6.3E+05	-2.1E+04	-2.9E+04	-5.5E+04	-4.8E+04	-6.1E+04	-5.3E+04	-5.8E+04	-7.1E+04
2.1E+02	-3.1E+05	1.4E+06	2.6E+05	-4.6E+05	-9.1E+05	-1.3E+05	-2.2E+05	-2.2E+05	-7.6E+04	-5.0E+04	-8.3E+04	-8.4E+04	-6.8E+04	-6.6E+04	-6.8E+04	-1.1E+05
2.1E+02	-1.7E+06	-1.7E+06	-1.0E+06	-2.3E+06	7.5E+05	1.9E+06	-1.3E+06	7.6E+05	-3.4E+04	-3.6E+04	-4.1E+04	-7.4E+04	-3.4E+04	-7.8E+04	-4.6E+04	-5.7E+04
2.2E+02	-2.0E+06	-1.3E+06	-4.6E+05	-1.9E+06	7.3E+05	2.2E+06	-1.5E+06	9.0E+05	-5.8E+04	-3.1E+04	-5.1E+04	-6.3E+04	-3.5E+04	-4.2E+04	-3.6E+04	-5.0E+04

Table 37. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.5 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	-7.6E+04	-2.2E+05	-1.8E+06	1.3E+05	1.7E+05	-3.8E+04	-2.6E+05	-7.2E+04	-5.6E+04	-8.0E+04	-7.6E+04	-7.8E+04	-7.5E+04	-6.2E+04	-7.0E+04
2.0E+01	-1.8E+06	5.1E+04	-5.8E+04	-2.0E+06	4.2E+05	3.0E+05	-4.0E+05	-2.3E+05	-1.6E+05	-5.2E+04	-1.1E+05	-5.7E+04	-1.4E+05	-5.2E+04	-1.2E+05	-5.5E+04
2.9E+01	-2.0E+06	-6.8E+04	-2.4E+05	-2.0E+06	1.0E+05	4.0E+05	-2.8E+05	-3.5E+05	-1.0E+05	-7.6E+04	-9.1E+04	-6.1E+04	-7.3E+04	-3.8E+04	-4.2E+04	-8.1E+04
3.9E+01	-2.1E+06	6.4E+04	-3.6E+05	-2.0E+06	-3.4E+04	4.2E+05	-2.8E+05	-9.8E+04	-1.1E+05	-4.3E+04	-8.4E+04	-6.8E+04	-8.5E+04	-3.8E+04	-1.1E+05	-7.4E+04
4.9E+01	-1.4E+06	7.2E+05	-1.5E+05	-2.1E+06	9.0E+05	3.6E+05	-4.5E+05	1.7E+05	-1.8E+05	-4.3E+04	-1.9E+05	-5.8E+04	-1.2E+05	-1.5E+05	-1.4E+05	-8.0E+04
5.9E+01	-2.0E+06	-8.9E+03	-9.5E+05	-1.9E+06	2.5E+05	4.6E+05	-4.5E+05	5.7E+04	-1.0E+05	-4.7E+04	-1.8E+05	-3.7E+04	-1.3E+05	-5.1E+04	-1.4E+05	-7.2E+04
6.8E+01	-2.3E+06	-1.7E+05	-2.9E+05	-2.1E+06	5.0E+05	4.6E+05	-7.4E+05	1.1E+05	-8.4E+04	-3.6E+04	-1.1E+05	-7.4E+04	-8.9E+04	-6.0E+04	-9.9E+04	-7.1E+04
7.8E+01	-2.1E+06	-4.9E+04	-3.6E+05	-2.1E+06	6.0E+05	4.9E+05	-6.8E+05	1.2E+05	-4.8E+04	-4.3E+04	-5.4E+04	-3.7E+04	-9.9E+04	-3.2E+04	-9.4E+04	-5.3E+04
8.8E+01	-2.1E+06	-1.8E+05	-5.0E+05	-2.1E+06	3.8E+05	5.8E+05	-9.1E+05	2.5E+05	-6.2E+04	-4.0E+04	-7.0E+04	-4.7E+04	-8.8E+04	-3.7E+04	-4.7E+04	-6.4E+04
9.8E+01	-1.7E+06	-6.4E+05	-5.5E+05	-2.5E+06	-2.0E+05	9.9E+05	-1.4E+06	3.4E+05	-1.4E+05	-1.4E+05	-8.6E+04	-6.6E+04	-9.6E+04	-1.2E+05	-9.4E+04	-8.6E+04
1.1E+02	-2.1E+06	-1.2E+05	-4.4E+05	-2.1E+06	7.5E+05	8.5E+05	-9.9E+05	5.6E+05	-9.2E+04	-4.2E+04	-7.7E+04	-7.2E+04	-6.0E+04	-5.0E+04	-4.9E+04	-5.6E+04
1.2E+02	-2.1E+06	-4.3E+05	-6.3E+05	-1.9E+06	7.8E+05	9.3E+05	-9.9E+05	6.8E+05	-3.6E+04	-3.5E+04	-5.3E+04	-5.0E+04	-3.9E+04	-4.2E+04	-5.8E+04	-5.2E+04
1.3E+02	-2.0E+06	-5.0E+05	-6.5E+05	-1.7E+06	8.5E+05	1.2E+06	-1.1E+06	3.6E+05	-6.9E+04	-5.9E+04	-8.4E+04	-5.2E+04	-8.1E+04	-5.1E+04	-5.5E+04	-4.8E+04
1.4E+02	-1.7E+06	-1.2E+06	-1.5E+06	-1.5E+06	7.8E+05	1.3E+06	-1.0E+06	3.5E+05	-3.6E+04	-2.9E+04	-4.7E+04	-4.2E+04	-4.8E+04	-4.0E+04	-3.8E+04	-5.0E+04
1.5E+02	-1.5E+06	-2.0E+06	-7.6E+05	-1.1E+05	4.4E+05	9.7E+05	-6.9E+05	2.0E+06	-4.6E+04	-4.2E+04	-5.4E+04	-9.6E+04	-3.7E+04	-8.3E+04	-9.1E+04	-1.4E+05
1.6E+02	-2.4E+06	-4.0E+05	-5.2E+05	-2.1E+06	7.5E+05	1.7E+06	-1.4E+06	4.7E+05	-4.7E+04	-4.3E+04	-3.6E+04	-4.2E+04	-4.3E+04	-5.1E+04	-4.5E+04	-6.2E+04
1.7E+02	-1.0E+06	-1.1E+06	-1.6E+06	-1.3E+06	6.1E+06	-1.5E+06	-4.9E+06	3.0E+06	-1.7E+05	-1.3E+05	-1.8E+05	-1.2E+05	-2.6E+05	-1.6E+05	-1.6E+05	-1.7E+05
1.8E+02	-2.8E+06	-4.5E+05	-5.1E+05	-1.1E+06	1.5E+06	2.0E+06	-1.7E+06	6.8E+05	-3.9E+04	-5.7E+04	-4.4E+04	-4.1E+04	-3.9E+04	-4.7E+04	-3.9E+04	-6.7E+04
1.9E+02	-2.9E+06	1.8E+06	1.7E+06	-6.1E+06	5.4E+05	3.1E+06	-8.3E+05	-4.3E+05	-7.2E+04	-3.5E+04	-6.5E+04	-4.2E+04	-3.9E+04	-4.7E+04	-4.4E+04	-6.1E+04
2.0E+02	-1.5E+06	2.3E+05	-4.0E+05	-2.5E+06	9.0E+05	2.3E+06	-1.6E+06	8.6E+05	-4.3E+04	-8.0E+04	-7.2E+04	-5.7E+04	-5.1E+04	-5.5E+04	-3.4E+04	-6.4E+04
2.1E+02	-9.4E+05	1.6E+06	2.9E+05	-9.4E+05	-7.6E+05	3.1E+05	-2.8E+06	-1.6E+05	-8.1E+04	-1.4E+05	-8.7E+04	-1.7E+05	-7.7E+04	-1.0E+05	-1.1E+05	-1.0E+05
2.1E+02	-2.1E+06	-1.4E+06	-1.1E+06	-2.9E+06	1.1E+06	2.4E+06	-1.8E+06	1.0E+06	-5.8E+04	-7.5E+04	-4.7E+04	-5.4E+04	-3.8E+04	-8.5E+04	-4.7E+04	-1.1E+05
2.2E+02	-2.4E+06	-1.1E+06	-6.2E+05	-2.4E+06	1.1E+06	2.9E+06	-1.9E+06	1.3E+06	-6.1E+04	-7.2E+04	-6.2E+04	-4.4E+04	-7.6E+04	-8.5E+04	-3.9E+04	-5.9E+04

Table 38. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.6 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-9.5E+05	-3.5E+04	2.4E+05	-9.8E+05	3.3E+04	4.6E+04	-6.1E+04	-1.8E+05	-8.6E+04	-1.2E+05	-8.3E+04	-8.4E+04	-8.2E+04	-1.3E+05	-4.2E+04	-9.5E+04
2.0E+01	-8.8E+05	-2.2E+05	-1.2E+05	-8.3E+05	2.5E+05	1.7E+05	7.6E+04	-2.9E+05	-1.2E+05	-8.8E+04	-1.5E+05	-8.8E+04	-1.0E+05	-1.3E+05	-1.6E+05	-8.2E+04
2.9E+01	-9.7E+05	-2.2E+05	2.5E+05	-9.0E+05	9.6E+04	2.0E+05	-1.1E+05	-4.2E+05	-8.7E+04	-1.4E+05	-8.7E+04	-1.1E+05	-8.1E+04	-8.8E+04	-4.8E+04	-8.1E+04
3.9E+01	-8.7E+05	-2.1E+05	1.5E+04	-9.8E+05	-1.4E+05	2.7E+05	-2.4E+05	-6.7E+04	-7.1E+04	-7.9E+04	-7.1E+04	-7.5E+04	-6.5E+04	-8.2E+04	-8.9E+04	-8.1E+04
4.9E+01	-9.7E+05	-1.1E+05	5.6E+04	-1.0E+06	-1.8E+05	1.7E+05	-2.5E+05	3.5E+03	-1.8E+05	-7.1E+04	-2.0E+05	-9.1E+04	-1.9E+05	-9.7E+04	-1.7E+05	-6.2E+04
5.9E+01	-1.0E+06	-2.2E+05	-3.6E+04	-9.6E+05	1.0E+05	1.4E+05	-5.2E+05	1.2E+05	-2.3E+05	-8.4E+04	-1.0E+05	-7.9E+04	-1.8E+05	-1.0E+05	-1.9E+05	-6.7E+04
6.8E+01	-1.2E+06	-2.8E+05	2.7E+05	-1.0E+06	2.4E+05	8.2E+04	-3.5E+05	6.3E+04	-8.0E+04	-1.2E+05	-1.4E+05	-1.1E+05	-9.5E+04	-9.0E+04	-9.6E+04	-9.4E+04
7.8E+01	-9.2E+05	-2.9E+05	-5.4E+04	-9.6E+05	6.3E+04	2.1E+05	-3.1E+05	1.3E+05	-1.2E+05	-7.0E+04	-8.7E+04	-7.6E+04	-1.6E+05	-6.5E+04	-5.7E+04	-6.8E+04
8.8E+01	-9.8E+05	-3.9E+05	-7.5E+04	-1.1E+06	1.0E+05	2.1E+05	-5.1E+05	1.4E+05	-9.9E+04	-6.3E+04	-9.7E+04	-5.9E+04	-4.9E+04	-9.2E+04	-8.8E+04	-5.5E+04
9.8E+01	-1.1E+06	-5.8E+05	-2.6E+05	-1.2E+06	1.6E+05	1.6E+05	-6.9E+05	8.1E+04	-2.4E+04	-6.7E+04	-5.6E+04	-6.2E+04	-6.0E+04	-8.6E+04	-1.1E+05	-5.9E+04
1.1E+02	-9.8E+05	-2.9E+05	2.1E+03	-1.1E+06	4.3E+05	4.8E+05	-6.3E+05	5.0E+05	-7.7E+04	-6.1E+04	-1.2E+05	-7.6E+04	-1.1E+05	-7.0E+04	-6.8E+04	-7.2E+04
1.2E+02	-1.1E+06	-5.9E+05	-3.0E+05	-9.5E+05	4.7E+05	4.2E+05	-5.4E+05	5.5E+05	-4.6E+04	-6.5E+04	-6.6E+04	-6.9E+04	-7.8E+04	-7.2E+04	-7.0E+04	-4.9E+04
1.3E+02	-1.0E+06	-5.4E+05	-3.5E+05	-6.4E+05	5.3E+05	6.3E+05	-6.1E+05	2.3E+05	-5.1E+04	-9.1E+04	-5.2E+04	-8.2E+04	-6.4E+04	-1.1E+05	-5.4E+04	-5.9E+04
1.4E+02	-7.8E+05	-1.3E+06	-1.1E+06	-5.9E+05	5.2E+05	8.3E+05	-4.7E+05	8.0E+03	-3.9E+04	-6.3E+04	-5.6E+04	-5.7E+04	-5.8E+04	-3.1E+04	-3.1E+04	-4.4E+04
1.5E+02	-9.5E+05	-2.1E+06	1.1E+05	8.6E+05	-3.0E+05	1.2E+06	3.8E+05	5.2E+05	-6.2E+04	-8.9E+04	-6.8E+04	-6.8E+04	-6.9E+04	-7.5E+04	-1.0E+05	-6.3E+04
1.6E+02	-1.3E+06	-5.0E+05	-1.4E+05	-1.1E+06	4.5E+05	1.1E+06	-8.5E+05	3.1E+05	-9.8E+04	-1.0E+05	-7.8E+04	-7.1E+04	-9.6E+04	-1.0E+05	-7.5E+04	-7.3E+04
1.7E+02	2.0E+05	-1.4E+06	-1.4E+06	-8.5E+04	2.4E+06	-3.5E+05	-1.7E+06	1.3E+06	-6.2E+05	-5.1E+05	-4.1E+05	-4.1E+05	-5.5E+05	-6.0E+05	-4.6E+05	-4.1E+05
1.8E+02	-2.6E+06	-4.0E+05	2.4E+05	-1.9E+05	2.6E+06	7.1E+05	-1.5E+06	6.4E+05	-1.8E+05	-1.8E+05	-9.7E+04	-1.4E+05	-2.1E+05	-1.9E+05	-1.6E+05	-1.2E+05
1.9E+02	-1.6E+06	1.3E+06	1.5E+06	-4.1E+06	3.9E+05	1.8E+06	-1.6E+05	-2.5E+05	-6.2E+04	-9.4E+04	-6.5E+04	-7.3E+04	-7.3E+04	-9.6E+04	-6.1E+04	-6.8E+04
2.0E+02	-4.7E+05	1.1E+05	-2.0E+05	-1.3E+06	6.1E+05	1.3E+06	-5.3E+05	5.1E+05	-5.6E+04	-8.0E+04	-6.5E+04	-8.6E+04	-7.6E+04	-1.0E+05	-6.5E+04	-7.6E+04
2.1E+02	1.7E+05	1.4E+06	5.5E+05	5.1E+04	-1.1E+06	-5.2E+05	-1.6E+06	-3.0E+05	-6.1E+04	-1.0E+05	-6.7E+04	-1.1E+05	-7.3E+04	-1.6E+05	-7.7E+04	-9.3E+04
2.1E+02	-1.1E+06	-1.4E+06	-6.9E+05	-1.6E+06	5.6E+05	1.5E+06	-4.6E+05	5.2E+05	-3.5E+04	-7.6E+04	-5.0E+04	-1.2E+05	-4.4E+04	-9.9E+04	-4.7E+04	-6.8E+04
2.2E+02	-1.4E+06	-1.2E+06	-1.3E+05	-1.3E+06	6.1E+05	1.8E+06	-7.9E+05	6.5E+05	-5.9E+04	-9.6E+04	-7.8E+04	-9.1E+04	-5.6E+04	-9.1E+04	-4.7E+04	-6.8E+04

Table 39. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.6 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.2E+06	-6.3E+04	7.2E+04	-1.0E+06	-1.4E+04	1.4E+05	-1.6E+05	-2.6E+05	-8.6E+04	-7.5E+04	-8.0E+04	-6.7E+04	-1.2E+05	-1.0E+05	-6.6E+04	-4.7E+04
2.0E+01	-1.2E+06	3.2E+04	-2.3E+05	-1.1E+06	2.9E+05	2.1E+05	-8.9E+04	-2.8E+05	-1.7E+05	-7.6E+04	-1.4E+05	-7.6E+04	-1.2E+05	-6.9E+04	-1.4E+05	-5.4E+04
2.9E+01	-1.4E+06	-1.2E+05	-2.5E+04	-1.1E+06	1.6E+05	2.5E+05	-1.7E+05	-4.4E+05	-9.7E+04	-8.7E+04	-9.2E+04	-6.3E+04	-5.7E+04	-9.2E+04	-5.4E+04	-1.0E+05
3.9E+01	-1.3E+06	-9.8E+04	-8.6E+04	-1.3E+06	-3.1E+04	2.4E+05	-2.1E+05	-9.2E+04	-9.1E+04	-6.9E+04	-6.0E+04	-8.1E+04	-6.9E+04	-8.6E+04	-9.0E+04	-4.6E+04
4.9E+01	-1.3E+06	-1.5E+04	-8.6E+04	-1.3E+06	-3.7E+04	2.1E+05	-2.8E+05	7.4E+03	-1.8E+05	-7.0E+04	-1.5E+05	-6.8E+04	-1.8E+05	-9.8E+04	-1.7E+05	-4.6E+04
5.9E+01	-1.3E+06	-2.3E+05	-1.2E+05	-1.2E+06	2.6E+05	3.3E+05	-7.6E+05	2.4E+05	-2.0E+05	-6.4E+04	-1.1E+05	-8.8E+04	-1.9E+05	-9.1E+04	-1.6E+05	-8.0E+04
6.8E+01	-1.3E+06	-3.5E+05	3.3E+05	-1.1E+06	3.8E+05	3.9E+05	-6.5E+05	3.1E+05	-1.1E+05	-1.1E+05	-1.8E+05	-1.8E+05	-1.1E+05	-1.2E+05	-1.1E+05	-8.2E+04
7.8E+01	-1.1E+06	-2.5E+05	3.3E+03	-1.2E+06	3.1E+05	4.6E+05	-5.9E+05	8.4E+04	-1.3E+05	-9.9E+04	-6.7E+04	-8.5E+04	-1.7E+05	-8.2E+04	-7.3E+04	-5.6E+04
8.8E+01	-1.2E+06	-2.3E+05	-2.2E+05	-1.3E+06	2.6E+05	5.2E+05	-8.2E+05	1.2E+05	-1.1E+05	-6.4E+04	-8.6E+04	-7.8E+04	-5.3E+04	-7.8E+04	-9.3E+04	-5.3E+04
9.8E+01	-1.3E+06	-4.2E+05	-4.4E+05	-1.5E+06	2.5E+05	5.2E+05	-1.1E+06	1.0E+05	-4.4E+04	-7.6E+04	-5.4E+04	-7.6E+04	-6.8E+04	-6.9E+04	-1.3E+05	-6.2E+04
1.1E+02	-1.1E+06	-1.6E+05	-2.6E+05	-1.3E+06	4.9E+05	8.3E+05	-8.9E+05	5.1E+05	-8.4E+04	-8.1E+04	-9.7E+04	-7.2E+04	-7.5E+04	-7.2E+04	-7.2E+04	-4.4E+04
1.2E+02	-1.1E+06	-4.3E+05	-5.2E+05	-1.2E+06	5.0E+05	6.7E+05	-9.2E+05	5.9E+05	-5.7E+04	-6.8E+04	-5.8E+04	-5.3E+04	-4.8E+04	-6.7E+04	-7.7E+04	-5.3E+04
1.3E+02	-1.1E+06	-4.0E+05	-4.7E+05	-9.1E+05	5.2E+05	9.5E+05	-8.9E+05	1.9E+05	-5.4E+04	-8.5E+04	-5.4E+04	-7.8E+04	-6.0E+04	-8.9E+04	-6.5E+04	-4.5E+04
1.4E+02	-9.6E+05	-1.2E+06	-1.2E+06	-8.3E+05	4.5E+05	1.1E+06	-7.5E+05	-2.5E+04	-3.8E+04	-5.9E+04	-4.7E+04	-5.8E+04	-4.2E+04	-6.7E+04	-3.5E+04	-5.7E+04
1.5E+02	-1.3E+06	-1.9E+06	-1.2E+05	5.5E+05	-3.3E+05	1.6E+06	9.7E+04	3.8E+05	-6.2E+04	-6.9E+04	-5.3E+04	-8.7E+04	-4.4E+04	-7.8E+04	-5.7E+04	-5.4E+04
1.6E+02	-1.7E+06	-2.9E+05	-3.7E+05	-1.4E+06	4.6E+05	1.4E+06	-1.1E+06	2.1E+05	-5.3E+04	-6.8E+04	-6.1E+04	-6.4E+04	-6.6E+04	-7.6E+04	-4.9E+04	-5.8E+04
1.7E+02	6.4E+05	-1.9E+06	-2.2E+06	1.8E+05	2.5E+06	7.3E+04	-2.1E+06	1.5E+06	-1.6E+05	-1.5E+05	-1.2E+05	-1.1E+05	-1.0E+05	-1.1E+05	-7.5E+04	-8.1E+04
1.8E+02	-2.9E+06	-2.0E+05	1.6E+05	-4.5E+05	2.9E+06	1.3E+06	-2.0E+06	6.3E+05	-1.2E+05	-8.3E+04	-5.2E+04	-9.2E+04	-7.6E+04	-9.1E+04	-6.4E+04	-5.4E+04
1.9E+02	-1.9E+06	1.4E+06	1.4E+06	-4.4E+06	5.0E+05	2.3E+06	-6.8E+05	-1.7E+05	-4.5E+04	-7.2E+04	-6.5E+04	-9.6E+04	-5.8E+04	-8.7E+04	-6.4E+04	-6.6E+04
2.0E+02	-7.8E+05	1.6E+05	-2.6E+05	-1.6E+06	7.4E+05	1.9E+06	-1.1E+06	5.4E+05	-4.1E+04	-7.6E+04	-4.5E+04	-8.2E+04	-7.1E+04	-9.7E+04	-5.9E+04	-6.8E+04
2.1E+02	-1.5E+05	1.5E+06	4.5E+05	-2.5E+05	-9.1E+05	1.3E+05	-2.2E+06	-2.7E+05	-9.3E+04	-1.5E+05	-7.2E+04	-1.5E+05	-8.3E+04	-1.2E+05	-7.5E+04	-7.4E+04
2.1E+02	-1.4E+06	-1.2E+06	-9.0E+05	-2.1E+06	6.8E+05	2.1E+06	-1.2E+06	5.6E+05	-6.3E+04	-9.4E+04	-2.9E+04	-9.2E+04	-4.2E+04	-1.1E+05	-4.2E+04	-6.8E+04
2.2E+02	-1.8E+06	-1.1E+06	-3.1E+05	-1.7E+06	7.7E+05	2.4E+06	-1.4E+06	8.2E+05	-6.0E+04	-1.0E+05	-7.7E+04	-8.7E+04	-5.2E+04	-7.7E+04	-5.2E+04	-7.1E+04

