DYNAMIC CHARACTERIZATION OF FULLY PARTITIONED DAMPER SEALS

A Thesis

by

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ABSTRACT

Balance piston gas seals restrict leakage at the discharge of centrifugal compressors. There are multiple types including labyrinth seals, textured seals, pocket damper seals (conventional PDS), and fully-partitioned pocket damper seals (FPDS). These annular seals develop large radial forces due to the high pressure differentials and gas density, which have a measureable impact on the compressor's rotordynamic performance. There is an extensive experimental database available for labyrinth seals and textured seals. However, there is not a comprehensive database for PDS and FPDS to compare against textured seals.

This investigation aimed at evaluating the rotordynamic performance of FPDS. Dynamic force coefficients were experimentally identified for the FPDS operating with three pre-swirl levels (Low, Medium, High), three pressure ratios (25%, 50%, 65%), and three rotor speeds (10, 15, 20 krpm). The results show the FPDS develops either similar effective damping coefficients or higher, for particular cases, when compared to a honeycomb seal. At low preswirl, the FPDS displays similar to higher effective damping values at synchronous to super-synchronous frequencies. The main difference between honeycomb and FPDS lies in their direct stiffness and leakage values. Honeycomb seals develop relatively large stiffness coefficients, whereas FPDS display either negative or negligible stiffness values depending on the pressure ratio. The FPDS leaks roughly ~33% more than the honeycomb seal. With these results, it is concluded that the FPDS

should be chosen in a case-by-case situation, considering the location of the system natural frequencies, rather than an over-all replacement for textured seals.

DEDICATION

To my sister, mother, and father, thank you for the motivation and being my stone. My values come from your teachings and helped me gain the friends and love ones I experience today. I appreciate the sacrifice you did to make the family successful and I only hope I can continue the torch.

To Veronica, I cannot say how much I admire you. Seeing you smile relaxes me and allows the kid in me enjoy the time we have together.

ACKNOWLEDGEMENTS

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I want to acknowledge former and current colleagues that contributed in completing my research and testing. Min Zhang, Tran Dung, and Hari Shrestha for giving advice, procedures, files, and training me to operate the test rig. Dr. Jing Yang for filtering coding issues and providing CFD predictions. Sean McLean and especially Andrew Moody for setting up and testing on the test rig with me. Carl Johnson provided advice in manufacturing and modifications at both the tool shop and in test lab. Also those in the Turbomachinery Laboratory that offered help with adding, removing, modifying the test rig.

CONTRIBUTORS AND FUNDING SOURCES

The principle investigator for this work is Dr. Adolfo Delgado. The thesis committee members include Dr. Adolfo Delgado and Dr. Luis San Andrés from the Mike J. Walker Department of Mechanical Engineering and Dr. Paul Cizmas from the Department of Aerospace Engineering. Undergraduates Andrew Moody and Sean McLean assisted with the collection of high preswirl data. The student completed all other work.

This research was funded by the Texas A&M Turbomachinery Research Consortium. Thank you to the company representatives for choosing this project from a large list of proposals. This project provided me with the opportunity to further continue my dreams in becoming an engineering citizen and providing work that contributes to current industry issues.

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NOMENCLATURE

e_o	Eccentricity
ω	Rotor frequency
Ω	Excitation frequency
C	Direct Damping
c	Cross-coupled Damping
D	Diameter
F_r	Radial Force
F_t	Tangential Force
K_{ij}	$i=j$ is direct component; $i\neq j$ cross-coupled component
K	Direct Stiffness
k	Cross-coupled Stiffness
L	Length
CC	Cross-coupled
GVF	Gas Volume Fraction
HP	Hole-Pattern Seal
HC	Honeycomb Seal
kcpm	Thousand Cycles Per Minute
krpm	Thousand Revolutions Per Minute
Laby	Labyrinth Seal
PDS	Pocket Damper Seal

PR	Pressure Ratio
FPDS	Fully-Partitioned Pocket Damper Seal

1. INTRODUCTION

1.1 GAS ANNULAR SEALS

Today's needs in turbomachinery require higher pressures, rotating speeds, and compressor loads while maintaining acceptable levels of vibration. Annular seals can generate large radial forces and have a measurable impact on the rotordynamic performance of centrifugal compressors. Balance pistons seals are the longest seals and are subjected to the largest pressure differentials in the machine. These are located at the center of a back-to-back compressor near the rotor's mid length or after the last stage of a straight-through compressor.

Labyrinth seals are a common balance piston used in industry due to their simplicity and manufacturability. These seals are effective in reducing leakage but can cause instability due to circumferential flow [1-4]. Other seal types such as the honeycomb, hole-pattern, and pocket dampers seals provide larger stiffness and damping when compared to labyrinth seals and can increase the stability margin of the machine [5-7].

Figure 1 shows examples of labyrinth, honeycomb, hole-pattern, and FPDS. Honeycomb seals have a hexagon pattern, while hole-pattern seals feature round holes. Similar to labyrinth seals, PDS feature circumferential grooves but also include circumferential buffer walls running axially, dividing the grooves into multiple pockets.

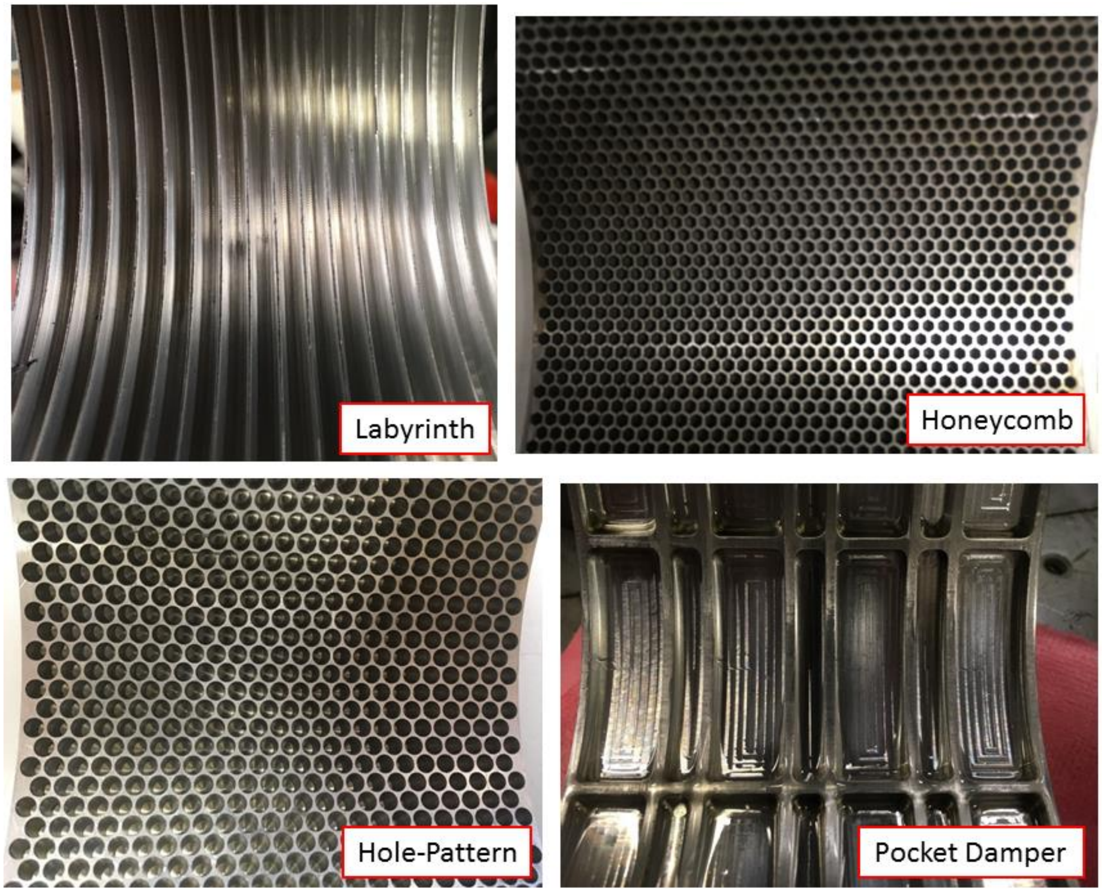

Figure 1 Close-up pictures of labyrinth, honeycomb, hole-pattern, and fully-partitioned pocket damper seals

1.2 POCKET DAMPER SEALS

Figure 2 shows a comparison between the conventional PDS and a FPDS. Convential PDS include active and inactive segments alternating along the length of the seal. Inactive segments are continuous circumferential grooves similar to those in labyrinth seals (i.e. without buffer walls). The inactive segments in the PDS are plenums maintaining constant boundary pressure for the cavities during rotor whirl [7, 8]. Active groove segments are segregated with buffer walls. A FPDS includes buffer walls spanning the entire length of the seal, thus including only active segments. The PDS may include notches toward the exit blade to provide a diverging clearance, where the FPDS only has a straight through clearance.

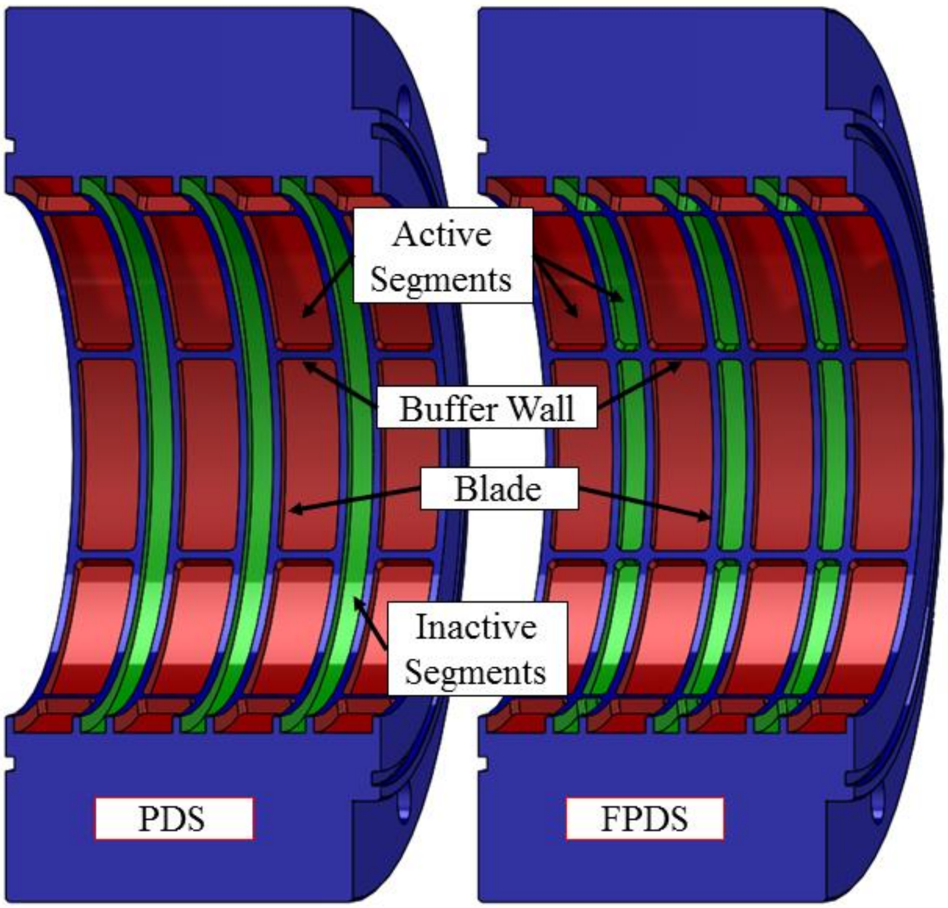

Figure 2 Differences between a standard PDS and FPDS

2. LITERATURE REVIEW

This literature review focuses on the dynamic performance of fully-partitioned pocket damper seals (FPDS) while briefly mentioning work related to textured seals. Please refer to [9-12] for a comprehensive review over textured seals

In 1965, Alford [8] explains the probable causes for destabilizing forces in axial flow turbomachinery. The author covers two main causes. The first one is the non-uniform circumferential static pressure acting on the rotor surface, and the second is the rotor eccentricity caused unequal circumferential blade clearance. The analysis of the labyrinth seals shows that a non-uniform circumferential pressure is directly related to radial deflections. This varying pressure provides a total radial force comprising two components, one parallel to deflection and the other perpendicular. Alford concludes that a labyrinth seal having a diverging clearance (tooth clearance increases along the flow direction) is more stable than a converging clearance, and rotor whirl begins at a torque level proportional to the rotor bearing system stiffness. The author only accounts for axial flow in the analysis, and neglected circumferential flow because it was assumed it had no effect on pressure within the seal. This shows inconsistent to the investigation from Benckert and Wachter [1], who identified circumferential flow in labyrinth seals directly affect the seal's destabilizing forces. Inlet preswirl was identified as a critical parameter and Benckert and Wachter concluds that reducing this value can significantly improve the seal dynamic performance.

Von Pragenau [13] shows that using a textured stator over a smooth stator results in lower circumferential flow and axial thin film fluid velocities, and consequently, decreases cross-coupled stiffness and leakage rate.

Vance and Schultz [14] presents a new invention in 1993 on a damper seal calling it the TAMSEAL. The new seal, later called PDS, provides damping from two distinct features. The first feature is the labyrinth’s blade divergence clearance along the length of the seal. The second feature is the buffer walls dividing the circumferential grooves into pockets and reducing circumferential flow. Vance and Li [15] tests and presents the results for this new damper seal. Coast-down tests serve to evaluate the seal effectiveness when crossing a critical speed and impact tests provided force coefficients. The pocket damper seal proves to have significantly more damping than a traditional labyrinth seal.

In 1999, Li et al. [16] creates a bulk-flow model for a single cavity pocket damper seal. The model uses turbulent shear stress parameters and Moody's friction factors. The authors compare the model to experimental data from Li [17] for a 4-pocket single cavity damper seal. Results show the predictions agree with measurements for leakage and direct damping. The model highlights the influence of rotor speed and pressure drop in the pocket damper seal dynamic performance. Results also show the pocket damper seal has larger damping when compared to the labyrinth seal.

Li et al. [18] tests a straight-through honeycomb seal and a pocket damper seal, both with a length to diameter ratio (L/D) of 0.54, on a flexible rotor. The author tests the seals, oriented in a back-to-back configuration, with different eccentricities at maximum supply pressure of 500 psi and preswirl values ranging from zero to 0.5. The authors only report experimental measurements in direct force coefficients with identifying effective stiffness and damping through a predictive code. The experimental results show that both seals produce high effective damping, where the honeycomb seal has positive stiffness, but the pocket damper seal has negative stiffness. Test results showed the effective damping decreases with eccentricity for both seals.

In 2003, Sprowl [5] tests two seals, a honeycomb seal and a labyrinth seal, with three pressure drops (.15, .35, .50 pressure ratio), three rotor speeds (10, 15, 20 krpm), and three preswirls (0, 30, 60 percent). The results show that preswirl does not affect effective stiffness, but does evidently affect effective damping. Effective stiffness drops 68% when the cavities in the honeycomb seal fill from debris and transits into a smooth seal; simulating a response when the honeycomb seal’s holes fill with metal particles and debris. Effective damping also drops to around 25 to 35 percent and increases the crossover frequency. Crossover frequency is the whirl frequency where the effective damping changes from negative to positive values. The lower the crossover frequency the more stable the system is.

Ertas and Ertas et al. [19, 20] measure the stiffness and damping coefficients from eight and twelve bladed pocket damper seals. The authors tests with a supply pressure up to 70 bar, rotor speeds up to 20 krpm, and whirl frequency excitation from 20 to 300 Hz. The eight bladed seal experiences the highest negative magnitude direct stiffness and positive direct damping, but all seals produce positive direct damping and same sign cross-coupling stiffness. Results show a conventional seal, a seal with active and inactive grooves, has a diverging clearance experiences large negative magnitude direct stiffness, but decreases in magnitude with increasing whirl frequency. The same seal with no clearance ratio has a negative stiffness at lower frequencies, but transitions into positive stiffness at higher frequencies. Pressure in the cavities affect phase and force density. The clearance ratio has the strongest effects of force coefficients when comparing to straight-through clearance. And the pressure ratio only has strong influence under lower frequencies.

Brown and Childs [21] tests a hole pattern seal with negative preswirls. The seal dimensions were similar to those of the seal investigated by Wade and Childs [6]. The authors tests with 70 inlet bar running up to 20 krpm rotor speed, and pressure ratios from 0.5 to 0.7. The pressure ratio is the exit pressure to inlet pressure. Direct coefficients are not affected by changing pressure ratio, speed, nor preswirl. Changing the pressure ratio shows no influence on effective damping. Cross-coupled coefficients increase in magnitude with rotor speed and decrease with an increase in negative preswirl. Changing preswirl shows little influence on direct damping for 20 krpm and 50% pressure ratio. The results provide evidence that negative preswirl helps in stabilizing the rotor. This is shown with increases in peak effective damping and lowering crossover frequency when comparing low and negative preswirl results.

Ertas et al. [7] tests labyrinth, honeycomb, and fully-partitioned pocket damper seals comparing their rotordynamic force coefficients. The authors test all seals with a low pressure ratio and in choked conditions, with a supply pressure of 6.9 bar discharging to atmosphere. All seals experience negative effective damping at low frequencies and increases in magnitude with preswirl. The pocket damper seal results display the lowest crossover frequency when comparing to other seals. With preswirl, the labyrinth seal has negative effective damping up to 100 Hz excitation frequency. When comparing both the honeycomb seal and FPDS to the labyrinth seal, the crossover frequency is greatly reduced, for both of the seals, to 40-60 Hz and the peak effective damping is increased. From the pocket pressure analysis in the FPDS, the preswirl demonstrates to be the dominant factor affecting seal stability. With preswirl, the effect in destabilizing forces show larger toward upstream than downstream of the seal.

In 2012, Li et al. [22] numerically calculates the leakage and rotordynamic coefficients for both a labyrinth seal and a fully-partition pocket damper seal by supplying both with a multi-frequency excitation whirl orbit and Reynolds-averaged Naiver-Stokes solution. The authors simulate two positive preswirls, two negative preswirls, and a low preswirl to predict their effect response of dynamic performance. The authors compare the numerical results to Ertas et al. [19] experimental values and show good agreement. The labyrinth seal's direct stiffness decreases and direct damping increases with increasing preswirl. The pocket damper seal shows no effect in direct force coefficients from increasing preswirl. For both seals, increasing the positive preswirl increases the cross-coupled stiffness resulting in a reduction of effective damping.

In 2013, Vannini et al. [2] builds a test rig to investigate a labyrinth and pocket damper seals response over negative preswirl, differences between single and multi-frequency excitation, and the difference between centered and offset seals. The authors find that negative preswirl shows a stabilizing effect in the seals. Results show testing with a multi frequency excitation proves to have a similar effect to single frequency excitation. Having the seal with a static offset, within 10% of seal clearance, shows negligible effect on the dynamic performance when comparing to a centered seal. The pocket damper seal displays a higher effective stiffness and damping coefficients when compared to the labyrinth seal.

Li et al. [23] presents a transient CFD method on the effects of preswirl, rotor speed, and pressure ratio of a fully-partitioned pocket damper seal. The authors use a previous analysis from Li et al. [22] and compare predictions to experimental results from Ertas et al. [7]. From the numerical results, coefficients are mostly affected by inlet pressure more than the discharge pressure. The dynamic forces and effective damping show a dependence on pressure ratio. Results show the crossover frequency increases and effective damping values decrease when increasing either rotor speed or preswirl.

Vannini et al. [4] in 2015, presents a case study with experimental measurements and theoretical results from a single stage compressor for a wet-gas compression application. Wet-gas refers to the presence of liquid within a mostly air volume. The labyrinth seal predictions results agreed with the experimental sub-synchronous vibration experienced in the compressor in field operation. CFD contour plots were created, showing swirl is significant in the labyrinth seals. Inserting a fully-partitioned pocket damper seal into the CFD model theoretically reduces swirl, but in effect causes a higher leakage than the labyrinth seal. Their choice in reducing the vibration was decided a higher priority than leakage.

3. MODELING BEARING OR SEAL

In 1993, Rovas and Childs [24] derived a model to characterize the dynamic performance of a seal's reaction force with linear rotordynamic coefficients:

$$-\begin{Bmatrix} \boldsymbol{r_x} \\ \boldsymbol{r_y} \end{Bmatrix} = \begin{bmatrix} \boldsymbol{K_{xx}} & \boldsymbol{K_{xy}} \\ \boldsymbol{K_{yx}} & \boldsymbol{K_{yy}} \end{bmatrix} \begin{Bmatrix} \boldsymbol{\delta x} \\ \boldsymbol{\delta y} \end{Bmatrix} + \begin{bmatrix} \boldsymbol{C_{xx}} & \boldsymbol{C_{xy}} \\ \boldsymbol{C_{yx}} & \boldsymbol{C_{yy}} \end{bmatrix} \begin{Bmatrix} \boldsymbol{\delta \dot{x}} \\ \boldsymbol{\delta \dot{y}} \end{Bmatrix} + \begin{bmatrix} \boldsymbol{M_{xx}} & \boldsymbol{M_{xy}} \\ \boldsymbol{M_{yx}} & \boldsymbol{M_{yy}} \end{bmatrix} \begin{Bmatrix} \boldsymbol{\delta \ddot{x}} \\ \boldsymbol{\delta \ddot{y}} \end{Bmatrix} \tag{1}$$

where $r_x$and r_y represent seals reaction forces. K_{xx} and K_{yy} are direct stiffness. K_{xy} and K_{yx} are cross-couple stiffness. C_{xx} and C_{yy} are direct damping. C_{yx} and C_{yx} cross-coupling damping. M_{xx} and M_{yy} are direct virtual masses. M_{xy} and M_{yx} are cross-coupled virtual masses. δx and δy are displacements, $\delta \dot{x}$ and $\delta \dot{y}$ are velocities, and $\delta \ddot{x}$ and $\delta \ddot{y}$ are accelerations.

Assuming small motions within the center, equation 1 reduces to,

$$-\begin{Bmatrix} \boldsymbol{r_x} \\ \boldsymbol{r_y} \end{Bmatrix} = \begin{bmatrix} \boldsymbol{K} & \boldsymbol{k} \\ \boldsymbol{k} & \boldsymbol{K} \end{bmatrix} \begin{Bmatrix} \boldsymbol{\delta x} \\ \boldsymbol{\delta y} \end{Bmatrix} + \begin{bmatrix} \boldsymbol{C} & \boldsymbol{c} \\ \boldsymbol{c} & \boldsymbol{C} \end{bmatrix} \begin{Bmatrix} \boldsymbol{\delta \dot{x}} \\ \boldsymbol{\delta \dot{y}} \end{Bmatrix} + \begin{bmatrix} \boldsymbol{M} & \boldsymbol{m} \\ \boldsymbol{m} & \boldsymbol{M} \end{bmatrix} \begin{Bmatrix} \boldsymbol{\delta \ddot{x}} \\ \boldsymbol{\delta \ddot{y}} \end{Bmatrix} \tag{2}$$

As the rotor displaces from the center, the fluid responds with a force in the radial and tangential direction. The radial force is in line with the rotor displacement vector, where the tangential force is in line with the rotor velocity vector. Figure 3 below shows a rotor moving in a forward procession, circling at an excitation frequency. The rotor displaced from the seal's center is called journal eccentricity and is denoted as e_o in the figure below [25].

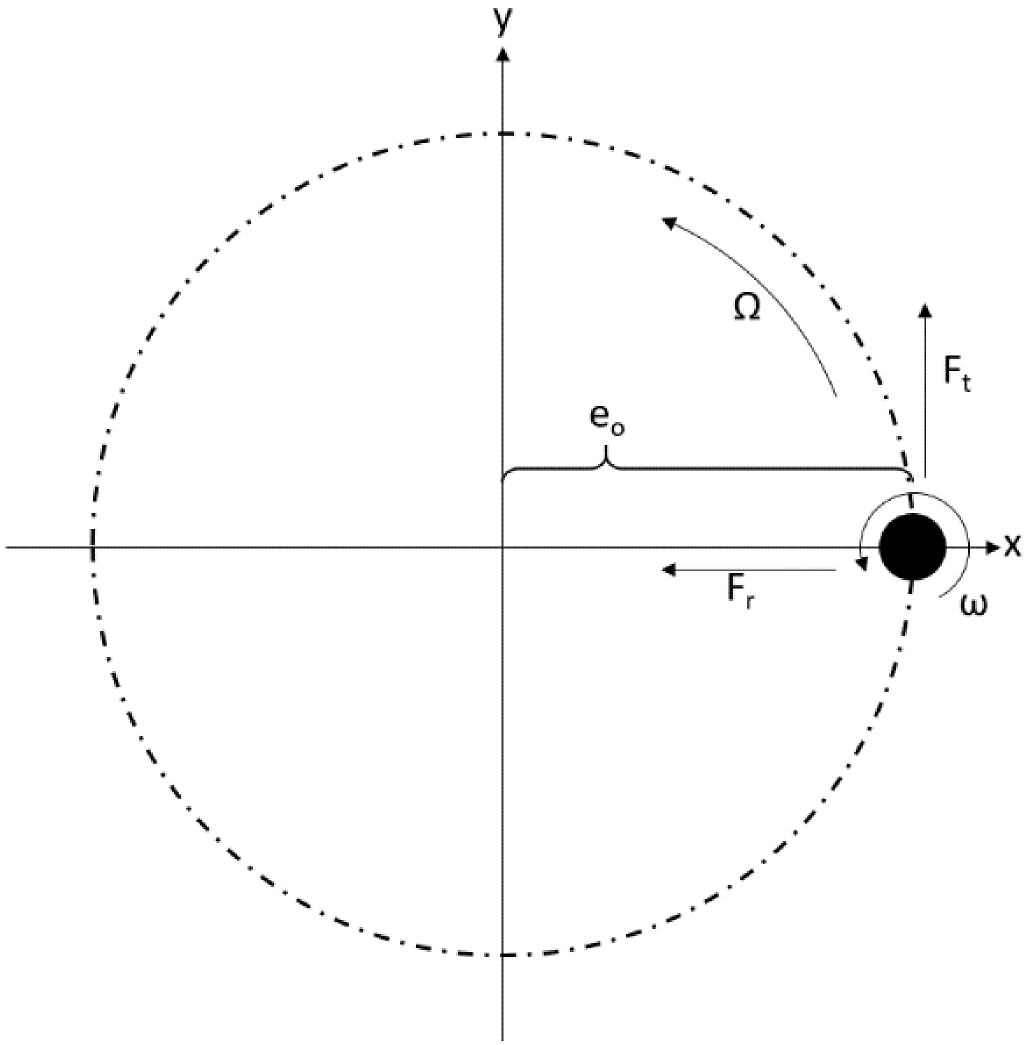

Figure 3 Rotor procession with radial and tangential forces

The radial and tangential forces shown above are called the effective stiffness and effective damping forces, respectively. Using terms from equation (2), the radial and tangential forces can be derived as,

$$\boldsymbol{F_r} = (\boldsymbol{K} + \boldsymbol{c}\Omega - \boldsymbol{M}\Omega^2)\boldsymbol{e_o}$$
$$\boldsymbol{F_t} = (-\boldsymbol{k} + \boldsymbol{C}\Omega - \boldsymbol{m}\Omega^2)\boldsymbol{e_o} \quad (3)$$

4. TEST RIG DESCRIPTION

4.1 TEST RIG

Figure 4 shows the test rig detailing stator assembly components. The test stand was originally designed in 1994 to test hydrostatic bearings [26]. Two stainless steel pedestals each hold a hydrostatic bearing that supports a 4.5 inch diameter rotor. The pedestals are 15 inches apart to accept a stator assembly in between. The cage surrounding the entire test section supports the hydraulic shakers, horizontal and vertical stiffeners. All components share this foundation to provide an increased structural stiffness to the stator assembly. The hydrostatic bearings housing includes pressure transducers to measure supply pressures within the bearing. Pressure transducers also measure the supply pressure at stator inlet and seal exit. The accelerometers, located orthogonally to each other, measure acceleration of the stator assembly. Four proximity probes, also orthogonal to the accelerometers, measure the position of the stator in reference to rotor shaft. Temperature probes are located at seal inlet, outlets, and piping system. The oil supply splits into two sections to the test rig. One is specifically for the seal inlet and the other is for the bearing lubrication. Two pumps provide oil supply for the bearings. Temperature probe readings help maintain acceptable operating conditions for the hydrostatic bearings.

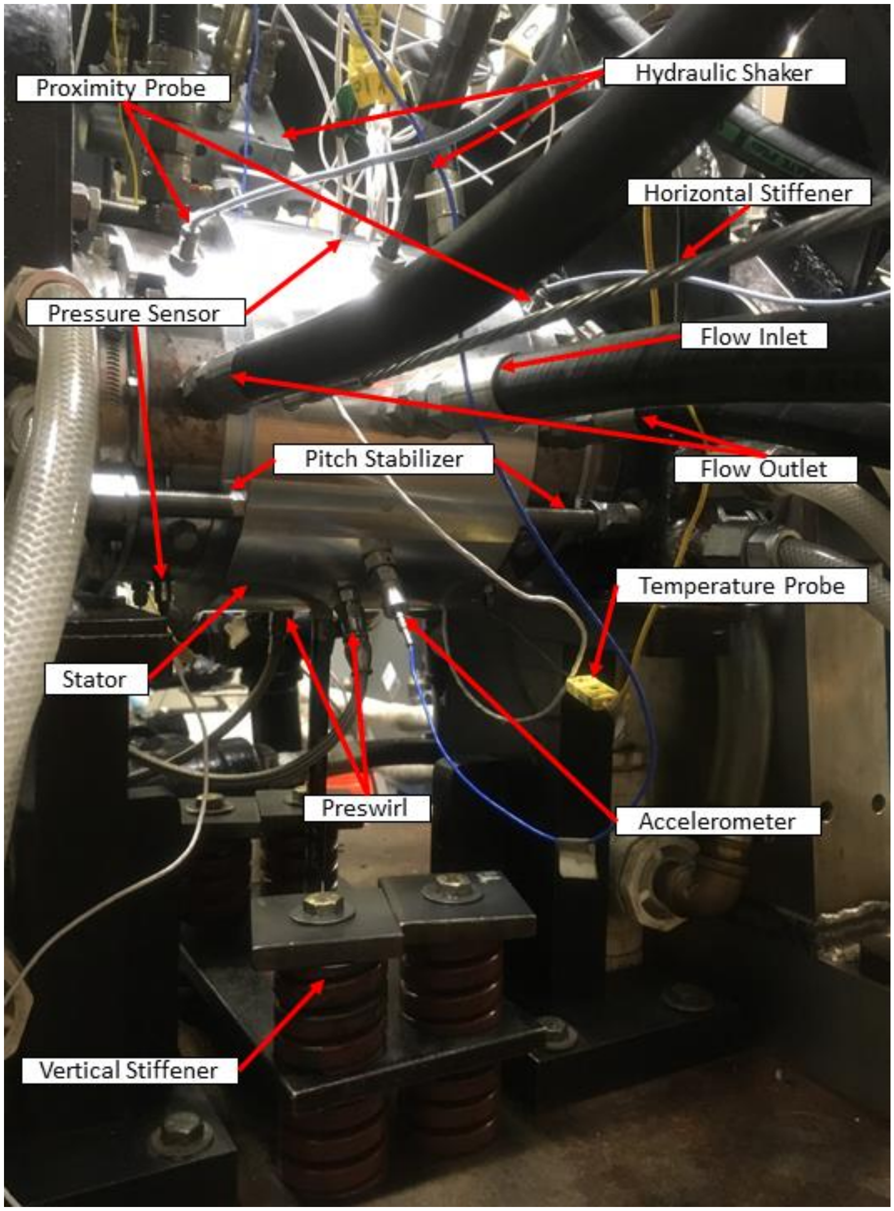

Figure 4 Close-up of the test section depicting stator assembly components

Figure 5 shows the cross-section of the stator assembly. Both a static and pitot tube connect to a differential pressure sensor. The measured value defines the preswirl ratio over a rotor speed.

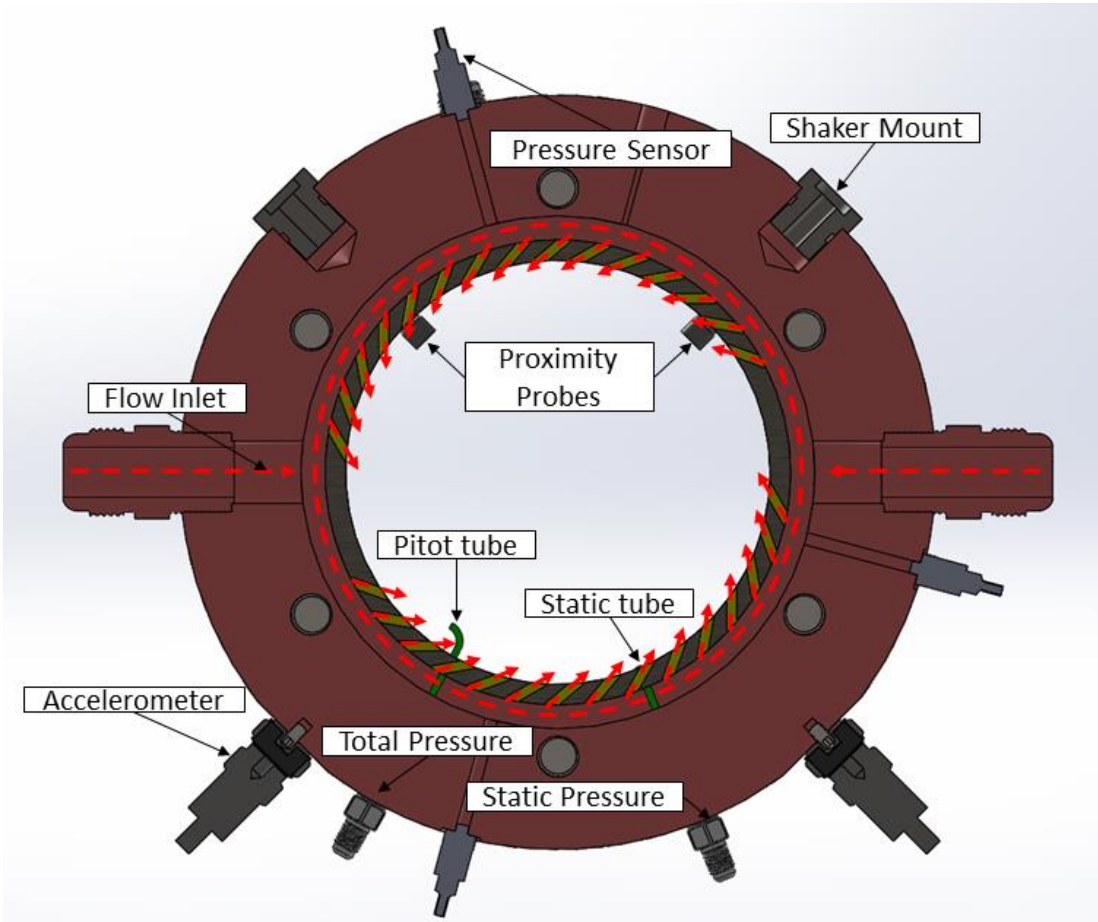

Figure 5 Cross-section of the stator assembly

4.2 TEST SEAL

Table 1 and Figure 6 provides the test seal properties and dimensions, respectively. As mentioned before, comparing to a FPDS, a conventional PDS features baffle walls only within its active pockets and not within its inactive pockets. This allows fluid to flow circumferentially within the inactive segment. For a FPDS, all segments restrict circumferential flow. The seal material is aluminum 7075 T6 and is

CNC milled from an entire billet. The seals fit into the stator in a back-to-back configuration to reduce axial thrust.