Table 40. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.6 PR and zero preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.7E+06	-3.4E+03	-1.4E+05	-1.4E+06	-6.5E+04	1.8E+05	-1.8E+05	-2.1E+05	-8.2E+04	-1.1E+05	-7.4E+04	-9.3E+04	-6.5E+04	-1.3E+05	-4.6E+04	-6.5E+04
2.0E+01	-1.7E+06	1.2E+05	-6.1E+05	-1.5E+06	2.9E+05	3.1E+05	-9.1E+04	-2.8E+05	-1.6E+05	-7.0E+04	-1.4E+05	-5.6E+04	-9.3E+04	-8.4E+04	-1.5E+05	-6.7E+04
2.9E+01	-1.8E+06	1.2E+05	-2.8E+05	-1.6E+06	6.5E+04	3.5E+05	-2.3E+05	-4.6E+05	-8.5E+04	-9.8E+04	-5.7E+04	-8.5E+04	-6.4E+04	-1.0E+05	-5.4E+04	-8.0E+04
3.9E+01	-1.8E+06	3.4E+02	-3.7E+05	-1.7E+06	-9.0E+04	4.0E+05	-2.3E+05	1.9E+04	-8.0E+04	-7.0E+04	-5.6E+04	-7.2E+04	-8.0E+04	-8.7E+04	-5.3E+04	-8.0E+04
4.9E+01	-1.4E+06	-2.2E+05	-1.5E+05	-1.9E+06	-5.0E+05	6.0E+05	-3.1E+05	3.4E+04	-4.5E+05	-2.1E+05	-1.7E+05	-1.0E+05	-3.8E+05	-2.5E+05	-2.0E+05	-1.0E+05
5.9E+01	-1.7E+06	-7.4E+04	-3.4E+05	-1.6E+06	3.1E+05	5.1E+05	-8.6E+05	1.7E+05	-2.3E+05	-6.7E+04	-1.1E+05	-8.8E+04	-1.9E+05	-9.1E+04	-1.6E+05	-4.8E+04
6.8E+01	-1.8E+06	-1.9E+05	2.7E+04	-1.8E+06	5.1E+05	3.4E+05	-6.7E+05	2.9E+05	-9.7E+04	-1.1E+05	-1.3E+05	-8.8E+04	-8.9E+04	-1.1E+05	-9.0E+04	-8.0E+04
7.8E+01	-1.6E+06	-1.6E+05	-2.3E+05	-1.6E+06	4.1E+05	7.3E+05	-6.2E+05	2.2E+05	-1.3E+05	-6.1E+04	-7.6E+04	-7.6E+04	-1.7E+05	-9.0E+04	-6.7E+04	-4.8E+04
8.8E+01	-1.7E+06	-2.2E+05	-2.8E+05	-1.8E+06	4.7E+05	7.2E+05	-9.8E+05	3.1E+05	-1.0E+05	-6.7E+04	-7.5E+04	-6.5E+04	-4.1E+04	-7.6E+04	-1.0E+05	-5.7E+04
9.8E+01	-1.5E+06	-3.7E+05	-5.0E+05	-1.9E+06	3.6E+05	8.2E+05	-1.4E+06	3.3E+05	-1.5E+05	-1.5E+05	-1.2E+05	-1.2E+05	-1.8E+05	-1.7E+05	-1.5E+05	-1.2E+05
1.1E+02	-1.7E+06	2.9E+05	-6.7E+05	-1.7E+06	5.1E+05	1.2E+06	-1.2E+06	4.0E+05	-9.4E+04	-9.5E+04	-1.1E+05	-1.1E+05	-1.0E+05	-9.2E+04	-8.0E+04	-5.0E+04
1.2E+02	-1.8E+06	-1.1E+05	-8.0E+05	-1.6E+06	5.3E+05	9.8E+05	-1.0E+06	5.5E+05	-6.7E+04	-5.8E+04	-5.4E+04	-5.8E+04	-6.1E+04	-6.2E+04	-7.5E+04	-4.4E+04
1.3E+02	-1.7E+06	-2.7E+05	-6.3E+05	-1.4E+06	7.7E+05	1.1E+06	-1.1E+06	3.3E+05	-4.9E+04	-6.8E+04	-5.6E+04	-8.1E+04	-5.7E+04	-7.9E+04	-6.4E+04	-7.2E+04
1.4E+02	-1.4E+06	-9.8E+05	-1.4E+06	-1.3E+06	7.5E+05	1.5E+06	-1.1E+06	1.4E+05	-3.1E+04	-6.6E+04	-5.6E+04	-6.7E+04	-5.8E+04	-3.4E+04	-4.6E+04	-4.6E+04
1.5E+02	-1.7E+06	-1.7E+06	-1.6E+05	1.4E+04	-1.5E+05	2.1E+06	-3.1E+05	5.1E+05	-6.6E+04	-6.9E+04	-8.6E+04	-7.7E+04	-5.7E+04	-8.2E+04	-8.4E+04	-5.7E+04
1.6E+02	-2.0E+06	-1.6E+05	-3.8E+05	-1.9E+06	6.1E+05	1.9E+06	-1.5E+06	3.4E+05	-4.2E+04	-7.4E+04	-5.2E+04	-7.1E+04	-6.5E+04	-7.2E+04	-6.6E+04	-6.1E+04
1.7E+02	-3.8E+05	-1.3E+06	-1.8E+06	-6.1E+05	2.3E+06	1.2E+06	-2.3E+06	1.0E+06	-1.2E+05	-9.6E+04	-7.5E+04	-8.8E+04	-1.0E+05	-1.1E+05	-9.3E+04	-7.3E+04
1.8E+02	-2.6E+06	3.9E+05	-1.9E+05	-1.2E+06	3.2E+06	1.6E+06	-2.7E+06	9.9E+05	-6.9E+04	-7.8E+04	-7.3E+04	-8.2E+04	-6.7E+04	-1.1E+05	-4.6E+04	-8.0E+04
1.9E+02	-2.4E+06	1.7E+06	1.3E+06	-5.0E+06	6.7E+05	2.9E+06	-1.1E+06	-2.3E+04	-3.8E+04	-7.5E+04	-5.5E+04	-8.7E+04	-4.7E+04	-6.9E+04	-6.2E+04	-5.2E+04
2.0E+02	-1.1E+06	5.0E+05	-4.3E+05	-2.2E+06	9.6E+05	2.4E+06	-1.7E+06	7.8E+05	-3.4E+04	-6.3E+04	-5.6E+04	-8.7E+04	-5.1E+04	-8.5E+04	-4.1E+04	-6.4E+04
2.1E+02	-6.4E+05	1.8E+06	2.7E+05	-6.9E+05	-6.5E+05	7.2E+05	-8.2E+03	-7.2E+04	-9.3E+04	-7.5E+04	-9.7E+04	-7.0E+04	-9.5E+04	-7.1E+04	-9.3E+04	-9.3E+04
2.1E+02	-1.9E+06	-1.1E+06	-1.2E+06	-2.6E+06	8.9E+05	2.6E+06	-1.7E+06	9.2E+05	-4.1E+04	-9.2E+04	-3.6E+04	-7.9E+04	-4.3E+04	-9.5E+04	-3.7E+04	-5.8E+04
2.2E+02	-2.3E+06	-9.0E+05	-6.0E+05	-2.3E+06	9.4E+05	3.0E+06	-2.0E+06	1.2E+06	-6.1E+04	-1.0E+05	-6.1E+04	-7.3E+04	-5.3E+04	-9.0E+04	-5.5E+04	-8.6E+04

Table 41. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.4 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	1.2E+06	-1.3E+06	-1.5E+06	1.4E+05	4.6E+04	-2.5E+05	-1.7E+05	-6.9E+04	-9.3E+04	-5.1E+04	-9.0E+04	-9.4E+04	-1.0E+05	-8.9E+04	-6.4E+04
2.0E+01	-1.9E+06	1.3E+06	-1.3E+06	-1.3E+06	8.7E+04	2.9E+05	-4.3E+05	1.2E+05	-1.1E+05	-5.8E+04	-7.3E+04	-8.5E+04	-8.6E+04	-1.1E+05	-1.3E+05	-7.1E+04
2.9E+01	-1.8E+06	1.2E+06	-1.4E+06	-1.1E+06	2.3E+05	3.6E+05	-4.1E+05	7.0E+04	-4.4E+04	-6.8E+04	-6.3E+04	-1.1E+05	-5.6E+04	-7.7E+04	-5.8E+04	-6.0E+04
3.9E+01	-1.8E+06	1.3E+06	-1.7E+06	-1.3E+06	7.8E+04	4.0E+05	-2.7E+05	2.5E+05	-1.3E+05	-5.1E+04	-1.1E+05	-6.0E+04	-5.5E+04	-6.1E+04	-3.5E+04	-4.4E+04
4.9E+01	-1.8E+06	1.3E+06	-1.5E+06	-1.2E+06	1.2E+05	3.9E+05	-5.8E+05	3.0E+05	-1.4E+05	-6.7E+04	-1.3E+05	-9.6E+04	-1.1E+05	-8.6E+04	-1.2E+05	-4.6E+04
5.9E+01	-1.8E+06	1.2E+06	-1.7E+06	-1.2E+06	1.7E+05	5.0E+05	-5.0E+05	3.7E+05	-9.9E+04	-5.2E+04	-6.0E+04	-7.8E+04	-1.5E+05	-5.5E+04	-1.4E+05	-4.2E+04
6.8E+01	-1.9E+06	1.4E+06	-1.4E+06	-1.4E+06	2.3E+05	5.5E+05	-6.7E+05	6.5E+05	-7.7E+04	-8.7E+04	-7.4E+04	-9.1E+04	-4.6E+04	-1.0E+05	-5.7E+04	-9.2E+04
7.8E+01	-1.8E+06	1.0E+06	-1.5E+06	-8.7E+05	5.1E+05	6.6E+05	-5.9E+05	6.0E+05	-5.0E+04	-5.2E+04	-4.4E+04	-6.0E+04	-9.2E+04	-6.1E+04	-1.2E+05	-4.8E+04
8.8E+01	-1.8E+06	1.0E+06	-1.5E+06	-1.0E+06	5.4E+05	6.8E+05	-1.0E+06	4.7E+05	-3.1E+04	-4.4E+04	-1.2E+04	-6.1E+04	-5.4E+04	-4.6E+04	-9.5E+04	-3.5E+04
9.8E+01	-1.7E+06	8.6E+05	-1.8E+06	-1.3E+06	3.4E+05	6.5E+05	-1.3E+06	4.4E+05	-5.2E+04	-4.0E+04	-7.3E+04	-5.2E+04	-7.1E+04	-7.3E+04	-8.4E+04	-4.5E+04
1.1E+02	-2.0E+06	1.0E+06	-1.5E+06	-1.2E+06	7.8E+05	7.3E+05	-1.3E+06	7.4E+05	-5.9E+04	-3.9E+04	-6.6E+04	-6.1E+04	-5.8E+04	-5.8E+04	-6.8E+04	-5.3E+04
1.2E+02	-1.6E+06	8.3E+05	-1.6E+06	-1.0E+06	6.2E+05	9.9E+05	-1.1E+06	7.3E+05	-3.9E+04	-4.9E+04	-3.2E+04	-6.0E+04	-4.3E+04	-4.6E+04	-4.7E+04	-4.0E+04
1.3E+02	-1.5E+06	6.6E+05	-1.6E+06	-1.1E+06	6.8E+05	1.3E+06	-1.0E+06	4.7E+05	-3.2E+04	-5.5E+04	-4.8E+04	-7.5E+04	-3.4E+04	-6.4E+04	-3.6E+04	-6.5E+04
1.4E+02	-1.5E+06	4.0E+05	-2.3E+06	-8.3E+05	1.0E+06	1.9E+06	-6.5E+05	7.9E+05	-7.4E+04	-5.7E+04	-6.6E+04	-6.7E+04	-5.8E+04	-7.0E+04	-4.2E+04	-4.3E+04
1.5E+02	-2.3E+06	4.5E+05	-5.6E+05	-9.6E+05	-4.2E+05	2.0E+06	-1.9E+05	5.7E+05	-4.2E+04	-4.7E+04	-3.7E+04	-6.3E+04	-4.3E+04	-7.1E+04	-2.6E+04	-3.9E+04
1.6E+02	-1.3E+06	7.5E+05	-2.0E+06	-4.9E+04	1.3E+06	1.4E+06	-2.1E+06	1.3E+06	-4.0E+04	-6.2E+04	-4.5E+04	-6.1E+04	-4.0E+04	-5.5E+04	-4.5E+04	-4.5E+04
1.7E+02	-3.5E+06	1.8E+06	-4.8E+05	-5.7E+05	-1.9E+04	2.7E+06	-7.0E+05	4.1E+05	-6.0E+04	-6.4E+04	-5.9E+04	-7.7E+04	-8.1E+04	-8.1E+04	-5.3E+04	-5.4E+04
1.8E+02	-2.0E+06	6.4E+05	-1.4E+06	7.3E+04	8.0E+05	1.9E+06	-1.6E+06	9.8E+05	-4.5E+04	-4.3E+04	-3.9E+04	-5.8E+04	-4.9E+04	-5.1E+04	-3.3E+04	-4.7E+04
1.9E+02	-2.3E+05	3.5E+06	-8.9E+05	-4.7E+06	6.1E+06	-1.7E+06	-6.2E+06	3.8E+06	-8.2E+04	-8.9E+04	-9.6E+04	-1.1E+05	-1.1E+05	-6.8E+04	-1.3E+05	-7.1E+04
2.0E+02	-1.0E+06	7.4E+05	-1.3E+06	-9.2E+05	1.1E+06	2.3E+06	-2.1E+06	8.2E+05	-5.6E+04	-5.9E+04	-4.1E+04	-6.8E+04	-4.6E+04	-6.0E+04	-3.8E+04	-5.7E+04
2.1E+02	-4.8E+05	2.7E+06	-1.9E+05	8.2E+05	-5.6E+05	3.6E+05	-3.0E+06	1.1E+05	-6.5E+04	-8.9E+04	-5.5E+04	-1.0E+05	-7.2E+04	-6.2E+04	-7.4E+04	-5.1E+04
2.1E+02	-1.5E+06	-3.1E+04	-1.8E+06	-1.7E+06	9.8E+05	2.1E+06	-2.3E+06	1.2E+06	-3.2E+04	-5.8E+04	-3.3E+04	-7.0E+04	-4.6E+04	-6.3E+04	-3.8E+04	-7.1E+04
2.2E+02	-1.9E+06	1.9E+05	-1.3E+06	-1.3E+06	1.0E+06	2.6E+06	-2.3E+06	1.2E+06	-3.7E+04	-3.8E+04	-5.7E+04	-8.4E+04	-3.5E+04	-7.1E+04	-2.5E+04	-5.4E+04

Table 42. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.4 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.2E+06	1.1E+06	-1.5E+06	-1.7E+06	3.7E+04	6.6E+02	-1.5E+05	-1.1E+05	-1.0E+05	-7.7E+04	-5.0E+04	-7.2E+04	-1.1E+05	-1.3E+05	-6.8E+04	-7.3E+04
2.0E+01	-2.2E+06	1.1E+06	-1.5E+06	-1.5E+06	1.4E+05	3.5E+05	-3.4E+05	1.4E+05	-9.3E+04	-4.9E+04	-4.2E+04	-6.5E+04	-8.8E+04	-6.0E+04	-1.2E+05	-3.5E+04
2.9E+01	-2.2E+06	1.1E+06	-1.6E+06	-1.4E+06	2.9E+05	4.0E+05	-3.4E+05	1.4E+05	-3.8E+04	-5.5E+04	-7.6E+04	-8.4E+04	-8.1E+04	-7.5E+04	-4.5E+04	-4.6E+04
3.9E+01	-2.1E+06	1.2E+06	-1.8E+06	-1.6E+06	5.1E+04	5.5E+05	-2.3E+05	2.3E+05	-1.2E+05	-5.0E+04	-1.0E+05	-5.8E+04	-5.7E+04	-5.2E+04	-3.2E+04	-4.6E+04
4.9E+01	-2.1E+06	1.3E+06	-1.5E+06	-1.6E+06	3.2E+05	4.7E+05	-5.8E+05	2.3E+05	-7.9E+04	-3.6E+04	-1.0E+05	-6.7E+04	-1.1E+05	-6.4E+04	-8.5E+04	-4.6E+04
5.9E+01	-2.2E+06	1.1E+06	-1.7E+06	-1.5E+06	2.9E+05	6.6E+05	-4.7E+05	3.5E+05	-8.8E+04	-5.3E+04	-5.2E+04	-5.2E+04	-1.3E+05	-8.1E+04	-1.7E+05	-6.7E+04
6.8E+01	-2.3E+06	1.3E+06	-1.5E+06	-1.7E+06	2.9E+05	7.9E+05	-6.0E+05	5.8E+05	-9.0E+04	-8.0E+04	-7.9E+04	-1.0E+05	-5.6E+04	-7.4E+04	-5.0E+04	-6.4E+04
7.8E+01	-2.2E+06	9.4E+05	-1.6E+06	-1.2E+06	5.0E+05	7.2E+05	-5.4E+05	6.9E+05	-4.5E+04	-5.6E+04	-5.5E+04	-8.3E+04	-8.4E+04	-5.6E+04	-1.0E+05	-3.9E+04
8.8E+01	-2.1E+06	9.1E+05	-1.5E+06	-1.5E+06	6.4E+05	8.1E+05	-1.0E+06	4.7E+05	-3.1E+04	-5.3E+04	-2.0E+04	-5.3E+04	-6.5E+04	-5.5E+04	-6.7E+04	-4.2E+04
9.8E+01	-2.1E+06	8.4E+05	-1.7E+06	-1.7E+06	4.5E+05	7.7E+05	-1.2E+06	4.9E+05	-4.6E+04	-4.1E+04	-6.5E+04	-6.5E+04	-5.7E+04	-4.3E+04	-9.8E+04	-3.8E+04
1.1E+02	-2.4E+06	9.1E+05	-1.5E+06	-1.6E+06	8.7E+05	1.0E+06	-1.3E+06	7.4E+05	-7.8E+04	-5.6E+04	-6.4E+04	-5.8E+04	-3.4E+04	-5.7E+04	-4.8E+04	-5.3E+04
1.2E+02	-1.9E+06	7.3E+05	-1.6E+06	-1.4E+06	8.2E+05	1.2E+06	-1.1E+06	7.8E+05	-4.1E+04	-4.1E+04	-3.3E+04	-5.9E+04	-2.5E+04	-5.7E+04	-4.9E+04	-5.0E+04
1.3E+02	-1.8E+06	5.1E+05	-1.6E+06	-1.3E+06	8.8E+05	1.5E+06	-1.2E+06	4.7E+05	-2.7E+04	-5.5E+04	-4.7E+04	-6.7E+04	-3.9E+04	-6.2E+04	-3.1E+04	-5.9E+04
1.4E+02	-1.6E+06	3.4E+05	-2.2E+06	-1.0E+06	1.3E+06	2.2E+06	-7.9E+05	8.0E+05	-6.4E+04	-4.3E+04	-5.1E+04	-5.1E+04	-2.9E+04	-6.7E+04	-2.1E+04	-5.3E+04
1.5E+02	-2.5E+06	3.6E+05	-4.9E+05	-1.2E+06	-3.5E+05	2.3E+06	-3.4E+05	5.7E+05	-3.0E+04	-4.6E+04	-2.5E+04	-5.5E+04	-5.2E+04	-6.1E+04	-3.7E+04	-3.8E+04
1.6E+02	-1.6E+06	5.6E+05	-2.1E+06	4.6E+04	1.5E+06	1.7E+06	-2.5E+06	1.5E+06	-4.9E+04	-5.1E+04	-5.4E+04	-6.6E+04	-3.4E+04	-6.0E+04	-4.8E+04	-5.0E+04
1.7E+02	-3.8E+06	1.8E+06	-3.5E+05	-1.1E+06	2.1E+05	3.0E+06	-1.2E+06	5.5E+05	-3.9E+04	-4.9E+04	-5.5E+04	-8.5E+04	-6.8E+04	-6.4E+04	-7.1E+04	-6.2E+04
1.8E+02	-2.2E+06	5.9E+05	-1.3E+06	-2.4E+05	1.1E+06	2.3E+06	-1.9E+06	9.6E+05	-4.4E+04	-4.4E+04	-4.2E+04	-6.4E+04	-4.9E+04	-5.0E+04	-4.0E+04	-4.9E+04
1.9E+02	-1.6E+06	3.7E+06	2.7E+05	-5.5E+06	6.7E+06	-1.3E+06	-7.0E+06	3.9E+06	-1.0E+05	-1.1E+05	-1.0E+05	-1.1E+05	-9.6E+04	-8.1E+04	-1.2E+05	-5.5E+04
2.0E+02	-1.3E+06	7.6E+05	-1.2E+06	-1.4E+06	1.1E+06	2.6E+06	-2.6E+06	7.5E+05	-5.3E+04	-5.2E+04	-4.0E+04	-7.9E+04	-6.9E+04	-7.3E+04	-5.2E+04	-4.8E+04
2.1E+02	-7.1E+05	2.6E+06	-2.0E+05	3.4E+05	-4.3E+05	8.2E+05	-3.3E+06	1.9E+05	-9.5E+04	-9.8E+04	-8.0E+04	-1.3E+05	-7.6E+04	-6.9E+04	-9.1E+04	-7.6E+04
2.1E+02	-1.9E+06	-4.2E+04	-1.6E+06	-2.1E+06	1.2E+06	2.7E+06	-2.8E+06	1.0E+06	-5.7E+04	-7.2E+04	-3.0E+04	-9.3E+04	-4.2E+04	-7.5E+04	-5.2E+04	-6.0E+04
2.2E+02	-2.3E+06	1.1E+05	-1.2E+06	-1.8E+06	1.2E+06	3.1E+06	-2.7E+06	1.3E+06	-6.0E+04	-6.6E+04	-3.5E+04	-7.5E+04	-3.9E+04	-6.3E+04	-5.8E+04	-3.9E+04

Table 43. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.4 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-2.3E+06	1.0E+06	-1.5E+06	-1.9E+06	1.0E+05	1.5E+05	-2.2E+05	-1.8E+05	-7.3E+04	-7.5E+04	-5.4E+04	-7.1E+04	-9.8E+04	-7.9E+04	-8.3E+04	-8.6E+04
2.0E+01	-2.4E+06	1.4E+06	-1.5E+06	-1.9E+06	1.6E+05	3.6E+05	-4.2E+05	5.2E+04	-9.2E+04	-5.9E+04	-5.6E+04	-7.5E+04	-7.3E+04	-6.8E+04	-1.2E+05	-4.7E+04
2.9E+01	-2.3E+06	1.3E+06	-1.6E+06	-1.8E+06	2.7E+05	4.8E+05	-4.2E+05	1.2E+05	-5.9E+04	-5.4E+04	-5.6E+04	-9.4E+04	-7.9E+04	-6.1E+04	-4.6E+04	-4.9E+04
3.9E+01	-2.3E+06	1.4E+06	-1.8E+06	-2.0E+06	-3.1E+04	6.8E+05	-2.9E+05	2.9E+04	-1.2E+05	-3.3E+04	-1.0E+05	-6.7E+04	-7.1E+04	-6.8E+04	-4.8E+04	-5.7E+04
4.9E+01	-1.6E+06	1.6E+06	-1.3E+06	-1.9E+06	-1.0E+05	-1.1E+05	-5.2E+05	1.2E+05	-9.1E+04	-5.5E+04	-1.2E+05	-6.5E+04	-1.1E+05	-5.9E+04	-9.4E+04	-4.0E+04
5.9E+01	-2.4E+06	1.3E+06	-1.7E+06	-2.0E+06	1.5E+05	7.5E+05	-7.0E+05	4.6E+05	-8.9E+04	-5.8E+04	-5.7E+04	-7.2E+04	-1.3E+05	-8.9E+04	-1.5E+05	-7.4E+04
6.8E+01	-2.5E+06	1.6E+06	-1.4E+06	-2.3E+06	6.3E+04	9.4E+05	-7.7E+05	5.4E+05	-8.1E+04	-7.8E+04	-6.5E+04	-8.5E+04	-5.4E+04	-8.5E+04	-5.6E+04	-5.3E+04
7.8E+01	-2.6E+06	1.2E+06	-1.6E+06	-1.5E+06	4.2E+05	7.1E+05	-7.0E+05	5.3E+05	-6.1E+04	-4.7E+04	-6.1E+04	-6.3E+04	-8.2E+04	-5.7E+04	-1.1E+05	-4.5E+04
8.8E+01	-2.5E+06	1.2E+06	-1.5E+06	-1.9E+06	3.8E+05	8.0E+05	-1.2E+06	3.7E+05	-3.7E+04	-3.6E+04	-2.3E+04	-6.9E+04	-6.3E+04	-5.6E+04	-7.6E+04	-4.4E+04
9.8E+01	-3.1E+06	1.4E+06	-1.7E+06	-2.1E+06	2.6E+05	7.0E+05	-1.6E+06	6.0E+05	-4.7E+04	-5.0E+04	-7.6E+04	-5.9E+04	-7.6E+04	-9.4E+04	-8.8E+04	-4.5E+04
1.1E+02	-2.8E+06	1.1E+06	-1.5E+06	-2.1E+06	7.3E+05	9.4E+05	-1.5E+06	7.1E+05	-5.2E+04	-4.1E+04	-6.3E+04	-7.0E+04	-3.1E+04	-6.4E+04	-6.3E+04	-4.9E+04
1.2E+02	-2.5E+06	8.9E+05	-1.6E+06	-1.9E+06	6.4E+05	1.1E+06	-1.4E+06	7.2E+05	-5.5E+04	-4.6E+04	-3.6E+04	-5.7E+04	-4.3E+04	-5.2E+04	-5.0E+04	-4.3E+04
1.3E+02	-2.4E+06	6.0E+05	-1.6E+06	-2.0E+06	7.9E+05	1.3E+06	-1.4E+06	5.4E+05	-3.7E+04	-5.3E+04	-4.8E+04	-7.6E+04	-4.1E+04	-5.1E+04	-3.4E+04	-5.6E+04
1.4E+02	-2.1E+06	4.4E+05	-2.0E+06	-1.6E+06	1.2E+06	2.1E+06	-1.1E+06	8.3E+05	-5.5E+04	-4.9E+04	-4.3E+04	-5.4E+04	-3.2E+04	-4.8E+04	-2.8E+04	-4.5E+04
1.5E+02	-3.1E+06	2.7E+05	-5.1E+05	-1.7E+06	-2.7E+05	2.4E+06	-5.9E+05	6.7E+05	-2.9E+04	-4.9E+04	-3.1E+04	-6.1E+04	-2.6E+04	-4.9E+04	-3.0E+04	-4.0E+04
1.6E+02	-2.2E+06	5.0E+05	-1.9E+06	-6.8E+05	1.5E+06	1.9E+06	-2.7E+06	1.5E+06	-3.9E+04	-4.3E+04	-5.2E+04	-6.9E+04	-4.6E+04	-7.0E+04	-6.0E+04	-5.4E+04
1.7E+02	-4.3E+06	1.7E+06	-3.6E+05	-1.6E+06	2.1E+05	3.1E+06	-1.6E+06	6.8E+05	-4.8E+04	-5.3E+04	-6.7E+04	-8.4E+04	-5.1E+04	-5.0E+04	-4.3E+04	-4.6E+04
1.8E+02	-2.8E+06	5.0E+05	-1.3E+06	-7.8E+05	1.1E+06	2.6E+06	-2.3E+06	1.1E+06	-5.3E+04	-4.1E+04	-3.2E+04	-6.2E+04	-5.1E+04	-6.3E+04	-3.6E+04	-4.0E+04
1.9E+02	-2.2E+06	3.1E+06	3.1E+05	-5.6E+06	6.3E+06	-1.1E+06	-7.0E+06	4.0E+06	-1.3E+05	-2.1E+05	-1.3E+05	-2.2E+05	-2.0E+05	-9.3E+04	-2.2E+05	-7.8E+04
2.0E+02	-1.8E+06	7.3E+05	-1.1E+06	-2.0E+06	1.4E+06	3.1E+06	-3.0E+06	9.0E+05	-5.1E+04	-4.7E+04	-3.6E+04	-6.7E+04	-5.1E+04	-7.5E+04	-3.7E+04	-5.7E+04
2.1E+02	-1.2E+06	2.8E+06	-2.2E+05	-2.8E+05	-1.8E+05	1.2E+06	-4.0E+06	3.8E+05	-7.5E+04	-6.6E+04	-8.3E+04	-9.2E+04	-7.5E+04	-8.1E+04	-5.7E+04	-6.5E+04
2.1E+02	-2.5E+06	-1.4E+05	-1.7E+06	-2.7E+06	1.3E+06	3.1E+06	-3.3E+06	1.4E+06	-2.4E+04	-5.8E+04	-4.0E+04	-6.9E+04	-4.9E+04	-8.0E+04	-3.8E+04	-6.3E+04
2.2E+02	-3.1E+06	-6.1E+03	-1.1E+06	-2.2E+06	1.3E+06	3.6E+06	-3.3E+06	1.6E+06	-3.0E+04	-6.1E+04	-4.5E+04	-6.6E+04	-5.0E+04	-4.7E+04	-6.9E+04	-6.6E+04

Table 44. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.5 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.1E+06	1.1E+06	-1.4E+06	-8.8E+05	1.0E+05	4.5E+04	-9.6E+04	-1.4E+05	-8.9E+04	-1.0E+05	-8.4E+04	-8.6E+04	-9.8E+04	-1.1E+05	-7.0E+04	-8.9E+04
2.0E+01	-1.2E+06	1.3E+06	-1.1E+06	-1.0E+06	6.6E+05	1.9E+05	-4.7E+05	-2.2E+04	-1.4E+05	-7.3E+04	-1.1E+05	-6.5E+04	-1.4E+05	-5.3E+04	-1.2E+05	-5.5E+04
2.9E+01	-1.1E+06	1.0E+06	-1.3E+06	-9.3E+05	4.0E+05	4.3E+05	-3.6E+05	-1.4E+05	-9.6E+04	-3.8E+04	-7.7E+04	-4.3E+04	-5.9E+04	-4.9E+04	-4.6E+04	-8.8E+04
3.9E+01	-1.3E+06	1.2E+06	-1.5E+06	-9.4E+05	2.4E+05	4.1E+05	-3.5E+05	2.1E+05	-1.4E+05	-6.1E+04	-1.1E+05	-4.0E+04	-9.5E+04	-6.3E+04	-9.3E+04	-6.3E+04
4.9E+01	-1.2E+06	1.1E+06	-1.3E+06	-1.0E+06	4.5E+05	3.7E+05	-8.5E+05	2.1E+05	-1.6E+05	-6.9E+04	-1.8E+05	-4.6E+04	-9.9E+04	-4.5E+04	-1.3E+05	-5.7E+04
5.9E+01	-1.0E+06	1.1E+06	-2.1E+06	-8.9E+05	4.5E+05	5.8E+05	-4.3E+05	3.7E+05	-1.3E+05	-8.4E+04	-1.9E+05	-7.9E+04	-1.3E+05	-4.8E+04	-1.6E+05	-1.0E+05
6.8E+01	-1.1E+06	1.1E+06	-1.5E+06	-1.2E+06	2.9E+05	5.5E+05	-6.2E+05	5.5E+05	-9.0E+04	-7.4E+04	-1.3E+05	-9.1E+04	-8.8E+04	-9.4E+04	-9.8E+04	-1.2E+05
7.8E+01	-1.1E+06	1.1E+06	-1.4E+06	-8.0E+05	4.9E+05	6.5E+05	-7.8E+05	1.1E+06	-6.1E+04	-4.0E+04	-3.7E+04	-3.5E+04	-9.3E+04	-7.1E+04	-9.4E+04	-1.2E+05
8.8E+01	-1.2E+06	1.1E+06	-1.5E+06	-4.9E+05	3.6E+05	7.9E+05	-9.3E+05	5.1E+05	-6.1E+04	-3.8E+04	-8.8E+04	-3.1E+04	-8.7E+04	-5.4E+04	-5.2E+04	-6.3E+04
9.8E+01	-1.2E+06	8.4E+05	-1.7E+06	-7.3E+05	4.6E+05	7.6E+05	-1.3E+06	4.0E+05	-8.1E+04	-6.1E+04	-5.3E+04	-4.5E+04	-5.3E+04	-4.7E+04	-6.1E+04	-6.9E+04
1.1E+02	-1.3E+06	9.8E+05	-1.3E+06	-7.4E+05	8.2E+05	8.0E+05	-1.2E+06	7.6E+05	-9.1E+04	-2.8E+04	-8.3E+04	-5.0E+04	-6.6E+04	-4.3E+04	-4.5E+04	-7.4E+04
1.2E+02	-9.3E+05	8.4E+05	-1.6E+06	-5.9E+05	7.5E+05	1.1E+06	-1.2E+06	7.2E+05	-3.7E+04	-3.5E+04	-4.8E+04	-3.9E+04	-4.9E+04	-3.8E+04	-4.4E+04	-5.4E+04
1.3E+02	-8.6E+05	7.1E+05	-1.6E+06	-4.8E+05	7.5E+05	1.4E+06	-1.1E+06	5.0E+05	-6.0E+04	-4.8E+04	-8.5E+04	-4.9E+04	-7.9E+04	-4.6E+04	-6.1E+04	-6.8E+04
1.4E+02	-8.7E+05	3.1E+05	-2.2E+06	-3.8E+05	9.9E+05	2.0E+06	-8.1E+05	9.5E+05	-6.7E+04	-4.5E+04	-5.3E+04	-3.7E+04	-5.3E+04	-4.4E+04	-4.4E+04	-6.1E+04
1.5E+02	-1.6E+06	5.1E+05	-5.2E+05	-4.9E+05	-3.2E+05	2.0E+06	-1.9E+05	5.8E+05	-5.2E+04	-5.0E+04	-4.2E+04	-4.9E+04	-3.1E+04	-4.6E+04	-4.5E+04	-6.3E+04
1.6E+02	-7.6E+05	7.7E+05	-1.9E+06	2.9E+05	1.3E+06	1.5E+06	-2.2E+06	1.3E+06	-8.7E+04	-5.6E+04	-8.1E+04	-6.9E+04	-8.0E+04	-7.8E+04	-8.7E+04	-6.9E+04
1.7E+02	-2.8E+06	1.9E+06	-3.4E+05	-4.1E+05	7.1E+04	2.5E+06	-1.2E+06	6.3E+05	-2.9E+05	-3.2E+05	-2.6E+05	-2.2E+05	-3.2E+05	-1.9E+05	-2.0E+05	-2.2E+05
1.8E+02	-1.3E+06	8.1E+05	-1.1E+06	4.7E+05	9.4E+05	2.0E+06	-1.7E+06	9.6E+05	-1.1E+05	-1.2E+05	-9.4E+04	-8.4E+04	-1.2E+05	-1.1E+05	-8.7E+04	-1.0E+05
1.9E+02	-5.0E+05	4.1E+06	-1.7E+05	-4.8E+06	6.1E+06	-1.4E+06	-6.0E+06	3.7E+06	-1.5E+05	-1.1E+05	-1.8E+05	-9.5E+04	-1.4E+05	-8.8E+04	-1.2E+05	-1.2E+05
2.0E+02	-3.4E+05	8.2E+05	-1.2E+06	-3.9E+05	9.6E+05	2.3E+06	-2.1E+06	8.8E+05	-7.2E+04	-6.5E+04	-6.9E+04	-6.6E+04	-9.1E+04	-8.4E+04	-5.5E+04	-8.3E+04
2.1E+02	3.3E+05	3.0E+06	-1.6E+05	9.9E+05	-6.2E+05	4.4E+05	-3.2E+06	3.7E+04	-9.6E+04	-9.2E+04	-6.5E+04	-6.9E+04	-8.5E+04	-7.3E+04	-6.9E+04	-8.7E+04
2.1E+02	-1.0E+06	1.6E+05	-1.5E+06	-1.1E+06	9.2E+05	2.3E+06	-2.5E+06	1.0E+06	-4.4E+04	-6.7E+04	-3.6E+04	-5.7E+04	-3.5E+04	-7.2E+04	-4.2E+04	-8.1E+04
2.2E+02	-1.4E+06	3.9E+05	-1.2E+06	-8.6E+05	8.7E+05	2.7E+06	-2.4E+06	1.1E+06	-6.4E+04	-4.4E+04	-5.8E+04	-9.3E+04	-6.7E+04	-6.7E+04	-5.4E+04	-7.4E+04