Table 1 Seal properties

ID (inches [mm]):	4.531 [115]	# of Pockets per Cavity:	8
Length (inches [mm]):	3.375 [85.7]	# of Buffer Walls (Circumferential):	8
L/D ratio:	0.745	# of Axial Pockets:	7
Material:	7075-T6	# of Small and Large Active Cavities:	3,4
Radial Clearance (inches [mm]):	.008 [.2]	# of Blades:	8
Pocket Depth (inches [mm]):	.1425 [3.6]	Small to Large Active Length Ratio:	0.429

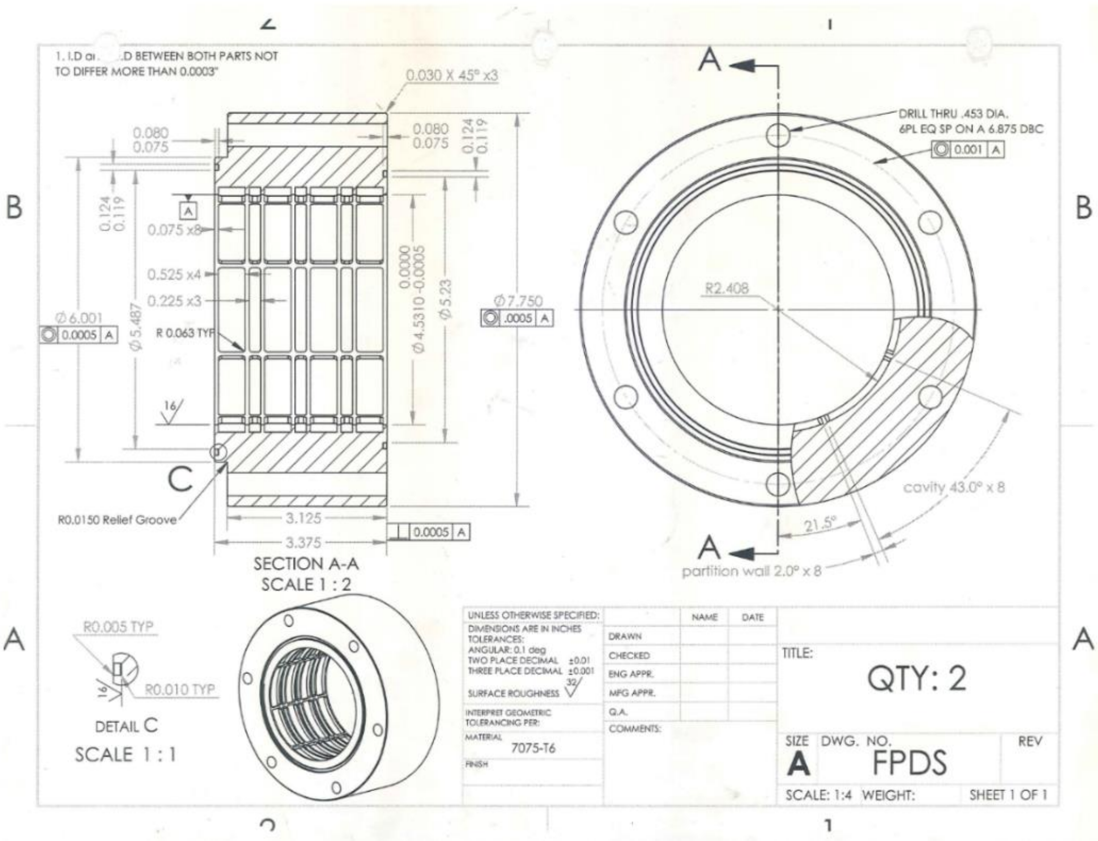

Figure 6 Fully-partitioned pocket damper seal design

5. EXPERIMENTAL RESULTS

5.1 TEST PROCEDURE

Table 2 shows the test matrix. When beginning the experiment, the inlet pressure and pressure ratio are first adjusted before increasing rotor to the desired speed. The test rig's first test condition, for any preswirl, is 25% pressure ratio with the rotor operating at 10 krpm. This specific test condition has the inlet pressure and exit pressure at 70 and 17.5 bar, respectively. The flow is choked at this pressure ratio. Once the system reaches steady state condition, the electrohydraulic shakers input a pseudorandom excitation sequentially for each axis, following the procedure described in [24]. The pseudorandom excitation lasts roughly 30 seconds providing 10 averages, and it is repeated 3 times for each axis. This procedure is repeated for the 15 and 20 krpm rotor speeds, before adjusting the discharge pressure to achieve the next pressure ratio.

Table 2 Test Matrix

Preswirl	Inlet/Exit Pressure (Bar [psi])	Pressure Ratio (%)	Rotor Speed (krpm)	Rotor Surface Speed (m/s)
Low, Medium, and High	70/17.5 [1015/254]	25	10	60
			15	90
			20	120
	70/35 [1015/508]	50	10	60
			15	90
			20	120
	70/45.5 [1015/660]	65	10	60
			15	90
			20	120

5.2 RESULTS

5.2.1 FULLY-PARTITIONED POCKET DAMPER SEAL

Figure 7 through Figure 11 represents the direct stiffness, cross-coupled stiffness, damping, effective damping, and effective stiffness for the FPDS, respectively.

Each figure is arranged into a three by three matrix. Each column represents rotor speed increasing from the left to right from 10 krpm, 15krpm, to 20krpm. Each row represents the inlet preswirl increasing from the top to bottom from low, medium, to high preswirl. Each graph in the matrix shows measured values from the FPDS. There are three sets of pressure ratios for the FPDS- 25%, 50%, and 65%. Each graph has a black dashed line representing the rotor's operating speed. Data to the left is excitation that is sub-synchronous to rotor speed and data to the right is excitation that is super-synchronous.

Figure 7 shows the direct stiffness vs excitation frequency for the FPDSs. Measured values show an overall increase in stiffness values with increasing excitation frequencies. The FPDS experiences negative direct stiffness for lower excitation frequencies. At high preswirl, the FPDS displays a decreasing trend resulting in negative direct stiffness for high excitation frequencies. Rotor speed and preswirl show no apparent influence on direct stiffness. The FPDS could potentially lower the machine natural frequency due to the negative direct stiffness and its axial location, but these values are relatively small when compared to an oil-lubricated tilting pad bearing (i.e. a 4" bearing with L/D: 0.3 would develop 10x to 20x larger direct stiffness coefficients).

Hence, even if the FPDS has negative stiffness, it is insignificant compared to the rotor-bearing system stiffness.

Figure 8 shows the cross-coupled stiffness vs excitation frequency. The measured values for the FPDS show frequency independence except for high preswirl. The cross-coupled stiffness values grow with an increase in rotor speeds and preswirls. At high preswirl, the measured values decrease when operating toward high excitation frequencies.

Figure 9 shows the damping versus excitation frequency for the FPDS. The measured values for the FPDS shows no apparent change with an increase in rotor speed nor preswirl. Measured values for the FPDS shows no influence from excitation frequency. Increasing from low to high preswirl increases damping to 25 percent at most.

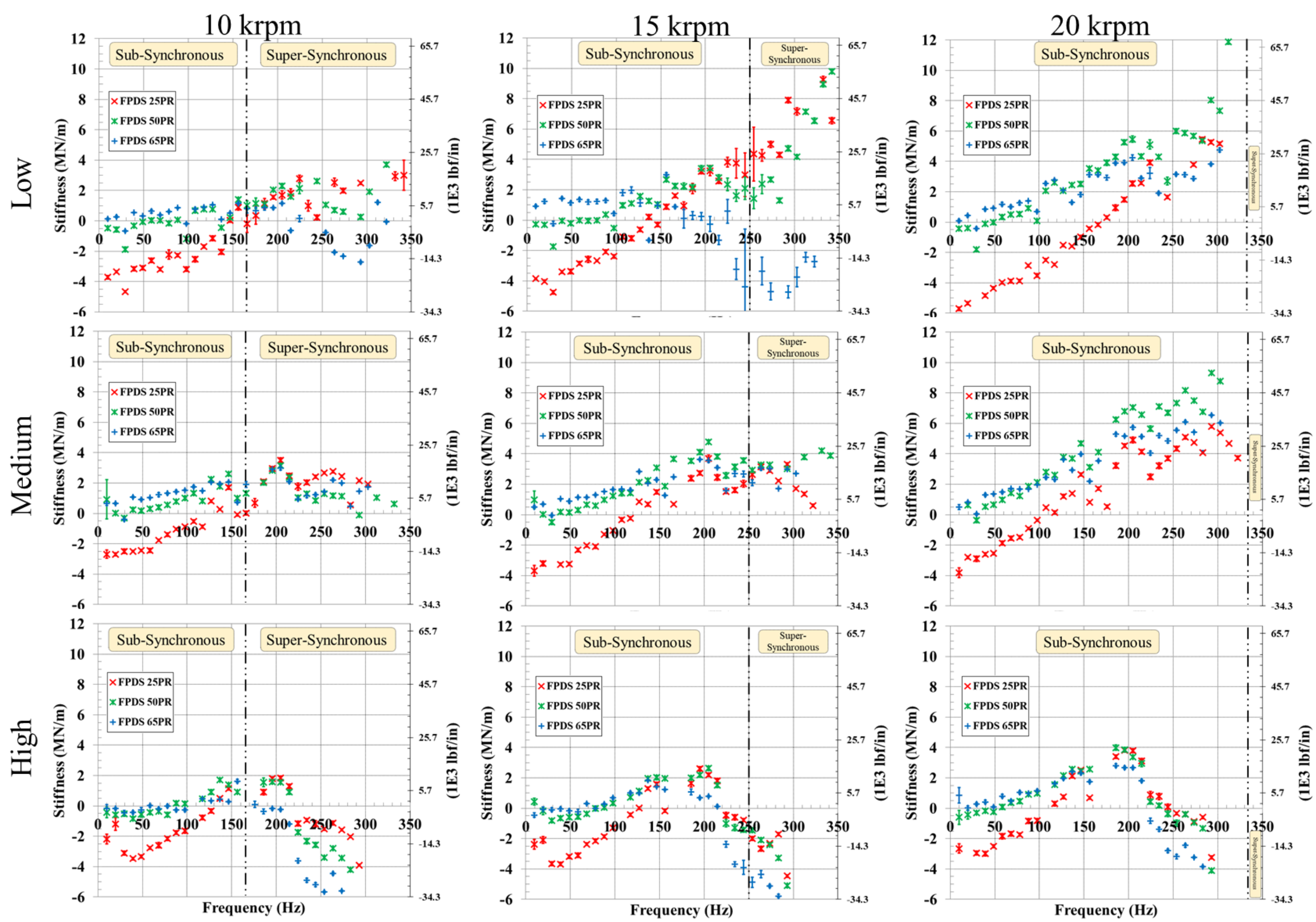

Figure 7 Direct stiffness coefficients versus frequency for FPDS, three pressure ratios (25%, 50%, 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

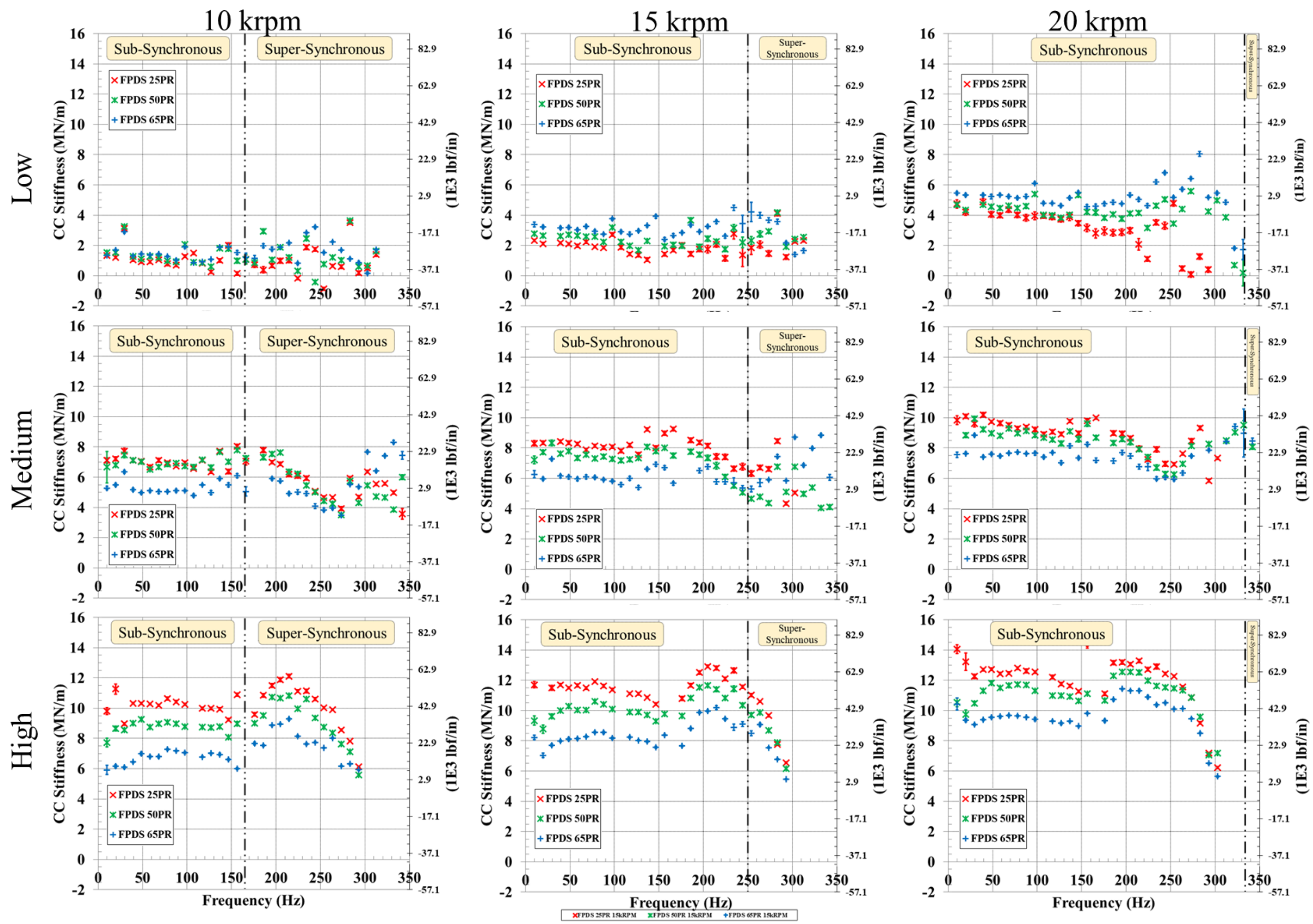

Figure 8 Cross-coupled stiffness coefficients versus frequency for FPDS, three pressure ratios (25%, 50%, 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

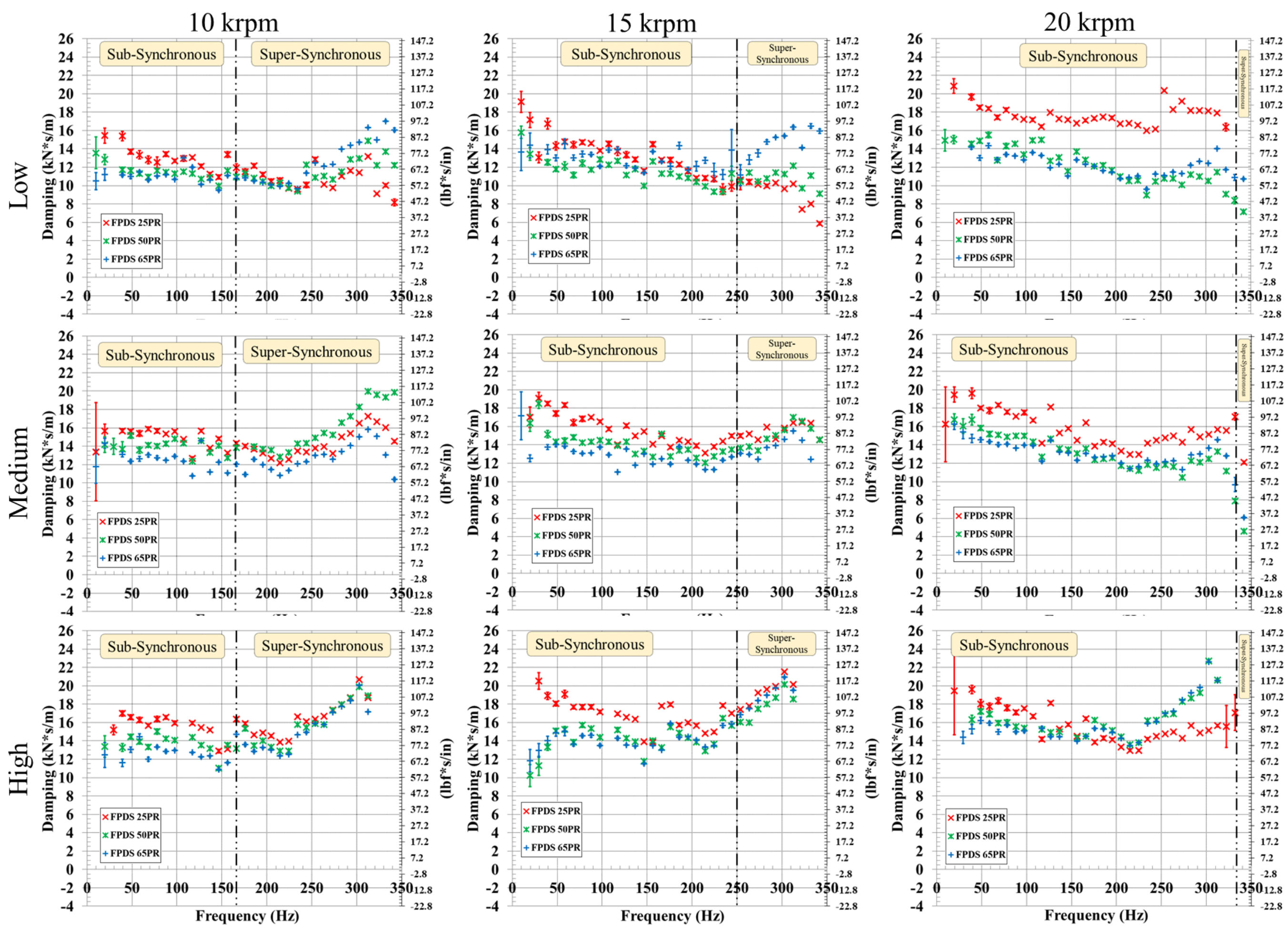

Figure 9 Direct damping coefficients versus frequency for FPDS, three pressure ratios (25%, 50%, 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

Figure 10 shows the effective damping versus excitation frequency, with the effective damping defined as [3, 10]

$$\boldsymbol{C_{eff} = C\left(1 - \frac{k}{C\omega}\right)} \tag{4}$$

Effective damping combines the stabilizing and destabilizing contributions of the direct damping, “C”, and cross-coupled stiffness, “k”, respectively. The larger the positive value, the more stable the seal. Measured values for the FPDS shows higher influence for low excitation frequencies. At low excitation frequencies, the measured values are negative and can be a cause for concern if the systems natural frequency falls within this region. The frequency at which values for effective damping transfers from negative to positive is denominated crossover frequency. Crossover frequency for the FPDS increases with increasing rotor speed and preswirl. For 20 krpm, the crossover frequency increases from roughly 60 Hz to 120 Hz when transitioning from low to high preswirl. For low excitation frequencies the values are extremely negative as in the case of textured seals. The magnitudes at low frequencies grow with rotor speed and preswirl.

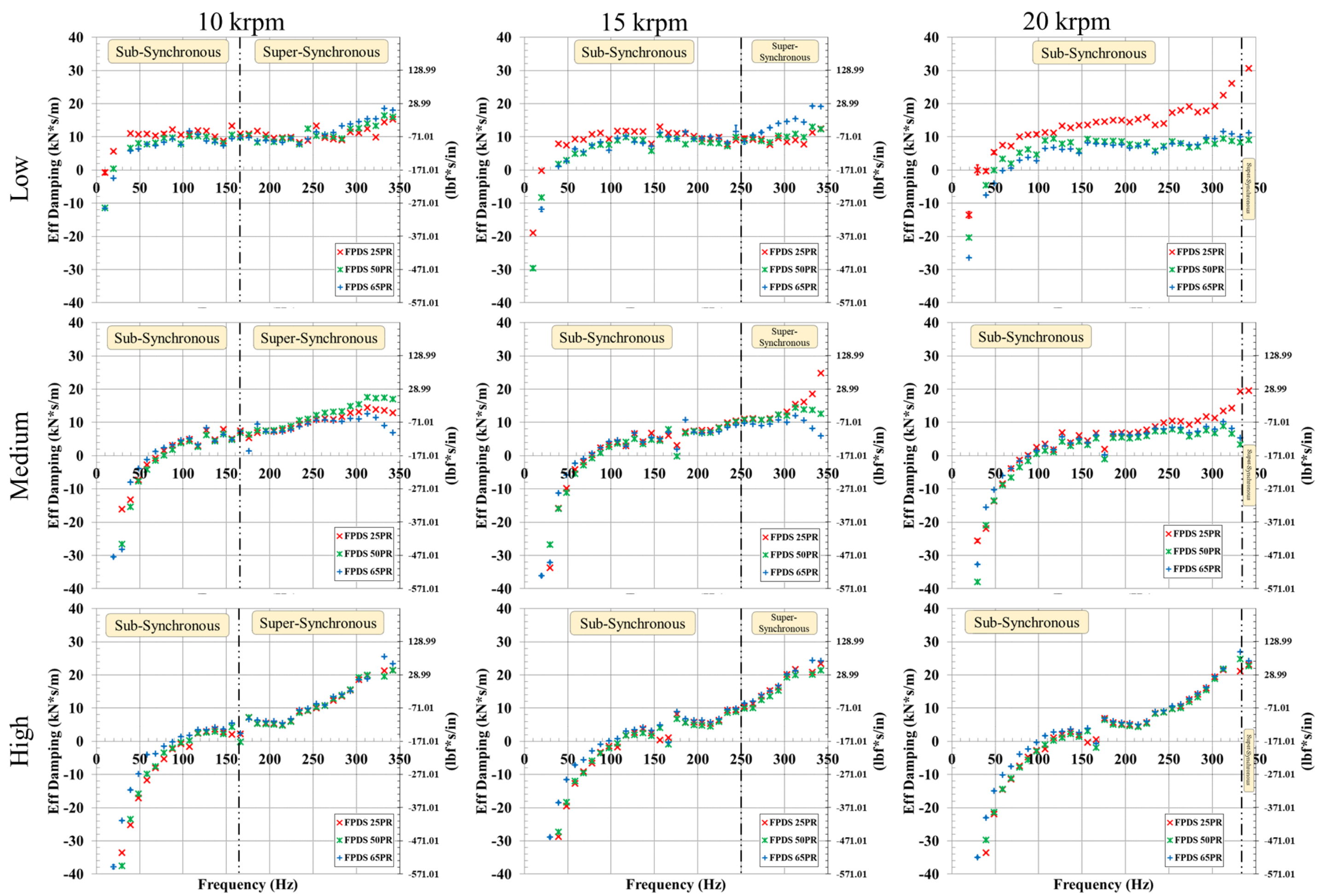

Figure 10 Effective damping coefficients versus frequency for FPDS, three pressure ratios (25%, 50%, 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

Figure 11 shows the effective stiffness vs excitation frequency for the FPDS. Effective stiffness combines both the cross-coupled damping and direct stiffness to provide the overall seal stiffness. Effective stiffness is defined as [3, 10]

$$\boldsymbol{K_{eff} = (K + c\omega)} \tag{5}$$

The experiments show effective stiffness values enlarge with an increase in excitation frequency except for high preswirl. At high preswirl, the measured values begin decreasing at 180 Hz. The values show the larger the pressure ratio the higher the influence of excitation frequency. The 65 percent pressure ratio shows to have a larger negative linear digression than the 50 and 25 percent pressure ratios. No explanation is determined for this phenomenon.

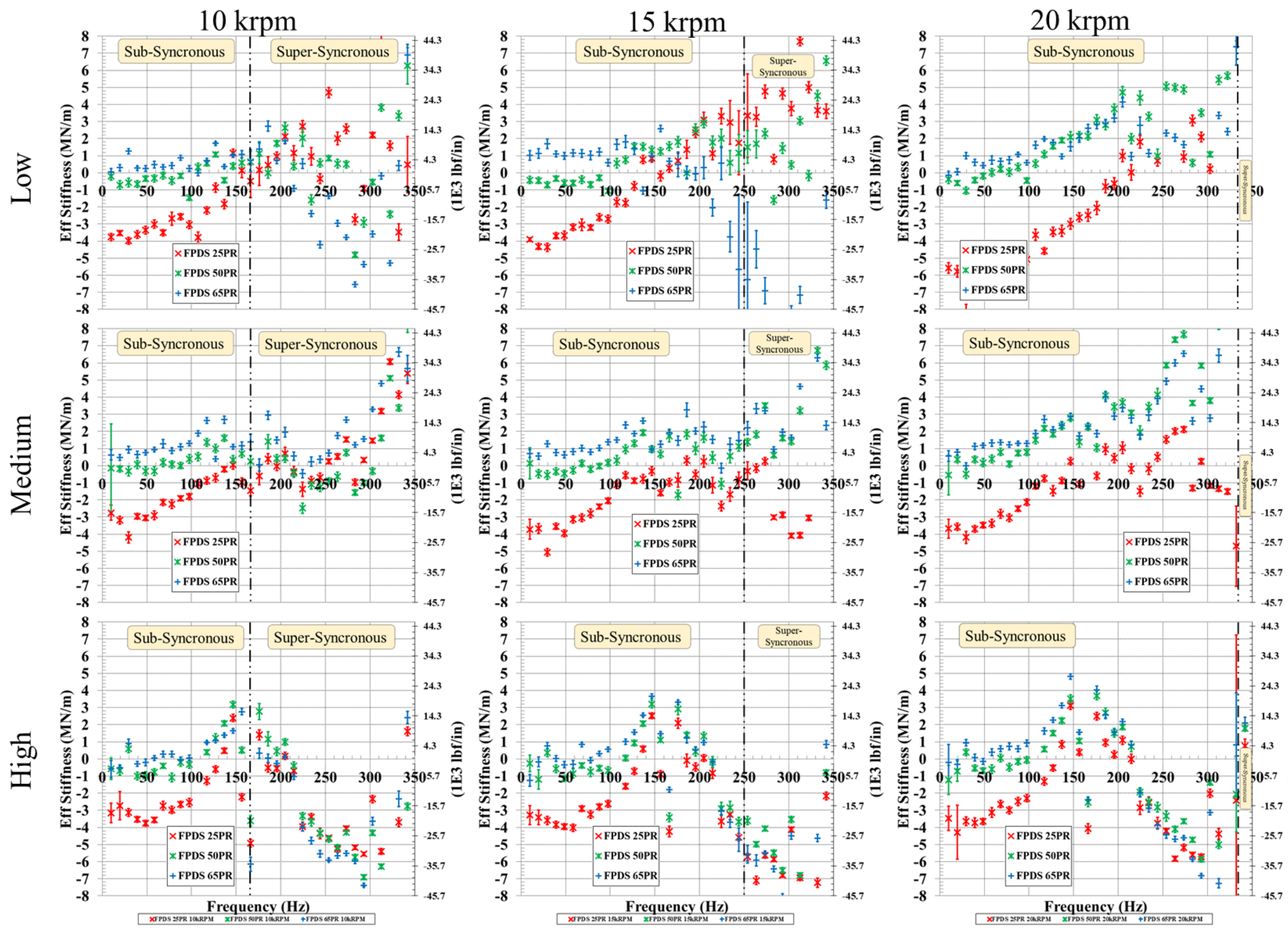

Figure 11 Effective stiffness coefficients versus frequency for FPDS, three pressure ratios (25%, 50%, 65%), three pressure ratios (25%, 50%, 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

5.2.2 TEXTURED SEAL COMPARISON

Figure 12 through Figure 19 compares the FPDS to the honeycomb and labyrinth from previous investigations under similar conditions. Measured values of the honeycomb seal are from Sprowl's thesis [5]. For comparison purposes, the data is normalized respect to clearance and supply pressure following the expression given in [5].

$$\boldsymbol{K}^{*} = \frac{\boldsymbol{K} \cdot \boldsymbol{C_r}}{\boldsymbol{F_o}} = \boldsymbol{K}\left(\frac{\boldsymbol{C_r}}{\Delta \boldsymbol{P} \cdot \boldsymbol{D_{in}} \cdot \boldsymbol{L}}\right) \qquad (6)$$

Normalizing the measured values results in non-dimensional values for stiffness and seconds for damping. Measured values of the labyrinth seal are from Picardo's thesis [27].

The original honeycomb seal would be expensive to manufacture, which in turn places an advantage to the FPDS. However, a hole-pattern seal can produce similar benefits as a honeycomb seal and have simpler manufacturability when compared to the FPDS. Manufacturability does not differ between the FPDS and these textured seals if plunge EDM is used to create the honeycomb pattern or a simple right-angle drill to create a hole pattern.

Each figure is arranged into either a one by three or three by three matrix. The one by three matrix compares three graphs with columns referencing to the rotor speed from left to right. The three by three matrix shows columns as a thousand cycles per minute (kcpm) and rows as rotor speed in thousand revolutions per minute. The columns increase from the left to right from 10 kcpm, 15kcpm, to 20kcpm. Note that kcpm refers to excitation frequency, as opposed to rotor speed given in thousand revolutions per minute (krpm). The rows increase with rotor speed from the top to bottom from 10, 15, to 20 krpm. Each graph shows measured values from both seals, the honeycomb and the FPDS. Each seal has three sets of pressure ratios; the honeycomb seal- 15%, 35%, and 50% and the FPDS- 25%, 50%, and 65%.

Figure 12 shows the stiffness vs excitation frequency for the honeycomb, labyrinth, and FPDSs at low preswirl. Similar to Figure 7 through Figure 11, the dashed line represents the rotor’s operating speed. The rationale for only showing low preswirl and not including medium nor high inlet preswirl is explained hereafter in this section. Measured values for the FPDS show lower stiffness values when compared to the honeycomb seal. Stiffness values follow a similar trend to the honeycomb seal with increasing excitation frequency and rotor speed. Yet, the honeycomb seal has positive stiffness and the FPDS has low or negative stiffness. Though it is not evidently shown in the FPDS experimental results, the honeycomb seal shows an increase in stiffness with an increase in pressure ratio or decrease in pressure drop.

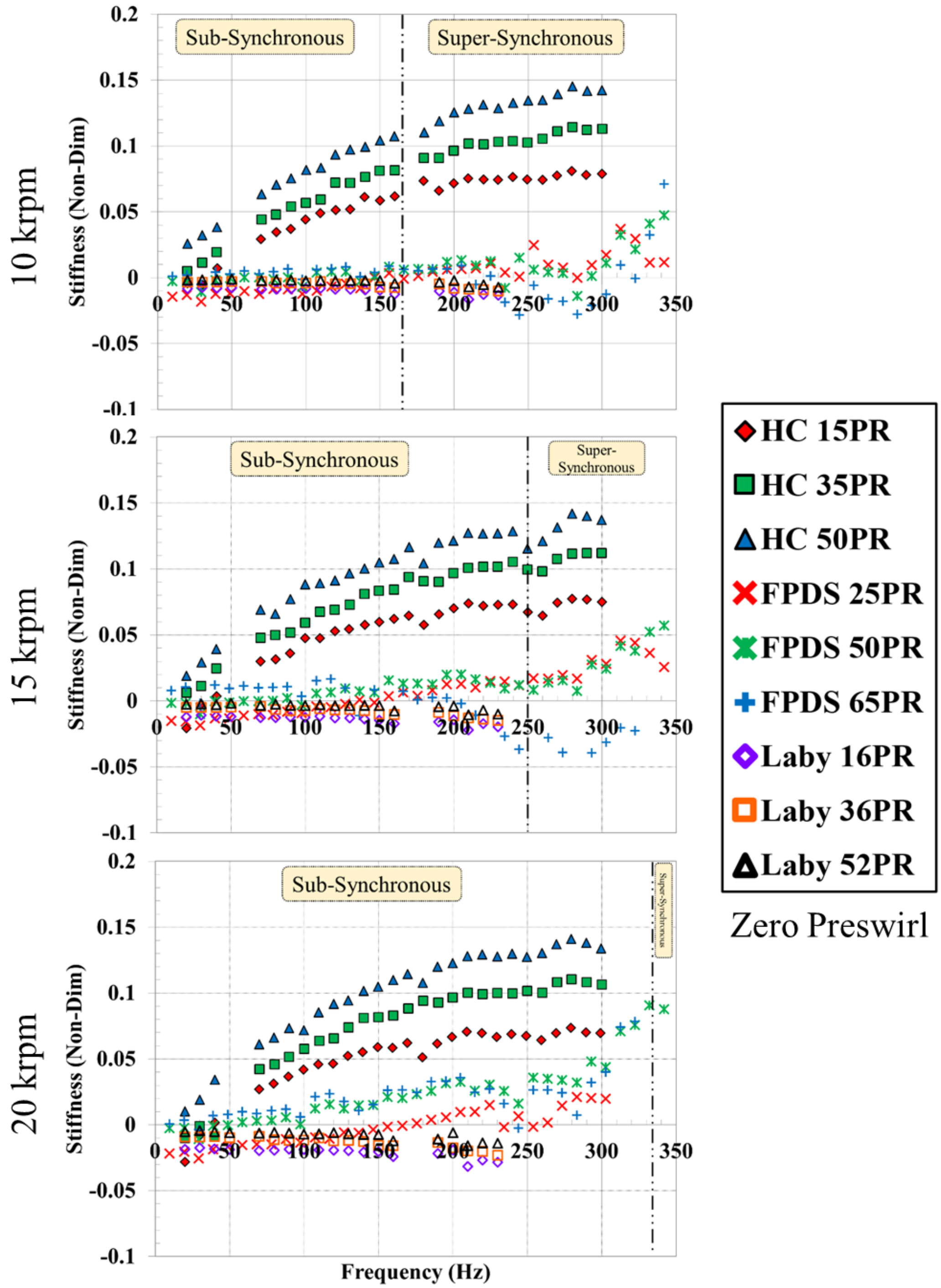

Figure 12 Direct Stiffness coefficients versus frequency for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three rotor speeds (10, 15, 20 krpm), and low preswirl.

Figure 13 shows the cross-coupled stiffness versus excitation frequency for the honeycomb, labyrinth, and FPDS at low preswirl. Measured values for the FPDS show no influence from excitation frequency when compared to the honeycomb and labyrinth seals. The FPDS shows a similar cross-coupled stiffness values from mid to high excitation frequencies ranging from 150 to 350 Hz when compared to honeycomb seal.

Figure 14 shows the damping versus excitation frequency for the honeycomb, labyrinth, and FPDSs at low preswirl. Comparing the FPDS to the other two seals, the damping values display little influence from excitation frequency and rotor speed. At lower frequencies, the honeycomb seal shows larger values but decrease with increasing excitation frequency. The FPDS has larger damping values than the honeycomb seal at around 150 to 170 Hz.

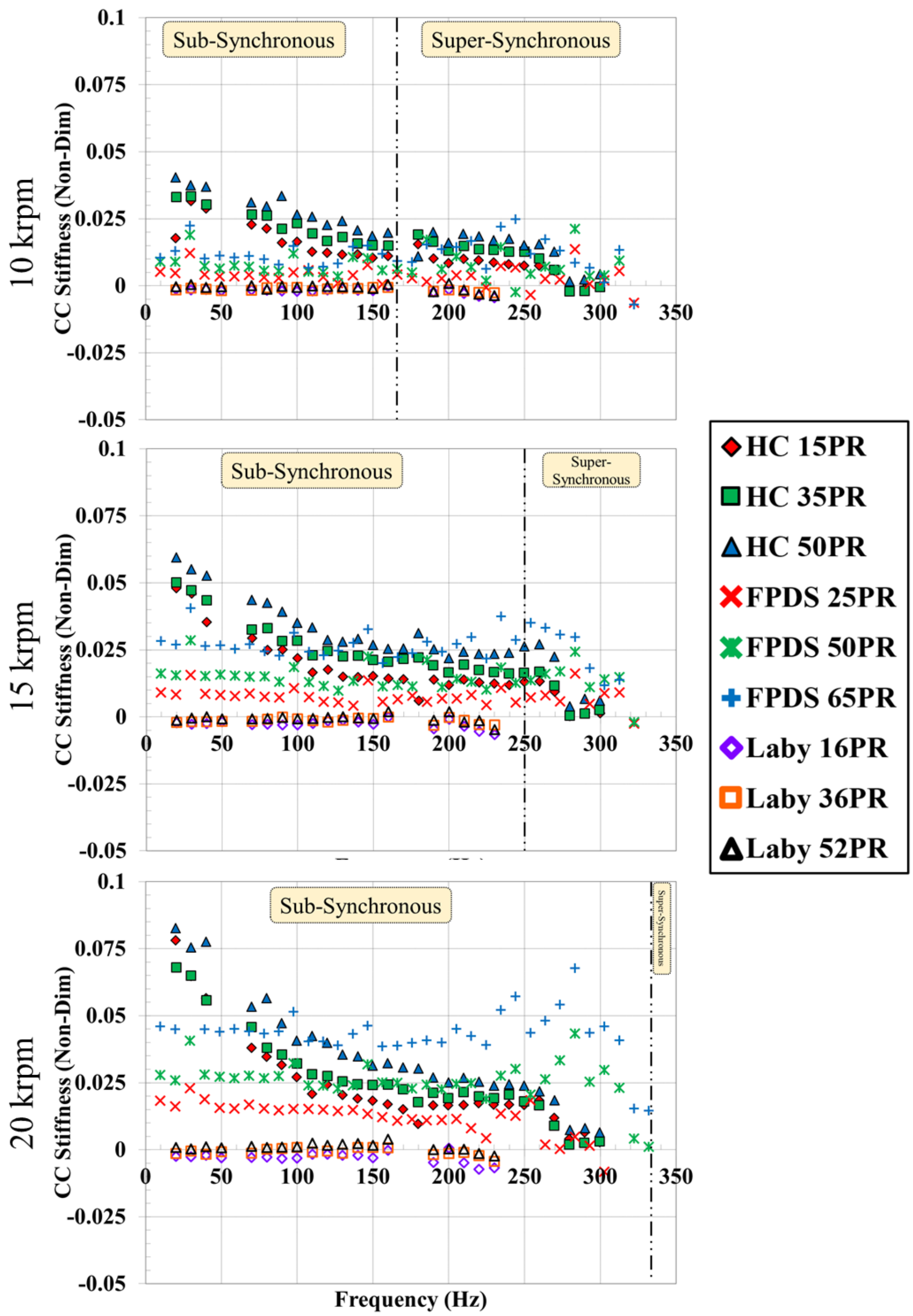

Figure 13 Cross-coupled stiffness coefficients versus frequency for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three rotor speeds (10, 15, 20 krpm), and low preswirl.

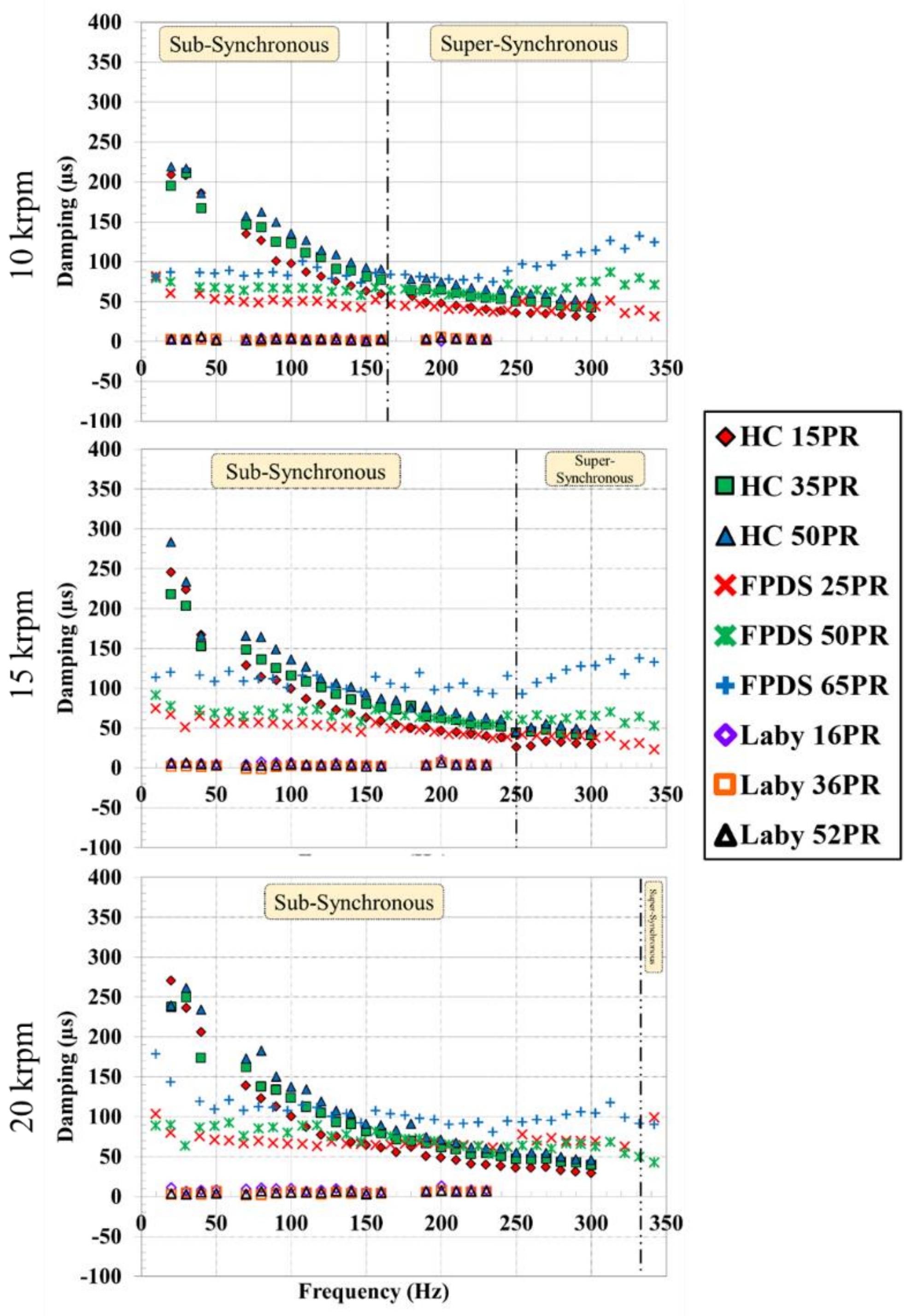

Figure 14 Direct Damping coefficients versus frequency for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three rotor speeds (10, 15, 20 krpm), and low preswirl.

The following figures compare force coefficients for all the seals versus preswirl ratios. Comparisons of the force coefficients versus frequency are not possible for the medium and high preswirl rings. While the preswirl rings are the same for all the seals, the actual swirl ratio is a function of the seal leakage. Since the FPDS leakage rate is higher than that of the honeycomb seal, the preswirl values for the FPDS are larger for the medium and high preswirl rings.

Figure 15 shows the effective damping versus excitation frequency for the honeycomb, labyrinth, and FPDS at low preswirl. Measured values for the FPDS show an overall higher influence at the lower excitation frequencies. When comparing to the honeycomb seal, the measurements follow a similar trend with increasing excitation frequency. The FPDS shows a higher effective damping at synchronous vibration frequency when compared to the honeycomb seal, which presents higher values near cross-over frequency. The crossover frequency for the two seals have similar values and both increase with rotor speed. Due to limited data from Sprowl [5], it is unknown how the measurements from the FPDS compare to the negative effective damping values for the honeycomb seal.

Figure 16 shows the effective damping versus preswirl for the honeycomb, labyrinth, and FPDS. Each data point corresponds to the stator preswirl ring at low, medium, or high preswirl. Testing with a higher preswirl ring is denoted with a larger size data point. Sprowl’s data does not reach excitation frequencies up to 330 Hz and as a result, only the FPDS has values for 20kcpm.

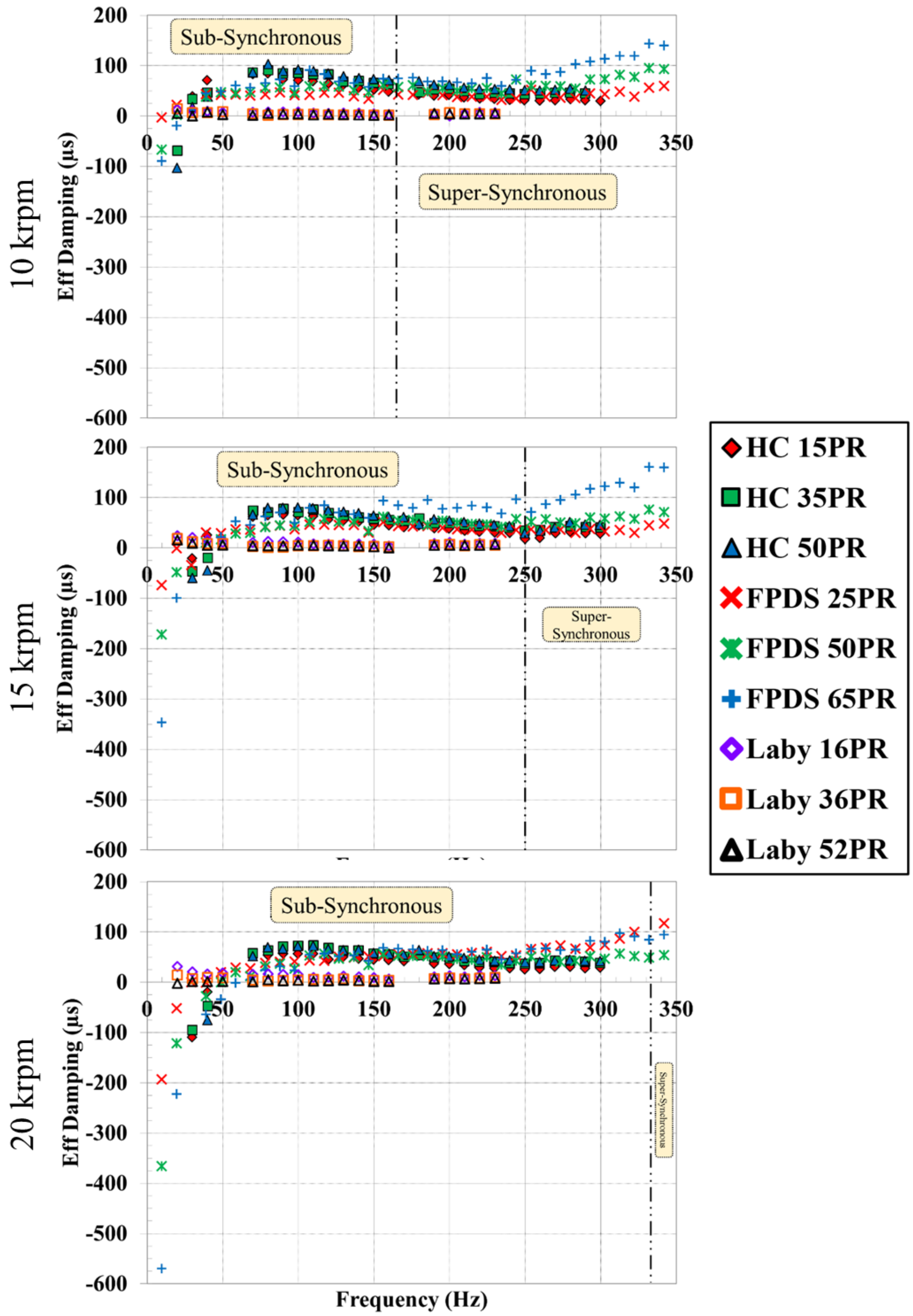

Figure 15 Effective damping coefficients versus frequency for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three rotor speeds (10, 15, 20 krpm), and low preswirl.

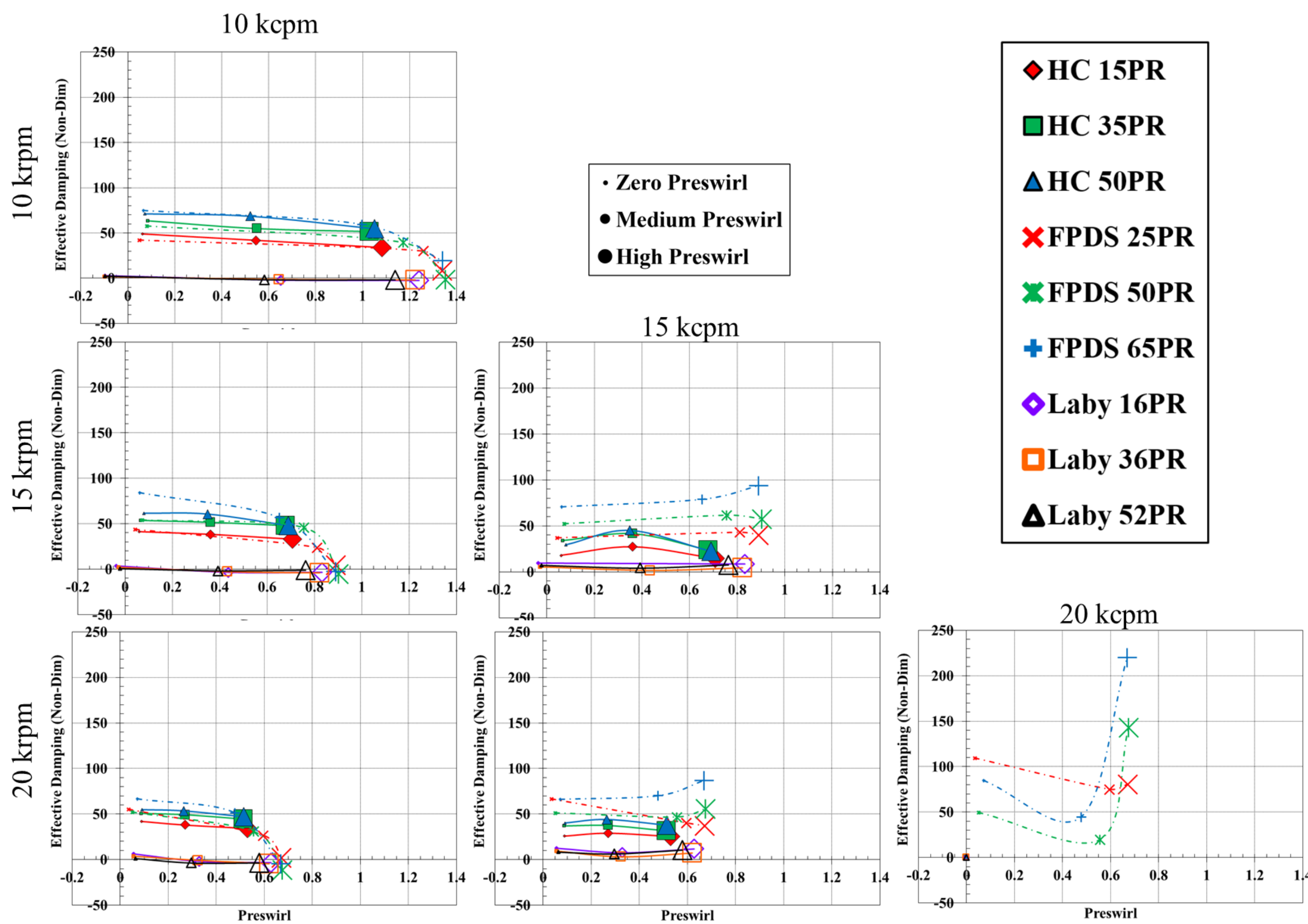

Figure 16 Effective damping coefficients versus preswirl for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three rotor speeds (10, 15, 20 krpm), three synchronous excitations (10, 15, 20 kcpm), and three preswirls (low, medium, high).

Figure 17 shows peak effective damping vs preswirl at differing rotor speeds for the honeycomb, labyrinth, and FPDS from sub-synchronous to synchronous frequency. When comparing to experimental values from Sprowl [5], the FPDS shows comparable magnitudes but has higher inlet preswirl. The honeycomb seal shows no apparent change in peak effective damping with in an increase in rotor speed, while the FPDS has differing values between rotor speeds. Peak values for the honeycomb seal lie closer to the crossover frequency, where peak values for the FPDS lie closer to synchronous excitation.

Figure 18 shows the crossover frequency versus preswirl for the honeycomb, labyrinth, and FPDS. Measured values for the FPDS show high crossover frequencies for medium and high preswirl ring. Measured and experimental values for all seals at the low preswirl ring show a comparable range. Data points for the low preswirl show both the honeycomb and FPDS having similar values in preswirl and range between 28 and 62 Hz. The labyrinth seal has no crossover frequency at low preswirl as the effective damping is positive over entire frequency range.

Figure 19 shows the leakage versus preswirl for the honeycomb, labyrinth, and FPDS. Measured values for the FPDS are much higher, by a factor of roughly one-third, when compared to the other two seals for most operating conditions. Increasing the rotor speed does decrease the leakage, but the FPDS still vastly underperforms respect the honeycomb and labyrinth seal. Pressure shows more influence in leakage than increasing the inlet preswirl. Low preswirl shows the highest leakage where high preswirl has the lowest.

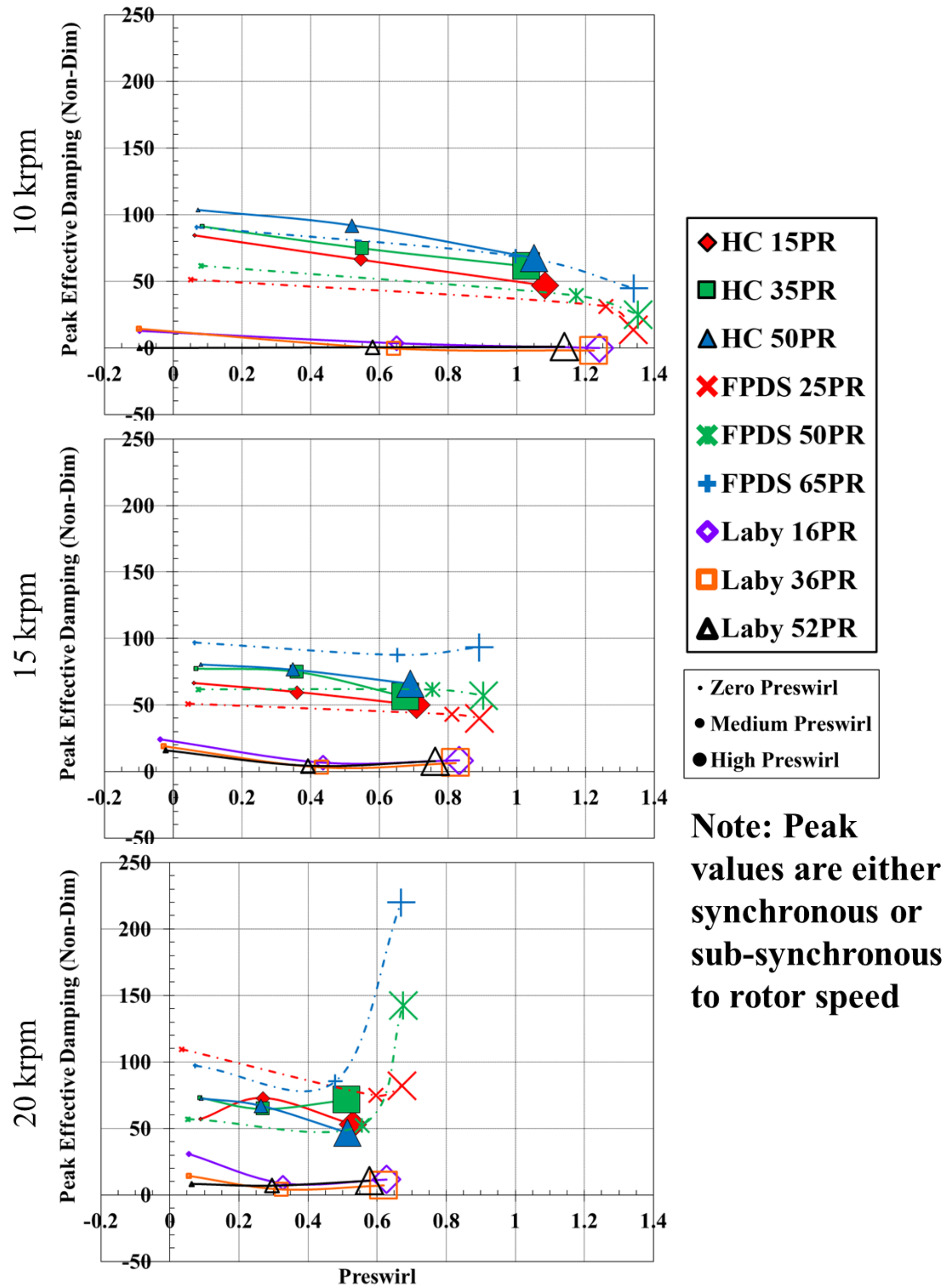

Figure 17 Peak effective damping coefficients versus preswirl for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

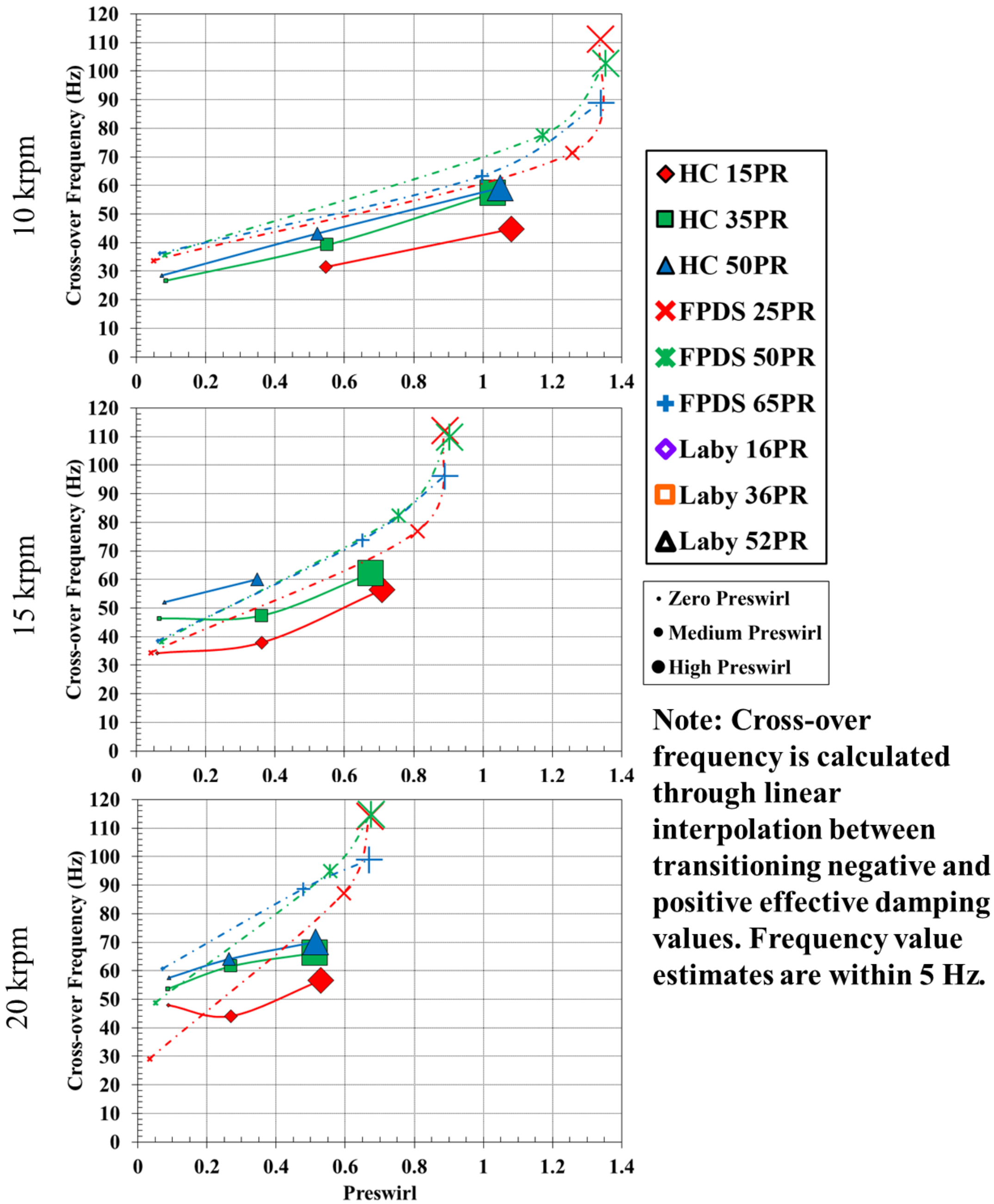

Figure 18 Crossover frequency versus preswirl for FPDS, honeycomb [5] and labyrinth [27] seals, multiple pressure ratios (15% – 65%), three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

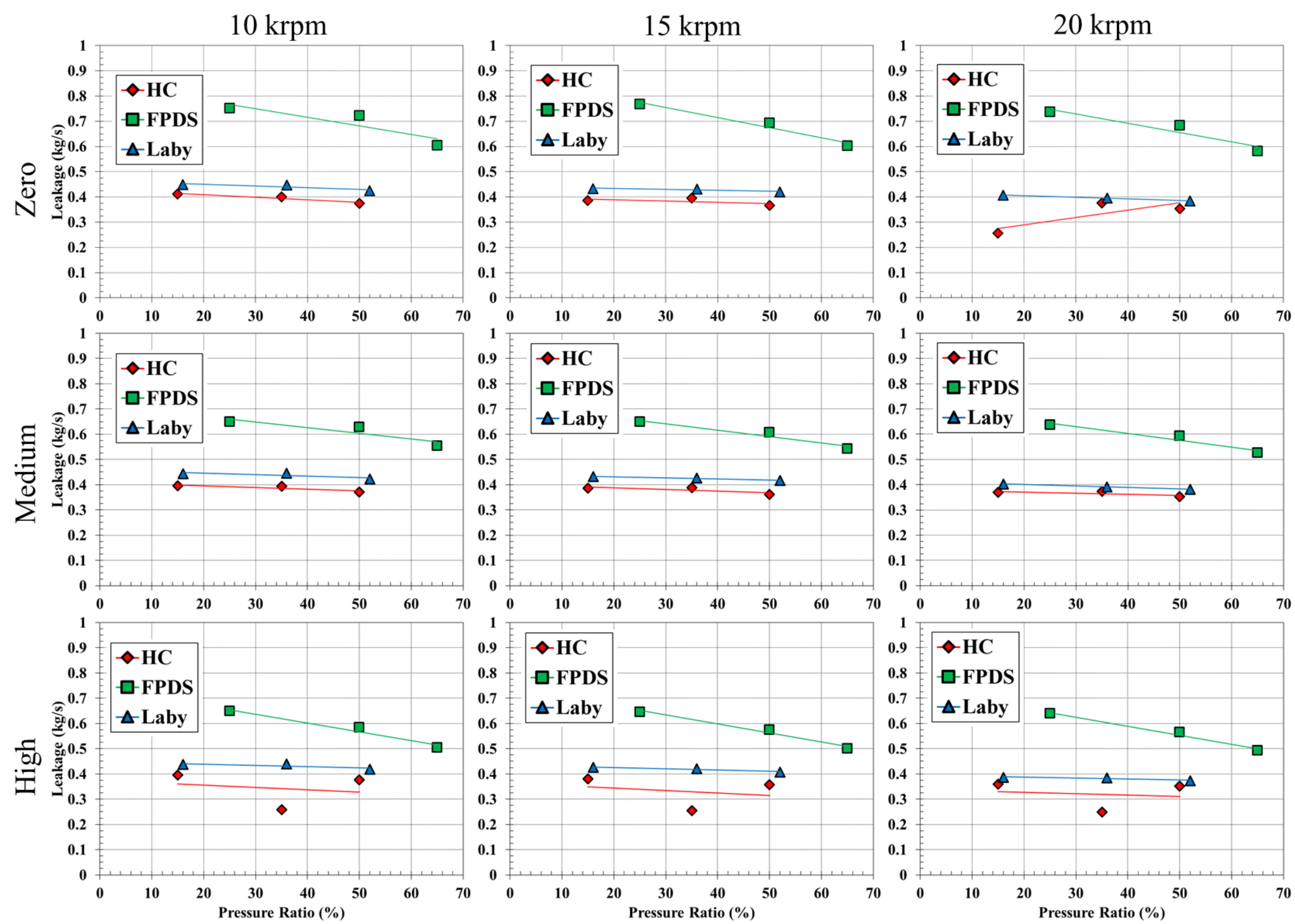

Figure 19 Leakage versus pressure ratio for FPDS, honeycomb [5] and labyrinth [27] seals, three preswirls (low, medium, high), and three rotor speeds (10, 15, 20 krpm).

6. SUMMARY

6.1 CONCLUSIONS

A characterization of the dynamic and leakage performance of a FPDS is presented. The seal was tested with a supply pressure of 70 bars and multiple pressure ratios (35,50,65%) speeds (10,15,20 krpm) and preswirls (0.2-1.2). The test results are compared to leakage and dynamic performance data from a honeycomb and a labyrinth seal tested at similar operating conditions. The following are the main findings from the experimental results and comparisons between the three seals:

(1) The FPDS possesses very low to negative direct stiffness at low frequencies. Comparing to the honeycomb seals, the FPDS provide little stiffness, which magnitude decreases as the pressure ratio increases

(2) The FPDS cross-coupled stiffness is frequency independent, but increases in magnitude with rotor speed and preswirl. Cross-coupled stiffness decreases as the pressure ratio increases.

(3) The direct damping of the FPDS decreases as the pressure ratio increases. The magnitude increases as the preswirl increases

(4) Effective damping values are negative at low excitation frequencies. The measurement values increase in magnitude with increasing rotor speed and inlet preswirl. Effective damping increases with increasing synchronous excitation frequency. The crossover frequencies improve greatly when

transitioning from high to low preswirl. The values decrease from ~100 Hz to ~50 Hz.

(5) The FPDS leaks roughly 33% more than the honeycomb seal.

(6) The FPDS exhibits lower stiffness when compared to the honeycomb seal.

(7) The FPDS exhibits less cross-coupled stiffness at low frequencies when compared to the honeycomb seal. At mid to high excitation frequencies the FPDS is comparable to the honeycomb seal.

(8) The FPDS exhibits less damping than the honeycomb seal at lower excitation frequencies.

(9) The FPDS and honeycomb seals have similar effective damping values. Specific conditions do provide the FPDS with an advantage. At low preswirl, the FPDS has favorable crossover frequencies when compared to the honeycomb seal. While the honeycomb seal has lower crossover frequency when inlet preswirl increases.

Considering that the FPDS presents higher leakage, small overall improvements in effective damping and smaller stiffness when compared to the honeycomb seal, it is suggested the selections of the seal should be done in a case-by-case basis. Besides manufacturing considerations, the FPDS may be a better alternative to a textured seal in the case that adding stiffness to the system will decrease the separation margin between the compressor running speed and natural frequency, which could place the compressor out of API compliance. In these cases, the FPDS will have a better advantage in providing damping to the system.

6.2 RECOMMENDATIONS

Further testing is needed for mainly air conditions as in 90% to 98% gas volume fraction (GVF). These conditions provide a response on how these seals behave when small amounts of liquid is present in the compressor core flow.