Table 45. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.5 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.3E+06	1.2E+06	-1.3E+06	-1.1E+06	7.9E+04	1.4E+05	-1.3E+05	-2.2E+05	-1.0E+05	-5.1E+04	-6.7E+04	-6.6E+04	-7.7E+04	-9.7E+04	-7.9E+04	-7.4E+04
2.0E+01	-1.3E+06	1.4E+06	-1.1E+06	-1.3E+06	6.0E+05	1.9E+05	-5.3E+05	-6.0E+04	-1.1E+05	-5.2E+04	-1.3E+05	-5.1E+04	-1.6E+05	-4.5E+04	-1.2E+05	-6.4E+04
2.9E+01	-1.4E+06	1.3E+06	-1.3E+06	-1.3E+06	4.3E+05	3.5E+05	-4.8E+05	-9.7E+04	-8.5E+04	-7.9E+04	-9.5E+04	-5.7E+04	-7.0E+04	-1.0E+05	-6.2E+04	-7.2E+04
3.9E+01	-1.5E+06	1.4E+06	-1.4E+06	-1.3E+06	9.3E+04	3.5E+05	-4.7E+05	2.0E+05	-1.1E+05	-5.2E+04	-1.2E+05	-6.1E+04	-7.5E+04	-5.6E+04	-1.0E+05	-6.1E+04
4.9E+01	-1.4E+06	1.3E+06	-1.2E+06	-1.4E+06	4.8E+05	3.5E+05	-9.7E+05	2.7E+05	-1.5E+05	-4.8E+04	-2.0E+05	-4.0E+04	-1.1E+05	-6.0E+04	-1.5E+05	-7.3E+04
5.9E+01	-1.3E+06	1.2E+06	-1.9E+06	-1.3E+06	4.5E+05	5.5E+05	-6.5E+05	4.2E+05	-1.0E+05	-5.1E+04	-1.8E+05	-8.9E+04	-1.3E+05	-8.3E+04	-1.3E+05	-6.7E+04
6.8E+01	-1.3E+06	1.2E+06	-1.4E+06	-1.5E+06	3.9E+05	5.1E+05	-8.1E+05	6.1E+05	-9.7E+04	-1.2E+05	-1.1E+05	-7.8E+04	-8.3E+04	-1.1E+05	-9.4E+04	-1.1E+05
7.8E+01	-1.5E+06	1.2E+06	-1.3E+06	-9.2E+05	5.6E+05	6.2E+05	-9.6E+05	1.1E+06	-5.3E+04	-3.3E+04	-5.1E+04	-6.0E+04	-1.0E+05	-4.8E+04	-1.3E+05	-6.8E+04
8.8E+01	-1.4E+06	1.2E+06	-1.4E+06	-1.0E+06	4.0E+05	7.6E+05	-1.3E+06	3.7E+05	-6.9E+04	-4.3E+04	-7.0E+04	-6.2E+04	-8.1E+04	-4.7E+04	-6.0E+04	-6.6E+04
9.8E+01	-1.5E+06	8.6E+05	-1.7E+06	-1.1E+06	4.4E+05	7.2E+05	-1.5E+06	5.2E+05	-7.3E+04	-3.0E+04	-6.5E+04	-4.3E+04	-6.7E+04	-5.8E+04	-6.6E+04	-6.9E+04
1.1E+02	-1.6E+06	1.0E+06	-1.4E+06	-1.0E+06	8.4E+05	7.9E+05	-1.4E+06	8.3E+05	-8.5E+04	-4.7E+04	-8.5E+04	-4.8E+04	-6.4E+04	-4.5E+04	-3.4E+04	-6.5E+04
1.2E+02	-1.3E+06	8.0E+05	-1.6E+06	-8.8E+05	6.7E+05	1.1E+06	-1.4E+06	8.2E+05	-4.2E+04	-3.4E+04	-5.1E+04	-3.4E+04	-3.8E+04	-4.5E+04	-4.7E+04	-5.1E+04
1.3E+02	-1.1E+06	6.2E+05	-1.6E+06	-7.8E+05	7.8E+05	1.4E+06	-1.4E+06	6.8E+05	-6.3E+04	-4.8E+04	-6.8E+04	-2.8E+04	-8.0E+04	-6.2E+04	-5.7E+04	-5.4E+04
1.4E+02	-1.0E+06	4.3E+05	-2.1E+06	-5.9E+05	1.0E+06	2.1E+06	-1.1E+06	9.2E+05	-6.6E+04	-4.0E+04	-5.6E+04	-3.7E+04	-4.4E+04	-4.1E+04	-2.0E+04	-5.0E+04
1.5E+02	-1.9E+06	3.7E+05	-5.2E+05	-8.1E+05	-3.6E+05	2.2E+06	-5.6E+05	6.6E+05	-4.9E+04	-4.2E+04	-3.0E+04	-3.5E+04	-3.7E+04	-4.0E+04	-4.5E+04	-4.2E+04
1.6E+02	-1.2E+06	8.3E+05	-1.7E+06	-3.4E+05	1.3E+06	1.7E+06	-2.4E+06	1.3E+06	-5.4E+04	-4.3E+04	-6.5E+04	-5.7E+04	-5.6E+04	-4.6E+04	-5.3E+04	-5.9E+04
1.7E+02	-3.2E+06	1.9E+06	-3.6E+05	-7.1E+05	1.6E+05	2.8E+06	-1.5E+06	7.0E+05	-7.1E+04	-7.5E+04	-4.9E+04	-4.5E+04	-1.1E+05	-5.6E+04	-3.6E+04	-4.6E+04
1.8E+02	-1.7E+06	7.1E+05	-1.2E+06	9.4E+04	9.2E+05	2.3E+06	-2.1E+06	1.0E+06	-3.8E+04	-3.1E+04	-3.6E+04	-4.0E+04	-2.7E+04	-4.6E+04	-3.5E+04	-5.2E+04
1.9E+02	-2.4E+06	4.9E+06	1.3E+06	-6.0E+06	6.5E+06	-1.1E+06	-6.9E+06	3.8E+06	-1.7E+05	-1.8E+05	-1.7E+05	-1.6E+05	-1.6E+05	-7.0E+04	-1.4E+05	-7.6E+04
2.0E+02	-6.1E+05	9.0E+05	-1.2E+06	-8.9E+05	1.1E+06	2.6E+06	-2.7E+06	9.4E+05	-3.9E+04	-4.7E+04	-4.0E+04	-4.3E+04	-8.0E+04	-6.2E+04	-4.4E+04	-5.2E+04
2.1E+02	-1.6E+05	2.7E+06	-3.1E+05	4.9E+05	-7.1E+05	7.9E+05	-3.7E+06	2.2E+05	-6.7E+04	-7.0E+04	-7.0E+04	-9.0E+04	-9.3E+04	-6.9E+04	-6.0E+04	-7.6E+04
2.1E+02	-1.3E+06	1.4E+05	-1.7E+06	-1.5E+06	8.9E+05	2.6E+06	-3.0E+06	1.2E+06	-5.4E+04	-3.9E+04	-4.0E+04	-5.4E+04	-4.5E+04	-5.5E+04	-4.1E+04	-5.9E+04
2.2E+02	-1.8E+06	2.9E+05	-1.4E+06	-1.3E+06	8.7E+05	3.0E+06	-2.9E+06	1.4E+06	-4.5E+04	-3.7E+04	-5.2E+04	-4.5E+04	-6.1E+04	-5.9E+04	-4.0E+04	-6.9E+04

Table 46. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.5 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.7E+06	1.3E+06	-1.4E+06	-1.4E+06	3.0E+02	1.9E+05	-1.7E+05	-1.5E+05	-8.4E+04	-8.7E+04	-7.1E+04	-4.9E+04	-6.9E+04	-9.1E+04	-7.2E+04	-7.9E+04
2.0E+01	-1.8E+06	1.4E+06	-1.2E+06	-1.6E+06	5.2E+05	2.7E+05	-5.7E+05	-1.1E+05	-1.4E+05	-6.4E+04	-1.1E+05	-3.4E+04	-1.3E+05	-3.6E+04	-1.4E+05	-6.1E+04
2.9E+01	-2.0E+06	1.4E+06	-1.4E+06	-1.7E+06	2.0E+05	5.1E+05	-5.1E+05	-9.9E+04	-8.2E+04	-4.2E+04	-8.6E+04	-6.6E+04	-6.9E+04	-4.9E+04	-3.8E+04	-6.5E+04
3.9E+01	-2.0E+06	1.4E+06	-1.6E+06	-1.6E+06	8.5E+03	5.1E+05	-4.8E+05	1.1E+05	-1.0E+05	-6.6E+04	-9.6E+04	-4.9E+04	-8.4E+04	-5.2E+04	-9.2E+04	-5.1E+04
4.9E+01	-2.4E+06	1.4E+06	-1.3E+06	-1.8E+06	2.4E+05	9.3E+05	-1.1E+06	2.8E+05	-3.0E+05	-2.3E+05	-2.2E+05	-5.7E+04	-3.5E+05	-1.4E+05	-1.5E+05	-9.3E+04
5.9E+01	-2.0E+06	1.3E+06	-2.2E+06	-1.7E+06	4.7E+05	6.7E+05	-6.1E+05	4.2E+05	-1.1E+05	-4.4E+04	-1.8E+05	-7.5E+04	-1.1E+05	-4.7E+04	-1.5E+05	-4.6E+04
6.8E+01	-2.0E+06	1.6E+06	-1.6E+06	-2.0E+06	3.4E+05	8.9E+05	-8.6E+05	5.9E+05	-8.5E+04	-8.9E+04	-1.1E+05	-9.0E+04	-9.1E+04	-5.4E+04	-8.8E+04	-8.1E+04
7.8E+01	-2.0E+06	1.2E+06	-1.5E+06	-1.3E+06	7.0E+05	7.0E+05	-1.1E+06	1.0E+06	-4.2E+04	-4.3E+04	-5.1E+04	-3.2E+04	-9.6E+04	-3.9E+04	-1.1E+05	-5.5E+04
8.8E+01	-2.1E+06	1.3E+06	-1.6E+06	-1.4E+06	5.3E+05	9.1E+05	-1.2E+06	4.7E+05	-6.2E+04	-3.4E+04	-5.8E+04	-4.4E+04	-9.1E+04	-6.6E+04	-6.0E+04	-5.9E+04
9.8E+01	-1.9E+06	9.3E+05	-1.9E+06	-1.5E+06	7.2E+05	9.7E+05	-1.5E+06	4.6E+05	-2.3E+05	-1.6E+05	-8.4E+04	-4.7E+04	-1.8E+05	-1.7E+05	-6.6E+04	-6.7E+04
1.1E+02	-2.1E+06	1.2E+06	-1.5E+06	-1.3E+06	8.5E+05	1.1E+06	-1.5E+06	7.8E+05	-8.4E+04	-5.2E+04	-7.5E+04	-5.1E+04	-8.6E+04	-4.0E+04	-5.2E+04	-8.2E+04
1.2E+02	-1.7E+06	1.1E+06	-1.7E+06	-1.4E+06	9.0E+05	1.1E+06	-1.5E+06	7.2E+05	-5.1E+04	-4.0E+04	-8.1E+04	-4.1E+04	-2.6E+04	-3.9E+04	-5.8E+04	-4.7E+04
1.3E+02	-1.6E+06	8.1E+05	-1.7E+06	-1.3E+06	9.4E+05	1.5E+06	-1.5E+06	5.9E+05	-7.2E+04	-5.4E+04	-8.0E+04	-7.3E+04	-7.1E+04	-3.8E+04	-5.6E+04	-5.4E+04
1.4E+02	-1.4E+06	5.1E+05	-2.0E+06	-1.1E+06	1.2E+06	2.2E+06	-1.2E+06	8.9E+05	-5.8E+04	-4.4E+04	-7.3E+04	-4.4E+04	-3.8E+04	-2.8E+04	-2.8E+04	-5.7E+04
1.5E+02	-2.5E+06	4.2E+05	-5.0E+05	-1.3E+06	-2.6E+05	2.5E+06	-6.7E+05	6.6E+05	-4.9E+04	-3.1E+04	-3.7E+04	-4.3E+04	-3.6E+04	-5.3E+04	-5.1E+04	-5.5E+04
1.6E+02	-1.8E+06	1.0E+06	-1.5E+06	-1.2E+06	1.5E+06	2.0E+06	-2.7E+06	1.2E+06	-4.4E+04	-3.8E+04	-4.7E+04	-5.2E+04	-3.8E+04	-4.3E+04	-3.8E+04	-5.9E+04
1.7E+02	-3.8E+06	1.9E+06	-3.8E+05	-1.2E+06	2.1E+05	3.1E+06	-1.8E+06	7.2E+05	-5.5E+04	-4.5E+04	-7.5E+04	-6.6E+04	-9.4E+04	-5.8E+04	-5.6E+04	-6.5E+04
1.8E+02	-2.3E+06	7.7E+05	-1.1E+06	-5.4E+05	1.1E+06	2.7E+06	-2.4E+06	1.0E+06	-5.3E+04	-5.0E+04	-4.8E+04	-5.5E+04	-4.1E+04	-5.6E+04	-5.3E+04	-6.5E+04
1.9E+02	-1.5E+06	3.1E+06	6.6E+04	-5.0E+06	5.5E+06	-4.7E+05	-6.0E+06	3.7E+06	-2.0E+05	-1.3E+05	-1.8E+05	-1.1E+05	-1.5E+05	-1.2E+05	-1.6E+05	-1.1E+05
2.0E+02	-1.2E+06	9.7E+05	-1.2E+06	-1.5E+06	1.3E+06	3.0E+06	-3.0E+06	1.1E+06	-5.3E+04	-5.3E+04	-6.2E+04	-8.8E+04	-5.4E+04	-5.1E+04	-9.5E+04	-9.4E+04
2.1E+02	-4.3E+05	3.1E+06	-1.9E+05	-5.1E+04	-2.7E+05	1.2E+06	-4.2E+06	3.1E+05	-7.7E+04	-1.2E+05	-6.5E+04	-7.5E+04	-1.0E+05	-6.0E+04	-9.6E+04	-8.2E+04
2.1E+02	-1.8E+06	9.3E+04	-1.7E+06	-2.1E+06	1.1E+06	3.0E+06	-3.4E+06	1.5E+06	-4.2E+04	-4.8E+04	-3.6E+04	-4.6E+04	-4.3E+04	-6.2E+04	-4.2E+04	-7.9E+04
2.2E+02	-2.3E+06	3.5E+05	-1.2E+06	-1.8E+06	1.2E+06	3.6E+06	-3.4E+06	1.6E+06	-7.6E+04	-4.4E+04	-4.8E+04	-5.3E+04	-4.6E+04	-6.1E+04	-5.0E+04	-6.3E+04

Table 47. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.6 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-9.2E+05	1.2E+06	-1.2E+06	-7.4E+05	1.2E+04	2.1E+05	-1.2E+05	-2.4E+05	-1.4E+05	-1.8E+05	-7.1E+04	-1.2E+05	-1.1E+05	-1.4E+05	-8.3E+04	-9.6E+04
2.0E+01	-8.5E+05	1.3E+06	-1.6E+06	-4.2E+05	5.1E+05	3.8E+05	-1.3E+05	-1.7E+05	-1.7E+05	-6.4E+04	-1.4E+05	-8.6E+04	-1.0E+05	-1.0E+05	-1.3E+05	-6.7E+04
2.9E+01	-8.7E+05	1.4E+06	-1.3E+06	-6.0E+05	5.6E+05	1.8E+05	-4.4E+05	-1.8E+05	-1.1E+05	-1.0E+05	-1.0E+05	-1.0E+05	-6.1E+04	-6.2E+04	-7.9E+04	-8.7E+04
3.9E+01	-7.9E+05	1.2E+06	-1.5E+06	-7.4E+05	1.5E+05	3.5E+05	-3.2E+05	1.9E+05	-8.5E+04	-7.3E+04	-7.6E+04	-7.7E+04	-6.0E+04	-6.8E+04	-8.9E+04	-3.6E+04
4.9E+01	-7.2E+05	1.1E+06	-1.4E+06	-7.4E+05	1.1E+05	3.1E+05	-3.1E+05	2.0E+05	-1.9E+05	-9.2E+04	-1.5E+05	-7.0E+04	-1.9E+05	-9.2E+04	-1.6E+05	-5.1E+04
5.9E+01	-7.2E+05	1.0E+06	-1.5E+06	-5.1E+05	4.6E+05	7.3E+05	-9.2E+05	6.0E+05	-2.1E+05	-9.6E+04	-1.0E+05	-9.9E+04	-1.9E+05	-9.5E+04	-1.7E+05	-7.4E+04
6.8E+01	-6.8E+05	1.3E+06	-1.2E+06	-7.3E+05	2.9E+05	4.1E+05	-5.0E+05	5.9E+05	-7.4E+04	-9.2E+04	-1.7E+05	-9.9E+04	-1.3E+05	-8.6E+04	-9.6E+04	-1.0E+05
7.8E+01	-7.8E+05	9.0E+05	-1.2E+06	-2.8E+05	2.7E+05	6.6E+05	-6.3E+05	1.3E+06	-1.4E+05	-1.2E+05	-7.9E+04	-8.2E+04	-1.5E+05	-9.2E+04	-7.4E+04	-8.2E+04
8.8E+01	-7.6E+05	1.1E+06	-1.3E+06	-1.5E+05	3.3E+05	7.8E+05	-9.9E+05	5.1E+05	-1.0E+05	-6.7E+04	-9.1E+04	-6.2E+04	-6.2E+04	-6.7E+04	-9.1E+04	-5.0E+04
9.8E+01	-9.9E+05	9.2E+05	-1.4E+06	-5.0E+05	4.4E+05	6.2E+05	-1.3E+06	4.6E+05	-4.2E+04	-6.5E+04	-5.3E+04	-7.5E+04	-8.1E+04	-7.9E+04	-1.2E+05	-4.1E+04
1.1E+02	-8.8E+05	1.0E+06	-1.2E+06	-4.5E+05	7.4E+05	7.9E+05	-1.2E+06	8.2E+05	-7.2E+04	-8.2E+04	-8.6E+04	-6.8E+04	-6.4E+04	-6.4E+04	-5.3E+04	-4.6E+04
1.2E+02	-5.1E+05	8.3E+05	-1.5E+06	-3.0E+05	6.8E+05	8.7E+05	-1.3E+06	7.1E+05	-5.2E+04	-7.8E+04	-4.5E+04	-5.7E+04	-5.2E+04	-7.3E+04	-7.5E+04	-4.1E+04
1.3E+02	-4.3E+05	7.3E+05	-1.5E+06	-2.0E+05	7.3E+05	1.2E+06	-1.2E+06	5.7E+05	-5.5E+04	-1.0E+05	-6.1E+04	-8.1E+04	-6.5E+04	-1.1E+05	-4.7E+04	-3.8E+04
1.4E+02	-4.7E+05	3.2E+05	-2.1E+06	-1.5E+05	9.8E+05	1.9E+06	-8.7E+05	7.6E+05	-5.6E+04	-6.2E+04	-8.9E+04	-7.1E+04	-7.9E+04	-7.2E+04	-6.3E+04	-6.5E+04
1.5E+02	-1.3E+06	5.5E+05	-3.4E+05	-4.1E+05	-6.0E+05	2.0E+06	-1.5E+05	6.3E+05	-5.4E+04	-7.2E+04	-7.1E+04	-6.5E+04	-6.8E+04	-8.5E+04	-5.8E+04	-5.9E+04
1.6E+02	-7.8E+05	1.4E+06	-1.2E+06	-6.5E+05	1.3E+06	1.4E+06	-2.3E+06	1.3E+06	-4.4E+04	-6.4E+04	-5.5E+04	-7.5E+04	-7.1E+04	-7.7E+04	-5.6E+04	-5.2E+04
1.7E+02	-2.5E+06	1.7E+06	-5.2E+05	1.5E+05	4.1E+05	2.4E+06	-1.3E+06	6.4E+05	-1.3E+05	-1.5E+05	-1.3E+05	-1.3E+05	-1.2E+05	-1.0E+05	-8.6E+04	-8.0E+04
1.8E+02	-1.4E+06	8.4E+05	-9.8E+05	7.1E+05	1.0E+06	2.1E+06	-1.7E+06	9.0E+05	-8.9E+04	-7.9E+04	-5.9E+04	-8.3E+04	-6.7E+04	-1.1E+05	-5.3E+04	-5.3E+04
1.9E+02	1.4E+06	1.6E+06	-1.8E+06	-2.0E+06	3.7E+06	-6.7E+05	-4.2E+06	3.2E+06	-7.4E+04	-9.0E+04	-8.9E+04	-8.8E+04	-9.7E+04	-9.9E+04	-8.9E+04	-6.9E+04
2.0E+02	-1.1E+05	8.8E+05	-1.0E+06	-1.2E+05	9.5E+05	2.3E+06	-2.1E+06	8.4E+05	-5.8E+04	-8.1E+04	-4.7E+04	-7.3E+04	-5.3E+04	-7.8E+04	-5.8E+04	-6.7E+04
2.1E+02	6.7E+05	3.0E+06	-1.2E+05	1.0E+06	-4.3E+05	5.5E+05	-3.3E+06	7.8E+04	-7.7E+04	-9.4E+04	-5.7E+04	-1.1E+05	-7.3E+04	-9.8E+04	-6.2E+04	-6.3E+04
2.1E+02	-6.5E+05	5.7E+04	-1.6E+06	-8.7E+05	6.1E+05	2.1E+06	-2.3E+06	1.2E+06	-3.8E+04	-1.1E+05	-4.6E+04	-8.1E+04	-4.8E+04	-8.8E+04	-3.8E+04	-5.4E+04
2.2E+02	-1.1E+06	3.8E+05	-9.8E+05	-5.5E+05	8.0E+05	2.5E+06	-2.3E+06	1.4E+06	-5.2E+04	-7.3E+04	-7.6E+04	-6.6E+04	-6.3E+04	-6.4E+04	-2.8E+04	-7.8E+04

Table 48. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.6 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.3E+06	1.2E+06	-1.2E+06	-8.1E+05	2.2E+05	1.5E+05	-3.0E+05	-1.8E+05	-9.4E+04	-1.1E+05	-6.5E+04	-7.6E+04	-9.3E+04	-1.1E+05	-5.0E+04	-6.3E+04
2.0E+01	-1.2E+06	1.4E+06	-1.6E+06	-7.3E+05	5.7E+05	3.5E+05	-2.1E+05	-1.9E+05	-1.5E+05	-1.0E+05	-1.4E+05	-6.8E+04	-9.4E+04	-7.5E+04	-1.4E+05	-5.5E+04
2.9E+01	-1.2E+06	1.4E+06	-1.2E+06	-9.7E+05	4.5E+05	2.5E+05	-4.5E+05	-1.5E+05	-1.1E+05	-1.1E+05	-5.7E+04	-8.6E+04	-7.6E+04	-1.3E+05	-8.6E+04	-4.7E+04
3.9E+01	-1.2E+06	1.2E+06	-1.5E+06	-9.9E+05	1.3E+05	4.0E+05	-4.5E+05	1.5E+05	-6.7E+04	-8.9E+04	-7.5E+04	-7.4E+04	-7.2E+04	-8.4E+04	-8.8E+04	-4.6E+04
4.9E+01	-1.1E+06	1.2E+06	-1.4E+06	-1.0E+06	1.3E+05	3.9E+05	-4.1E+05	2.1E+05	-1.8E+05	-7.3E+04	-1.2E+05	-6.4E+04	-1.9E+05	-7.5E+04	-1.7E+05	-4.5E+04
5.9E+01	-1.0E+06	1.1E+06	-1.5E+06	-7.9E+05	5.4E+05	7.5E+05	-9.9E+05	5.6E+05	-1.9E+05	-9.7E+04	-1.1E+05	-1.1E+05	-1.9E+05	-9.0E+04	-1.5E+05	-6.3E+04
6.8E+01	-1.0E+06	1.2E+06	-1.1E+06	-1.2E+06	2.6E+05	6.4E+05	-5.3E+05	6.1E+05	-9.0E+04	-8.7E+04	-1.4E+05	-9.4E+04	-1.1E+05	-9.6E+04	-1.2E+05	-8.8E+04
7.8E+01	-1.1E+06	9.8E+05	-1.4E+06	-4.3E+05	3.0E+05	8.6E+05	-8.5E+05	1.2E+06	-1.4E+05	-6.8E+04	-8.9E+04	-1.2E+05	-1.8E+05	-1.2E+05	-8.4E+04	-7.4E+04
8.8E+01	-1.1E+06	1.2E+06	-1.4E+06	-4.7E+05	4.1E+05	9.8E+05	-1.1E+06	4.1E+05	-1.2E+05	-8.7E+04	-1.0E+05	-7.1E+04	-6.4E+04	-9.0E+04	-1.0E+05	-6.6E+04
9.8E+01	-1.3E+06	1.0E+06	-1.5E+06	-8.8E+05	4.5E+05	8.1E+05	-1.3E+06	4.1E+05	-3.4E+04	-6.3E+04	-5.3E+04	-7.4E+04	-5.2E+04	-7.6E+04	-1.0E+05	-5.9E+04
1.1E+02	-1.2E+06	1.2E+06	-1.4E+06	-7.5E+05	8.4E+05	8.2E+05	-1.4E+06	8.8E+05	-8.0E+04	-6.7E+04	-1.1E+05	-7.3E+04	-8.0E+04	-9.0E+04	-6.8E+04	-4.8E+04
1.2E+02	-8.6E+05	8.7E+05	-1.5E+06	-5.9E+05	8.0E+05	1.0E+06	-1.4E+06	7.4E+05	-5.4E+04	-7.6E+04	-5.2E+04	-5.9E+04	-7.6E+04	-6.3E+04	-7.7E+04	-5.8E+04
1.3E+02	-8.5E+05	8.3E+05	-1.5E+06	-4.7E+05	7.7E+05	1.4E+06	-1.3E+06	4.9E+05	-5.6E+04	-9.3E+04	-5.4E+04	-7.4E+04	-6.4E+04	-1.1E+05	-6.0E+04	-7.9E+04
1.4E+02	-7.5E+05	4.4E+05	-2.0E+06	-3.9E+05	1.1E+06	2.2E+06	-8.4E+05	6.8E+05	-6.1E+04	-6.9E+04	-6.9E+04	-7.0E+04	-4.4E+04	-6.3E+04	-4.3E+04	-6.3E+04
1.5E+02	-1.7E+06	6.2E+05	-3.4E+05	-7.6E+05	-5.6E+05	2.3E+06	-2.8E+05	6.0E+05	-5.7E+04	-7.2E+04	-6.4E+04	-6.2E+04	-5.7E+04	-7.5E+04	-6.0E+04	-5.3E+04
1.6E+02	-1.2E+06	1.5E+06	-1.1E+06	-9.7E+05	1.4E+06	1.6E+06	-2.4E+06	1.4E+06	-6.4E+04	-8.4E+04	-4.9E+04	-9.0E+04	-5.2E+04	-7.7E+04	-7.5E+04	-5.8E+04
1.7E+02	-2.7E+06	1.7E+06	-3.2E+05	-3.1E+05	5.8E+05	2.5E+06	-1.7E+06	7.7E+05	-8.4E+04	-8.5E+04	-7.6E+04	-6.6E+04	-7.7E+04	-8.7E+04	-6.2E+04	-7.1E+04
1.8E+02	-1.7E+06	7.5E+05	-8.6E+05	3.1E+05	1.1E+06	2.3E+06	-2.1E+06	8.8E+05	-5.7E+04	-7.4E+04	-5.6E+04	-6.5E+04	-5.3E+04	-7.8E+04	-3.5E+04	-5.5E+04
1.9E+02	8.3E+05	1.5E+06	-1.3E+06	-2.2E+06	3.6E+06	1.1E+05	-4.3E+06	2.7E+06	-7.6E+04	-8.4E+04	-5.8E+04	-7.0E+04	-8.4E+04	-9.3E+04	-8.2E+04	-5.0E+04
2.0E+02	-3.3E+05	9.8E+05	-9.8E+05	-6.4E+05	1.0E+06	2.7E+06	-2.5E+06	9.2E+05	-4.5E+04	-8.6E+04	-4.2E+04	-6.7E+04	-4.8E+04	-7.0E+04	-4.5E+04	-6.3E+04
2.1E+02	4.8E+05	3.2E+06	-8.8E+04	4.9E+05	-3.9E+05	9.1E+05	-3.7E+06	1.6E+05	-7.8E+04	-1.3E+05	-7.1E+04	-8.4E+04	-1.0E+05	-1.6E+05	-6.7E+04	-7.8E+04
2.1E+02	-9.3E+05	2.6E+05	-1.5E+06	-1.3E+06	8.1E+05	2.6E+06	-2.9E+06	1.3E+06	-4.2E+04	-8.7E+04	-3.4E+04	-7.9E+04	-4.9E+04	-8.0E+04	-4.8E+04	-6.6E+04
2.2E+02	-1.5E+06	4.6E+05	-1.0E+06	-1.1E+06	1.0E+06	3.1E+06	-3.0E+06	1.5E+06	-6.2E+04	-1.1E+05	-5.1E+04	-9.0E+04	-6.6E+04	-9.0E+04	-6.2E+04	-5.0E+04

Table 49. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.6 PR, medium preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.7E+06	1.3E+06	-1.4E+06	-1.1E+06	7.2E+04	3.2E+05	-2.4E+05	-2.8E+05	-8.7E+04	-9.9E+04	-6.7E+04	-1.1E+05	-1.1E+05	-7.0E+04	-6.8E+04	-5.2E+04
2.0E+01	-1.6E+06	1.4E+06	-1.8E+06	-1.1E+06	4.3E+05	3.7E+05	-1.5E+05	-2.0E+05	-1.2E+05	-8.8E+04	-1.3E+05	-7.4E+04	-9.5E+04	-7.9E+04	-1.2E+05	-4.7E+04
2.9E+01	-1.7E+06	1.5E+06	-1.4E+06	-1.3E+06	3.6E+05	4.1E+05	-4.3E+05	-3.2E+05	-9.4E+04	-8.7E+04	-6.9E+04	-7.0E+04	-6.5E+04	-1.2E+05	-7.2E+04	-1.0E+05
3.9E+01	-1.6E+06	1.3E+06	-1.7E+06	-1.4E+06	5.3E+04	5.7E+05	-4.9E+05	3.4E+04	-7.3E+04	-5.7E+04	-6.2E+04	-8.4E+04	-6.7E+04	-8.8E+04	-8.5E+04	-5.7E+04
4.9E+01	-8.6E+05	2.1E+06	-1.6E+06	-1.5E+06	2.2E+05	9.2E+05	-3.1E+05	3.0E+05	-1.9E+05	-1.2E+05	-1.7E+05	-7.4E+04	-1.9E+05	-9.9E+04	-1.4E+05	-6.0E+04
5.9E+01	-1.6E+06	1.3E+06	-1.6E+06	-1.3E+06	5.0E+05	7.6E+05	-9.7E+05	4.6E+05	-2.0E+05	-8.6E+04	-9.9E+04	-9.9E+04	-1.7E+05	-9.8E+04	-1.6E+05	-5.7E+04
6.8E+01	-1.5E+06	1.4E+06	-1.3E+06	-1.7E+06	3.6E+05	8.1E+05	-7.2E+05	6.8E+05	-9.2E+04	-1.1E+05	-1.4E+05	-1.2E+05	-9.1E+04	-1.3E+05	-9.6E+04	-8.0E+04
7.8E+01	-1.8E+06	1.1E+06	-1.3E+06	-7.6E+05	4.5E+05	9.3E+05	-8.8E+05	1.2E+06	-1.5E+05	-8.1E+04	-7.2E+04	-7.7E+04	-1.6E+05	-7.5E+04	-5.7E+04	-7.8E+04
8.8E+01	-1.7E+06	1.3E+06	-1.4E+06	-1.1E+06	5.0E+05	1.0E+06	-1.3E+06	6.0E+05	-9.2E+04	-6.0E+04	-7.5E+04	-5.6E+04	-5.2E+04	-8.1E+04	-1.0E+05	-4.2E+04
9.8E+01	-2.0E+06	4.7E+05	-1.4E+06	-1.2E+06	2.0E+05	8.3E+05	-1.7E+06	5.3E+05	-5.1E+04	-8.8E+04	-5.6E+04	-8.1E+04	-7.3E+04	-1.9E+05	-1.1E+05	-4.8E+04
1.1E+02	-1.6E+06	1.3E+06	-1.6E+06	-1.2E+06	9.1E+05	1.2E+06	-1.5E+06	7.9E+05	-8.9E+04	-7.6E+04	-9.1E+04	-8.9E+04	-7.5E+04	-8.5E+04	-8.4E+04	-4.5E+04
1.2E+02	-1.4E+06	1.1E+06	-1.7E+06	-1.1E+06	8.4E+05	1.2E+06	-1.6E+06	7.5E+05	-4.2E+04	-7.7E+04	-6.6E+04	-7.5E+04	-6.8E+04	-7.3E+04	-6.8E+04	-4.0E+04
1.3E+02	-1.4E+06	8.7E+05	-1.6E+06	-9.8E+05	8.8E+05	1.5E+06	-1.5E+06	5.9E+05	-5.9E+04	-1.2E+05	-6.3E+04	-9.6E+04	-6.8E+04	-9.1E+04	-5.1E+04	-5.3E+04
1.4E+02	-1.2E+06	5.5E+05	-2.0E+06	-8.4E+05	1.2E+06	2.3E+06	-1.2E+06	7.2E+05	-4.4E+04	-7.2E+04	-6.3E+04	-7.2E+04	-7.0E+04	-7.9E+04	-4.4E+04	-6.7E+04
1.5E+02	-2.3E+06	6.7E+05	-2.1E+05	-1.3E+06	-4.1E+05	2.5E+06	-6.5E+05	7.5E+05	-6.2E+04	-8.1E+04	-5.5E+04	-7.9E+04	-5.6E+04	-8.2E+04	-6.3E+04	-5.6E+04
1.6E+02	-1.5E+06	1.5E+06	-1.5E+06	-1.5E+06	2.0E+06	1.1E+06	-3.6E+06	2.3E+06	-8.8E+04	-1.1E+05	-9.9E+04	-1.1E+05	-7.2E+04	-9.5E+04	-6.7E+04	-9.2E+04
1.7E+02	-3.3E+06	1.9E+06	-4.6E+05	-9.6E+05	6.4E+05	2.8E+06	-1.9E+06	7.9E+05	-8.0E+04	-7.5E+04	-7.8E+04	-7.4E+04	-7.0E+04	-7.9E+04	-6.8E+04	-7.1E+04
1.8E+02	-2.3E+06	7.8E+05	-1.0E+06	-3.4E+05	1.3E+06	2.7E+06	-2.4E+06	1.1E+06	-6.4E+04	-7.5E+04	-7.0E+04	-9.1E+04	-5.7E+04	-8.5E+04	-5.7E+04	-5.8E+04
1.9E+02	-3.8E+04	1.2E+06	-1.3E+06	-2.7E+06	3.3E+06	9.2E+05	-4.2E+06	2.6E+06	-1.1E+05	-9.9E+04	-1.3E+05	-9.1E+04	-1.1E+05	-1.3E+05	-1.1E+05	-1.0E+05
2.0E+02	-9.2E+05	1.1E+06	-1.2E+06	-1.4E+06	1.3E+06	3.1E+06	-3.0E+06	1.1E+06	-5.4E+04	-8.1E+04	-5.4E+04	-7.9E+04	-5.2E+04	-9.2E+04	-6.5E+04	-8.1E+04
2.1E+02	-2.6E+05	3.1E+06	-2.3E+05	-9.2E+04	-1.5E+05	1.5E+06	-4.2E+06	4.6E+05	-1.1E+05	-1.5E+05	-7.1E+04	-1.1E+05	-6.9E+04	-1.4E+05	-7.3E+04	-9.2E+04
2.1E+02	-1.5E+06	2.3E+05	-1.7E+06	-2.0E+06	1.0E+06	3.1E+06	-3.3E+06	1.5E+06	-4.0E+04	-7.8E+04	-2.8E+04	-6.5E+04	-3.9E+04	-9.2E+04	-3.6E+04	-7.9E+04
2.2E+02	-2.1E+06	4.4E+05	-1.2E+06	-1.6E+06	1.3E+06	3.7E+06	-3.3E+06	1.9E+06	-3.4E+04	-7.8E+04	-4.2E+04	-7.4E+04	-4.7E+04	-7.8E+04	-3.3E+04	-5.3E+04

Table 50. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.4 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.3E+06	2.6E+06	-2.2E+06	-1.3E+06	9.8E+04	8.2E+04	-2.6E+05	9.7E+04	-6.2E+04	-6.3E+04	-7.7E+04	-7.6E+04	-9.1E+04	-6.0E+04	-6.1E+04	-5.3E+04
2.0E+01	-1.3E+06	2.7E+06	-2.2E+06	-1.3E+06	1.7E+05	3.0E+05	-5.1E+05	1.8E+05	-8.5E+04	-5.7E+04	-7.6E+04	-7.8E+04	-7.5E+04	-6.5E+04	-1.2E+05	-5.5E+04
2.9E+01	-1.3E+06	2.7E+06	-2.4E+06	-1.2E+06	3.3E+05	3.9E+05	-5.0E+05	-2.4E+04	-5.1E+04	-4.9E+04	-5.2E+04	-5.6E+04	-7.4E+04	-5.2E+04	-4.4E+04	-6.1E+04
3.9E+01	-1.3E+06	2.8E+06	-2.6E+06	-1.3E+06	1.2E+05	7.0E+05	-4.2E+05	1.3E+05	-1.4E+05	-4.8E+04	-9.8E+04	-6.2E+04	-5.4E+04	-6.3E+04	-3.9E+04	-3.9E+04
4.9E+01	-1.2E+06	2.8E+06	-2.4E+06	-1.3E+06	3.8E+05	6.1E+05	-8.4E+05	1.9E+05	-1.0E+05	-7.8E+04	-1.1E+05	-8.2E+04	-1.3E+05	-7.1E+04	-1.1E+05	-4.8E+04
5.9E+01	-1.4E+06	2.6E+06	-2.6E+06	-1.4E+06	3.8E+05	6.6E+05	-9.3E+05	2.3E+05	-9.8E+04	-5.1E+04	-6.3E+04	-7.9E+04	-1.4E+05	-5.9E+04	-1.5E+05	-4.4E+04
6.8E+01	-1.5E+06	2.6E+06	-2.6E+06	-1.5E+06	5.9E+05	9.3E+05	-1.1E+06	1.4E+05	-7.8E+04	-7.9E+04	-5.8E+04	-8.2E+04	-6.5E+04	-7.8E+04	-6.1E+04	-4.9E+04
7.8E+01	-1.3E+06	2.5E+06	-2.6E+06	-1.5E+06	9.5E+05	9.6E+05	-1.0E+06	3.9E+05	-5.9E+04	-5.4E+04	-4.7E+04	-6.3E+04	-8.2E+04	-5.4E+04	-1.2E+05	-6.1E+04
8.8E+01	-1.2E+06	2.4E+06	-2.8E+06	-1.6E+06	7.5E+05	1.1E+06	-1.5E+06	4.5E+05	-3.4E+04	-3.9E+04	-2.7E+04	-6.9E+04	-4.8E+04	-5.6E+04	-8.1E+04	-5.3E+04
9.8E+01	-1.5E+06	2.2E+06	-3.2E+06	-1.9E+06	6.2E+05	1.2E+06	-1.7E+06	4.7E+05	-5.1E+04	-4.3E+04	-8.6E+04	-5.9E+04	-6.7E+04	-5.5E+04	-1.1E+05	-4.8E+04
1.1E+02	-2.3E+06	1.8E+06	-3.9E+06	-2.6E+06	1.3E+06	1.6E+06	-1.4E+06	1.4E+06	-5.8E+04	-4.7E+04	-6.4E+04	-5.6E+04	-5.4E+04	-5.6E+04	-4.7E+04	-4.6E+04
1.2E+02	-8.4E+05	2.5E+06	-2.7E+06	-1.1E+06	1.1E+06	1.5E+06	-1.7E+06	9.0E+05	-5.3E+04	-3.5E+04	-3.1E+04	-6.3E+04	-3.9E+04	-4.5E+04	-5.0E+04	-3.8E+04
1.3E+02	-8.3E+05	2.5E+06	-2.9E+06	-9.8E+05	1.2E+06	1.8E+06	-1.7E+06	7.9E+05	-3.9E+04	-6.3E+04	-4.5E+04	-7.0E+04	-4.1E+04	-7.8E+04	-3.5E+04	-5.7E+04
1.4E+02	-9.1E+05	1.9E+06	-3.7E+06	-1.2E+06	1.2E+06	2.1E+06	-1.8E+06	6.7E+05	-4.1E+04	-4.6E+04	-3.3E+04	-6.5E+04	-3.4E+04	-6.5E+04	-3.5E+04	-3.5E+04
1.5E+02	-1.3E+06	2.1E+06	-1.9E+06	-9.8E+05	3.5E+05	2.6E+06	-1.2E+06	6.2E+05	-5.8E+04	-5.4E+04	-3.5E+04	-5.5E+04	-4.2E+04	-5.6E+04	-4.1E+04	-5.2E+04
1.6E+02	-1.6E+06	3.0E+06	-2.4E+06	-2.3E+06	1.2E+06	2.1E+06	-2.5E+06	1.1E+06	-5.8E+04	-6.5E+04	-4.7E+04	-6.7E+04	-6.3E+04	-7.0E+04	-7.6E+04	-5.8E+04
1.7E+02	-4.7E+06	5.1E+06	-6.5E+05	-3.8E+06	1.6E+06	2.0E+06	-3.0E+06	2.4E+06	-1.6E+05	-1.7E+05	-1.9E+05	-2.4E+05	-1.9E+05	-2.0E+05	-1.9E+05	-1.8E+05
1.8E+02	-2.0E+06	3.0E+06	-2.6E+06	-6.1E+05	6.9E+06	-6.8E+05	-7.0E+06	3.8E+06	-2.5E+05	-1.6E+05	-2.7E+05	-2.3E+05	-2.3E+05	-1.9E+05	-2.8E+05	-2.2E+05
1.9E+02	-2.3E+06	4.8E+06	-7.5E+05	-5.8E+06	1.4E+06	3.1E+06	-2.7E+06	1.1E+06	-7.6E+04	-8.4E+04	-6.8E+04	-7.4E+04	-8.5E+04	-1.0E+05	-6.6E+04	-7.7E+04
2.0E+02	-2.9E+05	2.2E+06	-3.8E+06	-4.9E+05	1.6E+06	2.8E+06	-3.2E+06	1.1E+06	-9.2E+04	-7.0E+04	-7.6E+04	-7.2E+04	-6.6E+04	-9.3E+04	-6.7E+04	-6.8E+04
2.1E+02	5.3E+03	3.9E+06	-3.2E+06	8.3E+04	-5.2E+05	1.0E+06	-4.0E+06	4.3E+05	-1.1E+05	-9.5E+04	-9.1E+04	-1.1E+05	-7.9E+04	-9.4E+04	-7.8E+04	-7.3E+04
2.1E+02	-1.8E+06	8.7E+05	-4.3E+06	-1.7E+06	1.9E+06	3.0E+06	-3.3E+06	1.6E+06	-3.8E+04	-5.5E+04	-4.5E+04	-8.8E+04	-3.5E+04	-6.2E+04	-4.4E+04	-4.6E+04
2.2E+02	-1.6E+06	1.0E+06	-4.2E+06	-1.4E+06	1.9E+06	3.5E+06	-3.6E+06	1.6E+06	-3.8E+04	-5.6E+04	-4.1E+04	-6.0E+04	-2.3E+04	-7.7E+04	-5.3E+04	-5.7E+04