Another seal design, scallop, could provide a needed compromise between manufacturing time and equivalent dynamic response to the textured seal and FPDS. The scallop design uses a groove as a labyrinth seals except the grooves are separated as in PDS [28].

Flow meter calibration for higher pressures will further verify measurements for needed test conditions. Adding thicker wires for the horizontal stiffener can increase the testing envelope for lower pressure ratios.

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APPENDIX

APPENDIX A: TEST CODE

Table 3 below is a key decoder for describing a specific the test condition. The code is in a four digit format. First digit represents either low, medium, or high preswirl. Second digit represents the rotor speed from either 10, 15, or 20 krpm. The third digit represents the pressure ratio from either 25%, 35%, 50%, or 65%. The four digit represents the GVF from either 100%, 98%, 96%, 94%, 92%, or 90%.

Table 3 Test condition key decoder

Test Code [ABCD]			
A	**B**	**C**	**D**
0-Zero Preswirl	0-10 krpm	0-25 PR	0-100% GVF
1-Medium Preswirl	1-15 krpm	1-35 PR	1-98% GVF
2-High Preswirl	2-20 krpm	2-50 PR	2-96% GVF
		3-65 PR	3-94% GVF
			4-92% GVF
			5-90% GVF

APPENDIX B: TEST CONDITIONS

Table 4 through Table 6 are test conditions for low, medium, and high preswirl. These tables provide values for inlet pressure, exit pressure, leakage rate, and other sensor readings.

Table 4 Test conditions for low preswirl

Test Conditions [Code]	Inlet pressure [PSI]	Exit pressure [PSI]	Pressure Ratio (Exit/Inlet) [%]	GVF [%]	Temp Inlet [°F]	Rotor Speed [krpm]	Air Flow Rate per seal [kg/s]	Oil Flow Rate per seal [kg/s]	Oil Density [kg/m^3]	Preswirl Ratio [%]
0000	1024	281	0.27	100	59	10	0.964	0	0	0.049
0100	1021	282	0.28	100	64	15	0.914	0	0	0.042
0200	1025	270	0.26	100	38	20	0.798	0	0	0.034
0020	1020	523	0.51	100	50	10	0.971	0	0	0.080
0120	1028	530	0.52	100	57	15	0.900	0	0	0.072
0220	1019	534	0.52	100	60	20	0.791	0	0	0.050
0030	1022	648	0.63	100	49	10	0.940	0	0	0.067
0130	1022	675	0.66	100	52	15	0.877	0	0	0.061
0230	1017	673	0.66	100	58	20	0.766	0	0	0.072

Table 5 Test conditions for medium preswirl

Test Conditions [Code]	Inlet pressure [PSI]	Exit pressure [PSI]	Pressure Ratio (Exit/Inlet) [%]	GVF [%]	Temp Inlet [°F]	Rotor Speed [krpm]	Air Flow Rate per seal [kg/s]	Oil Flow Rate per seal [kg/s]	Oil Density [kg/m^3]	Preswirl Ratio [%]
1000	1005	278	0.28	100	50	10	0.805	0	0	1.258
1100	1018	275	0.27	100	45	15	0.803	0	0	0.810
1200	1019	274	0.27	100	49	20	0.790	0	0	0.595
1020	1021	517	0.51	100	42	10	0.778	0	0	1.173
1120	1025	521	0.51	100	41	15	0.752	0	0	0.755
1220	1020	527	0.52	100	46	20	0.734	0	0	0.556
1030	1022	673	0.66	100	40	10	0.686	0	0	0.997
1130	1030	673	0.65	100	39	15	0.671	0	0	0.652
1230	1022	674	0.66	100	46	20	0.650	0	0	0.478

Table 6 Test conditions for high preswirl

Test Conditions [Code]	Inlet pressure [PSI]	Exit pressure [PSI]	Pressure Ratio (Exit/Inlet) [%]	GVF [%]	Temp Inlet [°F]	Rotor Speed [krpm]	Air Flow Rate per seal [kg/s]	Oil Flow Rate per seal [kg/s]	Oil Density [kg/m^3]	Preswirl Ratio [%]
2000	1030	269	0.26	100	32	10	0.803	0	0	0.921627
2100	1025	267	0.26	100	29	15	0.800	0	0	0.610222
2200	1029	270	0.26	100	34	20	0.791	0	0	0.456402
2020	1027	521	0.51	100	41	10	0.723	0	0	0.846373
2120	1023	520	0.51	100	39	15	0.713	0	0	0.55658
2220	1024	522	0.51	100	38	20	0.699	0	0	0.407386
2030	1029	674	0.65	100	37	10	0.624	0	0	0.723667
2130	1026	670	0.65	100	33	15	0.620	0	0	0.47615
2230	1025	670	0.65	100	36	20	0.609	0	0	0.353322

APPENDIX C: TEST CONDITION DYNAMIC RESPONSE

Table 7 through Table 33 correspond to the complex dynamic response over the excitation frequency for each test condition. Each table has the test code for that detailed test condition. The order of test conditions will follow beginning with the listings from Table 4, the listings from Table 5, and ending with the listings from Table 6. The units are in N/m.

Table 7 Test condition: Low preswirl-10 krpm-25% Pressure Ratio-100% GVF

0000	Test Data								Uncertainties							
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
9.765625	-3719621	1329310.801	-2751067.71	-4177631	1286575	-50080.05	85460.6	1164845	117190.286	59475.0044	158571.686	82961.0276	102548.66	93463.378	159872.92	55925.937
19.53125	-3360147	1207200.139	-2818079.3	-3970069	1896176	-173193.9	479179.8	1933568	65582.8737	72042.0313	97867.5865	71897.4611	101881.44	84749.275	108437.92	51754.979
29.296875	-4672344	3120349.802	-632996.129	-6245341	1475226	691103.1	1352230	1791746	71009.3524	82808.8125	112760.421	82230.9735	60304.663	133945.01	138585.94	120802.33
39.0625	-3157321	1061067.725	-2698156.04	-3768568	3776517	-457123.5	734537.2	3811385	126556.725	94196.0442	119137.539	59930.5135	124520.11	101487.74	171075.05	81201.664
48.828125	-3101376	905183.9006	-2318541.81	-3643449	4201415	-265094.9	367185.4	4392493	134133.001	79752.0628	213794.904	109561.811	71407.234	90154.301	177949.52	64137.32
58.59375	-2614216	906170.828	-2309942.63	-3411486	4915818	-394714.7	261268.1	5492898	137296.403	77465.7109	173212.415	129678.624	161624.6	106836.43	132226.05	83937.926
68.359375	-3189766	1036987.637	-1931308.39	-3286096	5497678	-321210	495652.6	6266328	87734.4026	60783.8139	98415.5163	68292.5077	182742.5	91093.028	146308.75	76685.013
78.125	-2223278	784758.9791	-2388616.36	-2892586	6147549	-462575.9	949780.6	7518479	294267.293	104688.878	363240.381	84513.4784	287512.53	86255.584	198587.64	112465.44
87.890625	-2260799	707411.2837	-2426702.87	-2458061	7411617	-314021.7	278275.9	8144317	97342.7534	97529.7717	168702.024	74151.59	136574.05	98532.522	143428.76	101926.17
97.65625	-3182520	1288041.389	-1398963.23	-3209105	7789190	136824.9	978680.7	8545343	148350.413	85724.6121	150193.084	108559.995	91491.356	90502.772	92356.851	118770.63
107.42188	-2532289	1482475.697	-1811329.87	-2608167	8759029	-1249175	34327.36	11011117	179799.599	91016.6951	208890.631	67125.2002	211625.66	130385.35	202967.52	101568.7
117.1875	-1692339	834614.4846	-2677852.83	-1250226	9600435	-503189.8	397408.5	10642931	104996.663	76945.167	254311.183	125381.751	103891.37	106785.11	141586.53	69623.497
126.95313	-1156131	254793.7422	-2296110.77	-684815.1	9669735	285269.9	1546184	10819591	167311.947	103794.486	260669.731	119508.477	147703.53	101257.83	221040.55	110257.64
136.71875	-2037656	1010368.979	-967652.482	-1309311	9688522	199386.5	1734119	11343722	162892.582	109651.591	178851.773	120689.098	109583.16	120782.42	128843.02	108847.74
146.48438	30782.148	1997443.617	-2658005	-1884212	10050715	1118507	2929375	11241596	131073.749	158365.383	143269.094	109289.424	193594.51	112682.94	187466.96	106380.04
156.25	887711.99	139385.5612	-3712376.47	323023.6	13151756	-758856.7	-532981.5	13658615	198779.643	108362.787	227772.808	193842.732	305085.28	214087.97	151292.18	176957.92
166.01563	-202006.9	1079866.669	-2791767.38	938482.92	12448434	-299055.3	1303261	13476719	570358.326	277452.604	544556.96	282846.827	467528.42	390956.66	386628.01	321507.46
175.78125	362560.8	723533.3645	-3042447.4	-1183147	12707697	-192013	2647959	14105248	591076.667	188255	533912.457	271777.177	364354.94	324747.06	658859.83	233600.15
185.54688	1142395.7	390377.7446	-1945720.21	2337140.5	14162398	-702373.6	348805.8	15309384	329271.789	212565.524	363681.79	147106.14	251768.97	166433.65	462630.97	164480.96
195.3125	1552138	681287.2119	-2762682.77	1822955	13743929	-592571.9	481118.2	15308763	99699.7021	144377.571	242631.209	79985.5012	249629.92	163641.13	252180.11	125394.79
205.07813	1702431.1	984807.8856	-2951130.13	1889608.3	13443091	419488.6	1783067	14933433	277262.189	172531.332	296126.718	153754.751	358325.09	147594.19	169631.35	177619.7
214.84375	1836899.7	1004171.054	-1323917.32	945227.67	14235435	-687224.8	2041788	16525514	260985.01	152198.007	339881.027	104549.373	358383.59	161714.39	242017.21	112430.24
224.60938	2770185.6	-180282.232	-2505372.25	2863829.5	13719031	-52436.11	1921170	16961592	235211.732	87917.4858	366487.495	84349.623	208921.57	112376.17	339956.33	143962.94
234.375	986812.51	1871332.295	-1231013.13	1540893.5	14105533	-28790.48	1541139	17703942	344604.058	139543.128	199480.186	148514.689	275399.43	167410.27	275800.02	98273.303
244.14063	213075.52	1736825.276	316142.6977	1877240.5	15427507	-568601.4	437937.6	19011178	164143.683	98737.7817	296814.365	94587.7359	468241.33	121781.76	408061.32	155495.82
253.90625	6320423.3	-866653.009	-2123781.15	4021602.1	20484403	-1617842	-1108547	20897229	193279.418	87765.3974	231521.832	80375.9655	318271.33	104135.85	481671.96	96079.655
263.67188	2531349.9	643321.5148	-1426714.19	3768468.7	16755162	-515235.4	304875.7	20447497	271973.561	76587.8169	234970.602	83039.005	112343.39	91612.965	270771.08	103206.2
273.4375	1988070.3	587350.0965	-1628663.27	4439090.3	16755373	594144.2	50912.79	21844561	136735.294	103937.868	262173.14	95970.6987	178234.91	154385.27	171842.05	98012.065
283.20313	-19022.72	3495863.86	-2930876.08	5764263.7	19666807	-2711685	1405108	19972924	149368.11	94789.6045	245188.039	156228.809	216357.89	159635.75	197310.72	104444.29
292.96875	2477998.5	180263.1368	-950699.936	5982888.8	21381185	-3395389	-1295713	22311931	85434.9052	128912.532	205909.261	150988.048	230854.43	86764.362	295524.15	115428.74
302.73438	4462904.5	502240.1848	-3134501.45	6558642.4	21667097	-2259435	-1471896	20378733	73662.2725	125499.04	207109.442	128912.859	177793.56	90949.899	186730.71	137032.32
312.5	9498422.1	1404293.304	-2138477.63	4342408.6	25892398	-1446683	1303707	23018043	222923.906	119161.019	284107.139	133541.172	152242.34	141037.7	244852.66	136655.72
322.26563	7613235.4	-1646996.79	-4690096.06	2507636.7	18441310	-6033919	1405507	25204777	182474.476	152424.622	127035.189	124323.018	165612.19	104826.37	229196.04	113326.32
332.03125	2950030.3	-9294027.55	-1475607.92	5353078.4	20900557	-6414972	-5725579	23614560	285763.759	190929.624	361535.459	228474.875	328945.69	191875.21	309722.98	233457.88
341.79688	3004458.8	-15467042.9	-14492501.4	-4586344	17495585	-2528979	-9262370	19369455	999992.598	636531.969	1247045.61	933692.659	792485.87	651859.02	1517399.8	1028612.5

Table 8 Test condition: Low preswirl-15 krpm-25% Pressure Ratio-100% GVF

0100	Test Data								Uncertainties							
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**
9.765625	-3857604	2330265.507	-3331449.88	-4408925	1173051	-46092.96	124243.7	1129696	47401.7248	65502.5682	130675.811	68513.3953	69391.158	55031.514	90469.405	73353.273
19.53125	-4027084	2117392.992	-3544525.57	-4264534	2104260	-289051.7	473426.6	2259618	82149.3462	75575.4766	163335.122	71812.9162	103069.72	101957.91	177137.35	73538.3
29.296875	-4754409	3991686.06	-1899850.18	-6291751	2403570	389294.7	1069897	2596409	123177.277	103596.15	125054.809	80064.4791	105286.11	119013.27	187609.5	100332.57
39.0625	-3401338	2170776.22	-3635184.29	-3787560	4102987	-285996.9	422876.7	4391539	78303.5834	75422.3541	122158.74	95613.1717	144422.63	98927.567	68575.616	129936.02
48.828125	-3377954	2093790.848	-3411508.07	-3656656	4396517	-294171.5	798475.7	5235470	136331.23	86653.799	118588.61	96113.8928	139296.19	130215.56	150012.81	99677.223
58.59375	-2848420	1979171.377	-3574022.78	-3389034	5441768	-351599.5	300337.5	6251418	108733.622	90935.0644	128317.377	110609.465	75958.778	91589.993	62692.342	95168.377
68.359375	-2578533	2224758.841	-3123037.01	-3146706	6195496	-468621.9	208346.5	6988002	212648.591	91042.1878	194064.383	101955.853	159728.33	128659.4	325461.75	105342.22
78.125	-2678503	1921695.589	-3552916.69	-2613793	7218102	-527090.4	455451.5	8198173	55508.1285	68558.4071	88846.9983	132234.455	102813.4	101165.15	110357.15	118500.05
87.890625	-2073742	1844932.369	-3437007.17	-2247317	8055231	-537895.4	295836.2	8888532	99510.8151	73009.5254	74644.5444	83186.1145	84802.685	108243.28	119446.39	85270.373
97.65625	-2381732	2714979.527	-2281959.28	-2732884	8483464	-310306.8	814448.7	9641223	115383.369	112544.939	179091.196	137120.354	89047.627	110962.13	108799.07	102037.81
107.42188	-1103629	1877913.22	-4113333.94	-889656.7	9813046	-619125.3	488925.5	11347081	119737.961	135389.738	138752.158	122836.401	180112.02	149686.14	210753.51	95917.448
117.1875	-1196092	1429856.309	-4162555.57	-630954.6	10132661	-561709.2	654741.4	11435379	173190.374	86473.2636	410562.545	125152.925	339953.01	75822.395	605904.66	113307.67
126.95313	-611873.4	1377707.5	-3948224.27	-73671.2	10650129	-161581	1271440	11840344	127410.957	124474.149	148090.366	99004.6071	260876.67	134829.15	313847.74	100320.35
136.71875	214111.69	1064042.007	-3816735.82	512384.65	11033208	554731.8	1592549	12240678	157822.964	115924.243	121426.036	147500.776	212933.59	80091.623	117424.83	135575.3
146.48438	-294387.5	3484286.113	-2807404.32	-1569760	10715318	1149980	2462344	12076307	142134.26	166890.68	239899.202	114067.162	133003.96	104824.28	149693.46	167211.67
156.25	876592.79	1419268.374	-3347500.85	1345275.6	14258273	-1063939	-466387.5	14906208	154538.871	122116.082	281588.206	173577.699	256285.93	134709.7	247195.37	194298.45
166.01563	1614000.4	1684022.913	-3396763.25	1113621.6	13341086	-1337695	634433.8	14983412	113838.297	106279.17	377852.77	123164.906	188948.89	154664.1	186894.13	88986.11
175.78125	956607.04	2018155.767	-3952060.89	-187451.5	14156339	-258799.8	888631.7	15213516	257602.249	134113.578	506377.227	148894.077	275433.49	181033.64	380911.83	143518.91
185.54688	2081584.4	1442882.104	-4044002.82	3195907.2	14340289	-713554.8	1752643	16117883	333670.322	144873.336	277728.082	207517.637	206882.49	188688.82	283970.72	159245.7
195.3125	3214871.7	1743942.13	-3272365.63	2909702.4	14217254	-849529.4	-148165.5	16388190	144238.136	162040.537	184867.633	146480.579	334446.75	143350.17	234210.72	151992.41
205.07813	3263248	1751356.894	-4063796.49	2722543	13927909	-171599.2	1919508	16250328	326943.745	261175.152	388180.516	152079.236	238610.19	126839.47	411395.68	122078.58
214.84375	2593012.2	2084975.686	-2335446.92	3296080.4	14605770	-1471707	2264928	18065272	181996.529	207172.727	209365.816	257263.142	321020.19	178506.58	243000.63	137382.12
224.60938	3823728.8	1142949.055	-2898589.03	4347376.3	15150402	-519199.3	2114807	17701147	304868.97	202545.474	359831.564	134374.485	469302.11	149692.88	301842.82	174607.67
234.375	3757053.2	2768817.761	-2172587.55	3305996.3	14162571	-809389.2	2619718	18797866	976010.681	346087.873	1371812.75	461754.962	870804.77	292161.05	1275512.4	298414.1
244.14063	3000533.8	1372394.673	-2620542.28	4523437.3	15241958	-1246124	2090352	19930477	1443324.59	778355.784	1426982.23	576971.595	865002.92	429755.8	1447198.4	810047.95
253.90625	4358358.5	1858679.46	-1610214.01	5257335.6	16976722	-1008097	821149.6	20409702	1765839.75	464476.044	3007262.59	957209.551	1704637.2	670592.85	2286151.3	646954.35
263.67188	4278494.1	2052299.825	-2031241.14	5924323.9	17240636	-1007454	945703.2	21106946	383279.687	228064.255	902623.002	240330.866	437749.82	175966.81	599505.98	249538.44
273.4375	4998174.8	1458020.871	-2789943.58	6441723	17423553	-240693.9	383772.7	22320620	215009.454	183588.726	367524.689	147167.844	211006.86	163930.72	156055.33	246926.96
283.20313	4309113	4113598.446	-3507050.32	8847754	17759366	-3517107	-94380.19	20410966	156060.391	171395.81	268742.303	213200.623	250949.88	129512.34	342009.9	165251.9
292.96875	7901839.6	1228444.133	-3187305.27	8632203.3	18968627	-3256275	-660959.2	21705267	176272.173	147131.28	338975.029	155923.954	186344.11	149002.54	219064.28	178475.2
302.73438	7167301.2	2267584.498	-3829268.78	8862027.2	18371567	-3402321	-629316.6	19957130	245379.858	98096.9849	217059.776	142631.39	137118.76	168982.29	198014.93	147744.07
312.5	11619010	2327742.356	-4076669	6862099	20049059	-3924004	-576335.9	21538651	152625.006	105142.434	176814.487	131979.2	102416.94	99779.547	208677.01	120709.38
322.26563	11261531	-631912.687	-5499409.46	5829374.4	15019373	-6257046	914306.2	24369016	185218.964	117450.638	161836.779	117469.47	171735.13	131926.51	152115.5	116589.81
332.03125	9250634.1	-7088045.38	-4896707.43	7677493.1	16691716	-5591308	-6149803	21601195	226774.532	110231.82	300482.892	168206.591	209912.65	164177.19	154768.17	152995.71
341.79688	6560049	-14042288.3	-14628199.8	-2463563	12625690	-2956363	-7581862	20059120	219101.516	165277.809	237955.401	208172.965	311572.1	198799.09	286466.19	166571.33

Table 9 Test condition: Low preswirl-20 krpm-25% Pressure Ratio-100% GVF

0200	Test Data								Uncertainties							
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**
9.765625	-5711633	4751385.865	-6846496.43	-3196840	1657418	130628.6	30878.21	1193299	115084.999	268705.408	156456.109	359214.646	159812.17	199952.21	207111.41	259904.11
19.53125	-5354186	4212074.78	-7115444.86	-1928062	2554865	-419913.7	924362.1	2186538	88596.1426	223205.728	96965.2934	354614.174	97879.964	258448.41	120157.23	258109.75
29.296875	-6622634	5988691.707	-4911753.29	-4794250	5992788	-1675422	-1316031	6116044	130379.956	390605.532	205556.619	514178.207	124346.37	449453.42	187365.38	390492.73
39.0625	-4831450	4886955.977	-6758526.15	-689140.7	4826010	-851873.6	1853318	4907986	104576.238	209383.029	87798.4126	469388.058	86137.618	371979.19	129576.38	179711.15
48.828125	-4347358	4054944.534	-6579444.91	-836523.4	5681647	-605806.6	1648407	6816513	73592.7902	196951.433	72618.8955	309005.051	57578.887	222734.74	76301.317	214997.12
58.59375	-3981174	3988992.626	-6347890.41	-1003382	6764366	-1009629	2025972	7104104	81897.2996	175533.97	99062.2339	235908.254	61718.587	163670.56	129623.3	205350.42
68.359375	-3885579	4364937.237	-6229132.92	-790232.2	7488501	-1042324	1937530	8718798	111829.384	199300.335	99606.6987	267252.626	89040.433	223652.61	61117.031	245621.17
78.125	-3866694	4012201.199	-5694061.83	-188354.8	8958003	-907673.9	2464677	9507452	88363.612	176441.157	134114.824	249627.072	91503.228	272419.68	98215.944	184526.57
87.890625	-2868319	3827018.241	-5728818.02	821487.99	9668969	-1391852	2525214	10337582	74444.6375	219570.878	58852.1192	267407.882	81598.666	214295.72	97896.142	285393.14
97.65625	-3514634	3957539.865	-5034239.63	828466.47	10570255	-1555277	2538171	11315886	100558.308	253211.949	94980.1131	260733.229	43863.397	194860.08	103118.44	227695.8
107.42188	-2492369	3967954.572	-4696036.13	1038693.3	11591257	-1145235	2499855	12104800	83449.5646	157131.465	135333.938	257936.55	102145.12	243401.28	145107.93	263150.05
117.1875	-2784168	3891330	-4554981.86	1821585.5	12099952	-1798071	2325350	14061516	55650.0071	197701.269	100835.522	202336.488	93945.897	154579.6	75031.223	222107.21
126.95313	-1519107	3747143.395	-4970413.12	2904732.7	14329200	-1947316	2264018	14829768	75292.0426	192350.698	80734.8767	331199.357	58096.969	189672.98	63078.556	279371.32
136.71875	-1582676	3878213.531	-4485137.46	3097049.8	14846564	-1824155	2349703	15819522	52851.2504	256077.996	69527.5863	251325.947	90357.261	277171.44	107501.74	164390.27
146.48438	-983910.1	3467818.439	-4635663.98	4038041.3	15813992	-1996900	2387954	16264191	112393.215	181887.245	87709.5855	326782.823	90237.717	197760.37	64628.595	220474.93
156.25	-411187.6	3160465.052	-4492175.21	4797881.8	16508663	-2201268	2866499	16830740	84080.7437	248296.212	92231.4296	295251.512	99361.619	186116.57	120001.59	183690.05
166.01563	-168809	2804332.432	-4859099.98	5677926.3	17826796	-2316677	2460685	19187296	93597.2078	305183.181	108081.128	341019.646	125383.49	266576.55	158734.69	201211.27
175.78125	315890.11	2948022.038	-4496945.95	6019100.6	19107526	-2379355	2569718	18546805	93791.3113	268472.461	135789.675	299381.215	150234.55	278154.67	95923.232	252887.33
185.54688	954027.51	2844338.438	-4400049.77	6608559.7	20380551	-1744119	3267179	19415155	186960.745	229050.514	136516.436	303399.815	126511.94	201523.26	193111.08	293205.02
195.3125	1475401.4	2873586.279	-4400437.33	7595608.2	21344217	-2114562	2805261	19960491	136049.964	228754.465	84072.3475	304069.565	182423	217537.21	86079.041	205230.38
205.07813	2541890	2983243.179	-6355228.44	5172353.1	21558852	-1545797	4336287	18227841	157688.674	219052.068	235214.224	252118.455	102720.5	201542.78	178791.03	237548.77
214.84375	2578635.7	2077396.811	-4840496.33	6003580	22659605	-2553537	3885001	23041705	93791.4848	380333.282	108545.857	393428.577	111939.59	368064.72	97398.935	252324.22
224.60938	3927277.8	1103256.56	-4905142.19	11089771	23410694	-2115607	3500798	22320132	147793.247	149701.727	323458.967	300739.471	128453.12	212453.05	188136.04	205691.76
234.375	-489505.9	3525357.172	-1529876.28	8170735.5	23564260	-1333527	3446954	22066812	100234.631	186810.81	152227.681	351141.784	95819.339	252801.48	104867.97	250306.19
244.14063	1657071.2	3301163.493	-2599754.31	11318374	24740812	-944634	3282238	23265127	100492.358	236397.547	180061.682	311443.473	52636.127	219396.9	190245.26	186635.72
253.90625	-411250.4	4794059.766	-2717012.81	10956594	32444582	-6088989	-2138136	27225517	214386.322	183473.48	243145.297	236644.403	89480.403	236418.01	134035.63	216687.21
263.67188	423597.53	476570.1561	-4151584.97	14772149	30333020	-3372792	1955918	24573837	111414.912	156785.998	105230.214	218778.363	87351.17	156789.23	115656.36	147768.88
273.4375	3795064.5	81444.39163	-5655686.85	16739738	32933705	-2850700	1352930	24321957	85388.8221	179763.595	129047.638	196555.333	91573.896	245611.68	80159.739	191959.07
283.20313	5466079.3	1258032.58	-6644692.8	15200986	32316370	-2397358	3458916	22150847	100592.693	182738.833	112099.723	234568.889	115085.33	206389.82	76400.38	161348.39
292.96875	5271492.1	405119.5028	-6131306.3	14536357	33413618	-3181487	2748151	22517237	112596.845	173422.975	100123.822	255024.117	124473.61	176484.4	109150.47	177774.57
302.73438	5170555.2	-2152308.06	-7325868.5	11894861	34434428	-4940663	2023619	21591989	104037.763	158730.079	94093.0937	212625.738	91888.802	166367.1	105950.54	177140.27
312.5	-3347382	-9110429.07	-16656456.1	5174172	35146855	-1050491	967772.7	25259878	182581.709	257275.158	172190.431	250883.321	226374.94	255184.03	162732.27	215685.71
322.26563	-11150592	-19705398	-28036724.3	-7981244	33139515	-6537925	-5742879	19086056	716496.555	614596.143	358661.674	510171.963	814979.24	866281.17	570336.08	464018.11
332.03125	92634839	118096383.4	71564403.53	122529937	-29118518	-1.05E+08	-55514347	-63259670	30480969.9	42008397	35944042.9	48689350.4	25276257	24782324	29645725	28668751
341.79688	-285010.3	-10092971	-17491811.6	6166873.9	55586409	-2557573	11525724	26354310	661826.013	638112.04	957056.393	1046091.66	640814.26	628168.18	1239084.2	941106.69

Table 10 Test condition: Low preswirl-10 krpm-50% Pressure Ratio-100% GVF

0020	Test Data								Uncertainties							
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**
9.765625	-476518.9	1533009.808	-2252774.62	-754880.1	832664.2	283157.7	330908.7	960061.3	89229.719	90746.0003	162893.173	75962.3553	105918.33	148828.94	116641.41	154450.64
19.53125	-573408.6	1534144.39	-1786241.6	-735953.3	1576470	-137232.9	67961.44	1742120	148412.606	95701.6286	104273.223	86987.6118	68544.404	109083.93	117330.03	96352.649
29.296875	-1876443	3260202.706	48677.39658	-2903333	798837.1	1297581	1908330	536150.6	136967.829	73512.5216	133163.654	82167.1408	98846.73	120127.36	116313.02	86826.463
39.0625	-324978.2	1258962.673	-1948699.89	-399968.3	2873754	-337254.8	-72460.81	3126566	86080.5874	76081.1288	54647.2203	92284.9362	76044.536	110080.38	110921.98	49880.638
48.828125	-54596.49	1102929.368	-1916633.55	-218878.3	3561230	-278567.3	255830.6	3732466	42739.0279	98027.1913	73957.2274	110881.72	107620.34	113450.37	129785.12	70997.526
58.59375	31035.655	1274845.101	-2040700.65	-391750	4159580	-354115.6	305126.1	4739165	123085.345	101407.684	88134.5508	82092.7332	70534.546	86950.405	134491.62	106742.37
68.359375	22374.931	1205687.127	-1745669.1	-379623.9	4703527	-182442.9	685017	5474469	86943.8109	101478.502	55535.8385	104416.537	100086.24	114860.03	106046.19	114353.88
78.125	-170433.6	975750.0176	-1673918.78	-106865.2	5717332	-287515.1	67136.9	6214050	103559.142	70147.6675	129970.206	92481.6908	75197.876	130327.71	104442.1	108492.26
87.890625	49363.177	931476.8668	-1967102.55	186534.58	6347219	-222325.9	88146.93	6999239	57426.2671	83137.7771	65353.2621	96551.7138	48841.377	84890.83	72918.828	106893.13
97.65625	-1184938	2071095.131	-697327.847	-1066236	6939706	-259088.9	18433.86	8099002	77275.566	62218.2971	93962.1595	92160.9474	88504.414	108072.67	99548.609	83701.587
107.42188	658469.15	887087.9492	-2381927.54	421847.99	7762351	-332340.2	87515.51	8438815	110943.993	86343.2705	171819.764	108312.043	80622.553	114357.3	164235.97	114842.59
117.1875	777643.74	872310.6319	-2192630.44	807689.99	8334237	-219876.6	115902.4	9113417	70512.5387	78574.7485	113034.176	115327.662	96795.531	93751.917	92853.54	98643.46
126.95313	752672.67	602484.4965	-1899816.83	1242023.2	8569520	317877.2	553278.3	9528608	41359.9186	98802.8415	83189.7151	80193.4554	68363.035	87863.247	84544.232	74547.48
136.71875	-463636.1	1829689.034	-848320.362	473106.76	9339817	20908.23	516925.8	10701022	55040.83	92437.6687	69863.6111	64184.8866	93031.781	102443.38	88978.285	109466.88
146.48438	210545.27	1774356.969	-1444763.62	882617.26	9165867	178577.3	1235841	11054543	101332.994	117307.713	101683.786	112883.038	89900.226	101538.47	129264.33	89831.297
156.25	1409005	985662.9139	-2847855.91	1785767.8	11416094	-814472	-377098.3	12536154	137886.763	150897.43	116654.314	151664.486	128214.4	133110.44	159409.93	116537.81
166.01563	1023087.6	1086479.762	-2280742.82	1995779.9	11428364	-373691.7	-64235.27	12637233	277362.072	326546.765	301863.54	346029.422	288996.01	319755.9	346988.96	395481.18
175.78125	1143757.5	859885.4459	-2652255.02	322659.75	12509999	-15451.06	558142.2	12883726	349591.975	192868.299	520574.187	255862.009	379457.41	245468.48	389020.42	234251.49
185.54688	1098891	2944305.645	-1981274.77	1268123.6	12648160	-1109005	737199.3	16864072	164476.828	140666.317	239598.838	146340.121	92135.733	154824.86	212886.81	157793.07
195.3125	2047923.9	1053225.007	-2476942.24	2618288.6	12813137	-335079	647474.9	13689946	66218.2192	111810.948	216070.604	75526.0154	141069.97	116630.29	144505.76	125991.77
205.07813	2300951.9	1871192.878	-2820250.72	1744983.4	12868389	345583.7	1362287	13642481	172505.785	110359.324	158696.199	109220.443	188875.32	118683.45	183906.54	110702.69
214.84375	1607012.8	1194704.299	-2149486.16	2955859.9	13904615	-1211773	153310.7	16518210	98159.1576	155495.631	125411.52	196620.175	145968.3	135655.32	110833.43	80296.592
224.60938	2146892.9	317074.4341	-2131594.5	2960651.2	13768199	-105840.1	656325.3	15572671	345190.095	91006.0746	314888.71	80656.3103	297051.29	133243.18	294339.17	73714.274
234.375	-1346142	2463365.877	-237240.519	1072455.6	13826622	-244711.9	1072849	16662769	177151.708	136010.519	174505.334	93698.0971	104088.24	121194.94	180987.73	108221.69
244.14063	2604640.1	-405227.249	-2800742.59	2862994.4	18786353	-2035614	-1660262	18823068	119918.018	76496.0945	167038.266	92226.9063	103431.87	120749.68	142278.73	63618.943
253.90625	1062897.8	767520.6099	-1649379.96	2989425.6	17332718	-204905.5	59414.25	19969514	77026.9815	80834.0749	103294.666	68011.2106	141746.99	90578.206	109805.89	51371.584
263.67188	717043.41	1223604.035	-1488815.09	2984181.4	18275438	-188330.9	-284834.9	20156117	156241.006	92057.0482	78164.3759	57391.2624	110433.17	100226.85	54802.981	79211.141
273.4375	594853.57	1021720.321	-1980942.55	3580044.2	18356851	-99390.33	-801583.3	21356541	138753.001	107548.205	123302.934	97670.6418	100250.89	83327.84	83582.184	89358.952
283.20313	-2376973	3634410.011	-3101421.69	4537195.3	20472201	-2437065	13261.03	20509344	89747.3192	98530.0917	104176.947	68870.3886	90599.698	80736.406	97771.08	97855.387
292.96875	243498.2	611810.9345	-1693072	4294767.2	23621221	-3145052	-1441986	22327309	154477.801	119545.892	90286.1923	79881.6042	155325.49	129206.88	119195.76	73480.489
302.73438	1923488.1	662823.0875	-3168698.87	4872294.4	24610167	-2480373	-1794255	21709321	66082.3861	97931.821	97101.1139	85887.7847	120931.57	107259.72	90208.712	96992.201
312.5	5586270.3	1609414.883	-3638425.79	3573508.7	29199786	-1767710	413845.9	24879429	102144.82	119111.289	80225.2421	77148.9491	102108.04	105626.78	108614.07	84300.701
322.26563	3712449.8	-2179578.95	-2561115.9	3816269.4	24756376	-6145851	-257229.4	26577028	118075.48	112213.54	173591.321	80534.9168	81278.931	101874.19	125397.14	125978.57
332.03125	7016828.1	-5567115.72	-4520292.47	4851140.9	28597441	-3672464	-7408000	23111492	142592.301	161668.163	166777.538	205337.961	213361.76	153903.9	373420.2	175008.08
341.79688	8153039.8	-8034936.49	-6862811.07	2071894.6	26255334	-1893192	-8214728	21846277	639480.886	334834.375	170406.673	579442.418	417324.63	420987.82	1151590.5	608496.81