Table 51. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.4 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.5E+06	2.7E+06	-2.3E+06	-1.6E+06	2.8E+04	2.5E+05	-1.3E+05	-9.8E+04	-8.0E+04	-9.9E+04	-6.5E+04	-7.6E+04	-1.2E+05	-1.4E+05	-6.5E+04	-4.4E+04
2.0E+01	-1.6E+06	2.8E+06	-2.3E+06	-1.7E+06	1.2E+05	3.4E+05	-4.5E+05	7.2E+03	-1.0E+05	-5.4E+04	-4.9E+04	-6.5E+04	-7.6E+04	-5.6E+04	-1.2E+05	-4.0E+04
2.9E+01	-1.6E+06	2.8E+06	-2.4E+06	-1.6E+06	2.9E+05	4.1E+05	-5.2E+05	9.0E+03	-5.0E+04	-5.0E+04	-6.5E+04	-6.9E+04	-6.3E+04	-6.7E+04	-4.3E+04	-5.3E+04
3.9E+01	-1.6E+06	2.9E+06	-2.6E+06	-1.7E+06	1.0E+05	6.9E+05	-4.9E+05	1.3E+05	-1.2E+05	-4.2E+04	-1.1E+05	-6.8E+04	-6.2E+04	-4.6E+04	-4.4E+04	-4.1E+04
4.9E+01	-1.6E+06	2.9E+06	-2.3E+06	-1.8E+06	3.7E+05	5.7E+05	-8.9E+05	1.7E+05	-9.0E+04	-5.8E+04	-9.7E+04	-5.5E+04	-1.2E+05	-5.8E+04	-1.1E+05	-4.4E+04
5.9E+01	-1.7E+06	2.7E+06	-2.6E+06	-1.7E+06	3.4E+05	7.2E+05	-1.0E+06	4.0E+05	-1.1E+05	-6.4E+04	-5.7E+04	-7.5E+04	-1.3E+05	-6.0E+04	-1.7E+05	-7.0E+04
6.8E+01	-1.8E+06	2.6E+06	-2.5E+06	-1.9E+06	6.3E+05	8.3E+05	-1.4E+06	3.2E+05	-7.1E+04	-8.1E+04	-7.7E+04	-1.1E+05	-5.6E+04	-5.8E+04	-4.6E+04	-7.8E+04
7.8E+01	-1.6E+06	2.6E+06	-2.7E+06	-1.9E+06	8.9E+05	1.0E+06	-1.2E+06	3.8E+05	-6.0E+04	-5.8E+04	-4.7E+04	-7.3E+04	-8.5E+04	-4.5E+04	-1.0E+05	-3.9E+04
8.8E+01	-1.6E+06	2.4E+06	-2.9E+06	-2.0E+06	6.2E+05	1.0E+06	-1.6E+06	5.9E+05	-3.9E+04	-5.1E+04	-2.0E+04	-6.0E+04	-5.9E+04	-5.3E+04	-8.3E+04	-4.7E+04
9.8E+01	-1.8E+06	2.2E+06	-3.3E+06	-2.2E+06	4.9E+05	1.1E+06	-1.8E+06	5.8E+05	-5.3E+04	-6.2E+04	-6.6E+04	-6.0E+04	-7.3E+04	-6.2E+04	-9.2E+04	-5.5E+04
1.1E+02	-2.7E+06	1.7E+06	-4.0E+06	-3.0E+06	1.2E+06	1.7E+06	-1.6E+06	1.4E+06	-6.1E+04	-4.2E+04	-6.9E+04	-6.4E+04	-4.9E+04	-6.5E+04	-5.1E+04	-3.8E+04
1.2E+02	-1.2E+06	2.5E+06	-2.7E+06	-1.4E+06	9.7E+05	1.6E+06	-1.9E+06	9.2E+05	-3.6E+04	-3.9E+04	-3.5E+04	-5.1E+04	-3.7E+04	-5.2E+04	-4.2E+04	-4.3E+04
1.3E+02	-1.3E+06	2.6E+06	-3.0E+06	-1.3E+06	1.3E+06	2.0E+06	-1.9E+06	8.9E+05	-3.8E+04	-4.4E+04	-4.5E+04	-6.1E+04	-4.3E+04	-7.1E+04	-3.0E+04	-4.2E+04
1.4E+02	-1.2E+06	1.9E+06	-3.8E+06	-1.4E+06	1.1E+06	2.2E+06	-1.9E+06	6.5E+05	-4.1E+04	-3.5E+04	-3.3E+04	-6.2E+04	-3.1E+04	-4.3E+04	-4.1E+04	-5.8E+04
1.5E+02	-1.7E+06	2.1E+06	-2.1E+06	-1.2E+06	2.2E+05	2.8E+06	-1.3E+06	5.3E+05	-2.3E+04	-4.4E+04	-2.7E+04	-6.1E+04	-3.9E+04	-5.7E+04	-3.3E+04	-4.0E+04
1.6E+02	-2.0E+06	2.9E+06	-2.6E+06	-2.6E+06	1.1E+06	2.4E+06	-2.6E+06	8.9E+05	-3.3E+04	-4.3E+04	-2.9E+04	-5.7E+04	-3.3E+04	-5.6E+04	-4.0E+04	-3.8E+04
1.7E+02	-5.2E+06	5.2E+06	-4.2E+05	-4.6E+06	7.6E+05	3.1E+06	-2.6E+06	1.3E+06	-4.0E+04	-4.2E+04	-4.2E+04	-6.7E+04	-5.0E+04	-5.8E+04	-4.9E+04	-5.3E+04
1.8E+02	-3.5E+06	2.5E+06	-1.8E+06	-1.3E+05	7.1E+06	-5.6E+05	-7.6E+06	4.0E+06	-1.2E+05	-9.3E+04	-8.0E+04	-7.5E+04	-8.1E+04	-7.0E+04	-4.7E+04	-5.9E+04
1.9E+02	-2.4E+06	4.5E+06	-1.2E+06	-5.8E+06	1.2E+06	3.3E+06	-2.8E+06	1.2E+06	-4.7E+04	-4.0E+04	-5.9E+04	-5.4E+04	-3.6E+04	-6.4E+04	-5.1E+04	-6.0E+04
2.0E+02	-7.7E+05	2.2E+06	-3.8E+06	-8.1E+05	1.7E+06	3.2E+06	-3.6E+06	1.0E+06	-6.2E+04	-5.2E+04	-3.4E+04	-6.6E+04	-4.0E+04	-5.6E+04	-3.8E+04	-4.6E+04
2.1E+02	-2.9E+05	3.9E+06	-3.4E+06	-4.2E+05	-5.5E+05	1.2E+06	-4.5E+06	4.4E+05	-5.6E+04	-5.4E+04	-7.0E+04	-1.0E+05	-5.6E+04	-6.5E+04	-7.5E+04	-7.2E+04
2.1E+02	-2.2E+06	6.8E+05	-4.4E+06	-2.1E+06	1.8E+06	3.3E+06	-3.7E+06	1.6E+06	-2.6E+04	-6.8E+04	-3.1E+04	-6.3E+04	-3.5E+04	-6.0E+04	-3.0E+04	-5.2E+04
2.2E+02	-2.1E+06	9.2E+05	-4.2E+06	-1.7E+06	1.7E+06	3.9E+06	-3.9E+06	1.7E+06	-5.1E+04	-5.6E+04	-3.0E+04	-6.7E+04	-4.3E+04	-4.8E+04	-5.4E+04	-5.4E+04

Table 52. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.4 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.9E+06	2.8E+06	-2.4E+06	-1.7E+06	1.0E+05	1.8E+05	-1.4E+05	-1.2E+05	-1.0E+05	-1.2E+05	-4.4E+04	-6.1E+04	-1.1E+05	-8.5E+04	-8.1E+04	-6.8E+04
2.0E+01	-1.9E+06	2.9E+06	-2.4E+06	-1.9E+06	1.4E+05	4.0E+05	-5.7E+05	-3.1E+04	-1.1E+05	-7.9E+04	-5.5E+04	-8.6E+04	-7.9E+04	-6.2E+04	-1.5E+05	-5.4E+04
2.9E+01	-1.8E+06	2.9E+06	-2.5E+06	-1.8E+06	2.5E+05	5.2E+05	-5.0E+05	-1.5E+05	-5.6E+04	-4.9E+04	-6.6E+04	-7.1E+04	-6.9E+04	-7.9E+04	-4.3E+04	-4.2E+04
3.9E+01	-1.9E+06	3.0E+06	-2.8E+06	-1.8E+06	-1.2E+04	7.7E+05	-5.6E+05	1.4E+04	-1.2E+05	-5.5E+04	-1.1E+05	-6.2E+04	-5.8E+04	-5.4E+04	-4.2E+04	-4.1E+04
4.9E+01	-2.0E+06	3.2E+06	-2.4E+06	-1.9E+06	1.2E+05	6.0E+05	-9.8E+05	7.5E+04	-2.7E+05	-2.1E+05	-1.4E+05	-9.8E+04	-3.1E+05	-2.6E+05	-9.2E+04	-7.3E+04
5.9E+01	-2.0E+06	3.0E+06	-2.8E+06	-2.0E+06	1.9E+05	8.4E+05	-1.1E+06	2.6E+05	-7.7E+04	-5.1E+04	-6.8E+04	-7.2E+04	-1.5E+05	-8.2E+04	-1.5E+05	-9.5E+04
6.8E+01	-2.3E+06	2.9E+06	-2.7E+06	-2.1E+06	3.7E+05	1.1E+06	-1.3E+06	-5.5E+04	-8.2E+04	-7.9E+04	-7.1E+04	-6.2E+04	-7.3E+04	-8.2E+04	-5.3E+04	-6.1E+04
7.8E+01	-1.9E+06	2.9E+06	-3.0E+06	-2.3E+06	6.0E+05	1.0E+06	-1.2E+06	1.6E+05	-5.7E+04	-5.3E+04	-3.7E+04	-6.7E+04	-7.9E+04	-6.8E+04	-1.0E+05	-6.6E+04
8.8E+01	-2.1E+06	2.7E+06	-3.0E+06	-2.3E+06	5.1E+05	1.1E+06	-1.6E+06	3.9E+05	-3.3E+04	-4.8E+04	-3.7E+04	-6.9E+04	-7.1E+04	-5.5E+04	-8.4E+04	-4.1E+04
9.8E+01	-2.3E+06	2.5E+06	-3.4E+06	-2.6E+06	3.5E+05	1.2E+06	-1.9E+06	4.2E+05	-8.2E+04	-6.5E+04	-9.2E+04	-8.9E+04	-1.1E+05	-1.2E+05	-1.1E+05	-7.2E+04
1.1E+02	-3.2E+06	2.1E+06	-4.2E+06	-3.3E+06	1.1E+06	1.6E+06	-1.5E+06	1.3E+06	-6.6E+04	-3.2E+04	-5.1E+04	-5.6E+04	-4.7E+04	-6.3E+04	-5.1E+04	-5.3E+04
1.2E+02	-1.9E+06	2.8E+06	-2.8E+06	-1.9E+06	8.1E+05	1.5E+06	-1.8E+06	7.8E+05	-4.1E+04	-4.8E+04	-3.2E+04	-5.8E+04	-5.2E+04	-4.7E+04	-6.0E+04	-4.4E+04
1.3E+02	-1.9E+06	2.5E+06	-3.0E+06	-1.7E+06	1.2E+06	1.9E+06	-1.7E+06	8.9E+05	-3.9E+04	-6.6E+04	-5.6E+04	-7.8E+04	-5.9E+04	-9.4E+04	-4.7E+04	-7.8E+04
1.4E+02	-1.9E+06	1.9E+06	-3.7E+06	-1.9E+06	1.1E+06	2.2E+06	-1.8E+06	5.9E+05	-4.7E+04	-4.3E+04	-4.1E+04	-6.0E+04	-3.6E+04	-6.0E+04	-2.3E+04	-4.0E+04
1.5E+02	-2.3E+06	2.1E+06	-1.9E+06	-1.7E+06	2.7E+05	2.8E+06	-1.5E+06	5.4E+05	-4.7E+04	-5.2E+04	-2.7E+04	-5.7E+04	-3.8E+04	-5.0E+04	-3.9E+04	-4.5E+04
1.6E+02	-2.6E+06	2.9E+06	-2.4E+06	-3.0E+06	1.3E+06	2.5E+06	-2.8E+06	9.0E+05	-4.0E+04	-4.0E+04	-4.2E+04	-6.1E+04	-5.2E+04	-6.2E+04	-3.4E+04	-3.4E+04
1.7E+02	-5.8E+06	5.1E+06	-3.5E+05	-4.9E+06	8.3E+05	3.3E+06	-2.7E+06	1.2E+06	-3.4E+04	-5.5E+04	-3.6E+04	-6.4E+04	-5.6E+04	-4.7E+04	-5.0E+04	-5.1E+04
1.8E+02	-3.8E+06	2.3E+06	-2.1E+06	-3.0E+05	6.8E+06	-4.9E+05	-7.5E+06	4.1E+06	-9.2E+04	-5.1E+04	-5.6E+04	-7.8E+04	-1.3E+05	-8.9E+04	-1.3E+05	-7.1E+04
1.9E+02	-3.0E+06	4.5E+06	-1.1E+06	-6.2E+06	1.3E+06	3.6E+06	-3.0E+06	1.2E+06	-6.0E+04	-4.6E+04	-5.5E+04	-7.1E+04	-3.6E+04	-7.6E+04	-5.9E+04	-4.5E+04
2.0E+02	-1.3E+06	2.2E+06	-3.8E+06	-1.3E+06	1.7E+06	3.5E+06	-4.0E+06	1.0E+06	-7.6E+04	-6.2E+04	-4.4E+04	-7.5E+04	-5.5E+04	-6.6E+04	-4.8E+04	-5.4E+04
2.1E+02	-9.1E+05	3.8E+06	-3.4E+06	-8.1E+05	-4.8E+05	1.4E+06	-4.9E+06	4.5E+05	-1.0E+05	-9.8E+04	-5.0E+04	-6.8E+04	-7.5E+04	-1.0E+05	-6.9E+04	-6.9E+04
2.1E+02	-2.4E+06	9.9E+05	-4.5E+06	-2.7E+06	1.9E+06	3.6E+06	-4.0E+06	1.6E+06	-2.8E+04	-5.0E+04	-4.8E+04	-6.1E+04	-5.1E+04	-7.1E+04	-6.1E+04	-9.4E+04
2.2E+02	-2.6E+06	9.1E+05	-4.2E+06	-2.3E+06	1.7E+06	4.1E+06	-4.3E+06	1.8E+06	-5.9E+04	-5.0E+04	-3.1E+04	-7.7E+04	-3.6E+04	-7.7E+04	-5.9E+04	-6.0E+04

Table 53. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.5 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-7.4E+05	2.6E+06	-2.2E+06	-9.4E+05	1.1E+05	4.4E+04	-6.5E+04	-3.1E+05	-4.9E+04	-5.4E+04	-7.0E+04	-4.9E+04	-7.3E+04	-6.6E+04	-7.6E+04	-5.7E+04
2.0E+01	-6.5E+05	2.7E+06	-2.1E+06	-1.1E+06	5.9E+05	2.5E+05	-5.7E+05	8.9E+04	-1.3E+05	-8.8E+04	-1.2E+05	-4.6E+04	-1.5E+05	-5.2E+04	-1.2E+05	-6.5E+04
2.9E+01	-8.4E+05	2.6E+06	-2.3E+06	-1.1E+06	3.3E+05	5.9E+05	-5.3E+05	-3.9E+04	-9.2E+04	-4.3E+04	-7.7E+04	-6.0E+04	-6.6E+04	-6.2E+04	-4.5E+04	-6.6E+04
3.9E+01	-9.7E+05	2.8E+06	-2.4E+06	-1.1E+06	1.7E+05	6.1E+05	-5.8E+05	2.3E+05	-1.3E+05	-4.4E+04	-9.5E+04	-4.2E+04	-7.7E+04	-3.6E+04	-1.0E+05	-6.7E+04
4.9E+01	-8.2E+05	2.8E+06	-2.2E+06	-9.8E+05	3.9E+05	6.9E+05	-9.6E+05	2.4E+05	-1.5E+05	-4.1E+04	-1.9E+05	-4.4E+04	-8.5E+04	-5.4E+04	-1.4E+05	-6.1E+04
5.9E+01	-7.2E+05	2.6E+06	-3.0E+06	-9.9E+05	4.8E+05	6.9E+05	-9.0E+05	5.1E+05	-1.2E+05	-4.5E+04	-1.9E+05	-5.1E+04	-1.4E+05	-6.8E+04	-1.5E+05	-6.7E+04
6.8E+01	-1.1E+06	2.7E+06	-2.7E+06	-9.5E+05	5.4E+05	8.5E+05	-1.2E+06	3.8E+05	-9.5E+04	-6.0E+04	-1.1E+05	-6.9E+04	-6.5E+04	-7.2E+04	-1.1E+05	-9.7E+04
7.8E+01	-7.8E+05	2.5E+06	-2.6E+06	-1.2E+06	9.3E+05	7.8E+05	-1.3E+06	4.5E+05	-5.5E+04	-4.3E+04	-4.7E+04	-5.7E+04	-8.9E+04	-4.1E+04	-9.0E+04	-6.0E+04
8.8E+01	-8.0E+05	2.4E+06	-2.9E+06	-1.2E+06	5.4E+05	1.1E+06	-1.5E+06	4.8E+05	-5.5E+04	-2.8E+04	-7.4E+04	-5.0E+04	-8.1E+04	-4.6E+04	-4.6E+04	-5.2E+04
9.8E+01	-1.0E+06	2.2E+06	-3.3E+06	-1.4E+06	5.0E+05	1.2E+06	-1.8E+06	6.6E+05	-7.0E+04	-4.3E+04	-5.6E+04	-4.9E+04	-6.2E+04	-3.7E+04	-6.8E+04	-5.6E+04
1.1E+02	-2.0E+06	1.7E+06	-3.9E+06	-2.4E+06	1.2E+06	1.6E+06	-1.4E+06	1.5E+06	-6.7E+04	-4.1E+04	-6.4E+04	-4.9E+04	-6.5E+04	-5.7E+04	-4.3E+04	-5.7E+04
1.2E+02	-5.7E+05	2.6E+06	-2.7E+06	-5.8E+05	9.5E+05	1.5E+06	-1.8E+06	9.5E+05	-5.1E+04	-2.8E+04	-5.1E+04	-4.7E+04	-3.1E+04	-3.5E+04	-4.1E+04	-5.2E+04
1.3E+02	-4.3E+05	2.6E+06	-3.0E+06	-6.7E+05	1.3E+06	1.9E+06	-1.6E+06	8.1E+05	-7.2E+04	-3.1E+04	-7.8E+04	-4.0E+04	-7.2E+04	-4.5E+04	-5.9E+04	-5.4E+04
1.4E+02	-5.2E+05	1.9E+06	-3.7E+06	-6.7E+05	9.1E+05	2.1E+06	-1.6E+06	5.4E+05	-3.7E+04	-2.8E+04	-4.1E+04	-5.2E+04	-3.8E+04	-4.5E+04	-2.8E+04	-5.3E+04
1.5E+02	-9.7E+05	2.1E+06	-2.0E+06	-4.8E+05	9.2E+04	2.5E+06	-1.3E+06	4.6E+05	-6.0E+04	-5.8E+04	-4.2E+04	-4.9E+04	-5.5E+04	-4.4E+04	-3.7E+04	-5.1E+04
1.6E+02	-1.2E+06	3.0E+06	-2.7E+06	-1.8E+06	1.1E+06	2.1E+06	-2.5E+06	1.1E+06	-5.8E+04	-4.0E+04	-4.7E+04	-5.2E+04	-5.6E+04	-5.2E+04	-6.0E+04	-6.4E+04
1.7E+02	-4.4E+06	5.2E+06	-6.9E+05	-3.5E+06	1.2E+06	2.1E+06	-2.9E+06	2.3E+06	-1.3E+05	-1.3E+05	-1.4E+05	-1.6E+05	-1.7E+05	-1.4E+05	-1.4E+05	-1.5E+05
1.8E+02	-3.4E+06	3.5E+06	-1.6E+06	-2.9E+05	4.7E+06	6.5E+05	-5.4E+06	3.0E+06	-1.2E+05	-1.0E+05	-1.7E+05	-1.5E+05	-1.3E+05	-1.1E+05	-1.8E+05	-1.5E+05
1.9E+02	-1.9E+06	5.1E+06	-6.6E+05	-5.7E+06	9.7E+05	3.1E+06	-2.1E+06	1.0E+06	-8.6E+04	-9.0E+04	-8.0E+04	-6.3E+04	-9.5E+04	-5.5E+04	-6.9E+04	-6.4E+04
2.0E+02	-1.4E+05	2.3E+06	-3.8E+06	-5.8E+04	1.4E+06	2.9E+06	-3.0E+06	1.4E+06	-6.9E+04	-6.9E+04	-4.0E+04	-4.9E+04	-5.9E+04	-6.1E+04	-6.1E+04	-5.9E+04
2.1E+02	3.1E+05	3.9E+06	-3.0E+06	6.7E+05	-7.1E+05	1.0E+06	-3.8E+06	5.4E+05	-7.5E+04	-6.7E+04	-8.2E+04	-7.5E+04	-1.1E+05	-7.5E+04	-7.4E+04	-6.7E+04
2.1E+02	-1.3E+06	1.2E+06	-4.3E+06	-1.4E+06	1.7E+06	2.9E+06	-3.3E+06	1.5E+06	-6.6E+04	-7.2E+04	-5.9E+04	-6.6E+04	-4.8E+04	-6.4E+04	-4.5E+04	-6.5E+04
2.2E+02	-1.3E+06	1.2E+06	-4.2E+06	-1.2E+06	1.5E+06	3.4E+06	-3.4E+06	1.8E+06	-4.6E+04	-5.9E+04	-2.5E+04	-4.1E+04	-4.5E+04	-5.1E+04	-6.1E+04	-6.3E+04