Table 11 Test condition: Low preswirl-15 krpm-50% Pressure Ratio-100% GVF

0120	Test Data								Uncertainties							
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**
9.765625	-265818.6	2786197.997	-3493384.34	-619842.4	969907.9	-162196.4	116494	978089.4	109746.621	78048.9815	153329.309	145742.996	39652.464	101097.32	95344.46	85846.62
19.53125	-287471.5	2662336.414	-3203422.35	-470344.5	1648868	-162578.9	257632.9	1833585	90251.3355	92330.4182	97561.0771	69874.3872	85462.093	85033.278	57476.43	80142.468
29.296875	-1739649	4926676.632	-1394966.83	-3000491	1287840	1035266	1744462	988794.3	89758.6137	67171.4631	125746.589	106236.495	103759.27	101096.54	76681.088	87210.624
39.0625	-38505.79	2625975.497	-3193980.28	-262587.1	3071581	-304621.5	436748.7	3537309	93774.7075	62970.9617	178020.675	73581.6694	78385.697	64578.388	100053.79	97369.829
48.828125	-202066.9	2719109.416	-3082237.96	-151921.9	3618893	-390629.2	299309.4	4220897	84090.8672	72975.9249	184466.42	105176.447	63368.402	91033.285	148546.22	89232.571
58.59375	-15347.08	2649339.412	-3301629.06	-167456.9	4461419	-590496.1	88102.06	5045239	86393.5207	82569.5359	143590.527	133979.595	169034.55	93221.917	113733.58	91772.732
68.359375	-38423.2	2584277.604	-2664391.69	105251.71	4791803	-362922.5	327075.1	5470888	147066.979	80487.9568	215038.78	82531.5071	133599.01	77918.017	90782.924	72361.169
78.125	-948.1115	2589071.111	-3187304.85	417630.87	6104384	-691551.9	483019.1	6676578	97566.3493	90992.4848	173671.347	124420.771	182702.08	90391.085	197819.24	95657.921
87.890625	381107.46	2242537.317	-3133024.72	399922.48	6492973	-667528.5	261029.9	7412970	65162.3981	71000.7933	127902.579	85747.5814	53521.953	97007.63	74325.704	77354.11
97.65625	-532351.8	3197399.168	-2302623.02	-360256.7	7877792	-525067.3	158591.5	8198817	60373.7437	74335.7231	167732.764	71653.5946	145621.67	74879.345	179028.78	90651.034
107.42188	979570.94	2239121.01	-2382590.88	1127286.6	8271325	-413476.3	164007.6	9154645	169996.509	129857.684	191826.205	120365.748	109719.24	121107.08	287387.89	139901.66
117.1875	1100264.2	1978808.647	-3735440.4	1439725.3	9327408	-342517.1	-33558.94	9918639	104651.155	92457.174	334444.751	104993.122	144405.64	124297.97	396801.9	94713.663
126.95313	1597090.4	1686537.494	-3432927.98	1758274.9	8912789	-52828.53	653239.9	10459417	98629.2689	105439.103	106573.193	175093.976	99417.916	117685.43	79376.712	100635.26
136.71875	1260293.9	2307901.336	-3047890.64	1726639.6	10135778	268981.9	712020.4	10748978	134006.703	80168.5765	143573.407	130777.009	42116.76	105287.79	150252.2	90370.238
146.48438	1041731.1	3887203.808	-2845227.53	499653.02	9181825	298739	2563705	11329704	112655.441	91785.4584	176837.011	114404.233	104239.98	103636.7	149997.71	92513.26
156.25	2675841.7	1958523.933	-4222558.63	2975982.4	12412287	-1426051	-866298.5	13586277	124601.098	100529.233	166395.155	208217.738	166662.99	103209.64	150815.89	144269.14
166.01563	2244712.1	2043615.28	-3446677.03	3212909.3	11786051	-682597.3	513196.9	13185882	160187.853	149790.303	190533.494	232308.343	121434.59	93753.689	193488.34	236965.96
175.78125	2237192.3	1964429.989	-3995632.55	1251565.9	12516152	-427406.7	1319528	13856852	198192.852	141170.558	264837.682	74161.8458	124222.38	103942.84	289368.23	154905.07
185.54688	2170538.4	3656879.092	-2816536.85	2805212.2	12787681	-2169004	953919.8	17776339	171575.413	157300.072	272788.067	141832.569	177790.4	207022.12	296459.83	138485.94
195.3125	3410318	1911630.429	-3134380.4	3782934.9	13308247	-875061.4	630892.4	14698729	177187.701	167979.512	171241.288	132277.393	218655.02	144350.81	132941.56	136095.9
205.07813	3430908.9	2443245.974	-3788684.96	3829122.6	13435288	-501160.8	1962341	15166342	148609.168	166517.476	434038.868	139493.999	313521.89	155198.13	156234.66	155333.63
214.84375	2793319.4	2254867.138	-2800491.14	3791184.5	13385985	-998924.8	1691275	16558429	186259.096	140041.176	178943.283	157380.782	160693.93	166079.01	77418.462	185515.81
224.60938	2346461	1738866.98	-2293995.72	4391309.2	13169888	-346569	1316291	16665642	412214.178	140883.689	398961.652	122944.75	268268.77	126509.63	216000.68	91022.601
234.375	1615339.3	3167982.362	-2409973.59	2980278.8	13768063	-1025660	1305922	17715583	380221.729	228421.495	441104.55	274820.699	262895.76	316123.86	454215.74	257772.24
244.14063	2095148.6	2186514.885	-1455118.86	3834020.5	17383519	-926760.1	329573.2	18697321	725023.913	353942.412	1264252.59	334337.816	1178244.7	357943.78	857345.84	346663.9
253.90625	1432515.2	2338854.621	-1875433.5	5297874	16669709	69840.96	-586213.1	20250519	681419.332	255823.655	1219894.87	352790.195	701446.14	267053.45	951214.69	346507.07
263.67188	2374318.9	2757755.402	-1570865.93	4775997.1	18933914	-684546.2	-98602.2	20662911	617754.307	219119.508	403933.47	198080.675	276321.11	193116.62	771572.44	265587.52
273.4375	2679928.2	2922738.707	-2939132.43	5777619.4	17935393	-383124.9	-730881.5	21512153	145497.9	119979.72	186502.11	101365.817	152693.08	149007.08	147893.69	121539
283.20313	1306742.6	4192435.431	-3820208.28	6526472.4	19157116	-2899403	-1250902	21516741	145489.608	130002.201	138562.347	145721.23	162207.31	117486.5	255500.15	102659.71
292.96875	4732258.7	1918779.189	-3691981.43	7052394.7	21034821	-3287863	-1247952	22134433	188279.456	93110.2443	112833.943	97197.0067	115177.8	118385.33	145482.21	89040.467
302.73438	4163356.5	2411977.304	-4718257.04	7228560.5	21438934	-3695947	-631024.4	20868737	128971.868	116897.83	128659.46	109794.758	131850.63	108139.77	141776.26	91430.381
312.5	7147572.2	2542543.688	-5191795.8	5762352	23839664	-4110784	-842381.7	23022493	138966.557	108437.987	177354.105	147274.943	139532.52	103332.33	212763.65	110815.57
322.26563	6542838.1	-332750.068	-3838519.43	6072860.6	19662504	-6708944	823889.5	26359054	173699.902	99489.7059	164297.4	99765.7614	119562.37	120583.94	132778.64	122151.2
332.03125	8982357	-4079287.97	-4472001.63	7794840.7	23188631	-4470173	-6314658	22947209	189791.648	133028.538	117256.576	99279.1176	244360.21	125936.4	111477.95	98995.068
341.79688	9809847.2	-6892387.18	-7934422.52	3389087.1	19557607	-3242502	-7220866	22234791	139989.011	118438.704	198769.318	165127.55	256246.17	136032.84	219689.16	118873.3

Table 12 Test condition: Low preswirl-20 krpm-50% Pressure Ratio-100% GVF

0220	Test Data								Uncertainties							
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**
9.765625	-436547.5	4678614.116	-5057866.79	77868.443	916099.9	47221.3	247392.6	1255953	96068.426	154685.542	109280.562	119444.35	73387.165	138235.66	92841.052	142177.6
19.53125	-384528.1	4335610.89	-4842767.66	-120384.2	1843532	-224584.4	463096.4	2177808	65272.5702	96721.894	99420.8423	67394.6453	56610.268	71899.413	64651.301	82442.919
29.296875	-1812578	6822056.539	-2879401.75	-2460622	1964665	757792.4	1400840	2052227	114036.459	96980.955	101038.838	79642.6523	86674.053	99289.166	112817.31	69441.431
39.0625	-115343.2	4694410.282	-5093545.77	412202.16	3571486	-315412.1	335823.1	4115698	56447.9165	86268.5531	91241.5769	65697.2052	47113.352	125368.9	94497.561	82281.943
48.828125	-18867.78	4564443.641	-4955954.18	476479.01	4559642	-167618.3	399577.8	5109430	118805.399	87979.5758	58384.577	97191.0595	59295.611	69215.3	64456.435	47246.859
58.59375	328069.76	4475126.328	-4758650.98	705766.24	5714595	-304404.8	676139.5	6091995	134939.466	120549.03	146556.853	93890.95	121363.43	84907.879	94406.163	93683.737
68.359375	493664.14	4625839.898	-4478385.17	1068510.5	5480777	-265471.9	658925	6658271	54148.0483	79901.1272	121777.883	69733.9578	68096.762	112563.99	127370.66	73902.211
78.125	535449.37	4465230.39	-4757331.38	1432122.1	7027524	-494417.3	801031.2	7676015	120674.051	96685.3775	89758.8044	87995.153	149661.79	112315.6	116942.78	112262.86
87.890625	925976.43	4596049.629	-5226849.45	1626630.8	8026647	-593457.1	345148.9	8544713	119888.272	119164.815	109983.125	64812.2071	46996.614	97625.516	102187.7	83386.132
97.65625	74571.641	5409487.96	-4000895.91	746133.04	8225581	-530994.8	1039919	9009660	81679.2189	94693.11	115232.723	89508.4292	64666.709	70214.748	72012.053	90989.996
107.42188	2079443.1	4024524.467	-5537528.84	2613165.4	10072660	-1547720	-198190.7	10641549	85166.4276	85107.2486	192512.065	134824.49	96958.025	135781.31	246599.55	117942.15
117.1875	2611969.9	4003730.682	-5435038.25	2619516.8	11036932	-1535187	136362.5	11375113	102349.177	108941.674	176021.816	83122.6784	102855.62	111296.34	109144.87	104898.71
126.95313	2072596.1	3820672.029	-5148491.26	3066937.4	10125245	-507547.6	1553000	11981828	74258.9066	118013.392	113127.194	94505.6894	68964.417	111704.63	96941.841	146629.25
136.71875	2447809.3	4033156.11	-4860061.01	3522904.3	11237450	-546545.8	981194.3	12640984	67542.0969	90357.3414	86570.2809	109623.856	70997.057	85748.849	121328.78	115105.25
146.48438	2512618.8	5330204.797	-4533942.6	3081047.3	10654810	-408850.3	3129092	12960693	148251.539	138475.058	172603.384	149515.372	78892.653	149151.37	176241.36	137061.17
156.25	3522547.8	4209803.884	-5292908.21	4191609.5	13448540	-1370145	466039.7	14443505	119642.228	134686.996	146837.998	113709.306	103734.12	128544.85	162744.56	206822.38
166.01563	3392965.5	4177379.311	-5400935.26	5248608.4	13329296	-1250087	1023514	15307815	113374.512	180085.11	112641.243	162885.451	161274.93	111689.87	104083.7	125905.22
175.78125	3905924.9	3815883.336	-5905480.6	3456029	13382700	-821435.5	1169042	15827296	175198.937	120914.349	256778.833	112561.468	146256.58	138476.38	291215.26	135229.44
185.54688	4287563.5	4062266.178	-5715081.88	6905671.5	14267468	-1479000	1789901	16767050	159853.383	80655.3026	309495.492	159366.781	243127.69	130335.61	157607.35	131767.99
195.3125	5271130.9	3776314.994	-5641020.5	6234199.6	14305952	-1520441	1511054	16672348	158182.83	163775.745	131380.36	140446.994	179044.3	113825.79	226056.52	128734.32
205.07813	5468012.3	4104517.77	-5617610.78	5688582.2	14171038	-760000.6	3290621	16123953	207056.524	108450.738	208129.488	131764.72	223021.33	144570.28	226248.52	156946.13
214.84375	4337433.5	4153980.757	-3760091.59	6004098.6	14180559	-2333911	2817493	18822893	132349.366	133236.041	110785.864	177121.827	80355.526	171305.32	140350.21	120956.86
224.60938	5114280.2	3163935.233	-4857819.1	7393753.8	14939543	-730014.4	2538542	18325377	297284.785	107125.817	269134.699	128017.733	252738.72	124719.84	330386.52	109348.21
234.375	4293610.8	4618920.433	-2924561.09	5805707.9	13234285	-1011295	3524394	19213921	115364.41	122720.955	94807.5692	108054.53	152937.21	133662.32	88252.773	123965.13
244.14063	2707395.4	5043642.713	-2336002.04	6317910.9	16035759	-1712650	866818.5	20868422	255288.568	135025.076	185758.048	130953.63	210286.34	128191.15	165203.91	100018.51
253.90625	5990255.6	3443254.742	-4697229.93	9242226.9	17154581	-928802.9	1549940	21876912	158462.287	87970.2079	141561.722	60309.1863	115340.33	88932.135	179033.74	90759.187
263.67188	5876427.4	4393325.741	-3835740.09	8700498.1	17836656	-874347.9	1417514	21762583	142940.645	87732.3394	229708.913	87537.3068	111444.78	86384.307	138376.91	102957.92
273.4375	5682675.7	5577347.638	-3777935.23	9395355.5	17324175	-810857.7	411428.7	22936032	122225.56	104552.353	160817.849	107553.109	151906.39	130384.93	164249.62	129248.79
283.20313	5357910.7	7249803.856	-4563733.74	10005598	19918613	-4778039	1851528	21597371	94416.8526	124680.211	152881.186	125433.192	142138.87	116200.51	123215.52	149957.66
292.96875	8027711.2	4243530.251	-4428804.79	9928883.5	20272006	-4513212	-148040	23516442	125189.035	102032.292	162364.247	98960.0099	85630.614	102083.27	178924	97553.147
302.73438	7333112	4987790.993	-4600482.07	10658602	19978838	-6252692	-283543.6	22268052	74345.0721	95351.269	137541.354	136633.912	120733.9	86972.863	202558.5	104472.32
312.5	11879652	3861348.748	-3653954.17	10121735	22527668	-6438696	-750816.7	25308843	154481.107	107030.684	173680.544	129639.336	120130.38	118040.36	128002.51	103604.06
322.26563	12680231	688586.2845	-6745791.05	10078233	18361804	-6994185	-334590.8	25736851	118321.477	119698.467	210040.701	170963.104	85438.4	103510.45	282570.26	147731.3
332.03125	15184221	191482.8088	-6619736.78	10762662	17483027	-6121862	-3721686	22245741	578907.619	875405.492	1022139.88	1252748.65	795308.83	769809.6	1075995.5	1403793.6
341.79688	14719023	-4067830.99	-6898709.15	7596873.7	15401160	-5020396	-3408431	25984959	174478.932	128112.014	120534.137	180528.031	204095.27	132137	263277.82	161380.5

Table 13 Test condition: Low preswirl-10 krpm-65% Pressure Ratio-100% GVF

0030	Test Data								Uncertainties							
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**
9.765625	134239.12	1348509.469	-2143993.09	346380.25	643465.3	-93145.84	-85823.32	1321825	63353.7524	80828.1973	105316.983	116323.4	57969.727	157092.76	62115.587	114912.34
19.53125	266997.02	1677170.98	-1609259.6	165653.27	1374502	28462.03	34392.8	1530099	82455.2245	77441.1596	62867.7836	59705.5845	78707.528	97867.106	68608.379	82734.068
29.296875	-668467.2	2897996.371	-422912.754	-1316073	338578.6	1931575	2335169	-64348.87	64914.8731	88030.353	107335.99	55054.7979	85622.56	95972.584	76412.489	73618.677
39.0625	545995.59	1307156.54	-1758154.59	1015383.5	2734378	-273460	-53837.33	3561866	33607.272	73361.3867	70014.7779	72840.5126	43051.547	94031.288	66726.218	74958.308
48.828125	325370.27	1439606.941	-1682251.52	817449.21	3369856	-83399.16	121359.7	3866877	38838.5373	72173.7433	76838.5405	87021.9405	62061.018	127948.87	94629.521	80791.71
58.59375	630788.45	1352670.757	-1737116.33	946361.19	4221819	-160845.4	101329.4	4454891	104846.973	75188.2929	95215.8139	78368.2681	65460.389	88659.277	67535.979	75964.646
68.359375	378839.78	1428978.985	-1722473.45	588068.39	4560445	-44904.56	383130.7	5505713	55076.7774	66165.4275	95292.1582	55047.2101	59410.912	90588.437	57341.59	61515.544
78.125	592934.28	1276449.147	-1855924.27	1300369.8	5407275	-171823.8	283374.3	6073755	63273.1716	68645.597	109746.629	69008.9382	36846.723	118480.82	71505.351	76388.273
87.890625	857493.15	1018725.917	-1714764.63	1256136.6	6196114	9659.233	-19421.95	6891579	50722.6201	87495.3916	99668.9088	76492.998	59731.533	90966.577	63691.207	59815.595
97.65625	-184875.7	1902518.515	-820336.921	360661.3	6561761	435301.5	381402.3	7148466	66934.1305	82893.624	55699.6566	75358.0156	45698.648	111379.48	79111.917	84355.169
107.42188	777875.66	869425.6782	-1741756.97	1752688.9	8767040	-784203.2	-1600182	9665903	84320.8362	79156.6245	64793.1675	89036.2955	108043.19	86895.804	137658.91	82431.647
117.1875	887969.33	911194.9797	-2188721.51	1901906.5	8826635	-187051.3	-632715.7	9382146	58191.5305	56921.8068	102539.915	90616.1718	67803.138	85521.618	126396.7	57666.488
126.95313	1053595.3	1070965.805	-1990933.53	1770749.4	8098351	660582.6	216808.6	9726671	39917.338	51725.1948	44803.4631	77486.6994	49532.676	67007.442	44372.752	80440.416
136.71875	85194.76	1868002.409	-1275124.36	1050955.3	9098498	290927.1	111821	10861574	29799.0167	78433.8973	58188.8483	98164.347	36819.524	84569.247	56330.614	100716.6
146.48438	521190.67	1923009.171	-1455563.34	1309768.5	8740595	516321.8	1360976	10975805	37611.9653	89793.8835	137961.186	76917.2202	75156.105	71248.607	41892.019	63013.182
156.25	1145002.2	1531743.527	-2769823.49	2286465.2	10870643	-62347.72	-402782.4	12211066	79393.8096	116278.419	95803.8537	91500.9651	84409.531	125316.04	88490.044	108249.68
166.01563	807627.65	1196373.394	-2214966.32	2089595.5	11242810	-86813.06	-97694.89	13075228	290440.626	307825.047	313222.263	320424.895	188920.34	342446.42	272271.77	332954.48
175.78125	684984.04	1130184.435	-2754043.38	424099.78	11955452	706191.2	-67346.98	13364081	224908.181	190735.191	289599.142	188799.19	245451.07	206159.41	267615.57	241246.97
185.54688	854146.16	1973145.25	-2996061.78	946465.92	12240508	1879496	422846.9	15195436	159976.41	138500.368	177290.169	117797.972	120493.57	130614.82	123871.78	120628.94
195.3125	846465.39	1761259.269	-2610289.54	2784647.5	12730533	-124004.1	637164.5	14363441	66765.6527	105101.057	108986.523	95330.8755	110848.02	115731.21	113202.44	97454.325
205.07813	1152824.7	1867240.657	-2346478.13	2124043.4	13016501	712927	1552604	14221233	68182.6378	71198.4649	123601.379	81017.1594	120007.25	83125.536	153425.05	88522.656
214.84375	-650098.9	2155790.956	-1089044.62	1227532.1	13399152	-266995.5	1299021	16250081	73230.0085	78971.9446	69569.3037	78274.5809	99196.48	108359.47	123618.72	135632.79
224.60938	152789.42	811788.7034	-2082838.2	2717225.5	14476970	378237.5	815511.5	16573508	202527.761	86493.3411	122120.337	61021.5384	121026.18	76388.893	221299.56	65021.283
234.375	-2404780	2832678.226	-785054.974	717764.42	14196388	13541.32	1676714	17369157	98501.1645	67186.0143	55811.5877	100844.392	73186.224	70749.986	137078.61	89856.259
244.14063	-3652827	3207550.654	7013.734122	460177.38	17462070	-557170.7	-98147.76	19052543	117594.871	90954.3862	111952.59	71950.593	109425.23	93593.077	117562.16	83425.415
253.90625	-773287	1525089.709	-2079640.46	2667911.6	19916108	-594751.3	-342907.2	21120731	86240.8277	65803.476	84240.5258	57816.6188	32125.605	68455.45	82248.121	57034.555
263.67188	-2065505	2239368.406	-1654259.95	1913840.4	20083629	-895565.9	352589.6	21265003	79289.4731	51910.9047	86083.1612	51960.5138	65299.895	81373.79	78685.632	61703.195
273.4375	-2317617	1682203.214	-1202640.77	2103334.9	21149208	-1463624	-834903.5	22542210	57700.703	55682.4904	104312.281	63141.5526	38329.751	69795.644	64667.545	56073.433
283.20313	-3590745	1105431.635	-1609580.63	1229075.3	24842469	-2950890	669446.2	22300552	64752.3118	70596.8413	70342.2886	95770.3782	68799.152	78025.412	80514.098	47560.637
292.96875	-2722928	868074.9321	-2220502.24	2958115.6	26463213	-2642949	-1558929	24177928	76792.3838	77046.8851	79467.127	59335.5276	83740.502	75693.851	52617.152	61042.43
302.73438	-1627645	158829.3302	-3449417.71	3864848.1	28005780	-1959860	-2142993	24162721	92548.8299	80590.4896	94905.5856	79857.0123	74304.264	83159.303	77239.081	69112.064
312.5	1220051.2	1717840.733	-3891767.1	2099575.1	32037415	-1406435	-654176.5	26219572	103232.225	55900.896	69478.4865	67119.3965	57744.231	79547.331	60878.536	68231.86
322.26563	-62244.1	-908055.163	-1851802.24	1799776.2	30331840	-5237223	436991	28650580	76311.0025	60531.8268	78632.5723	76106.4771	35671.78	64223.925	110864.93	59668.405
332.03125	4179580.8	-3129440.01	-1407000.11	4411723.4	35520087	-3759133	-6924759	26403859	163676.417	105465.203	178150.526	136929.728	158276.38	114645.02	202908.17	117173.09
341.79688	9157465.1	-4288725	-2079241.91	3479260.2	34493641	-2267988	-6987245	26266389	380432.585	231474.334	595562.407	381278.031	370957.26	242658.85	517118.31	375414.81

Table 14 Test condition: Low preswirl-15 krpm-65% Pressure Ratio-100% GVF

0130	Test Data								Uncertainties							
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**
9.765625	922038.73	3385592.353	-2703933.44	365641.13	837829.1	89721.46	398772.2	1529601	82599.2539	159653.497	109784.011	98573.9536	125536.83	191786.62	95118.778	127556.61
19.53125	1236622.4	3222930.965	-2706401.48	366150.11	1764571	-108690.8	-16159.51	1893695	137407.911	95085.2149	107417.615	88935.0808	168020.66	134460.83	111093.49	116161.86
29.296875	-225462	4849064.892	-1304712.96	-1449835	923551.7	1924610	2428921	347552	148879.163	105060.839	116640.576	79652.1873	164223.63	130036.89	159791.72	84601.605
39.0625	1438795.3	3164580.498	-2709677.87	908518.19	3422017	-334679	308863.7	3434630	84659.2298	88301.7247	98755.9118	69786.8289	125037.7	84141.464	102834.25	54251.765
48.828125	1131230.3	3192266.787	-3008881.92	794256.75	3990972	-140592.1	147279.3	4356191	113648.326	103339.413	121221.762	73783.1012	96275.939	92555.926	89139.391	69101.379
58.59375	1349743.6	3033667.806	-2691829.68	933585.61	5358015	-188976.3	-236121.8	5154631	103659.124	94410.3632	129710.275	104353.799	190271.25	96657.038	137079.72	88226.039
68.359375	1196304.9	3244057.199	-2804003.02	765198.26	5598011	-60721.49	598223.2	5800196	142728.56	91171.3424	89006.0148	69902.2652	119170.84	79326.32	136991.57	51677.473
78.125	1224583.4	2919395.521	-2840855.12	997637.21	6598340	-214807.4	267598.6	6698739	154193.57	97462.5731	158909.817	73807.9104	158543.82	98795.338	197716.96	82985.937
87.890625	1297613.6	2739964.589	-2978475.73	1275402.1	7401168	-79893.2	89048.23	7369248	110455.946	76222.0779	132924.306	71391.0727	103527.52	106051.68	126674.53	61886.8
97.65625	424240.48	3749424.398	-2040697.69	184811.47	7419257	171287.4	432824.6	7988434	101492.259	66248.5362	170376.778	88327.3091	87758.998	95396.611	99452.533	99247.799
107.42188	1815968.6	2902737.948	-4011344.72	1500136.5	9367036	-159537.3	-234636.3	9959952	192924.789	97965.3145	339344.388	95209.463	138098.92	101023.83	246626.61	102569.77
117.1875	1975532.4	2756417.464	-3159658.06	1939520	10232070	-154438	226786.3	9980004	212176.454	116673.143	132640.694	126552.162	194206.43	134325.19	266094.82	69321.143
126.95313	1140727.4	2957089.313	-3451542.89	2331479.5	9705826	269626.8	894440.1	10512670	236394.972	92128.6458	164021.2	110318.322	184679.45	113213.35	210713.71	83583.451
136.71875	-1320658	3302644.295	-1470592.85	1724718.3	10219914	273581.4	1025737	11230480	104686.941	76394.919	149425.814	75044.7384	160295.54	99330.815	93548.871	78994.66
146.48438	992343.42	3909009.581	-4052214.56	1695794.1	10519714	-3026.404	2366250	12014358	191166.394	109713.879	257249.331	137679.585	158994.74	89285.62	171303.34	113985.78
156.25	2999898.1	2400027.69	-5971858.28	3261211.9	13454241	-415221.2	-1228588	12989258	108544.662	108102.45	166559.588	79461.0049	112209.25	74384.991	247426.61	70362.595
166.01563	877908.57	2662605.895	-3505623.17	3118628.8	13206854	-204124.5	543436.5	14030327	96563.3015	98487.9557	163318.823	74640.403	172919.11	81022.376	150990.52	110554.87
175.78125	101309.62	2849465.386	-2603701.95	1368281.6	13363469	382653.1	486748.2	14259441	637559.457	75685.6006	659757.851	80482.4725	345271.09	93614.79	460552.12	81695.34
185.54688	294680.11	3354253.031	-6406011.99	5159159.1	16716304	-258720.1	3240572	15835614	253772.4	105441.783	277368.94	116763.67	410032.13	105353.43	376211.91	98568.963
195.3125	248681.35	2915927.5	-4591457.91	3851455	14366378	-311367.3	1337213	15380414	264484.636	77882.364	267002.12	91526.7856	358073.13	109732.46	411025.03	85925.089
205.07813	-264168.7	3252315.99	-4746000.08	3186517.6	15604666	559272.7	2269622	15106664	494561.646	93964.8101	498471.793	99564.8033	659796.38	152187.71	432305.83	95033.093
214.84375	-1308972	3560085.945	-3988010.26	3379730.9	17181377	-733317	1487173	17515481	295336.108	120504.463	475430.325	130174.546	419320.48	204111.26	349861.47	109623.1
224.60938	584213.66	2600127.91	-3788966.47	3872482	16241758	-20463.28	1018014	17266964	784241.563	119999.183	1058816.37	156205.836	1327610.7	180945.95	1091825.6	163945.26
234.375	-3228765	4484683.593	-3670468.4	2104131.4	16508039	-517195.3	2661338	18245411	689396.676	190819.135	900134.095	228527.448	798457.61	210017.88	675463.43	166509.14
244.14063	-4400417	3432920.562	-4147723.21	2721548.5	16269523	-1267867	-523890.6	19863413	3799389.49	549718.822	3204885.21	544362.696	3408406.8	599290.88	4504684.9	625362.71
253.90625	-5733181	4197451.201	-6135667.61	3856648.5	17742734	-528263.5	5804565	20754393	4121781.44	638282.64	3979526.17	704995.036	1789089.8	414878.66	4122114.9	620813.27
263.67188	-3352740	3977694.906	-4515009.84	3488783.9	21231639	-1125214	569359	21822400	917236.24	190106.078	1247808.65	240064.282	824995.84	175869.74	869191.34	168679.44
273.4375	-4695218	3674300.486	-4181376.83	3495019.1	23246020	-2226635	122010.9	22695596	545899.731	165554.941	637209.776	235399.255	690399.37	222215.91	725581.25	160610.05
283.20313	-6846813	3569329.233	-5426425.49	3314715.6	26238439	-4882700	-696459.8	22487395	374184.306	170835.95	441801.702	180468.081	402308.19	184289.29	532925.4	216253.21
292.96875	-4729665	2173941.029	-4985653.49	4010162.6	28111328	-4284091	-1495998	24212163	396963.892	94952.1213	584934.539	136440.736	168582.72	156223.31	329583.47	193889.11
302.73438	-3760755	1405797.435	-7567664.47	4929016.6	29272921	-4941529	-2326016	23513148	638363.137	128065.99	236525.632	172402.442	209602.25	273625.14	411466.39	128643.03
312.5	-2439230	1640021.376	-7874217.63	3180472.5	32102790	-4719498	-1001394	25504271	326030.938	152851.651	449209.006	125599.443	398346.48	170576.17	215698.03	164393.06
322.26563	-2721478	-632530.788	-7640836.09	2058213	28587432	-7561152	2636373	28375421	351423.513	108425.929	444424.854	145711.864	165681.69	142631.73	341259.29	167356.82
332.03125	-7589080	-5727415.92	1065033.119	6167657.5	34422677	-8955435	-5559904	28225231	428993.014	211522.502	421789.668	147677.061	527227.94	212262.24	299085.97	196058.61
341.79688	2877843.9	-7048933.94	-8355885.28	2374719.8	34181662	-4478437	-6069921	25958137	330748.469	227323.087	455696.095	197396.426	476141.69	162471.91	389448.16	213155.66