Table 54. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.5 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-8.9E+05	2.9E+06	-2.2E+06	-1.1E+06	5.5E+04	9.2E+04	-2.0E+04	-3.0E+05	-7.6E+04	-7.8E+04	-7.2E+04	-4.4E+04	-7.5E+04	-5.0E+04	-6.2E+04	-7.2E+04
2.0E+01	-9.2E+05	2.9E+06	-2.1E+06	-1.2E+06	5.2E+05	3.4E+05	-5.7E+05	4.0E+04	-1.2E+05	-4.1E+04	-1.2E+05	-4.9E+04	-1.2E+05	-4.6E+04	-1.2E+05	-4.9E+04
2.9E+01	-1.1E+06	2.8E+06	-2.3E+06	-1.2E+06	1.9E+05	5.8E+05	-5.7E+05	-1.8E+04	-8.3E+04	-4.6E+04	-9.5E+04	-5.0E+04	-7.0E+04	-5.2E+04	-3.9E+04	-7.2E+04
3.9E+01	-1.2E+06	2.9E+06	-2.4E+06	-1.2E+06	1.2E+05	5.9E+05	-6.3E+05	2.6E+05	-1.1E+05	-4.7E+04	-8.7E+04	-5.6E+04	-7.4E+04	-3.8E+04	-1.0E+05	-5.9E+04
4.9E+01	-1.2E+06	3.0E+06	-2.2E+06	-1.3E+06	3.8E+05	6.1E+05	-1.1E+06	2.8E+05	-1.3E+05	-5.3E+04	-1.9E+05	-4.0E+04	-6.3E+04	-4.8E+04	-1.4E+05	-7.3E+04
5.9E+01	-1.2E+06	2.8E+06	-3.0E+06	-1.3E+06	4.0E+05	7.8E+05	-9.7E+05	6.3E+05	-9.8E+04	-4.0E+04	-1.9E+05	-4.5E+04	-1.4E+05	-5.9E+04	-1.5E+05	-6.8E+04
6.8E+01	-1.4E+06	2.9E+06	-2.4E+06	-1.1E+06	4.9E+05	8.8E+05	-1.5E+06	7.5E+05	-7.5E+04	-3.7E+04	-1.1E+05	-4.2E+04	-8.1E+04	-6.4E+04	-9.6E+04	-6.4E+04
7.8E+01	-1.1E+06	2.6E+06	-2.6E+06	-1.1E+06	9.9E+05	7.7E+05	-1.6E+06	5.7E+05	-6.7E+04	-5.5E+04	-3.7E+04	-4.2E+04	-1.1E+05	-3.8E+04	-9.6E+04	-7.7E+04
8.8E+01	-1.0E+06	2.5E+06	-3.1E+06	-1.3E+06	4.0E+05	1.1E+06	-1.9E+06	3.9E+05	-6.1E+04	-4.4E+04	-7.2E+04	-4.2E+04	-8.9E+04	-5.1E+04	-5.1E+04	-6.1E+04
9.8E+01	-1.3E+06	2.3E+06	-3.4E+06	-1.6E+06	5.4E+05	1.2E+06	-2.0E+06	5.5E+05	-6.4E+04	-4.2E+04	-5.4E+04	-3.9E+04	-5.8E+04	-4.0E+04	-6.6E+04	-5.7E+04
1.1E+02	-2.2E+06	1.9E+06	-4.0E+06	-2.5E+06	1.1E+06	1.6E+06	-1.5E+06	1.2E+06	-7.1E+04	-3.9E+04	-8.5E+04	-5.0E+04	-7.8E+04	-3.9E+04	-3.6E+04	-4.8E+04
1.2E+02	-7.5E+05	2.7E+06	-2.8E+06	-7.3E+05	9.0E+05	1.5E+06	-2.0E+06	9.1E+05	-4.3E+04	-3.2E+04	-5.4E+04	-3.5E+04	-2.4E+04	-4.1E+04	-4.6E+04	-6.2E+04
1.3E+02	-7.0E+05	2.6E+06	-3.0E+06	-7.6E+05	1.1E+06	1.9E+06	-1.8E+06	6.7E+05	-7.2E+04	-4.2E+04	-7.8E+04	-4.2E+04	-8.3E+04	-6.6E+04	-5.0E+04	-5.7E+04
1.4E+02	-8.7E+05	1.9E+06	-3.8E+06	-7.8E+05	8.2E+05	2.2E+06	-1.8E+06	4.1E+05	-3.7E+04	-2.5E+04	-4.6E+04	-4.8E+04	-3.1E+04	-3.4E+04	-3.3E+04	-5.3E+04
1.5E+02	-1.3E+06	2.1E+06	-2.2E+06	-6.2E+05	-4.1E+04	2.7E+06	-1.5E+06	3.7E+05	-4.1E+04	-2.7E+04	-4.4E+04	-3.9E+04	-3.5E+04	-3.4E+04	-4.8E+04	-5.2E+04
1.6E+02	-1.7E+06	3.0E+06	-2.5E+06	-1.9E+06	1.0E+06	2.3E+06	-2.7E+06	9.1E+05	-3.9E+04	-3.0E+04	-3.9E+04	-4.2E+04	-5.0E+04	-4.5E+04	-4.5E+04	-5.5E+04
1.7E+02	-5.0E+06	5.3E+06	-5.3E+05	-3.9E+06	7.6E+05	2.9E+06	-2.5E+06	1.4E+06	-4.5E+04	-5.2E+04	-5.0E+04	-5.2E+04	-4.8E+04	-4.0E+04	-5.0E+04	-5.2E+04
1.8E+02	-3.4E+06	2.8E+06	-1.9E+06	4.3E+05	5.6E+06	-2.4E+05	-6.4E+06	3.9E+06	-6.2E+04	-5.1E+04	-8.0E+04	-6.6E+04	-8.4E+04	-7.4E+04	-1.0E+05	-8.1E+04
1.9E+02	-2.2E+06	5.0E+06	-8.2E+05	-5.7E+06	9.9E+05	3.4E+06	-2.5E+06	9.6E+05	-9.4E+04	-6.2E+04	-7.9E+04	-6.0E+04	-6.9E+04	-6.9E+04	-6.5E+04	-6.3E+04
2.0E+02	-4.4E+05	2.3E+06	-3.9E+06	-4.9E+05	1.5E+06	3.1E+06	-3.7E+06	1.2E+06	-2.6E+04	-4.4E+04	-7.4E+04	-5.2E+04	-6.8E+04	-5.0E+04	-4.8E+04	-7.8E+04
2.1E+02	-1.5E+05	3.9E+06	-3.2E+06	5.5E+05	-2.9E+05	1.5E+06	-4.3E+06	5.4E+05	-7.5E+04	-5.7E+04	-5.5E+04	-4.5E+04	-8.1E+04	-8.1E+04	-5.5E+04	-6.6E+04
2.1E+02	-1.6E+06	1.1E+06	-4.5E+06	-1.8E+06	1.3E+06	3.1E+06	-3.4E+06	1.6E+06	-6.1E+04	-8.2E+04	-2.9E+04	-4.9E+04	-4.5E+04	-6.1E+04	-4.0E+04	-5.1E+04
2.2E+02	-1.9E+06	1.2E+06	-4.2E+06	-1.5E+06	1.7E+06	3.8E+06	-3.8E+06	1.7E+06	-6.6E+04	-6.5E+04	-5.4E+04	-7.1E+04	-4.7E+04	-5.8E+04	-5.0E+04	-6.8E+04

Table 55. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.5 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.4E+06	2.8E+06	-2.3E+06	-1.5E+06	2.4E+04	9.6E+04	2.4E+04	-3.9E+05	-1.0E+05	-8.7E+04	-6.3E+04	-7.1E+04	-6.8E+04	-1.1E+05	-6.7E+04	-8.7E+04
2.0E+01	-1.4E+06	2.8E+06	-2.2E+06	-1.6E+06	4.7E+05	3.3E+05	-5.9E+05	1.4E+04	-1.3E+05	-5.5E+04	-1.1E+05	-5.6E+04	-1.6E+05	-6.9E+04	-1.1E+05	-6.6E+04
2.9E+01	-1.5E+06	2.7E+06	-2.4E+06	-1.5E+06	2.4E+05	6.6E+05	-5.5E+05	-3.7E+04	-9.9E+04	-4.4E+04	-9.5E+04	-5.2E+04	-6.4E+04	-5.3E+04	-3.3E+04	-7.0E+04
3.9E+01	-1.6E+06	2.9E+06	-2.5E+06	-1.6E+06	4.5E+04	7.2E+05	-5.9E+05	2.1E+05	-1.1E+05	-3.6E+04	-9.4E+04	-5.0E+04	-7.4E+04	-4.4E+04	-1.1E+05	-5.9E+04
4.9E+01	-1.8E+06	3.2E+06	-2.3E+06	-1.6E+06	7.5E+05	6.0E+05	-1.1E+06	2.2E+05	-4.0E+05	-2.1E+05	-2.0E+05	-7.0E+04	-2.6E+05	-2.6E+05	-1.5E+05	-1.0E+05
5.9E+01	-1.6E+06	2.9E+06	-3.0E+06	-1.7E+06	4.3E+05	7.9E+05	-9.8E+05	4.9E+05	-1.1E+05	-7.1E+04	-1.7E+05	-8.5E+04	-1.2E+05	-4.5E+04	-1.5E+05	-5.1E+04
6.8E+01	-1.9E+06	3.0E+06	-2.5E+06	-1.5E+06	5.1E+05	9.4E+05	-1.4E+06	6.8E+05	-9.1E+04	-9.7E+04	-9.1E+04	-8.0E+04	-7.3E+04	-8.0E+04	-1.0E+05	-1.0E+05
7.8E+01	-1.5E+06	2.5E+06	-2.8E+06	-1.4E+06	1.1E+06	9.2E+05	-1.7E+06	6.1E+05	-6.5E+04	-3.7E+04	-3.2E+04	-3.3E+04	-7.2E+04	-3.5E+04	-1.1E+05	-5.2E+04
8.8E+01	-1.6E+06	2.5E+06	-3.0E+06	-1.7E+06	6.3E+05	1.3E+06	-1.8E+06	4.9E+05	-6.1E+04	-3.7E+04	-6.9E+04	-4.3E+04	-9.1E+04	-3.4E+04	-4.8E+04	-5.4E+04
9.8E+01	-1.8E+06	2.2E+06	-3.3E+06	-2.0E+06	8.3E+05	1.4E+06	-2.1E+06	6.8E+05	-1.5E+05	-9.4E+04	-8.4E+04	-6.2E+04	-1.2E+05	-8.2E+04	-9.7E+04	-7.9E+04
1.1E+02	-2.4E+06	1.8E+06	-4.2E+06	-2.9E+06	1.2E+06	1.8E+06	-1.8E+06	1.4E+06	-9.0E+04	-4.4E+04	-9.8E+04	-6.3E+04	-9.0E+04	-3.8E+04	-8.1E+04	-6.7E+04
1.2E+02	-1.1E+06	2.8E+06	-3.0E+06	-1.1E+06	8.3E+05	1.9E+06	-2.1E+06	8.6E+05	-5.5E+04	-3.7E+04	-7.0E+04	-5.3E+04	-3.6E+04	-5.1E+04	-3.3E+04	-4.9E+04
1.3E+02	-1.2E+06	2.7E+06	-3.1E+06	-1.2E+06	1.1E+06	2.1E+06	-1.8E+06	7.1E+05	-7.2E+04	-5.2E+04	-7.2E+04	-4.9E+04	-7.1E+04	-4.3E+04	-6.4E+04	-6.3E+04
1.4E+02	-1.4E+06	2.0E+06	-3.8E+06	-1.3E+06	9.1E+05	2.4E+06	-1.8E+06	4.8E+05	-4.2E+04	-3.6E+04	-4.1E+04	-3.9E+04	-4.0E+04	-3.8E+04	-3.0E+04	-5.4E+04
1.5E+02	-1.8E+06	2.1E+06	-2.1E+06	-1.1E+06	7.4E+04	2.9E+06	-1.7E+06	4.8E+05	-4.8E+04	-4.4E+04	-5.2E+04	-4.2E+04	-3.1E+04	-4.2E+04	-4.9E+04	-5.5E+04
1.6E+02	-2.2E+06	3.0E+06	-2.5E+06	-2.3E+06	1.1E+06	2.6E+06	-2.8E+06	1.0E+06	-4.5E+04	-4.1E+04	-3.5E+04	-4.3E+04	-3.5E+04	-4.1E+04	-3.4E+04	-4.8E+04
1.7E+02	-5.4E+06	5.4E+06	-3.6E+05	-4.4E+06	8.9E+05	3.2E+06	-2.8E+06	1.4E+06	-5.8E+04	-4.3E+04	-5.3E+04	-7.4E+04	-7.2E+04	-5.2E+04	-7.0E+04	-6.1E+04
1.8E+02	-3.0E+06	2.5E+06	-2.3E+06	5.4E+04	6.8E+06	-5.8E+05	-7.6E+06	4.5E+06	-1.3E+05	-4.3E+04	-1.0E+05	-3.2E+04	-1.3E+05	-1.3E+05	-1.2E+05	-1.2E+05
1.9E+02	-2.6E+06	5.1E+06	-7.7E+05	-6.3E+06	1.1E+06	3.7E+06	-2.8E+06	9.8E+05	-7.6E+04	-4.4E+04	-7.5E+04	-5.1E+04	-6.4E+04	-5.3E+04	-5.8E+04	-6.6E+04
2.0E+02	-8.9E+05	2.5E+06	-3.9E+06	-1.1E+06	1.6E+06	3.5E+06	-3.9E+06	1.3E+06	-3.3E+04	-4.8E+04	-5.4E+04	-5.3E+04	-4.1E+04	-5.7E+04	-6.7E+04	-9.2E+04
2.1E+02	-5.4E+05	4.0E+06	-3.3E+06	-1.2E+05	-3.1E+05	1.6E+06	-4.4E+06	9.9E+05	-8.5E+04	-6.2E+04	-1.3E+05	-1.2E+05	-9.7E+04	-8.9E+04	-6.5E+04	-1.3E+05
2.1E+02	-2.0E+06	1.1E+06	-4.6E+06	-2.3E+06	1.6E+06	3.5E+06	-3.9E+06	1.8E+06	-8.7E+04	-6.8E+04	-7.1E+04	-7.6E+04	-5.6E+04	-1.0E+05	-6.0E+04	-7.0E+04
2.2E+02	-2.2E+06	1.2E+06	-4.3E+06	-2.0E+06	1.6E+06	4.1E+06	-4.0E+06	2.1E+06	-6.3E+04	-4.8E+04	-6.0E+04	-4.6E+04	-7.9E+04	-7.2E+04	-6.3E+04	-6.7E+04