Table 15 Test condition: Low preswirl-20 krpm-65% Pressure Ratio-100% GVF

0230	Test Data								Uncertainties							
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**
9.765625	77865.654	5457798.739	-4600658.65	290747.12	1303805	-229278.4	179176.7	1647152	96321.4845	92842.0757	99141.4567	92884.956	94877.674	126972.7	116242.3	120881.9
19.53125	424845.18	5333116.522	-4485722.92	312599.89	2095889	-360881.1	-57054.87	2190962	83141.9904	98127.9934	62018.2116	111332.886	99203.464	101517.11	119860.9	96392.856
29.296875	-427961.9	7215138.774	-3022787.97	-1797374	884318.5	1429267	1951612	981090.9	93844.5437	76398.9421	130137.798	87191.0607	62238.143	84269.797	82124.852	73205.098
39.0625	841770.7	5330908.354	-4694357.6	722580.52	3479199	-235944.4	120873.2	4136239	70283.2963	82681.9106	69725.7708	83852.7984	48395.356	102095.29	84698.815	86554.942
48.828125	930106.62	5219797.053	-4903316.88	516388.42	3992028	-499555.6	36635.99	5028362	52760.4352	132319.912	74248.4157	84507.7249	87942.678	111861.92	55057.69	65447.446
58.59375	1182715.2	5346776.295	-4842101.82	902952.58	5288305	-438229.2	-94134.93	5969741	111638.603	78899.3198	124223.18	84373.1855	96738.155	122192.05	98878.21	106757.42
68.359375	1003177	5248349.459	-4944151.3	1001982.8	5506974	-333818.6	536343.1	6883198	93210.3671	96144.9092	72459.6513	82798.5589	107983.59	90558.011	99276.417	91815.701
78.125	1263920.3	5145029.795	-5002087.03	1571426.6	6562835	-515295.4	45679.41	7596583	111598.313	87869.5272	125881.402	90737.3807	84008.206	91252.663	140547.73	99874.068
87.890625	1391638	5241557.896	-5113780.88	1644058.6	7308928	-324797.2	118010.3	8772060	35325.5991	106488.406	77635.6228	100755.232	46288.631	94160.185	78004.272	97299.475
97.65625	699015.32	6108081.341	-4312569.72	756998.55	7843542	-111659.5	438795.9	9170609	73363.4801	70374.1402	73508.4113	101682.8	57190.635	76360.003	99460.93	109684.88
107.42188	2540148.3	4799414.901	-5354845.03	2472195.6	9194094	-917176.2	-301053	10960456	104939.609	77186.7208	219147.181	171263.564	71312.178	116563.75	228081.01	112130.01
117.1875	2777634.2	4801955.453	-5649839.81	2733840.6	9773425	-790575.2	52191.54	11292529	39507.5767	64708.6296	144947.276	75899.6431	64377.375	82884.912	125587.02	89045.778
126.95313	2093583.4	4631523.111	-5050239.96	3281269.5	9534113	-319820.8	871964	11700180	51012.2727	92306.4404	75840.5812	88038.956	53135.371	105240.73	96868.684	139755.09
136.71875	1283229.1	5135358.991	-4144474.52	2986603.2	10600710	-319294.1	367171.3	12595278	67140.3193	94746.2371	58117.3003	120395.982	51106.646	75802.351	78790.668	104555.68
146.48438	1814036.9	5493213.418	-4492601.19	2803694	10137769	-285175.2	1808602	13351594	121657.288	104163.955	113899.849	164405.094	78102.8	127656.72	127642.72	139674.52
156.25	3116061.1	4571496.516	-5967219.45	4567411.8	12565663	-1074986	289740.3	14618673	120884.141	124661.864	137027.597	93918.2376	113873.68	135896.67	100787.45	97107.361
166.01563	3133478	4601819.629	-5721781.99	4792826.2	12852370	-525369.3	612898.5	15141623	119902.453	134624.62	81243.2152	84411.9407	77601.505	94314.332	69141.707	113367.75
175.78125	2926986.6	4740668.347	-5431317.07	3012798.4	13345514	-99094.25	1286193	15586070	146016.377	120482.681	117184.261	109615.304	63340.721	117109.98	174815.1	69443.335
185.54688	3899844.3	4847631.027	-5003823.84	6292015.1	13544210	-995892.9	1170488	16420003	94876.7247	129330.861	124812.74	208314.685	95127.002	126647.52	166595.03	139468.61
195.3125	3934333.5	4754784.127	-5447112.07	5587269.4	14076138	-744858.2	1373412	16519904	114378.41	75441.5839	131493.726	109925.027	103832.88	101003.8	74639.384	127680.22
205.07813	4254768.9	5346699.35	-5994414.13	4988122	13850253	-111496.2	2362423	16378244	164766.581	122514.143	161588.873	122554.246	138556.31	108639.57	204920.45	111997.54
214.84375	2907768.1	5029394.51	-4572848.62	5074384.8	14706847	-1939616	1606915	19998000	87048.1102	111955.691	124674.446	204948.343	77487.54	140790.48	164211.48	100855.84
224.60938	3225112.1	4637053.334	-5333345.98	6415323.1	15546023	-461214.5	2255405	18480079	367478.36	122039.641	390437.858	143526.4	167343.61	127650.07	257038.08	92298.462
234.375	1902702.3	6186289.458	-4165625.64	4810145.3	14149805	-765912.7	2935797	19775879	108232.887	122345.425	87160.5301	142907.557	204922.2	102486.93	184592.61	148894.91
244.14063	-304508.1	6799106.847	-2669802	4893876.2	17287002	-2560903	493881.3	21606018	139939.248	96740.7843	299835.103	142876.882	138616.33	113009.16	217683.51	97113.294
253.90625	3151874.8	5184759.329	-5314111.06	7445176.9	17734191	-833494.8	1477013	22225288	91720.2284	81722.9132	113113.281	75382.0694	73586.299	70776.352	192323.31	79623.868
263.67188	3135566.9	5711603.181	-4633155.65	6545762.7	19004539	-1079075	1423786	22489853	127475.326	90387.1077	210868.531	105490.688	133285.07	83487.47	123822.62	70260.786
273.4375	2877128	6430334.849	-4718194.88	6897254.7	19439888	-1224907	628145.1	23510877	106952.792	80291.2829	51914.517	88328.5323	102535.05	83856.356	93976.354	90691.493
283.20313	847334.76	8041429.643	-6099315.2	8104490.5	21743256	-5016597	994160.7	22841874	93440.1323	151494.032	98557.0133	159076.154	150720.78	112488.48	126489.89	86918.533
292.96875	3813178.4	5186147.188	-5392730.15	7248580.4	23256810	-4778976	-27862.79	24751591	78893.5335	94593.0026	100069.558	101997.259	106494.24	84731.642	188615.94	108753.9
302.73438	4754038.9	5463225.49	-6077021.15	8019310.2	23630480	-5368418	-279944.6	24490299	116829.235	84345.2218	93189.4831	93697.3687	85167.34	98257.204	124544.92	101240.52
312.5	8818028.5	4847462.228	-4875486.63	7651927.3	27519362	-5460031	565712.3	27653201	111667.827	116677.734	105021.696	96118.9467	74010.179	79221.505	126629.74	140778.67
322.26563	9298173.2	1820816.445	-7301875.37	7575733.9	23803931	-6886041	-810978.3	27821854	80542.6032	102125.208	144355.498	127670.108	122999.01	115604.54	218833.2	117352.53
332.03125	13273077	1722270.056	-9539952.66	7991202.6	22673545	-5896171	-3911752	25019436	554187.713	658656.38	1040840.62	757713.268	663654.44	527302.44	756584.61	971421.35
341.79688	15446269	-1061329.21	-6195626.68	7086777.8	23003112	-4608094	-3670619	28391153	126854.257	122726.957	217842.605	164409.748	245193.47	130823.79	235975.81	155961.57

Table 16 Test condition: Med Preswirl-10 krpm-25% Pressure Ratio-100% GVF

1000	Test Data								Uncertainties							
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**
9.765625	-2680187	7106881.886	-10511176	-3303802	821753.7	-74617.4	-555544	1657783	277137.518	171959.851	351619.31	158514.379	327120.41	164141.56	291667.65	179114.14
19.53125	-2687021	7210155.646	-9505426.14	-2949900	1918908	-490109.5	116488.4	2393453	99720.4734	122652.851	98810.1583	113047.666	92312.545	124877.33	106634.09	114129.83
29.296875	-2490405	7738538.095	-9282634.51	-3424278	4784759	-1698175	-1489663	4450625	135132.316	168808.262	187766.338	332314.196	139042.45	190819.43	260679.55	217133.82
39.0625	-2493718	7109195.929	-9438744.71	-2548291	3848754	-466674	506078.9	4205690	42666.1085	85905.2701	90720.0177	105183.545	46098.563	116153.11	55092.731	90326.732
48.828125	-2445011	7044785.414	-9195208.21	-2419473	4791479	-601379.3	587435.7	5323428	70497.7479	113837.407	76706.3002	123316.918	60633.479	85807.261	92414.169	106462.79
58.59375	-2441957	6661667.058	-9303745.46	-2235369	5670671	-454702.3	806977.1	6427841	128666.089	144886.087	131692.192	100606.759	113879.59	125854.18	81645.069	127885.77
68.359375	-1762146	7121766.279	-9161862.29	-1914922	6820858	-388573.5	913490	7937071	70878.3118	133750.427	113239.953	66065.9957	79456.441	103299.64	60984.768	105037.7
78.125	-1395689	6965485.51	-9162042.72	-1162993	7694367	-851309.2	943415.4	8427783	112735.115	101678.943	91912.1208	90543.522	100793.49	133223.03	76942.552	121011.53
87.890625	-1038326	6737613.405	-9333663.45	-706075.5	8476333	-866508.4	1034461	9251389	60408.6597	64778.4508	71201.0095	119287.642	58895.943	82937.324	88526.506	103629.65
97.65625	-887901	6957049.633	-9479367.22	-610515.3	9580699	-911934.5	892740.8	10030431	79173.2924	98925.2474	56037.3318	108456.356	85732.671	107908.53	87133.775	124646.38
107.42188	-523948.3	6593195.664	-9253451.97	-167949.4	9949856	-535365.9	1223410	10821523	89507.9573	108597.072	174793.336	134546.071	57260.763	140807.3	133123.98	155081.71
117.1875	-879980.5	7125535.793	-8785674.82	163543.71	9330513	1962.45	2845705	11029792	88485.0982	84200.1188	71640.5036	76022.0513	128710.4	117928.71	70586.551	113000.21
126.95313	806938.77	6358959.51	-10211639.4	1500134.2	12497796	-1531551	618263.6	12915252	90683.6552	93780.7632	97490.4446	94166.095	114468.57	169262.84	82678.464	127284.14
136.71875	266455.25	7733657.523	-8983630.67	-202740.6	11831616	-481609.6	2726540	12020149	49815.357	103768.678	84694.9215	73921.4079	67860.07	116218.97	78057.391	133432.35
146.48438	1715175.6	6373884.107	-10187994.8	2811726.7	13636115	-1669928	467522.9	15578843	125237.178	134836.884	119175.15	185532.824	147589.77	135159.17	134609.58	144445.03
156.25	-76213.39	8047819.137	-8845736.59	1849211.9	13003766	-890472.2	2487432	14504704	79682.6435	139953.986	110305.733	150323.346	130153.89	167876.95	128667.08	134735.31
166.01563	24665.925	7047039.043	-9321056.05	3063064	14925928	-1467605	1816239	16004699	128603.821	253169.796	173494.578	266179.902	195375.52	185585.88	195841.78	331661.02
175.78125	704292.01	9504689.853	-7621890.75	662527.73	15452883	-1297322	2586658	15983574	284768.923	210460.906	280476.448	158773.707	177120.12	232194.66	198066.08	256554.92
185.54688	2113251.8	7797680.192	-9275394.1	4083159.5	15945327	-1710981	2581352	17844728	114953.595	155424.744	94362.793	156499.211	187471.09	189048.55	251230.43	160624.48
195.3125	2968972.2	7002417.781	-9185226.7	4510019.1	16259304	-3000791	2079966	17309387	106937.139	95217.8761	146753	156971.16	87929.764	152169	150728.81	191307.25
205.07813	3496777.5	6876086.696	-9790339.97	4973739.9	16332032	-2792935	2067078	18604167	157584.973	115062.322	199825.804	194323.299	124239.07	224911.47	159995.24	211371.41
214.84375	2496823.9	6208260.16	-9582422.8	6200304	16457788	-2836342	2528909	18916458	137446.158	161983.877	147523.072	215040.854	82624.955	159297.44	159486.2	168965.08
224.60938	1764469	6091543.658	-10060317.2	5673970.3	17699163	-3142701	2132766	20025876	252617.86	142294.618	175606.064	136845.276	137126	157705.16	267760.52	174483.94
234.375	2045847.8	5948412.565	-11009043.7	6031346.7	19880058	-2936944	2134335	21301511	133753.258	126381.812	150013.894	156920.124	106982.97	116144.73	101038.78	154810.58
244.14063	2411691	5065227.537	-10961163.3	7830890	20508559	-3103463	1857465	22213816	99944.5438	79269.2002	121245.317	120868.882	132457.43	153069.46	160742.17	159137.62
253.90625	2677582.4	4672740.063	-11945966.4	9198262.3	21972358	-2422281	3227611	22959419	60704.3285	80100.5119	77512.834	69660.8398	103256.84	74731.744	113631.61	149758.14
263.67188	2764949.9	4671828.427	-12032353.9	11019654	23108100	-2243503	3884291	23881775	77084.476	66518.8366	63364.7399	67622.7957	83141.922	91664.978	57259.954	112559.41
273.4375	2449447.8	3926573.605	-13607434.3	14184566	22716726	-920664.1	4931810	23514293	54905.3574	115999.891	108876.723	110039.833	43654.722	80541.164	89850.506	151001.63
283.20313	549684.17	5927581.81	-10138614.3	13168454	26759295	-1530960	7522274	19762418	94323.8109	90724.7198	90110.3929	105764.838	67627.801	99395.454	78845.734	116278.14
292.96875	2149780.6	4691798.212	-10142289	11883927	28321767	-1822789	5673383	20142824	47083.7009	101913.664	75468.6715	89304.6469	77432.302	79452.311	80158.384	142340.96
302.73438	1936579.3	6359546.756	-10509663.1	12462470	31414690	-474133	5749919	19048008	42556.6029	81623.1678	80797.7173	94910.0534	63462.417	85895.533	93936.358	104158.71
312.5	4929092.2	5540378.963	-9510685.04	11502237	33909921	-1741188	4075953	19638708	63860.9486	84978.1999	83213.7251	90229.7354	65841.684	80200.375	73785.855	104928.37
322.26563	7115069.5	5572779.406	-10419265.7	9955931.1	33762450	-1046778	522775	19205906	80733.2482	81491.6047	59988.5754	72056.7441	64446.965	83586.512	88012.341	101635.24
332.03125	5577370	4986873.128	-13626283.3	4393819.3	33389196	-1435925	-2852311	17903525	120597.609	99941.7704	153900.033	135042.451	106170.41	118227.32	127446.32	192289.97
341.79688	8209704.1	3565503.265	-15344835	-1721494	31188570	-2828540	-14010623	17452007	307908.565	354362.481	458187.155	565430.424	277676.53	268469.4	616273.64	601400.27

Table 17 Test condition: Med Preswirl-15 krpm-25% Pressure Ratio-100% GVF

1100	Test Data								Uncertainties							
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**
9.765625	-3680809	8304928.54	-10432620.6	-3913467	698244.9	-38147.2	-540507.6	1048864	356836.717	173798.703	303415.041	180104.68	195389.37	224118.68	344225.72	187482.07
19.53125	-3212071	8340207.038	-10322849	-3726143	2085119	-460865.1	-213257	2405685	151455.358	116571.107	161188.181	94829.7325	137383.26	140676.44	122077.26	170071.44
29.296875	-4913680	9720952.941	-9315471.3	-5267073	3515175	-148346	300160.9	3853664	102449.558	100208.239	134277.661	106985.707	111468.2	122575.57	96323.213	209642.77
39.0625	-3264003	8433218.327	-10506622.2	-3342707	4541342	-290005.9	1071870	4779537	73226.6536	85110.9563	99886.2155	88394.9343	48287.542	112786.67	64389.052	135787.63
48.828125	-3240426	8339507.34	-10359112.3	-3161599	5343021	-717657.9	871724.8	6034625	94000.0624	109823.93	76699.5324	115930.236	89560.967	105355.96	55064.075	131654.1
58.59375	-2318172	8266755.488	-10771662.5	-2585929	6743736	-824649.3	878337.1	7389005	105807.108	94136.7573	144773.852	95858.8404	77500.447	111769.66	86513.413	91349.12
68.359375	-2037333	7881684.401	-10980057.3	-1833922	7058814	-1012210	1069021	8563623	92710.0941	68532.2844	123013.909	125394.149	144756.53	132272.81	96820.46	137972.3
78.125	-2097391	8135082.215	-10414620	-1263740	8258081	-679961.5	1329717	9143898	102894.75	98798.5907	66568.8535	105430.087	135407.72	153950.54	118432.96	117923.78
87.890625	-1287644	8033224.204	-10951726.2	-786009.3	9384785	-1106182	1431429	10277963	59249.855	113045.427	72896.1397	91238.2906	72278.411	88233.499	83634.737	116412.33
97.65625	-1031777	8081688.45	-10398355.4	-577746.6	10153999	-1015063	1646309	11102646	70958.9108	93078.498	65931.4112	109054.221	79188.425	102650.04	70614.624	101934.95
107.42188	-315186.7	7818025.698	-10380683.2	-320187.8	10622827	-811592.1	1520419	11553429	100434.428	107012.919	145618.891	135652.76	108931.58	125843.34	91856.827	105386.19
117.1875	-226762.1	8192456.383	-10248869.1	258595.43	10343255	-336394.3	2921532	11936301	90256.0826	115105.662	91742.8415	89966.3035	111699.29	119511.77	134111.69	132518.49
126.95313	855501.52	7578177.207	-10976654.2	1535230.8	12838041	-1730133	1691367	13712009	70646.7209	107961.897	111316.77	82321.4618	147419.42	91751.463	112576.7	134940.68
136.71875	682666.75	9224593.933	-10196020.2	-274478.5	12848448	-1466335	2882228	14459335	117491.196	91663.0534	113130.762	93424.2748	93165.318	140123.15	92251.977	168039.27
146.48438	1490778.4	8004805.938	-10774923.7	2369351.2	14230938	-1810978	1004648	15499507	127719.926	123146.18	85867.5191	180895.289	112083.08	119819.45	128619.12	166047.52
156.25	-305966.5	8969855.838	-9704301.74	2255128.4	13837671	-1285578	2976042	16007132	74688.6895	120410.024	78881.3971	99241.6385	90769.485	110702.09	49470.142	123547.58
166.01563	682036.85	9245950.817	-9364817.25	2655458.4	15607194	-1641032	2651948	16642045	69032.5511	116242.928	120412.803	177922.289	92250.846	158985.7	117802.14	216777.13
175.78125	2460.8759	11771855.25	-6263403.83	-1342743	15183109	-845767.5	5379994	15529862	203045.679	181574.563	263423.413	152409.238	143299.78	198785.55	146784.97	154304.16
185.54688	2401164.6	8516037.278	-10023098.7	4720316.1	16882446	-2103045	4209053	18813815	175084.973	141569.27	109433.184	142850.738	179839.12	102124.35	232006.22	143264.6
195.3125	2731574.3	8372349.13	-10103024.4	5252692.9	17608236	-3259608	2497331	18813808	125582.461	127642.31	125298.351	128924.15	152765.15	139825.99	132699.75	176917.83
205.07813	3691603	8155102.361	-10268979	5568073.9	17906539	-3452242	2804769	19779858	215918.957	147000.212	215829.8	155239.231	215515.17	120806.13	157551.49	203075.34
214.84375	2445922.7	7438651.26	-10598623.5	6290390.1	17728789	-3588165	3419532	20557075	185378.371	192393.178	172047.971	230750.851	152273.24	261609.18	207091.49	300134.23
224.60938	1509226.6	7417086.799	-9914747.89	6101372.2	19490763	-3866772	3410554	21320280	123689.592	175889.134	209248.57	190164.504	220139.92	166691.81	205611.72	136287.34
234.375	1623973.3	6647931.809	-10353757.8	7863606	21172640	-3305701	3273962	23255150	167929.802	165963.268	177405.165	145135.862	138306.6	224642.35	195747.11	162097.58
244.14063	2035393.6	6773380.029	-10501601.7	9755928.7	22952882	-2842623	3295195	23406142	233748.858	228547.815	308451.17	234043.339	255811.52	204730.68	468784.57	207203.61
253.90625	2638329.1	6321961.569	-11765740.5	11389776	23934899	-2945547	3183718	24035044	316358.643	188417.538	326118.447	194521.994	267267.78	200704.66	346766.9	236395.4
263.67188	3151369.3	6718623.515	-11404654	12943313	25215295	-3297302	3391399	24075394	174881.533	146581.998	186250.189	140177.493	134720.08	87805.274	205279.42	123854.19
273.4375	2906172.4	6621590.707	-14310986.9	15798218	25013087	-2662593	3866313	23298109	105529.507	151965.58	105401.172	163700.215	78575.897	124189.61	81159.935	102249.61
283.20313	2235926.4	8452261.914	-11030316.1	13260236	28378010	-5258390	6516134	18720994	39336.5437	132994.188	62188.9267	90728.9266	92627.811	67552.642	73953.93	98306.897
292.96875	3321295.4	4330684.879	-11842484.2	11463576	27035971	-6203582	4065294	20365681	73606.7621	93351.4046	76180.8402	70057.9801	70552.78	93485.419	100387.35	97676.655
302.73438	1719821.8	5054604.814	-12039697.4	11295295	30166368	-5810477	3455936	17897787	60102.6881	80143.9884	70252.6152	73462.4747	70234.359	70887.721	87876.066	105396.27
312.5	1356061.1	1985740.628	-15377706.5	6556771.3	32279116	-5418749	300468.8	19719658	89997.2832	71577.7249	79437.823	99653.7788	77808.315	82198.674	95074.845	82202.098
322.26563	611544.72	733856.847	-19219969.1	4610665.8	33373773	-3662122	668828.2	23824911	89767.4775	66671.5238	115878.957	74584.468	85487.667	67302.699	89732.006	97300.53
332.03125	-6624263	-4665363.32	-26996297.7	-1717216	34166574	-3127221	3278649	29161760	91948.2308	95497.3621	122489.236	94373.5692	98142.655	94294.685	132631.84	129783.72
341.79688	-19718361	-21979818.9	-37675356.4	-12689227	31284510	431838.1	-4705722	31795545	238008.458	155659.14	197406.969	179857.351	228486.93	182164.62	187925.74	155891.1

Table 18 Test condition: Med Preswirl-20 krpm-25% Pressure Ratio-100% GVF

1200	Test Data								Uncertainties							
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
9.765625	-3817864	9840832.049	-13687701	-4162420	996852.1	135933.8	-575590	2104616	329203.496	277577.377	400453.645	275753.512	249941.89	231862.63	359092.18	342192.24
19.53125	-2804679	10083099.29	-12473054.8	-3487302	2390000	-770220.8	839784.6	2650886	89545.726	128712.467	152789.348	157457.536	102760.9	125332.17	118912.38	194962.18
29.296875	-2892259	9605211.653	-12838620.3	-3259561	4893621	-1298820	-766746.1	5168307	178347.784	217861.241	150288.407	161851.948	150814.63	174049.96	172575.78	187735.17
39.0625	-2591010	10198384.83	-12489725.4	-2992089	4812362	-1106026	1415565	5096599	91836.5642	148962.762	93460.1763	144079.555	143017.81	108500.51	100696.26	107732.49
48.828125	-2543498	9732713.24	-12109385.7	-2897686	5529869	-927010.9	1412392	6228716	84286.9364	78264.4731	107887.091	114819.07	53804.677	94919.501	127702.44	131585.85
58.59375	-1859222	9631341.623	-12346029.2	-2336900	6527358	-1524328	1490004	7949763	126223.1	141278.564	160811.773	108606.156	133313.67	114786.79	107167.93	120395.91
68.359375	-1544929	9521262.839	-12596501	-1600741	7885075	-1269163	1724936	8696078	117013.832	119587.321	113875.32	89838.1019	69920.966	137447.51	86436.029	146389.82
78.125	-1487526	9300332.837	-12209219.5	-1157351	8631605	-1565337	1955276	9413963	100561.735	113684.648	166807.644	107706.681	88607.707	128186.82	79126.534	105476.45
87.890625	-909311.9	9397073.752	-12063056.5	-766599.9	9445737	-1604806	2153092	10563215	65866.9458	91221.4357	88659.8515	104720.243	45452.679	89006.615	56262.012	113142.86
97.65625	-371349.2	9220431.53	-11938573.1	-201713.8	10748522	-1765619	2150973	11721656	61491.4894	144665.021	79409.2022	86159.9294	134092.82	127241.45	88377.643	128062.14
107.42188	464724.83	8910286.877	-11834629.7	368681.21	11247477	-1674408	2801826	12372502	72231.9417	116374.911	125856.91	131342.263	83691.155	102151.58	132377.14	172418.48
117.1875	146307.41	9066792.136	-11721985.6	953867.78	10443801	-893674.1	4127949	12836637	84436.8244	123058.501	94605.5158	122608.244	88944.154	107917.24	93280.47	131868.14
126.95313	1214593.5	8916359.534	-11865948.7	2030101.6	14453375	-2689075	1543371	14668806	111163.078	106147.533	53048.726	114283.318	84289.244	181914.99	91107.702	106394.47
136.71875	1407091.3	9777053.053	-11549286.1	1106131.2	13167229	-2287634	3834709	15581344	66297.4558	104875.037	86434.9237	101156.218	75787.292	124615.87	90490.663	142582.68
146.48438	2641763.2	8979907.951	-12050108.7	3207543.7	14512280	-2379122	3016865	16313472	88615.8098	121736.173	109793.29	156399.809	89188.488	130560.8	143599.66	159857.73
156.25	810938.94	9817374.383	-10546445	2811874.6	14225706	-1900389	3815464	16801027	66028.2767	116675.834	88282.4798	138732.451	68602.154	136387.03	117938.71	140362.48
166.01563	1719876.4	9981620.758	-10547147	4581156.4	17108950	-5185463	1967486	21549257	88024.6791	88871.2048	125517.51	149898.881	70663.377	145688.96	162682.99	199268.3
175.78125	539331.96	13133197.78	-6726648.32	-1063706	15327508	-1136966	6321810	15616052	100921.225	169163.525	184995.957	177604.399	139983.39	124186.59	132499.18	236887.75
185.54688	3222310.6	8987447.864	-10773357.9	5357036.9	16678161	-2273385	4332530	19352115	170009.885	148335.849	201822.652	112878.88	167521.42	141737.79	159081.69	212224.11
195.3125	4539335.5	8937287.551	-11179263.6	6347688.1	17351807	-4101763	3575032	19561197	108662.381	176475.996	198460.153	131061.297	156207.33	171569.5	114557.74	208911.67
205.07813	4910280.9	8653120.407	-11067890.7	7253939.4	17162516	-3867303	4361574	19795696	178370.524	127717.981	219457.692	175350.31	116817	174177.06	221748.81	160480.57
214.84375	4145345.2	7962848.849	-11691667.8	8118222.1	17509994	-4330310	4365334	20970507	122888.427	178418.678	179330.56	140713.771	150158.47	161312.38	154518.09	243156.1
224.60938	2487058.6	7233571.432	-11777110.4	8083770.7	18290599	-3974751	4948413	22457443	179550.22	121364.292	271816.121	181638.845	110800.26	118264.85	258110.44	154391.01
234.375	3219929.3	7912846.816	-10946955.8	9390977.9	20917186	-3401840	5102511	23383410	192742.396	177160.332	150021.789	207873.66	144615.33	137503.59	167778.58	190827.94
244.14063	3699672	6960153.097	-11230892.9	12245497	22254436	-3203282	4775340	24120017	147663.354	162306.628	235934.099	109038.392	119628.32	103096.51	106491.91	153788.77
253.90625	4338871	6930227.629	-11832999.9	13792543	23577167	-2813049	4569794	23548721	144649.147	110175.221	139937.407	58810.7439	98777.024	89973.338	183104.28	131237.06
263.67188	5091444.2	7617151.993	-12045858.3	15717935	24778404	-3076198	4685430	23163955	109252.969	86693.7869	106925.563	113299.654	79610.252	97512.415	75254.693	112182.59
273.4375	4741405.9	8452079.827	-13808307.8	17539599	24516358	-2623059	5908809	20683601	56402.5751	161242.86	48783.5988	138674.538	85865.974	127308.84	87747.247	165984.7
283.20313	4087359.2	9325934.192	-10755870.7	14440410	27882240	-5403343	7553773	18672869	71501.6829	119045.75	95734.4851	107818.057	109759.96	92275.531	132121.12	117281.98
292.96875	5796237.7	5835429.36	-9981748.45	14356073	27429362	-5551518	5114319	20010334	87738.1011	91324.079	78713.668	89885.5757	71631.457	91185.614	91480.18	133523.02
302.73438	5381153.2	7336581.188	-10210159.5	12507880	28782589	-6550906	2553777	16570645	66428.9133	83661.7111	87704.5385	104298.315	74964.801	75415.998	99293.535	100117.87
312.5	4674098.4	4327806.847	-14738801.2	8203513.6	30728755	-6025798	-2580681	18478743	60193.2611	104470.759	76430.0193	80818.7185	85999.765	90439.293	113204.74	101490.69
322.26563	3739607.8	2490374.698	-21091750.7	5777575.8	31550757	-5251704	-1693211	22204533	100033.277	82934.8376	84477.163	98989.2431	60933.951	81332.43	130589.79	135715.03
332.03125	-3613463	-4605227.08	-29210759.5	-44348.15	35634716	-1089893	2650976	27334017	1045327.76	1177766.91	430642.295	739067.965	851873.83	1298979.8	581734.4	683322.98
341.79688	-10598534	-16085985.7	-38903172.6	-12041046	25968916	-2171968	-9464255	26974378	336382.42	381759.524	200096.218	216777.611	272471.31	264401.84	138609.11	180450.26

Table 19 Test condition: Med Preswirl-10 krpm-50% Pressure Ratio-100% GVF

1020	Test Data								Uncertainties							
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
9.765625	925316.11	6666517.696	-7588715.52	-1202731	466630.3	-1080414	-956890.6	101426.7	1298237.41	1038607.68	1037510.97	971209.267	1092313.3	1293276.8	1044087.6	1019785.2
19.53125	6713.6187	6810946.67	-8595583.65	-379676.3	1737845	-190783.7	44262.33	2197775	77987.3772	98959.1208	114027.771	143740.125	104286.94	109240.52	83943.708	109775.17
29.296875	-302124.2	7479902.451	-7717514.56	-489833.1	2572124	-4085.745	713903.8	2348989	107645.979	198965.376	185564.199	143033.378	163077.76	175659.14	198689.53	153987.02
39.0625	247426.5	7111988.539	-8701368.28	-9276.069	3353318	-177356.5	262568.3	3998667	111985.225	118586.441	96129.6177	115231.423	204752.87	126885.18	81596.402	93097.213
48.828125	167685.33	7016298.523	-8335686.27	59495.208	4649627	-479007.8	312600.3	4733779	121309.318	130466.484	150307.073	136474.339	85058.414	136962.58	109504.33	117734.62
58.59375	304746.66	6511636.67	-8546981.88	-23438.79	4990168	-630357.7	280526.1	5971308	106709.473	77455.7045	106682.689	109544.721	128994.69	143009.97	119082.82	138099.61
68.359375	401943.92	6688643.583	-8284212.46	349846.1	6062795	-216143	580309.2	7029935	121342.16	112929.217	78304.611	93094.9405	85596.548	125113.71	110235.65	102018.3
78.125	565942.5	6857646.363	-7949537.71	1167109.2	6887679	-495765.7	570845.3	7650704	66248.3554	145960.537	79965.5471	123211.523	83593.747	142840.59	127668.67	139124.08
87.890625	793340.91	6923628.237	-8096758.04	1326709.5	7894975	-795424.9	432923.1	8824694	99646.3091	109571.912	86533.0754	76011.0714	92127.928	87418.956	149944.86	123485.8
97.65625	1004223.7	6752408.213	-8201193.99	1549419.4	9076931	-627042.2	378487.6	9552725	125094.516	139806.772	66248.3879	135416.83	79195.443	130680.18	103678.81	111555.03
107.42188	1340078.2	6688243.255	-8494699.05	1558062.9	9670197	-819650.3	423442.5	10510894	123625.14	147240.855	123337.224	66177.9048	98856.908	123375.1	106843.58	146381.47
117.1875	815045.02	7151098.252	-8007079.3	1571495.6	9093778	532528.2	1573407	10334633	97327.1104	95235.3446	115853.906	85648.9563	79809.086	125816.19	75898.504	118330.72
126.95313	2263091.6	6653105.988	-8765177.57	2850713.3	11651060	-1265855	393976.9	11973737	95222.7362	140746.824	71789.4674	142854.022	98114.506	142671.2	89152.911	123356.55
136.71875	1766937.9	7673822.292	-8333116.52	1346945.9	11447611	-160021.9	2046110	11779693	76885.0864	109940.819	114344.712	131256.943	86511.462	125446.72	70005.844	127795.25
146.48438	2598335.9	7008867.513	-8799715.94	2303241.9	12949478	-2254539	570016.7	16525888	117533.236	117684.237	123140.087	177157.398	105110.77	125899.37	120099.05	101164.23
156.25	1018776.3	7800951.977	-8849979.38	3236875.1	12490974	-307111.4	1015549	14857027	90525.8548	88079.213	114954.233	144687.717	73826.715	143074.01	90078.298	147331.26
166.01563	1318986.4	7252073.06	-8876985.58	4443770.3	14429370	-1060863	1069791	15779423	125244.028	169053.714	153484.611	182415.43	126545.72	216918.25	106928.82	148675.76
175.78125	-2134512	11348452.33	-1838115.51	-2426205	18406817	-4856625	-3471761	23304244	126803.681	179913.828	158610.225	269359.093	166388.1	309110.21	185623.04	232616.58
185.54688	2027935.1	7327389.834	-8929129.73	4792541.3	16284444	-621314.4	1431178	18151905	168161.65	189861.742	218550.67	197372.949	202787.89	243625.87	187524.04	220807.6
195.3125	2826259.6	7530514.975	-8796672.63	5020374.9	16794235	-2407863	754146.1	17750547	87792.4736	133110.439	142034.168	156617.362	123768.76	134156.13	138808.45	171365.52
205.07813	3153896.5	7640392.707	-8818981.43	5435208	17529250	-2703431	1253724	18954451	111727.087	101332.251	158182.703	187101.535	107264.89	151008.78	148096.94	181744.36
214.84375	2386440.6	6353285.242	-8993684.45	6222056.2	17345589	-2831094	670194.4	19529130	123546.247	156905.52	112824.524	110340.495	106063.05	128049.51	60237.269	173893.79
224.60938	1036640.3	6216728.613	-9465063.49	5528091.5	18777815	-3526785	549367.7	20971971	129450.198	152722.599	149018.395	124888.277	174099.61	178777.5	186329.26	158379.38
234.375	1309076.6	5469458.294	-11043916.7	6618908.9	21034098	-2403376	188815.9	21895065	116011.807	111003.42	144763.71	168564.887	137779.3	156346.35	132662.11	225354.6
244.14063	852237.84	5004329.973	-11023587.9	7406188.2	21984887	-2094679	517152	23101817	134830.955	110004.038	136703.208	151858.042	131742.23	129056.43	86501.523	117297.82
253.90625	1305813.2	4426694.759	-12306191.3	8562431.9	23823395	-2203034	1081375	24472620	79116.1813	105823.282	85758.5265	82711.8862	89646.251	111027.75	45419.893	103653.34
263.67188	1167844.4	4236746.281	-12517987.9	10038527	25547712	-1811666	1654435	25657510	128189.717	124860.377	87886.8112	91898.2618	105656.46	139114.15	69615.005	116981.9
273.4375	1142182	3524998.038	-14716535.5	12803190	26164025	-387160.9	2722722	25276745	72677.2995	88990.4806	53606.8516	157809.669	49331.779	122798.77	64746.272	125440.28
283.20313	-957904.8	5754844.023	-12099661.9	11717373	29514608	-614900.9	5571838	22337194	75170.2701	130575.104	96331.5766	78359.4295	79860.364	101424.78	66639.408	172609.22
292.96875	-111317.9	4296109.457	-11894052.6	10636197	31791355	-901803.2	3821054	23590648	74280.7051	98620.1691	85834.3001	86230.638	48188.492	82718.528	82931.007	107437.29
302.73438	-946006.4	5470667.372	-13286089.8	10575263	34754637	620043.8	3658070	22484665	108691.019	92920.8426	52172.9938	102195.024	70285.211	85379.297	71793.217	122834.31
312.5	1049888.1	4716308.525	-12903257.4	8756983	39261715	563007.6	2426205	23387344	72036.6885	80259.1207	65677.9196	66046.5058	67060.17	100472.92	79871.262	125843.29
322.26563	3321492.1	4654653.444	-15682691.4	6138997.6	39643277	1795331	-220195.1	24448012	52324.8704	60868.6381	84775.3585	110655.577	63227.558	81144.66	70027.297	98463.841
332.03125	621745.38	3853346.747	-21421529.1	-291046	40352409	2759130	-131759.5	26569535	100024.503	115689.237	71030.0643	87275.0109	79013.602	99865.957	89410.734	115664.24
341.79688	3551959.5	6008212.34	-22154123.3	-6756834	42692676	4496634	-7662132	26508571	116995.309	159087.353	171417.511	185189.018	131077.74	160021.48	207585.02	313259.2

Table 20 Test condition: Med Preswirl-15 krpm-50% Pressure Ratio-100% GVF

1120	Test Data								Uncertainties							
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**
9.765625	982470.46	7223800.258	-8960438.23	-563991.7	-295207.6	-839486.4	-2426652	862067.8	583968.767	252383.147	539249.814	262582.504	475870.33	321105.41	478918.36	301001.94
19.53125	5481.9598	7729207.796	-9238796.72	442986.66	2009286	-472783.2	266821.5	2166437	92763.1743	117435.857	109007.985	174764.45	114375.88	153588.05	104550.15	110996.03
29.296875	-497121.5	8331371.913	-8574140.03	179815.71	3402823	-43271.36	-146993	2552067	149899.998	184896.099	167600.347	126181.207	92196.795	107136.52	201307.83	167838.71
39.0625	186023.13	7635667.464	-9383742.38	882470.98	3720946	-525065	584733.7	4051772	94171.62	89023.0498	85551.1979	114106.341	98647.065	111084.66	137467.67	100371.94
48.828125	149886.66	7802210.571	-9041437.81	1020583.6	4405563	-620713.8	357273.9	5025246	85227.7826	81457.1926	53952.9076	98063.5746	51804.405	123484.79	94836.339	95312.227
58.59375	297288.23	7336907.821	-8986362.71	1218589.2	5321517	-556211.4	763603.2	5733741	121409.758	131469.59	95315.4671	100431.789	116726.76	110834.63	117134.47	153952.27
68.359375	660882.52	7573483.691	-8681974.14	1528956.4	6363996	-518681.9	852764.6	6992633	98537.5913	100376.799	82492.8763	104787.851	120892.47	96433.315	119506.69	116281.78
78.125	595340.53	7323579.991	-8764430.09	1932473.8	6988939	-796823.9	851646.5	7665655	62403.8089	90240.1718	123269.125	105550.101	90552.408	136860.65	78388.484	157622.79
87.890625	991635.15	7443627.237	-8877510.11	2038189.7	7909485	-1016267	682569.8	8776398	55975.8399	136337.294	121402.397	119305.849	76342.219	101440.67	56879.633	104009.26
97.65625	1226017.7	7267473.145	-8988214.68	2278470.3	8910969	-1066204	607588	9620353	59500.3447	121209.513	69432.5498	81887.942	74720.899	134180.89	60197.826	95813.938
107.42188	1416678.1	7184705.646	-9366734.05	2442193.6	9670404	-1112168	507172.7	10689868	168255.755	123314.498	138359.076	90311.9607	127406.59	107962.53	107012.58	95169.439
117.1875	1428550.5	7239327.486	-9091727.98	3087066.8	10262858	-459103.1	1043653	10517974	132134.82	110408.76	115899.211	135025.73	119999.48	121409.54	125872.56	109454.93
126.95313	2123017.4	7350369.194	-9379997.44	3663415.7	11431867	-813861.7	1178039	11622898	73697.0452	79900.1491	66856.3872	106747.862	89756.435	129065.27	89090.206	143300.1
136.71875	2260512.2	8093775.835	-9122933.1	2368696.9	11165676	-341032	2487564	11470890	80769.5413	102011.29	72516.0627	80722.893	84603.759	93104.508	57740.185	111779.17
146.48438	3081211.1	7780132.698	-9088313.34	3275075.6	12258872	-2130496	895129.9	14945860	85757.6477	114141.38	143836.124	132086.265	102441.01	114573.5	80450.1	158912.94
156.25	1876412.1	8022510.496	-9106352.79	4223780.2	12456792	-1198089	1417806	14175713	98643.4712	64245.6083	103707.808	119608.215	72072.435	123196.12	128226.77	144649.14
166.01563	3655072	7500990.629	-9991533.28	5461391.4	15828648	-1942350	1102869	15511754	126715.425	147815.933	148727.761	143269.589	90152.334	213689.58	83096.755	105750.56
175.78125	-1569605	14204203.4	-1126821.24	-5786212	14064652	-131094.7	3817187	13691616	145030.436	209224.066	147899.86	163242.847	122713.97	135678.77	120243.59	185768.01
185.54688	3527020.3	7758607.723	-9727600.08	6400619.5	15632925	-1698209	2654020	17614345	132601.905	170728.952	200445.71	137803.053	160748.14	143352.93	148957.21	169664.76
195.3125	4122220.2	7560968.93	-9534133.01	6276818.3	16527578	-3128284	1198052	17732412	163414.337	147079.129	116779.765	117583.452	135062.22	194689.02	118209.67	123431.68
205.07813	4795297.6	7357180.177	-9872795.52	6621849.2	16229189	-3153786	2064307	18880103	114783.106	185460.852	148327.323	111113.049	189150.95	180339.36	129703.45	222774.97
214.84375	3817688.9	6839603.189	-9685416.57	7544355.2	16283582	-3344083	1689287	19548098	154366.319	219972.651	191343.005	157764.948	151878.62	184180.89	106367.91	201997.84
224.60938	2581486.1	6113854.883	-10163314	6989928.4	17991826	-3647319	554489.4	20139201	182422.358	128390.095	155342.993	108020.648	198721.12	128369.13	184595.5	144979.13
234.375	3140789.2	5537635.172	-10993242.6	7479002.7	19586155	-2588355	982353.3	21466502	169485.168	185693.172	169539.721	221150.629	139693.82	214797.09	249414.15	137926.59
244.14063	3561758.2	5069034.306	-10993767	8727568.6	20706017	-2432355	1212021	22176146	160992.564	132678.259	175018.127	146076.715	113701.21	122996.61	131894.51	173754.96
253.90625	2918584.2	4662944.326	-11897114.6	9561037.7	21797668	-1537455	2264018	23490515	74287.4801	108139.51	138519.323	131607.481	143235.76	141295.31	170621.73	122410.23
263.67188	3277273.8	4795910.282	-12521616.9	11905094	22897603	-1457263	2636572	24365262	105037.962	92997.1907	151409.151	104553.83	118064.56	107948.13	126123.7	115130.57
273.4375	3285805	4371291.67	-14745654.3	14862428	22964215	221301.9	3294617	23072083	63763.4361	120009.298	59807.3304	90931.7571	90401.197	94859.987	86977.956	134850.2
283.20313	1332499.5	6773771.286	-11450522	12124615	26080319	-703747.7	5962851	19897703	78420.8424	110996.226	72818.9443	118301.533	72150.663	88675.227	92880.284	103425.86
292.96875	3009803.2	5098119.498	-11836077.6	10970901	27655680	-1400093	3976340	21782303	67545.2482	73521.1097	79438.5832	90176.742	58504.143	91258.68	66650.771	112312.01
302.73438	2062128.3	6769364.564	-13074005	10337783	29757490	-645921.5	3771595	20378247	88970.2457	70423.8536	63957.0679	75620.1421	65918.891	109564.2	71728.616	86118.888
312.5	3777042.9	4992991.087	-13115444.2	9057953.5	33443703	-560355.2	2883863	22031155	139765.467	126989.241	66996.5539	102290.884	90787.274	71531.988	115629.58	90944.32
322.26563	7003190.9	5402237.677	-15796119.5	6770939.1	33610474	1607356	865359	23556835	97673.8676	68816.271	101979.911	78695.3348	72199.317	77769.725	62285.752	93748.098
332.03125	4200774.9	4065287.453	-22087178	247048.69	32882866	2524212	1173506	26061802	98952.002	97695.0129	77809.5695	91408.195	108347.84	108353.03	111792.72	114580.18
341.79688	3882396.7	4106743.065	-23736751.4	-7577229	31308557	1980491	-7354409	26836966	122731.63	147727.131	137088.939	144246.047	149392.08	125916.77	162585.13	179595.05

Table 21 Test condition: Med Preswirl-20 krpm-50% Pressure Ratio-100% GVF

1220	Test Data								Uncertainties							
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**
9.765625	-1846720	6303558.913	-9641656.98	2737233.4	-840659	1305234	1718057	164966.9	542672.537	1213878.45	638955.097	1137328.23	1144065.1	625108.25	1125306.3	712279.33
19.53125	630461.72	8843337.256	-10494049.7	823958.4	2056422	-267691	353357.6	1985906	100060.051	153460.292	83451.5227	106639.489	79376.627	112637.06	68771.441	122650.83
29.296875	-376357.7	9948212.394	-9566543.28	-393075.7	2952364	-114854.4	315082.1	3222122	147336.553	142385.564	129031.925	127434.703	148547.28	111677.08	124424.53	127252.34
39.0625	520871.8	9230832.511	-10693978.6	927724.79	4105913	-146824.6	761648.2	4131722	81699.9747	115582.265	93743.3982	93404.2204	142649.98	117252.56	103051.61	107198.18
48.828125	675412.12	8985705.443	-10259842.5	1178355.3	4857256	-505225.4	868895.6	5048841	83110.7058	98039.719	71835.3461	71729.2256	76087.287	153814.32	56021.866	80962.661
58.59375	988192.18	8828332.343	-10557677.3	1260329.1	5584935	-590608.2	776594.1	5879673	111280.019	90149.7458	84042.222	128276.304	103484.63	122153.16	49729.988	106625.03
68.359375	1419258	9305958.972	-10303559.3	1319106.1	6480011	-617465.5	1169768	7437818	83143.781	102481.623	104060.688	112245.95	56827.263	134380.74	97177.492	113305.22
78.125	1242428.9	8968013.166	-9824226.97	2276175.2	7310525	-1142692	1156719	7790081	89325.6226	98670.7666	111286.43	119333.971	54570.106	90275.84	92657.851	99290.703
87.890625	1884666.9	9125409.652	-10187471.3	2255486.4	8265124	-1157357	1135944	8964558	65755.8001	92777.3253	83133.6083	78473.0981	50036.079	96589.819	56977.428	108200.05
97.65625	2118946.9	8837020.363	-10192938	2696932.4	9205903	-1317570	1411199	9730920	77903.1956	118947.436	124448.476	102209.809	126778.86	122548.06	91387.726	155285.83
107.42188	2786529.5	8688686.275	-10534441.9	2943354.7	9678566	-1281336	1648086	10806567	123625.725	92841.6217	74150.8331	93978.4021	84806.512	114476.41	95055.343	156894.18
117.1875	2600538	8551902.711	-10411442.7	3427610.1	9336967	-418577.9	2529828	10780102	80346.2623	108265.72	156252.9	109021.379	78904.577	101385.68	104878.43	119360.77
126.95313	3789323.1	8296087.728	-11076572.2	4811065.4	11706240	-1941913	1675516	12590614	76756.8118	166189.901	93619.747	108600.292	79705.199	110759.1	81851.844	175639.28
136.71875	3687253.7	9102660.022	-10397570.5	3308024.2	11666736	-1354623	2561612	12866174	84716.2403	85159.9122	108433.717	104275.038	61749.269	147005	82336.585	145499.39
146.48438	4692156.1	8583424.472	-10883310.3	5615838.1	12435098	-1879009	2218857	14376653	130505.391	185991.105	126931.237	150195.519	135378.66	98300.038	109957.58	136237.66
156.25	3132715.6	9602528.441	-9634552.21	5032578.2	12813534	-1750372	2787044	14493245	105512.61	176011.606	114674.642	252154.808	87478.839	207174.56	114119.88	177087.97
166.01563	4126407.3	8682683.778	-10346032.1	6246627.8	14181790	-1850848	2390321	15544634	66690.4042	116442.372	109823.235	196746.086	82546.549	133823.33	111641.02	185728.48
175.78125	1553707.6	14793312.73	-3406806.52	-3302286	13686423	-504750.7	4436019	13738685	91528.4173	116976.537	143448.865	155222.223	84736.519	138641.74	130239.76	194990.94
185.54688	6252643.6	8343011.302	-11147157.8	8225978.9	14556989	-2156131	3100646	18143287	128673.706	146322.935	252475.953	184329.792	129428.33	121096.55	127974.25	220141.18
195.3125	6810219.5	8584786.627	-10008390.4	7045934.6	15414487	-3382740	2348877	17171865	83898.3125	146189.792	167195.403	156584.843	89997.439	148874.35	161735.42	305835.31
205.07813	7041318	8406765.412	-10588804.9	7888141.7	15132965	-3357960	3109626	18701409	98594.4653	193394.863	209004.183	146672.197	127408.77	143179.76	173267.19	190128.32
214.84375	6575455.9	7919667.476	-9919221.76	8558770.5	15434118	-3486139	2670263	18846733	58590.0052	123812.567	116942.175	119548.369	89546.326	95140.309	76681.037	180845.11
224.60938	5660951.9	7408899.527	-10733887.4	8455522.6	15783262	-3694069	2551532	20550685	165808.322	149405.035	159297.673	156374.592	102719.89	189717.72	142508.43	175470.61
234.375	7100331.9	6714029.304	-11711487.6	9551124.5	17438839	-3680932	2085024	21731440	97618.5633	176965.315	167678.314	213232.759	113033.05	181797.83	160805.11	263273.43
244.14063	6685808.6	6296991.547	-12571680.6	10957636	17651030	-2547560	2656071	23227850	158207.542	149122.534	146029.352	173722.546	96503.447	222326.86	180596.06	234493.99
253.90625	7336930.5	6258279.959	-12861658.6	12536718	18900743	-1472908	3017084	23007743	57958.0227	88272.1106	92449.4276	149762.284	96684.484	96011.973	114921.91	124783.96
263.67188	8169100.7	6952103.658	-13279229.2	14157134	19284084	-805641.4	3806220	23308017	56440.0718	75440.3723	81610.1587	94320.0762	45531.912	109550.92	67522.974	142703.58
273.4375	7503274.8	8147490.081	-14141420.8	16664200	17978557	162020.9	5870686	21527598	71807.0196	97898.9845	65592.3097	97410.535	50066.417	141541.92	57746.181	175204.32
283.20313	6775096.3	10362438.72	-10906772	13841563	21816474	-3120315	7424746	19562428	49397.3301	84228.652	87098.6195	118432.768	47917.277	85200.821	62231.079	134498.84
292.96875	9328950.4	8268343.76	-10691189.3	13559691	22251131	-3484566	5490879	21340481	60351.0665	109202.304	71999.9983	77933.5921	76563.355	79026.551	55488.323	121923.93
302.73438	8792552.7	10927775.2	-10577106.9	13050628	23703209	-4994625	5361278	19822080	62486.2495	75801.9029	55720.718	66115.7499	70190.529	115969.33	65622.359	109814.96
312.5	13756351	8480470.093	-10153531.2	12724369	26086316	-5641096	2523445	22095733	67911.2743	95588.2685	103682.08	112652.442	104936.83	103333.11	69238.899	163658.35
322.26563	17871113	9036205.173	-12894928.6	12485107	22528083	-4855813	652868.2	21516683	99777.5043	72106.8839	99979.2032	109511.691	59025.593	85259.084	135736.02	160748.26
332.03125	19513993	9508545.285	-15843400.2	7460700.5	16524587	-8956798	-908083.2	19131601	389510.167	295659.449	565376.888	321044.011	373531.8	273120.83	520437.36	486039.07
341.79688	23337342	8092001.127	-12587083.5	5245112.5	9849131	-10144535	-10628699	19620281	145288.361	176317.083	116724.845	140419.927	145825.4	150818.96	128631.42	185119.77

Table 22 Test condition: Med Preswirl-10 krpm-65% Pressure Ratio-100% GVF

1030	Test Data								Uncertainties							
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**
9.765625	661949.93	5273601.31	-6900211.73	482376.51	722529.8	-38306.98	-51646.45	1211631	134182.342	115239.837	132720.478	114912.729	110934.88	162432.28	131825.8	147195.25
19.53125	655002.42	5494280.597	-6229431.66	771839.15	1758327	-170112.9	97014.64	1934205	68522.4169	95948.6302	94447.2875	126681.876	65737.377	98317.712	52481.229	113981.54
29.296875	-395784	6363345.001	-5010316.67	-412203.1	1180253	1322805	1624605	1042582	106740.046	89768.3009	121328.439	68622.2748	93676.273	97696.106	78435.065	93406.593
39.0625	1070593.2	5162080.653	-6507306.54	937808.77	3214972	-430774.2	139432.1	3792502	55174.4282	93783.2719	89995.0002	95356.9739	70837.548	147385.22	80903.016	131932.08
48.828125	912233.85	4969511.195	-6531463.03	997116.74	3785469	-155137.6	4188.634	4464111	55160.221	88177.8038	67041.7594	102757.695	47946.418	77771.328	55086.843	105778.86
58.59375	1032708.7	5101047.587	-6533635.75	1259715.5	4652572	-88429.24	36017.3	5091879	42363.3617	75307.9839	76626.2828	78878.3785	95213.641	78662.276	108780.65	124959.5
68.359375	1237768.5	5037186.781	-6325063.98	1215322.5	5602285	40823.68	351248.2	6399507	119426.986	115670.037	99239.9544	84710.1835	78629.269	125883.09	86745.502	130503.56
78.125	1318264.1	5051573.458	-6376707.3	1700560.9	6255701	-437021.1	210369	6866317	76175.3599	86873.4163	42686.2593	86001.7144	89534.112	99027.82	107177.34	127431.28
87.890625	1437602.8	5114402.399	-6616702.82	1805954.1	6884512	-346202.1	228721.8	7864009	74492.1656	95723.3347	59101.6795	66865.6386	45537.866	108548.94	56664.925	104123.23
97.65625	1527515.6	5093779.821	-6625414.4	1706315.3	7921261	-228420.1	-113482.6	8272179	48827.1153	65117.6525	78150.0933	118089.392	86476.631	96654.709	107406.16	88968.826
107.42188	1757933.5	4782152.495	-6680282.3	1980216.8	8348801	128136.9	252061.4	8935204	72506.9787	95012.3033	112310.679	137923.66	75017.822	85212.499	147120.38	88561.006
117.1875	1479857	5493300.947	-6465300.8	1636164.4	7934056	1157322	1424295	8971985	52706.6615	76152.8407	91473.8582	77132.0923	60942.682	108205.01	85848.418	105327.29
126.95313	2063901.4	4981990.128	-7150183.42	2770278.5	11621157	-1670049	-1204889	11912834	58909.9105	123138.229	73707.3642	136418.013	70438.095	93633.639	76709.39	112807.61
136.71875	1940845.6	5897625.471	-6428164.2	1144773.2	9624526	741720.3	1794078	10084163	84356.0297	92089.7463	67133.2868	128766.817	42016.299	121316.91	87953.421	154373.1
146.48438	2078353.4	5489000.206	-6119168.3	1773310.5	11290661	-967823.4	-397769.1	14536443	44650.6555	114911.557	104247.552	112955.181	80185.856	96915.136	111766.27	138898.64
156.25	737339.66	6095226.707	-6554213.41	2508986.3	10849894	433992.4	902495.2	13106481	73806.7794	135987.503	91265.7678	159782.49	96012.29	150095.73	61288.564	143337.04
166.01563	1914777.8	5056155.862	-7052778.76	3667611.3	12535144	-533413.1	240628.9	14057019	192827.441	294084.304	281852.963	330766.456	182133.06	270154.49	273829.72	476187.41
175.78125	-1315704	10464511.27	-1170014.23	-5061856	12059998	1353144	3054101	12402266	154469.944	193263.149	235682.58	270814.377	150337.56	203234.69	158402.38	240313.33
185.54688	4386811.3	3551969.75	-9918461.51	8292951.6	14667411	-1442570	412112.9	17992167	103148.491	134048.085	139993.762	259304.123	198854.74	137634.84	240602.22	163082.51
195.3125	2894803.6	5913361.838	-7171917.69	4113867.5	14731830	-1407560	395683.3	16191507	70296.6083	103657.353	75749.1326	135190.915	66808.054	125849.53	104546.62	120344.14
205.07813	3007358.4	5757795.962	-6976338.1	3653508.5	14787381	-1049304	750113.1	17208317	127166.045	118234.218	122196.993	114625.191	84709.373	150699.96	102510.72	128652.76
214.84375	2095703.6	4909280.96	-7007614.49	4106514.8	14620505	-1547912	142679.4	17956683	82888.2114	87099.8065	84868.8362	162386.672	76195.434	149117.63	78385.943	131630.62
224.60938	953331.75	5025359.9	-7046291.19	3687205.9	16016292	-1426441	142406.2	19019280	117120.443	136279.941	111060.102	92185.0124	111467.26	115815.5	125414.59	134043.15
234.375	1156927.4	4912840.753	-8133142.82	2950894.3	17764942	-930372.9	-352571.7	20641498	110593.569	117363.131	82870.5537	116920.654	66940.397	157982.26	83761.959	163422.32
244.14063	1226649.1	4084397.763	-8739405.74	5037760	18881833	-862892.6	-150435.6	21960449	93898.7363	156477.831	99636.7499	153716.121	117309.83	116261.8	112047.78	121461.46
253.90625	1417819.6	3841998.187	-9527932.81	5605845.9	20759613	-683259.2	11392.88	23177580	65713.2727	104980.481	68128.7052	58429.0583	76432.416	102615.89	39547.814	92130.817
263.67188	2202967.5	3940910.009	-9835808.3	7470989.9	21710167	-453787	691901.5	24414908	73965.2145	75364.3653	89384.5181	85234.0283	62179.675	89779.283	84019.257	109514.04
273.4375	1990670.4	3491746.293	-11092551.3	9603028.6	21607522	684571.8	1266260	24009085	55391.5161	110726.664	57290.9978	134041.021	40499.485	103996.52	60924.148	142467.09
283.20313	483058.04	5524153.806	-9919893.12	8488281.7	23855946	738809.5	3570197	21141734	56501.8253	68157.1525	63302.6963	102299.105	38321.358	89205.571	43793.672	98114.386
292.96875	1464680.3	5351055.876	-9464111.61	7085059.7	25903602	91927.11	2587289	22618124	35820.2569	76404.8761	44385.7393	65525.3398	57352.206	100341.33	81082.818	94988.212
302.73438	1756192	7679202.496	-10196111.1	7532319.6	28556035	1537522	2636399	22337216	36272.6882	81424.3471	63846.5667	93102.504	66971.715	84942.859	63001.753	111825.09
312.5	5186540.5	6409903.918	-9713137.5	5975586.2	31059100	-390609.2	1241951	22508978	62380.9191	76615.8679	57740.8784	91424.964	51531.932	80297.349	55829.521	109804.18
322.26563	8695516.4	7424056.479	-10241439.9	4762340.4	30568488	480803.9	-1365016	22554835	48499.6873	77391.5843	55966.8174	80413.923	64624.475	86319.367	61401.853	84781.61
332.03125	9368493.8	8317592.682	-11380517.3	599044.8	27235725	-2730569	-4329840	20363637	99805.9456	110466.052	149252.541	225397.764	98713.104	147561.16	170616.35	164072.65
341.79688	10845573	7438103.647	-10801874.7	-5906122	22272215	-5175591	-18164357	15321596	320002.394	260853.328	498007.912	804162.781	320933.73	448540.35	624997.09	520481.31

Table 23 Test condition: Med Preswirl-15 krpm-65% Pressure Ratio-100% GVF

1130	Test Data								Uncertainties							
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**
9.765625	511210	6264058.194	-7605128.8	485939.76	1053876	186931.7	-338930.2	1045210	84882.1972	239320.457	149798.006	174716.144	159209.12	144855.22	104906.09	272125.81
19.53125	693526.06	5973466.941	-7375387.92	1080201	1538456	-138882.8	166194.9	1790990	57135.788	100214.776	53945.8808	94102.3196	44789.782	126654.63	50828.892	87850.157
29.296875	-57894.98	7266621.354	-6151904.64	-251940.7	1356789	1324967	1809573	923684.5	70676.2951	89992.6476	69705.3054	106716.367	126408.24	101669.86	70626.55	117576.19
39.0625	1032627.7	6150840.8	-7730502.27	1159539.5	3377866	-278155.9	287883.8	3584637	55167.0053	105950.417	57556.0125	74639.5744	68584.257	120838.79	80913.993	101057.27
48.828125	877211.23	6084084.574	-7653050.56	1244336.5	4307209	-255131.6	166998.6	4672273	76370.962	98087.932	75552.7452	50272.888	68950.377	105391.53	79035.994	89040.525
58.59375	1143320.4	5966081.419	-7879088.46	1366111.5	5113257	-320022.2	267326.1	5492447	59340.3889	112043.315	67482.7745	89682.8067	65410.439	115327.18	126445.32	111187.59
68.359375	1138594.3	6096712.322	-7510333.45	1370935	5698457	-111892.4	745301.9	6370796	77279.4573	114847.189	83724.9515	72462.6508	77656.905	95589.946	73192.016	107809.67
78.125	1297835.6	6065556.649	-7571055.57	2147462.9	6415544	-500959.5	301364.5	7142276	55594.0787	85818.4164	65674.4314	48561.9339	50337.589	98720.549	71997.893	109298.27
87.890625	1524000.6	5921247.437	-7522774.89	2028378.8	7229670	-496819.4	446177.1	8022548	40131.7481	77288.2344	101128.965	104737.72	46053.884	118408.63	106759.17	135121.02
97.65625	1652107	5822119.408	-7600173.88	2281090.7	8445810	-273973.5	178828.4	8887617	52428.8912	80574.5335	120577.505	94524.1586	62582.721	102027.93	78258.828	117801.95
107.42188	1669812	5590849.467	-7710348.75	2341810.4	8719264	-167469.9	486226.8	9676058	56406.3038	118465.994	157301.181	129744.289	88265.589	90268.13	146903.22	158167.08
117.1875	1609401	6006491.834	-7566654.74	2675891.4	8122264	759250.5	1580579	9755255	96995.4586	132943.036	117040.191	133138.899	42735.846	79174.075	104003.48	134830.91
126.95313	2830768.6	5388568.507	-8247061.8	3588855.3	10818142	-963884.1	156246.5	11522087	52882.9617	123159.446	88214.5754	111816.234	62751.042	90523.894	94862.51	142347.04
136.71875	2056881.2	6616479.936	-7446510.17	1853866.4	10112566	563710.8	1975702	10615072	34995.2572	89113.296	56887.6546	72258.9844	43032.645	112737.45	57056.151	108025.66
146.48438	2300243.1	6927870.73	-7075501.54	2399075.9	11952504	-1349572	-479380	14840001	69959.7423	128316.724	110162.594	113359.51	40085.253	124442.93	81460.853	125243.14
156.25	1266116.8	6693279.727	-7475938.6	3589548.4	11669531	-14007.29	828177.2	13911365	70414.4582	129105.82	102491.184	136584.338	60440.708	108108.63	82248.61	167185.72
166.01563	2466100.4	5674959.898	-8242762.64	4546266.3	12992628	-535334.2	533632.6	15035351	50803.8401	116530.857	90074.3369	175176.393	71760.494	150450.1	73437.526	165546
175.78125	297396.92	11049252.92	-2264025.33	-4055504	13154102	1159763	3007172	13104539	110007.581	128303.289	120418.403	169978.077	130086.47	160741.3	108639.3	160026.69
185.54688	5667803.4	3523520.932	-12592104.7	11245075	16120769	-2416644	-1356451	20602639	127884.363	166993.328	285088.813	375045.228	139301	274172.56	130341	386013.65
195.3125	3621807.9	6515261.06	-8192551.51	5094559.2	15145816	-1599618	382452.4	16584547	68140.5718	147575.554	121586.246	140212.987	82927.695	109329.69	79121.034	194023.3
205.07813	3561534.3	6773453.45	-8286274.36	5229416.9	15327152	-1290848	1148817	18060493	114913.768	148226.46	116430.666	87581.9645	142432.76	175049.5	118633.26	220243.61
214.84375	3101382.9	5779187.954	-8193668.77	5789099.3	15242537	-1575667	575494.2	18483574	91247.9865	161667.379	94309.5045	186332.148	105679.17	129343.69	132230.83	182314.71
224.60938	1595161.1	5783548.771	-8750480.9	5160430.6	15962229	-1750486	230711.4	19833697	149667.532	177440.769	163179.968	137073.492	145783.47	140387.54	128200.26	216646.1
234.375	2690600.5	5726524.585	-9346382.05	5552661	18179757	-1437347	-405.052	19669408	167179.2	302905.019	281443.154	288056.527	187325	193310.68	224689	399861.76
244.14063	2676703.9	5359107.011	-9877155.16	6125469.4	19468936	-1192353	-125741.1	22372641	188961.062	171324.704	307981.747	282282.078	176181.17	283413.06	222165.93	252486.98
253.90625	2107631.6	5313133.568	-10617576.7	7913040	20824086	88859.64	768643.9	22879063	193459.251	190036.925	224318.083	193823.377	168988	179656.18	208187.41	226753.61
263.67188	3063506.8	5715219.452	-11376620.8	10114858	21473401	259718.2	1375582	24149221	123174.313	245383.094	215939.959	237648.13	140581.09	180993.95	204032.56	428090.7
273.4375	3028098.8	5906010.993	-12543343.7	11453217	21377190	181186.3	2320491	22910660	43404.1559	79030.165	74101.5914	106384.051	75859.819	123878.9	67095.445	131717.56
283.20313	1709424	7445572.744	-10302656.8	9179210.2	24401228	-744839.5	3914099	20896243	41754.3175	111017.181	53807.0299	106103.141	38887.349	82063.774	54647.088	109610.99
292.96875	3001295.5	5857228.528	-10334483.6	8537129.1	25658368	-1040735	2796807	22601013	54220.5571	56667.9047	68047.9148	92047.1804	50832.524	115226.34	53792.389	87500.991
302.73438	2702091.3	8703928.747	-11203012.9	8214619.5	27778542	-1055404	2575633	21199726	44044.6035	82198.8117	64265.668	62589.8579	53898.456	97033.037	57186.304	96290.852
312.5	6608220.3	6862502.498	-10544148.3	7628255.9	30459297	-1976965	1196076	22761071	54759.4416	82419.7672	56445.3952	68334.8978	59705.22	85027.351	55726.338	102161.69
322.26563	9996538.7	7987304.238	-11750810.5	6589721.1	29351646	-691863.8	-1265395	22354841	57480.6904	95717.2595	85346.4088	118327.082	46458.695	57031.463	63477.341	115100.04
332.03125	10533919	8847244.594	-13106790.8	1968443.7	25883548	-4235101	-4313385	19509457	78865.0537	100285.288	68871.9574	135007.55	48175.803	110946.43	75938.325	96710.442
341.79688	11339002	6053051.665	-14497172.3	-8262723	18933527	-8982803	-19674093	14521499	125732.2	188817.66	126265.502	140964.645	126354.61	136018.84	159355.81	216419.15

Table 24 Test condition: Med Preswirl-20 krpm-65% Pressure Ratio-100% GVF

1230	Test Data								Uncertainties							
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
9.765625	489762.62	7559296.315	-8957628.83	501388.29	1354194	74884.99	-401667.1	1236251	157537.204	171049.672	217530.342	260576.336	177082.97	154051.34	247274.43	207486.87
19.53125	820269.76	7646749.164	-8813569.96	1065352	1996896	-35547.31	425250.7	2106592	78562.0851	86424.7795	103132.67	134818.221	71136.885	76868.108	101246.44	130227.15
29.296875	43701.228	8840513.835	-7415079.9	-425989.2	2833580	-49699.62	207984.5	2789407	88239.0807	103633.639	119493.97	77874.1854	130842.43	89349.128	99835.236	157045.9
39.0625	1297003	7422973.73	-9001678.24	1239430.9	3608385	-171215.3	350427	4054294	90344.9544	86995.7463	84653.1407	102514.793	110132.64	90968.317	68700.358	100424.64
48.828125	1355463.2	7610284.747	-8843102.45	1396108.9	4457936	-182225.8	50006.58	4967750	49667.4848	82444.8382	107386.725	95451.5156	72671.127	87090.785	100311.31	132515.97
58.59375	1477448.9	7471841.485	-8755171.95	1620826.6	5277572	-161469.3	407276.2	5881756	81589.1313	86735.2072	62839.2213	115815.094	64060.678	102505.21	113457.59	102136.44
68.359375	1705887.4	7662546.839	-8742195.02	1625340.8	6029695	-343506.5	747857.8	7071835	55201.2513	62605.643	89345.2629	69257.8062	78892.497	90550.617	44669.874	95567.149
78.125	1667691.9	7714491.12	-8357255.65	2246400.1	6920718	-448551	665240.6	7544920	59819.5121	89101.7075	62534.6535	92241.4546	69799.676	100482.23	64014.094	107865.72
87.890625	1687923.2	7618548.941	-8541380.51	2293413.8	7540582	-390218.1	503825.5	8570349	33689.4059	65479.6987	118304.318	76055.9163	39007.573	81647.617	92712.993	109247.9
97.65625	1974864.1	7649345.457	-8614332.96	2680429.7	8572875	-679518.4	674983.8	9267834	48467.8097	112053.044	93496.8672	84038.7837	51025.031	111624.57	83119.864	135341.79
107.42188	2460642.5	7407304.592	-9131517.99	2795852.5	9395712	-598680	560123	10327411	98698.1039	104920.149	139933.107	136579.768	74813.216	109737.45	136282.04	141710
117.1875	2331244.8	7703283.226	-8758174.68	2930152.1	8999541	371260.6	1558465	10235990	106956.199	86598.7962	134559.514	96292.9856	84775.147	108957.31	61589.576	101052.54
126.95313	3621419.2	7036851.457	-9345106	4367995.6	11569040	-1528926	621004.1	12418902	63088.1835	123249.923	80096.8666	62059.645	68793.225	122346.4	51866.995	146800.58
136.71875	2935453.9	8134889.061	-8550695.69	2422034.3	11350685	-577871.2	1455480	12395194	58255.7716	123579.968	103277.308	83111.6678	55629.507	108746.95	62363.429	143223.98
146.48438	3979494.1	7348522.346	-9119963.24	4476309.5	12079523	-1115494	716595.2	13872141	77927.8685	93860.5184	90260.5229	168917.706	72785.46	110034.36	94465.858	189743.66
156.25	2199402.5	8253116.982	-8419669.61	4321979.4	12099594	-466112.6	1498871	14284732	63406.5641	105596.194	99194.7926	83653.2593	101862.91	114330.22	89418.299	172082.71
166.01563	3531444.9	7195358.068	-9248718.92	5455223.3	13635989	-1225760	976688.9	15436678	73175.0398	152463.472	74162.6289	100042.685	61296.385	113696.51	86830.626	117599.39
175.78125	733282.33	13663902.46	-2078167.94	-3479888	13984625	1125219	3649718	13488284	71915.7971	90184.3701	89800.1018	159890.781	74979.648	129760.01	63056.134	123124.59
185.54688	5278745.6	7156838.551	-10068647.7	7259064.6	14769350	-1260577	1814125	17744710	112828.851	154944.962	194976.343	187699.604	98704.305	149203.36	104169.28	219057.21
195.3125	5171104.9	7710496.611	-9169629.93	6020965.2	15700123	-2279968	983958.6	17332718	66760.2495	147842.241	115956.131	130663.043	78735.777	125928.44	122789.37	259200.22
205.07813	5736120.8	7482210.902	-9703940.59	6381836.3	15472271	-2350252	1370061	19197630	113644.115	165446.936	183349.184	129353.133	118921.01	135163.15	119555.31	271016.63
214.84375	5141213.9	6778909.638	-9519094.84	6905272	15433998	-2374253	1298459	19243634	102686.534	161690.939	82274.7661	139220.652	95865.653	166244.03	93173.441	164859.32
224.60938	4048199.1	6760032.872	-9886204.82	6544436	16394638	-2273309	1410028	20934766	141067.486	246675.132	134053.448	102687.049	120696.69	99159.696	103140	146533.73
234.375	5204180.2	5981276.676	-10551382.1	7903759.9	18129880	-2262716	509612	22095354	121146.875	112588.767	176278.665	147260.603	58779.681	198447.5	111705.18	311591.37
244.14063	4855008.4	6058177.815	-11280058.1	9317088.7	18362272	-951278.4	1111869	22824644	121122.681	126854.127	85227.6048	110535.978	153589.49	175543.09	129515.97	128069.69
253.90625	5550207.2	5946585.699	-12138894.1	10227770	19420478	-626581.4	1764716	23643508	78952.0199	114662.821	75845.6407	92910.2456	69190.623	115302.07	103130.59	159715.95
263.67188	6099942.9	6357719.775	-12529124.6	12064964	20331731	-100537.5	2192219	24003800	83171.5354	133176.764	99561.4969	110991.45	77309.343	108111.37	78840.77	91729.711
273.4375	5430856.8	7477500.356	-13534003.8	13923195	19399749	1118711	3789334	22611336	45623.7995	99120.3325	50835.9876	120672.188	61501.185	107551.22	46706.127	106214.91
283.20313	4136967.3	10005298.2	-10971368.4	10838352	23004296	-1532502	5428835	20265378	73586.324	94705.8402	86441.4768	87356.9207	61381.894	114555.22	106039.74	144329.51
292.96875	6538276.6	7864956.016	-10937305.2	10645338	23940308	-2061099	3774480	22688429	57737.7344	84402.4101	64579.0004	76055.978	81222.511	114608.34	52215.34	118333.86
302.73438	6032528.1	10729536.17	-10871242	9491281.9	25926230	-3258516	3288822	21326990	62485.4987	146027.98	99892.6786	146933.412	97840.649	127199.68	88877.731	115664
312.5	10738376	8416907.144	-10868313	9453142.8	28546968	-4304881	959254.5	23568204	143889.82	123611.708	225507.399	230364.902	165116.32	232793.7	145513.55	208007.46
322.26563	14976822	9435385.973	-12864425	9575514.4	25911527	-3124904	-902626.2	22793499	118431.788	155829.369	260106.702	206790.553	179201.08	155173.2	183609.46	265465.4
332.03125	17114158	8988107.238	-15924450	4090613.2	20189945	-8255021	-3537097	20807220	1365004.47	1581933.53	2418933.77	3020387.42	1574609.7	2140938.7	1889853.3	2502973.7
341.79688	21050945	8450014.088	-12726046.3	1240516.3	13078991	-10631954	-13019526	19864627	218918.905	196340.965	162976.133	168530.154	183457.75	269569.79	197407.31	269964.54