Table 56. Raw data for straight-tooth labyrinth seal at 10,200 rpm, 0.6 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-6.3E+05	2.7E+06	-1.8E+06	-5.6E+05	4.4E+02	1.7E+05	-2.8E+05	-2.4E+05	-1.1E+05	-9.9E+04	-6.3E+04	-9.8E+04	-6.2E+04	-8.4E+04	-6.0E+04	-5.8E+04
2.0E+01	-6.4E+05	2.7E+06	-2.3E+06	-3.9E+05	4.8E+05	3.5E+05	-3.9E+05	-7.4E+04	-1.4E+05	-7.7E+04	-1.4E+05	-7.5E+04	-1.1E+05	-1.0E+05	-1.4E+05	-4.9E+04
2.9E+01	-6.4E+05	2.7E+06	-2.1E+06	-4.4E+05	3.4E+05	4.9E+05	-5.4E+05	-1.5E+05	-8.6E+04	-8.2E+04	-7.9E+04	-7.8E+04	-6.1E+04	-8.6E+04	-5.3E+04	-5.2E+04
3.9E+01	-5.1E+05	2.7E+06	-2.2E+06	-7.0E+05	8.1E+04	5.2E+05	-6.5E+05	2.5E+05	-6.8E+04	-8.6E+04	-6.2E+04	-5.8E+04	-6.6E+04	-7.1E+04	-9.3E+04	-8.3E+04
4.9E+01	-5.4E+05	2.6E+06	-2.1E+06	-6.6E+05	1.1E+05	5.4E+05	-6.4E+05	3.4E+05	-2.2E+05	-8.9E+04	-1.5E+05	-7.7E+04	-1.9E+05	-1.3E+05	-1.6E+05	-8.2E+04
5.9E+01	-5.0E+05	2.6E+06	-2.3E+06	-5.3E+05	4.5E+05	7.3E+05	-1.4E+06	7.2E+05	-1.9E+05	-9.2E+04	-8.8E+04	-7.4E+04	-1.8E+05	-8.0E+04	-2.0E+05	-6.5E+04
6.8E+01	-6.7E+05	2.9E+06	-2.1E+06	-6.0E+05	3.0E+05	7.4E+05	-1.3E+06	6.3E+05	-8.2E+04	-1.2E+05	-1.4E+05	-1.1E+05	-1.1E+05	-7.1E+04	-8.7E+04	-9.3E+04
7.8E+01	-6.2E+05	2.6E+06	-2.5E+06	-3.3E+05	7.5E+05	6.0E+05	-1.5E+06	8.1E+05	-1.3E+05	-8.1E+04	-9.5E+04	-6.7E+04	-1.7E+05	-7.2E+04	-7.0E+04	-4.3E+04
8.8E+01	-5.0E+05	2.3E+06	-2.8E+06	-3.6E+05	4.7E+05	1.0E+06	-1.6E+06	6.3E+05	-1.1E+05	-6.2E+04	-7.6E+04	-6.4E+04	-5.3E+04	-9.3E+04	-8.9E+04	-6.5E+04
9.8E+01	-9.1E+05	2.1E+06	-3.1E+06	-7.8E+05	4.6E+05	1.2E+06	-1.7E+06	5.5E+05	-3.4E+04	-8.1E+04	-4.5E+04	-5.6E+04	-5.7E+04	-8.4E+04	-1.0E+05	-5.0E+04
1.1E+02	-1.7E+06	1.7E+06	-3.9E+06	-1.8E+06	1.1E+06	1.5E+06	-1.4E+06	1.5E+06	-7.8E+04	-6.9E+04	-9.0E+04	-7.4E+04	-8.9E+04	-8.1E+04	-6.7E+04	-6.7E+04
1.2E+02	-2.6E+05	2.5E+06	-2.6E+06	9.1E+04	9.3E+05	1.4E+06	-1.7E+06	9.3E+05	-4.4E+04	-6.3E+04	-4.5E+04	-6.7E+04	-5.4E+04	-6.3E+04	-7.9E+04	-4.3E+04
1.3E+02	-2.6E+05	2.5E+06	-2.8E+06	1.7E+05	1.1E+06	1.8E+06	-1.6E+06	7.2E+05	-5.0E+04	-6.7E+04	-5.1E+04	-6.1E+04	-6.0E+04	-6.3E+04	-5.8E+04	-5.8E+04
1.4E+02	-3.5E+05	1.9E+06	-3.5E+06	-1.3E+05	9.1E+05	2.1E+06	-1.5E+06	3.0E+05	-3.8E+04	-5.8E+04	-6.3E+04	-5.4E+04	-6.3E+04	-6.5E+04	-2.7E+04	-3.8E+04
1.5E+02	-7.8E+05	2.1E+06	-1.8E+06	-4.6E+03	-1.3E+05	2.6E+06	-1.3E+06	3.9E+05	-4.1E+04	-5.7E+04	-5.6E+04	-7.5E+04	-5.0E+04	-6.3E+04	-6.4E+04	-5.4E+04
1.6E+02	-1.1E+06	3.0E+06	-2.4E+06	-1.3E+06	1.0E+06	2.1E+06	-2.4E+06	9.3E+05	-5.9E+04	-6.7E+04	-3.0E+04	-6.7E+04	-4.2E+04	-7.1E+04	-5.7E+04	-5.7E+04
1.7E+02	-3.8E+06	5.1E+06	-7.8E+05	-3.1E+06	1.5E+06	1.6E+06	-2.8E+06	2.4E+06	-1.1E+05	-7.4E+04	-1.3E+05	-8.3E+04	-1.1E+05	-1.1E+05	-9.1E+04	-7.3E+04
1.8E+02	-2.9E+06	3.3E+06	-1.1E+06	2.4E+05	5.5E+06	-4.0E+05	-5.9E+06	3.6E+06	-8.6E+04	-9.0E+04	-9.5E+04	-1.1E+05	-8.7E+04	-1.1E+05	-9.4E+04	-8.2E+04
1.9E+02	-1.6E+06	4.9E+06	-6.6E+05	-4.7E+06	1.5E+06	2.5E+06	-2.8E+06	2.1E+06	-7.8E+04	-7.9E+04	-6.8E+04	-7.6E+04	-6.0E+04	-1.1E+05	-6.6E+04	-6.5E+04
2.0E+02	1.0E+05	2.2E+06	-3.6E+06	2.6E+05	1.3E+06	2.6E+06	-3.0E+06	1.2E+06	-4.5E+04	-9.1E+04	-3.9E+04	-8.4E+04	-5.1E+04	-8.0E+04	-6.2E+04	-5.5E+04
2.1E+02	6.1E+05	3.9E+06	-3.0E+06	1.1E+06	-2.5E+05	1.1E+06	-3.7E+06	6.7E+05	-8.4E+04	-9.2E+04	-8.0E+04	-7.3E+04	-7.5E+04	-8.2E+04	-6.6E+04	-6.0E+04
2.1E+02	-9.7E+05	1.0E+06	-4.0E+06	-8.5E+05	1.2E+06	2.7E+06	-2.8E+06	1.6E+06	-3.5E+04	-8.5E+04	-2.5E+04	-8.3E+04	-4.7E+04	-8.6E+04	-4.0E+04	-5.4E+04
2.2E+02	-1.2E+06	1.1E+06	-3.7E+06	-5.2E+05	1.6E+06	3.3E+06	-3.2E+06	1.7E+06	-4.5E+04	-1.2E+05	-5.7E+04	-6.4E+04	-6.0E+04	-7.8E+04	-4.7E+04	-4.5E+04

Table 57. Raw data for straight-tooth labyrinth seal at 15,350 rpm, 0.6 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.0E+06	2.7E+06	-2.0E+06	-6.8E+05	-7.7E+04	3.9E+05	-2.0E+05	-3.8E+05	-8.7E+04	-1.3E+05	-5.4E+04	-7.8E+04	-9.7E+04	-9.5E+04	-5.2E+04	-7.2E+04
2.0E+01	-9.2E+05	2.8E+06	-2.5E+06	-7.1E+05	4.7E+05	3.9E+05	-3.5E+05	-9.0E+04	-1.4E+05	-9.1E+04	-1.4E+05	-8.4E+04	-9.7E+04	-7.0E+04	-1.3E+05	-6.1E+04
2.9E+01	-9.8E+05	2.8E+06	-2.1E+06	-8.2E+05	3.5E+05	4.4E+05	-4.9E+05	-1.2E+05	-8.0E+04	-8.6E+04	-6.9E+04	-6.4E+04	-5.8E+04	-1.0E+05	-5.6E+04	-5.3E+04
3.9E+01	-8.3E+05	2.8E+06	-2.3E+06	-1.0E+06	1.1E+05	5.7E+05	-6.0E+05	1.5E+05	-7.2E+04	-8.9E+04	-5.5E+04	-7.0E+04	-6.4E+04	-9.3E+04	-7.9E+04	-5.9E+04
4.9E+01	-9.3E+05	2.8E+06	-2.2E+06	-9.4E+05	1.6E+05	6.2E+05	-5.7E+05	2.5E+05	-1.6E+05	-5.6E+04	-1.5E+05	-7.4E+04	-1.9E+05	-8.5E+04	-1.6E+05	-4.0E+04
5.9E+01	-8.3E+05	2.6E+06	-2.3E+06	-9.0E+05	5.6E+05	7.5E+05	-1.4E+06	7.8E+05	-2.1E+05	-8.8E+04	-8.7E+04	-7.8E+04	-1.9E+05	-7.9E+04	-1.8E+05	-5.9E+04
6.8E+01	-9.5E+05	2.7E+06	-1.7E+06	-7.9E+05	6.8E+05	7.8E+05	-1.4E+06	1.1E+06	-9.8E+04	-1.1E+05	-1.4E+05	-1.0E+05	-9.8E+04	-8.2E+04	-1.0E+05	-1.0E+05
7.8E+01	-6.8E+05	2.9E+06	-2.7E+06	-1.6E+05	4.3E+05	1.1E+06	-1.8E+06	5.5E+05	-1.3E+05	-7.5E+04	-9.8E+04	-8.6E+04	-1.9E+05	-9.1E+04	-7.9E+04	-6.2E+04
8.8E+01	-8.3E+05	2.5E+06	-3.0E+06	-7.3E+05	4.2E+05	1.2E+06	-1.7E+06	4.8E+05	-9.3E+04	-7.8E+04	-8.6E+04	-6.5E+04	-5.4E+04	-7.8E+04	-9.0E+04	-4.4E+04
9.8E+01	-1.2E+06	2.2E+06	-3.2E+06	-1.2E+06	5.0E+05	1.3E+06	-1.8E+06	5.6E+05	-3.4E+04	-7.6E+04	-4.3E+04	-6.6E+04	-4.6E+04	-7.2E+04	-9.9E+04	-4.3E+04
1.1E+02	-1.9E+06	1.8E+06	-4.0E+06	-2.2E+06	1.1E+06	1.7E+06	-1.5E+06	1.4E+06	-8.1E+04	-7.3E+04	-1.2E+05	-6.8E+04	-7.9E+04	-8.1E+04	-6.1E+04	-7.1E+04
1.2E+02	-4.6E+05	2.6E+06	-2.7E+06	-2.1E+05	9.4E+05	1.6E+06	-1.9E+06	9.6E+05	-4.2E+04	-6.6E+04	-6.2E+04	-6.5E+04	-6.1E+04	-6.7E+04	-6.0E+04	-3.8E+04
1.3E+02	-4.9E+05	2.6E+06	-2.9E+06	-2.7E+05	1.1E+06	1.9E+06	-1.7E+06	6.0E+05	-4.7E+04	-6.7E+04	-5.5E+04	-7.1E+04	-6.4E+04	-8.0E+04	-6.4E+04	-6.7E+04
1.4E+02	-6.0E+05	1.9E+06	-3.5E+06	-4.7E+05	8.8E+05	2.3E+06	-1.7E+06	2.2E+05	-4.7E+04	-6.1E+04	-4.4E+04	-6.2E+04	-5.4E+04	-8.5E+04	-2.6E+04	-4.6E+04
1.5E+02	-1.1E+06	2.1E+06	-1.8E+06	-3.6E+05	-1.3E+05	2.8E+06	-1.4E+06	3.2E+05	-5.8E+04	-6.6E+04	-5.4E+04	-6.2E+04	-5.9E+04	-7.1E+04	-5.4E+04	-4.8E+04
1.6E+02	-1.5E+06	3.0E+06	-2.3E+06	-1.7E+06	9.4E+05	2.4E+06	-2.5E+06	8.8E+05	-3.2E+04	-6.0E+04	-3.3E+04	-6.0E+04	-4.7E+04	-6.4E+04	-4.8E+04	-5.6E+04
1.7E+02	-4.5E+06	5.4E+06	-4.4E+05	-3.7E+06	1.3E+06	2.6E+06	-2.8E+06	1.7E+06	-7.0E+04	-7.9E+04	-6.6E+04	-7.0E+04	-6.0E+04	-7.4E+04	-6.0E+04	-6.8E+04
1.8E+02	-2.2E+06	2.6E+06	-2.0E+06	7.3E+05	7.2E+06	-1.2E+06	-7.7E+06	4.7E+06	-1.3E+05	-1.2E+05	-1.2E+05	-9.3E+04	-1.4E+05	-1.2E+05	-1.3E+05	-1.2E+05
1.9E+02	-1.8E+06	4.9E+06	-7.6E+05	-5.1E+06	1.5E+06	2.6E+06	-3.1E+06	2.1E+06	-4.7E+04	-8.8E+04	-5.9E+04	-8.2E+04	-6.1E+04	-7.5E+04	-7.1E+04	-6.3E+04
2.0E+02	-2.0E+05	2.4E+06	-3.7E+06	-2.2E+05	1.5E+06	3.0E+06	-3.5E+06	1.1E+06	-3.7E+04	-9.3E+04	-5.7E+04	-7.1E+04	-6.8E+04	-7.8E+04	-8.5E+04	-7.6E+04
2.1E+02	1.5E+05	3.9E+06	-3.2E+06	8.0E+05	-2.6E+05	1.4E+06	-4.0E+06	8.8E+05	-7.7E+04	-8.2E+04	-6.7E+04	-1.0E+05	-8.6E+04	-1.1E+05	-7.4E+04	-8.0E+04
2.1E+02	-1.3E+06	1.1E+06	-4.3E+06	-1.4E+06	1.3E+06	3.1E+06	-3.2E+06	1.7E+06	-2.7E+04	-9.6E+04	-3.9E+04	-9.5E+04	-4.3E+04	-8.4E+04	-4.6E+04	-7.1E+04
2.2E+02	-1.6E+06	1.2E+06	-4.0E+06	-1.1E+06	1.6E+06	3.7E+06	-3.6E+06	1.8E+06	-3.9E+04	-8.1E+04	-4.5E+04	-9.5E+04	-4.2E+04	-1.0E+05	-4.5E+04	-5.7E+04

Table 58. Raw data for straight-tooth labyrinth seal at 20,200 rpm, 0.6 PR and high preswirl

Freq Hz	Re Hxx	Re Hxy	Re Hyx	Re Hyy	Im Hxx	Im Hxy	Im Hyx	Im Hyy	Re eHxx	Re eHxy	Re eHyx	Re eHyy	Im eHxx	Im eHxy	Im eHyx	Im eHyy
9.8E+00	-1.1E+06	2.7E+06	-2.1E+06	-1.1E+06	-6.2E+04	2.9E+05	-2.2E+05	-3.0E+05	-7.6E+04	-1.2E+05	-9.0E+04	-8.6E+04	-6.8E+04	-1.3E+05	-5.6E+04	-8.9E+04
2.0E+01	-1.2E+06	2.9E+06	-2.5E+06	-1.0E+06	3.7E+05	4.7E+05	-3.6E+05	-1.1E+05	-1.3E+05	-7.6E+04	-1.4E+05	-8.0E+04	-8.6E+04	-9.4E+04	-1.6E+05	-4.7E+04
2.9E+01	-1.3E+06	2.8E+06	-2.3E+06	-1.1E+06	2.5E+05	5.2E+05	-5.0E+05	-9.9E+04	-8.9E+04	-7.7E+04	-6.5E+04	-1.1E+05	-6.2E+04	-9.1E+04	-5.9E+04	-8.1E+04
3.9E+01	-1.2E+06	2.8E+06	-2.3E+06	-1.4E+06	7.0E+04	6.3E+05	-6.7E+05	1.7E+05	-7.5E+04	-8.8E+04	-6.0E+04	-6.3E+04	-4.8E+04	-8.4E+04	-8.6E+04	-6.0E+04
4.9E+01	-9.8E+05	2.7E+06	-2.3E+06	-1.4E+06	1.4E+05	7.5E+05	-6.3E+05	1.7E+05	-3.8E+05	-2.5E+05	-1.9E+05	-1.3E+05	-4.4E+05	-3.4E+05	-1.9E+05	-9.0E+04
5.9E+01	-1.2E+06	2.8E+06	-2.4E+06	-1.2E+06	3.9E+05	7.5E+05	-1.4E+06	7.7E+05	-1.8E+05	-7.5E+04	-8.3E+04	-8.3E+04	-1.7E+05	-7.5E+04	-1.6E+05	-5.9E+04
6.8E+01	-1.5E+06	3.1E+06	-1.9E+06	-1.3E+06	4.8E+05	9.0E+05	-1.3E+06	8.4E+05	-7.8E+04	-9.0E+04	-1.1E+05	-7.4E+04	-1.0E+05	-9.1E+04	-9.7E+04	-1.1E+05
7.8E+01	-1.2E+06	2.4E+06	-2.6E+06	-8.5E+05	8.2E+05	8.2E+05	-1.7E+06	9.3E+05	-1.5E+05	-8.2E+04	-7.3E+04	-6.4E+04	-1.7E+05	-8.3E+04	-7.7E+04	-7.6E+04
8.8E+01	-1.1E+06	2.3E+06	-2.8E+06	-1.1E+06	5.6E+05	1.4E+06	-1.9E+06	7.9E+05	-1.0E+05	-8.3E+04	-7.8E+04	-7.1E+04	-4.2E+04	-7.7E+04	-9.9E+04	-5.5E+04
9.8E+01	-1.2E+06	2.3E+06	-3.3E+06	-1.0E+06	3.3E+05	1.8E+06	-2.5E+06	6.4E+05	-7.8E+04	-9.0E+04	-5.9E+04	-1.0E+05	-1.5E+05	-1.8E+05	-1.3E+05	-8.4E+04
1.1E+02	-2.2E+06	2.0E+06	-4.2E+06	-2.4E+06	1.1E+06	1.8E+06	-1.7E+06	1.3E+06	-8.2E+04	-8.6E+04	-9.1E+04	-5.8E+04	-8.7E+04	-7.3E+04	-6.6E+04	-6.7E+04
1.2E+02	-1.0E+06	2.7E+06	-2.8E+06	-6.1E+05	8.8E+05	1.7E+06	-2.0E+06	8.8E+05	-4.1E+04	-7.7E+04	-5.2E+04	-6.3E+04	-5.8E+04	-7.6E+04	-7.0E+04	-4.5E+04
1.3E+02	-1.1E+06	2.7E+06	-2.9E+06	-7.1E+05	1.2E+06	2.0E+06	-1.8E+06	7.5E+05	-5.3E+04	-7.9E+04	-6.6E+04	-7.2E+04	-6.8E+04	-9.2E+04	-6.0E+04	-7.0E+04
1.4E+02	-1.1E+06	2.0E+06	-3.6E+06	-9.3E+05	1.1E+06	2.4E+06	-1.8E+06	2.9E+05	-3.6E+04	-7.5E+04	-4.7E+04	-6.3E+04	-5.5E+04	-7.3E+04	-3.3E+04	-5.5E+04
1.5E+02	-1.6E+06	2.1E+06	-1.9E+06	-8.2E+05	1.8E+04	2.9E+06	-1.7E+06	4.7E+05	-7.7E+04	-6.7E+04	-7.1E+04	-6.3E+04	-6.3E+04	-7.6E+04	-6.0E+04	-4.2E+04
1.6E+02	-1.9E+06	3.0E+06	-2.3E+06	-2.0E+06	1.1E+06	2.6E+06	-2.8E+06	9.3E+05	-4.2E+04	-6.3E+04	-4.1E+04	-6.3E+04	-5.3E+04	-7.1E+04	-4.3E+04	-5.1E+04
1.7E+02	-4.9E+06	5.3E+06	-2.8E+05	-4.2E+06	1.5E+06	2.8E+06	-3.0E+06	1.6E+06	-7.7E+04	-8.3E+04	-7.5E+04	-9.9E+04	-6.4E+04	-8.0E+04	-7.5E+04	-6.7E+04
1.8E+02	3.6E+05	5.9E+05	-4.6E+06	1.8E+06	8.1E+06	-1.5E+06	-8.6E+06	5.3E+06	-2.1E+05	-1.4E+05	-1.5E+05	-1.1E+05	-1.2E+05	-9.0E+04	-8.7E+04	-6.5E+04
1.9E+02	-2.3E+06	4.9E+06	-7.0E+05	-5.7E+06	1.6E+06	2.9E+06	-3.6E+06	2.5E+06	-5.7E+04	-7.2E+04	-8.8E+04	-8.1E+04	-5.4E+04	-8.8E+04	-6.6E+04	-9.3E+04
2.0E+02	-7.0E+05	2.4E+06	-3.7E+06	-7.9E+05	1.5E+06	3.5E+06	-3.8E+06	1.2E+06	-4.9E+04	-8.6E+04	-5.2E+04	-8.6E+04	-5.4E+04	-7.8E+04	-4.3E+04	-5.5E+04
2.1E+02	-2.9E+05	4.1E+06	-3.2E+06	2.3E+05	1.5E+05	1.9E+06	-4.5E+06	1.0E+06	-7.2E+04	-9.0E+04	-7.8E+04	-1.1E+05	-6.2E+04	-8.3E+04	-7.9E+04	-5.3E+04
2.1E+02	-1.7E+06	1.1E+06	-4.4E+06	-1.9E+06	1.4E+06	3.5E+06	-3.6E+06	1.9E+06	-2.3E+04	-7.8E+04	-4.3E+04	-1.1E+05	-3.6E+04	-6.7E+04	-5.3E+04	-5.5E+04
2.2E+02	-2.1E+06	1.2E+06	-3.9E+06	-1.6E+06	1.7E+06	4.1E+06	-3.9E+06	2.1E+06	-5.8E+04	-8.6E+04	-5.2E+04	-7.8E+04	-2.7E+04	-8.3E+04	-4.8E+04	-5.8E+04

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