Table 25 Test condition: High Preswirl-10 krpm-25% Pressure Ratio-100% GVF

2000	Test Data								Uncertainties							
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
9.765625	-2175365	9806720.63	-12021587	-2143423	1976301	-987558.4	1549751	648095.2	315116.414	219278.065	176264.952	141842.323	311801.49	254509.48	167275.39	174062.31
19.53125	-1199852	11264784.45	-10061292.1	-1991213	3080345	-1541932	744703.8	5120.831	412041.661	328974.821	216298.865	263097.203	288332.04	409000.74	313425.25	265630.47
29.296875	-3110670	8965660.508	-14438629.5	-405955	2798004	-25101.32	1150910	3954260	118829.208	78412.7126	158895.076	57782.9154	96274.307	101166.5	81634.77	109914.8
39.0625	-3474795	10331376.11	-13491872.6	-2325915	4168102	-51020.34	482551.1	4914312	79228.0252	55941.7109	124758.363	80007.3787	70623.641	91252.655	102026.75	90309.91
48.828125	-3330274	10314659.76	-13630638.8	-1826169	5082723	-417583.7	915048.3	5862835	91250.9438	64412.4896	93233.3559	62279.7375	84521.888	76882.89	78229.858	64177.442
58.59375	-2767793	10271831.02	-13454007.6	-1376879	5993141	-796721.6	1162857	6505688	81931.8904	58224.6375	121161.801	83244.9978	109405.77	79078.923	113107.81	88361.179
68.359375	-2583713	10188913.72	-13436465.5	-1207257	6742913	-151440.3	1621476	8053321	173536.372	60610.1472	146993.623	54636.5437	54379.089	87964.229	85866.421	80666.656
78.125	-2165567	10637206.53	-13348963	-679528.2	8042764	-816442.8	1698814	8887519	115567.642	104799.177	98645.5166	64950.446	149345.69	95570.895	79661.41	74750.49
87.890625	-1761895	10419960.79	-13666675.5	-174166.6	9145853	-900354.6	1319862	10569007	118243.187	81607.4903	93365.6702	79002.7535	92661.965	71994.608	138151.32	91952.437
97.65625	-1645788	10253540.79	-13680111.3	317003.55	9794057	-895168.1	1374358	11067431	141728.129	65320.2839	94957.6795	64984.3243	112338.38	96743.526	95296.825	54875.18
107.42188	-8004877	6531841.425	-19515982.1	-2173739	5454118	-4235634	-1376057	10061694	163548.354	106699.622	195355.503	88096.2689	210920.17	131675.16	197789.8	92528.169
117.1875	-772112	9986386.14	-13653389.1	1480969.6	11732386	-501979	1896269	12860919	146507.29	82228.5435	87126.8237	45077.3748	114429.61	97092.309	86298.025	59045.168
126.95313	-331645.8	9989851.584	-14276995.7	2572431.3	12329896	-261075.2	2704349	13531236	118061.676	85130.3641	52191.384	48633.3079	52009.255	77273.547	82435.215	68369.389
136.71875	498542.24	9945876.682	-14616849.8	2985729.6	13050221	-14236.42	2724662	13815950	77352.057	84670.4982	91103.2859	67187.9157	78392.983	76623.535	89084.847	66810.01
146.48438	1136990.3	9239292.603	-14525523.9	3870538.5	11864933	1253538	5539949	12488631	99706.2209	83824.8088	119478.164	89820.3308	162834.11	105887.08	148178.95	90538.665
156.25	-1987109	10886647.67	-9954157.97	2716414.1	12899633	-242586.5	4714629	15722956	98079.6748	90300.8532	100574.139	91704.1389	136980.4	112658.02	124481.25	81240.808
166.01563	-4405919	14732093.16	-9675273.87	989494.68	17049996	-520003.5	1582869	17660215	111295.346	158954.152	124320.36	199304.512	228647.84	120073.7	132001.87	70921.446
175.78125	3260318.7	9595069.074	-16445324.4	5332729.1	17555372	-1857665	2674570	18310271	142466.497	121986.58	128180.159	96816.9111	143069.39	162265.58	132871.91	122352.3
185.54688	913411.48	10845375.32	-14191697.4	5207879.2	17088591	-1426798	4493326	18636940	176286.789	116408.793	131670.742	95948.9351	112931.71	89682.244	152601.75	110678.8
195.3125	1816800.2	11497910.55	-13882812.5	5848463	18276804	-2368708	4041095	18829592	105324.119	112725.478	70857.9517	73111.8757	103932.24	84837.485	97017.143	64440.771
205.07813	1839453.4	11887178.65	-13783494.6	6090496.8	18735804	-1668082	4844822	19845297	123347.486	136465.194	151071.149	87946.1602	187063.39	85980.21	117112.52	80671.679
214.84375	1286080.9	12113070.15	-13468500.4	6809879.6	18697128	-1971214	4486750	20649817	140388.557	109130.253	117212.955	123015.847	108456.93	108145.14	132728.5	93635.338
224.60938	-1171135	11117661.22	-13356089.1	7035460.6	19706009	-2784299	4037488	21048764	156634.042	79387.5508	238450.799	116402.221	98713.88	107870.6	170644.08	132900.54
234.375	-949002.2	11138030.99	-12629365.9	7580914.6	24518339	-2440114	6564291	23413378	95328.4123	103240.436	201503.684	186351.394	124146.51	94915.064	165339.72	126901.21
244.14063	-1179136	10599388.65	-14637087	8365916.5	24722745	-3172214	3583001	23010764	208345.394	93936.9974	187603.209	68250.8504	152973.11	94881.209	54850.699	96515.087
253.90625	-1523839	10020979.61	-15283962.7	9667710.4	26075526	-3093091	3586588	24368306	71706.5337	62793.8863	136281.669	103955.036	148489.92	58369.367	143713.03	61829.881
263.67188	-1137282	9907667.086	-17316206.1	9779021.7	27653988	-4133502	4382804	24368397	132952.037	38940.4488	147379.808	66077.2939	106032.43	62823.036	131521.59	50430.507
273.4375	-1581888	8570585.75	-18510606.3	12084233	29856277	-2480575	5676438	26112151	69229.4578	61447.6014	106834.042	125297.224	80620.081	63743.114	75761.374	70558.627
283.20313	-2028406	7824036.873	-17065082.1	11233160	32014670	-3143473	8783745	24969764	60353.7606	38946.9825	53853.931	28326.5661	78954.33	45487.133	80294.736	47590.828
292.96875	-3895043	6116498.424	-16872394.1	10624973	34439907	-1662052	8819527	25827396	44618.666	33755.6767	71541.2463	45494.7085	85720.116	43362.767	60148.742	45822.51
302.73438	-6295692	4077425.774	-19208975	8669497.9	39297128	3947782	8669720	29802703	89907.8373	74289.4922	88549.3998	117421.305	85963.175	121888.88	113376.12	75760.788
312.5	-5588864	-2317604.98	-20599200.8	679176.86	36769713	187211	1869512	24318254	109589.862	63670.1244	89488.5896	41163.4775	66558.637	56608.468	49915.807	59969.303
322.26563	-26576166	-8963003.79	-34149661.6	1016080.5	1.48E+08	1.61E+08	1.07E+08	1.91E+08	2144602.4	2126801.8	2185975.66	2039617.38	1120917.5	1437984.1	1225166.2	1688979.4
332.03125	3162276.9	27780152.62	-10606121.6	28587514	72283000	-6870511	32466808	35749162	93121.825	120550.223	268785.94	152325.185	123303.73	160644.12	127054.25	287055.57
341.79688	8666469	20479417.32	-12661501.9	33399163	66546504	-7055204	25499426	34925010	108488.018	68551.5415	135700.735	97091.3165	100735.43	140102.24	106702.8	111359.15

Table 26 Test condition: High Preswirl-15 krpm-25% Pressure Ratio-100% GVF

2100	Test Data								Uncertainties							
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**
9.765625	-2365690	11706053.41	-13849450.7	-2448799	2693238	-917636.3	718293	1292124	318782.913	193992.661	214737.855	214224.083	252417.51	227381.15	260818.95	217251.45
19.53125	-2085010	13059217.77	-13498549	-980910.5	3739091	-1329782	1515054	1851737	221164.636	306952.656	259295.574	208515.896	342077.64	205637.24	181970.25	255661.73
29.296875	-3647103	11491272.11	-15710291.4	-1226693	3776706	54227.67	802354.5	3633940	123660.278	154460.707	125290.804	117437.658	170617.39	112905.33	138347.5	116828.33
39.0625	-3677987	11697770.29	-15675507.4	-1609975	4638841	-160944	1064993	5690560	106858.366	79628.2387	126378.11	96178.5782	99671.154	93967.185	103823.23	96346.442
48.828125	-3189913	11500030.77	-15225619.8	-1490820	5536576	-765194.9	1243974	6238063	97752.3281	69309.8908	89309.4672	59222.3608	80660.701	79053.178	81708.948	73282.499
58.59375	-3099119	11673478.77	-14821370.5	-1001197	7023236	-918077.2	1613431	6951446	137144.265	96321.9099	106002.977	45890.5785	153238.48	81077.03	92054.011	78628.025
68.359375	-2372456	11489033.03	-15354627.9	-529037.3	7593370	-528911.3	2098373	8653348	80809.6008	86812.8102	109675.673	62988.3097	77818.51	87963.622	52617.725	69173.92
78.125	-2145132	11913749.82	-14542416.2	265870.95	8677698	-1106767	2655077	9171061	118234.996	73800.7208	99464.3221	74011.7126	110370.46	104147.89	86418.829	104607.52
87.890625	-1874338	11628798.05	-14770240.6	789298.68	9780000	-926690.5	2091314	10759393	92638.3772	95837.0454	83030.7207	86806.3882	118556.84	86915.926	91103.215	69233.592
97.65625	-1278832	11374697.62	-14933911.7	1224937.8	10526027	-1342947	2418463	11596317	122412.135	79527.0691	89213.2994	60004.6609	101457.32	67702.076	96186.565	79574.484
107.42188	-9141970	6426676.54	-21097752.2	-1659281	5213384	-3865303	-692234.5	11311490	158441.805	102457.316	149088.916	90154.9813	185618.69	84441.647	206532.92	122290.66
117.1875	-412655.6	11111239.91	-15166145.1	2394338.1	12463919	-1186961	3008907	13392482	94256.3942	65433.7817	108400.209	73227.1517	112045.98	69340.209	91627.857	70853.023
126.95313	9970.5722	11099535.76	-15363858.5	3559038.8	13212048	-719459.5	3249276	13980074	82390.3789	89578.2224	91848.8627	94826.2641	86757.495	113437.96	108039.9	61181.554
136.71875	1293438	10866139.76	-15736696.7	4451328.5	14075113	-713698.1	3851672	14171546	92708.1567	53154.5594	56672.7847	67933.5321	73806.665	93494.663	106495.45	63117.09
146.48438	1601132.7	10419238.15	-16039102.5	5079738.2	12807314	917390.8	6340282	12814576	98526.8348	74066.4554	68255.909	109552.019	88830.187	75104.53	198158.7	86695.442
156.25	-172301.8	13221238.82	-13431646.8	2758268.6	13601530	-716208	7106648	16502292	100881.07	100726.764	126089.819	84396.9971	103042.76	101206.38	97946.365	68440.788
166.01563	-3246239	17351727.35	-13870871.9	1193310.6	18559975	-992370.7	2375701	19420007	181556.399	148683.099	151011.05	166527.201	122876.72	143066.53	177713.4	124716.67
175.78125	4692436	10802259.89	-18322472.3	6664733	19835504	-2605335	2794976	19053290	191303.725	128958.146	145156.536	135498.078	175234.12	107082.12	117500.62	92368.12
185.54688	1661581.8	11672443.87	-15319230.5	6679899.3	18319727	-1762413	5388569	19069271	258154.127	108570.584	237604.877	66448.9712	187581.93	112834.92	113879.07	108534.15
195.3125	2596575.6	12512348.36	-14384806.4	7206597.1	19600949	-3073351	4582022	18927004	140078.483	117304.008	194432.824	101258.469	190162.8	95869.097	114809.07	105930.51
205.07813	2209316.2	12907732.68	-14485676.3	7413136.7	20205801	-2152281	5436333	20114304	113416.553	81836.4119	116197.964	78415.569	175874.04	91242.62	104512.2	109054.09
214.84375	1822640.3	12817528.45	-14055871.7	8485437.2	20013106	-2653691	5390755	20536986	159575.714	129791.679	157140.376	123187.432	159938.9	160690	155235.06	144477.05
224.60938	-454401.1	12097822.7	-13571254.9	8953612.2	21120128	-3196480	5177581	21284502	200687.851	115069.636	118718.782	79322.7703	195746.06	165336.19	173071.16	103778.22
234.375	-594107.5	12637626.24	-12653373.3	9666757.8	26309822	-2654913	7692323	22977619	168279.19	160566.69	292852.937	148370.138	236842.81	137531.4	159253.6	147988.38
244.14063	-766418.3	11566185.59	-14918604.9	9919357.1	26127529	-3807443	3855658	22706226	97965.6435	101031.389	172379.785	127499.642	163041.14	118944.54	191655.13	163153.3
253.90625	-1998499	11013227.91	-15605212.6	11458243	27771845	-3728605	5017672	24236298	134831.656	91251.9467	198760.894	137739.466	136566.47	86925.341	221697.88	116733.98
263.67188	-2664969	10591955.4	-18574044.3	11682075	29463297	-4438777	5999011	24485078	148619.346	57731.3362	174456.663	91685.9529	143989.83	92381.828	185358.81	91344.961
273.4375	-2324520	9661590.714	-19229951.7	14519854	33070966	-3312281	7737364	25593349	70596.9344	72226.0019	61790.2859	90173.2047	96162.006	104849.75	116897.89	82786.899
283.20313	-1702548	7744997.376	-17076106.2	13015514	34892536	-4169660	9993485	24841610	84481.982	41018.9313	84332.921	48421.1965	74732.327	47832.416	44207.758	28818.582
292.96875	-4466324	6560504.061	-16813228	12561924	36661907	-2324352	9891817	24984153	73572.3581	42502.8828	63667.1791	62844.7769	91818.617	46758.189	73615.566	46510.864
302.73438	-6525452	2536810.709	-18877871.1	9055800.4	40969251	2399760	8712754	28054419	69688.8732	29546.8738	69790.6249	37898.6039	81925.307	66028.802	72191.791	57953.66
312.5	-8339682	-2963502.19	-22435345.9	2140310.9	39602543	1394879	3251499	25066564	93628.2755	64291.0149	87634.8472	46148.0589	86122.131	80925.841	84276.979	82600.768
322.26563	-93340898	-69945662.5	-100228240	-57150177	1.6E+08	1.98E+08	1.21E+08	2.31E+08	1545614.48	1621164.51	1697056.49	1826463.3	1851409.1	1550191.1	1982544.8	1597887.7
332.03125	1415555.8	30540916.04	-6263133.34	32535492	74067765	-8641304	34518604	27166867	130259.915	110885.386	141468.169	149463.382	103820.61	138224.44	142797.47	144567.97
341.79688	7682702.9	23988659.46	-11331831.4	35074383	74271558	-9860695	25105235	31133122	137076.366	78455.2284	113725.523	59688.8807	80453.505	91038.777	67622.183	72306.88

Table 27 Test condition: High Preswirl-20 krpm-25% Pressure Ratio-100% GVF

2200	Test Data								Uncertainties							
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**
9.765625	-2657858	14057106.11	-16702072.1	-1401068	2870402	-811605.2	793762.2	1138304	300387.68	289900.744	551865.148	340881.918	313613.83	409940.6	451873.79	474975.26
19.53125	-726168.6	13223243.14	-15031419.7	-1201126	3791177	-3555641	1918065	622248.3	712791.43	567415.344	752313.097	733341.434	590060.86	867652.11	752676.04	918310.16
29.296875	-2938625	12262285.3	-17577464.7	581404.92	3844541	-699668.6	1900782	4348742	128770.343	140566.568	213438.317	109905.806	143910.87	126480.37	142618.65	176882.08
39.0625	-2999118	12707548.1	-16858327.5	-890642.5	4457061	-729472.3	1664597	5348121	147370.896	82447.9133	87191.6212	88600.6664	110496.8	128603.82	140384.51	98652.458
48.828125	-2504973	12717670.42	-16580206	-601028.1	6011786	-1151606	1927745	6397527	90231.1567	79481.0663	97387.3337	80603.8351	140965.43	91092.435	112242	84144.276
58.59375	-1842293	12439084.71	-16582749.6	-112983.9	7093075	-1291864	2106119	7135284	174488.427	82783.6659	111034.599	61646.0013	155151.95	105882.01	120607.5	74437.248
68.359375	-1678418	12471537.32	-16788381	314978.49	7577893	-958904.8	2797286	8674892	140879.575	79415.2169	52205.722	48593.1332	145619.39	74464.792	73209.198	54601.089
78.125	-1727994	12797494.95	-16309178.8	786904.74	9127161	-1265309	2758808	9552066	89215.0714	88347.1543	68898.4165	84213.7761	155932.72	125111.22	129398.57	71673.64
87.890625	-844937.7	12613717.45	-16385905.1	1434172.1	10026801	-1642495	2550102	10890497	150869.174	116271.633	124694.218	90601.8766	133004.85	86352.363	104721.92	73269.523
97.65625	-824694.3	12550961.47	-16230808.2	2061146.3	10886445	-1474300	2712629	11749985	134062.247	81293.4068	143550.041	84543.0084	81618.314	83338.122	68963.456	74342.842
107.42188	-7663662	8342195.444	-22340488	-170889.1	6745562	-5072016	843858.2	10846311	166481.456	121522.878	156417.307	91363.537	136850.62	88088.744	181523.16	77164.53
117.1875	296237.34	12207898	-16589696.1	3503090.9	12970382	-1604615	3819674	13836096	146815.138	107332.12	102067.088	86321.0322	141306.79	85253.72	190551.78	82291.238
126.95313	746361.95	11754471.46	-16570303.9	4850807.9	13465720	-1277965	4615823	14125137	108905.142	94990.6402	155477.464	118018.98	122128.13	71477.992	177450.19	122196.22
136.71875	2131891.4	11630656.17	-16950573.7	5868438.7	14189853	-1283414	5040595	14468349	124103.975	86721.7573	127184.061	72641.2398	82030.794	99149.787	109267.12	87531.781
146.48438	2505364.5	11259088.16	-17679777.9	6735108.1	13070814	617502.5	7408947	13306033	98115.6215	87799.9678	128477.665	88858.7917	147086.18	128157.8	98422.304	91942.194
156.25	682674.15	14188610.84	-14277856	3681957.1	13832987	-289739	7401298	15695040	88738.0654	70405.7805	106365.579	87904.3994	103754.54	116640.96	140687.54	85440.111
166.01563	-3222273	18057255.5	-13675575.4	2592988.4	18580636	-855942.8	3125710	19403633	131022.147	111742.302	163001.268	159309.372	163765.84	151563.98	118813.52	149945.28
175.78125	5370449.2	11103960.34	-17965683.2	8245563.1	18774909	-2876761	4509795	18444687	165870.549	107440.107	212508.438	100739.088	184956.97	62965.927	138099.45	95934.944
185.54688	3397170.1	13163272.66	-16556371.1	8197085.9	19681564	-2451935	6382914	19241278	116483.17	138020.411	214432.647	77010.6864	222860	92444.107	100243	119252.77
195.3125	3822515.1	13184611.01	-14473069.4	8345891.1	19613224	-3564531	5539852	18446957	119529.522	129533.619	160103.261	133271.514	164183.57	89686.545	156526.59	117436.9
205.07813	3792116.1	13059483.04	-15136962.4	9093622.2	19522584	-2701318	6730788	19787637	133290.947	94091.0975	134215.558	127813.208	122498.65	114534.47	175119.36	114998.42
214.84375	3124033	13281382.56	-14305754.6	9775745.1	19454625	-3127299	6300027	19945232	171955.357	116561.9	145468.346	119130.229	145792.56	96678.063	149762.27	131179.49
224.60938	876488.06	12722997.49	-14743318.5	10727090	20777360	-3732584	5981005	21361622	232800.844	112731.081	221716.094	113498.185	170907.96	147144.75	209467.69	134780.39
234.375	775478.22	12911664.15	-12598383.5	11723163	25501000	-3336495	8882055	21976299	207332.811	155365.691	165642.99	148161.591	166245.24	127849.67	160351.56	118988.98
244.14063	70430.822	12439882.34	-15114139.5	12066354	25971790	-3824508	5783965	22123994	202958.181	69478.3159	164324.923	105858.739	141311.74	132156.78	187675.04	112643.1
253.90625	-344825.1	12263633.68	-15992814.2	13430705	27936474	-3863589	5757601	23003260	93627.0635	54091.966	118116.556	61403.5392	88809.922	56095.809	65537.144	58366.383
263.67188	-391742.8	11577564.92	-18160886.5	12906136	29089067	-5437997	6084649	22695000	94573.455	58073.3453	125044.97	81115.9526	102723.8	50515.239	176422.83	46193.959
273.4375	-889116.7	10853208.82	-18760260	14897561	32546259	-4290047	8663196	24326098	95684.1759	65783.6187	83255.8783	67559.8177	62146.816	93838.117	100167.95	65432.762
283.20313	-599276.9	9172935.794	-17188168.5	14551131	34398005	-4999728	10486471	24523718	83971.1658	77762.0629	112310.655	63024.0042	83038.864	59325.4	101452.85	70537.356
292.96875	-3239959	7169095.874	-17071007.7	14362297	36553586	-2473719	10581848	24666066	97805.9793	37825.014	67010.2919	51771.629	92448.047	83293.15	67578.241	41806.637
302.73438	-5338031	6237908.89	-18776114.5	13521239	43224089	3326585	11080529	28844462	133489.77	62839.6136	72877.1098	67771.599	91900.778	100992.72	121478.04	60244.767
312.5	-7592211	-1436376.21	-23680759.6	4725266	40902024	3202679	4748683	26928602	168166.331	132117.108	106043.326	87704.851	237141.65	144212.82	100998.27	84591.8
322.26563	-7063608	11928037.99	-14166848.9	26275280	1.49E+08	1.47E+08	1.06E+08	1.74E+08	5722089.96	4747024.87	5065178.23	4168509.96	4646837.1	4114317.6	4471313.4	3934305.3
332.03125	3683734.1	30521139.27	-7695247.17	35140507	74679433	-6105958	37672931	28502473	4707733.52	3790465.57	7314891.66	6761401.44	4054243.8	4949738.3	7349277	7865524.3
341.79688	10710925	21875980.29	-10718604.9	32531550	71533110	-9952422	23108788	30934494	240295.662	178703.854	528359.447	414542.922	253858.68	149334.15	653205.06	350002.31

Table 28 Test condition: High Preswirl-10 krpm-50% Pressure Ratio-100% GVF

2020	Test Data								Uncertainties							
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**
9.765625	-418755.6	7720508.159	-10292182.1	-1462344	63730.98	-152520.8	-1429092	671076.2	350101.159	282079.505	376662.216	255311.441	230217.71	275455.61	284728.66	368836.75
19.53125	-574729.8	8644650.959	-10215364.9	-61030.33	1641822	-119712.3	219080.4	2099749	121106.87	164961.468	185693.224	142138.116	146084.54	135109.41	163039.51	157283.23
29.296875	-533637.8	8557491.089	-10854020.1	1201282.8	1643668	1111096	1246362	1957417	135584.157	107028.714	133888.655	86431.9628	182191.35	92742.777	154035.18	70325.611
39.0625	-827029.3	9004352.783	-10595521.5	581471.23	3258256	-170185	299226.8	4222389	124745.665	80044.761	168210.264	59045.6864	104530.7	107410.96	143349.91	99405.628
48.828125	-565965.1	9270754.708	-10297789.3	664841.14	4434320	-428781.8	450795.2	4467613	166562.487	77603.6112	131679.852	69708.1219	81048.589	95650.712	109249.93	54132.337
58.59375	-436354.8	8742705.166	-10266820.6	592807.34	5116295	-335456.8	314229.6	5455496	114136.309	65817.0895	118343	76507.2494	92532.939	89886.673	159219.09	60423.063
68.359375	-347043	8982143.372	-10642552.4	1000099.3	5736945	-68406.03	787662.1	6981135	68235.4139	71716.7011	64877.5426	61755.5833	104717.8	59965.894	70117.598	56458.911
78.125	-576240.1	9064602.788	-10372080.3	1347571.5	7367731	-516303.1	752051.6	7224095	151057.428	82275.715	167785.206	108371.954	153072.68	97246.715	148302.57	92810.148
87.890625	173996.14	8977116.804	-10688269	1717990.9	7859999	-393102.6	630928.1	8710786	120282.575	80746.449	70966.1396	84990.801	96281.645	79434.92	56028.563	58977.423
97.65625	158438.44	8795780.211	-10676592.3	1896711.9	8637291	-468161.7	846577.9	9466718	128855.519	69004.0987	89405.5702	81562.4383	112388.37	93779.596	161521.38	90484.367
107.42188	-7358585	4427731.409	-17203119.8	-1082514	4586232	-3151075	-1486689	9376993	204205.472	80140.2977	138960.37	75373.5055	146551.7	82746.343	230184.28	80098.418
117.1875	465871.66	8756356.059	-10899493.9	2538760.4	10584354	-79788.66	857339.4	11374452	88525.3685	65949.6866	148251.032	73819.9856	93281.555	54088.854	148714.33	65106.006
126.95313	907901.74	8708279.833	-11338351.3	3745071.5	10791893	300210.2	1564539	11955171	166285.945	84022.5153	169473.871	75661.6356	124178.83	84927.234	112013.92	73980.3
136.71875	1725147	8772603.434	-11740703.8	3977810	11326300	350045	1692942	12323050	78344.3096	76082.3943	76659.5539	58004.5495	85629.107	80797.842	85256.543	64842.933
146.48438	1406169.9	8083986.065	-11820944	4080095.6	10146618	1771120	3821408	11311052	98194.419	69430.3166	117039.56	71776.6385	144878.19	111642.1	114836.41	101808.92
156.25	901345.01	8973832.607	-11062067.9	3551464.1	13319591	-388884.6	277116	15014941	87475.5504	117161.688	97207.8119	58550.6158	196903.13	89690.213	71811.972	53504.504
166.01563	-3993783	13949213.86	-7320772.83	843824.14	13725283	371433.5	2388440	16015065	183547.028	91094.8309	143879.79	97210.83	76181.557	127916.34	152040.49	98793.775
175.78125	3585203.8	9010402.595	-13776012.2	5262928	16983096	-815126.9	954362.4	16593031	333731.281	101996.69	185495.009	92689.8732	333288.46	138146.82	239918.09	93628.27
185.54688	1562983.6	9524508.369	-12256636.6	5216378.1	15753092	-392406.9	3513677	17351182	280497.993	98990.7792	221715.838	77287.4098	194678.57	132146.63	119646	98873.979
195.3125	1580204.8	10740105.3	-11036755.5	5375349.6	17213021	-1138622	2096530	17157145	126956.188	80499.3447	80845.3144	80792.7526	117130.46	114340.97	154413.79	101075.51
205.07813	1568924.3	10673025.42	-11360589.2	5466611.5	17183672	-583631	2853482	18451893	110551.667	54777.6038	142202.089	56813.6065	154830.27	84132.383	121340.25	70699.357
214.84375	905037.1	10816443.22	-10381932.5	5946737.5	17387043	-1321074	2720389	18872670	146949.791	109732.968	127578.808	92514.5764	102690.3	97545.244	81787.644	89209.221
224.60938	-1738305	9949320.391	-10635517.6	6019752	18228551	-1598050	1646497	19915246	134436.927	89593.5197	194180.12	93029.4067	180559.97	79096.007	232528.35	75884.503
234.375	-2320980	10593382.32	-10126387.9	7149516.9	23226931	-1312882	4776115	21847341	178049.393	75286.3281	126379.132	134225.433	139124.67	119242.19	182974.02	95979.242
244.14063	-2572773	9365589.867	-11683205.5	6610152	23696197	-1763711	1205268	21907783	153338.154	102664.96	141044.285	78703.8747	130159.21	81269.041	172701.57	84242.279
253.90625	-3398617	8736437.067	-12579490.6	7609134.4	25312060	-1277977	1788947	23766144	105649.634	54995.0857	107371.903	63436.2735	122236.51	68879.386	110526.11	58262.33
263.67188	-2785351	8376560.781	-14278128.8	7661455.2	26140653	-2377383	1382857	24223671	96015.3559	49420.1538	78338.836	31200.2805	125264.44	49234.33	148028.8	38926.656
273.4375	-3441200	7644493.869	-15382568.6	9976680	29777916	-857284.3	2597729	25856150	34647.0231	77161.8643	65664.6462	51933.0743	72842.839	56242.985	82836.859	71018.925
283.20313	-4204588	7127968.838	-14530439.6	9048110.5	31947521	-1538452	5706825	24590820	108043.089	67184.4952	62610.7869	39823.1739	128656.62	67343.043	74936.557	37921.36
292.96875	-6023411	5582177.312	-13866852.1	8146996.5	34342247	-876719.1	5392306	25107964	85100.7427	52080.9643	73682.7047	42521.7535	85695.151	57706.411	56513.756	41572.424
302.73438	-6827042	1059306.254	-15484309.6	3898861.7	37838839	2511716	2019043	26188010	90803.8558	53831.0082	53538.1001	55485.9876	81870.99	57305.78	50332.606	36110.348
312.5	-7809253	-2202136.86	-19129250.1	-3032609	37184998	1533294	-2519344	22905450	72918.7034	69683.5366	68798.5766	48787.8338	91762.657	51388.742	104440.24	76417.59
322.26563	-2.25E+08	-228908563	-236632341	-2.27E+08	1.72E+08	2.58E+08	1.42E+08	3.09E+08	2181631.12	2420406.92	2240709.04	2689869.18	3006037.2	2941908.1	3457332.7	3289428.5
332.03125	-1093714	26204632.81	-16446822.2	24989625	67106808	-8658241	24859555	34337063	188913.219	122389.981	255150.454	150700.735	122553.3	187588.77	129743.28	250295.16
341.79688	5924419.8	21138558.32	-12473490.8	28740524	67226904	-8697473	21009013	32867631	139498.277	69447.5245	157185.747	92173.5128	100077.1	82212.411	170273.85	103024.68

Table 29 Test condition: High Preswirl-15 krpm-50% Pressure Ratio-100% GVF

2120	Test Data								Uncertainties							
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**
9.765625	449271.89	9331269.958	-11138463.8	-139658.3	199753.2	-715746.6	-60499.72	564878.5	225251.955	299231.829	187636.909	212535.261	343722.56	261766.44	238406.1	219467.85
19.53125	-185469.2	8768408.047	-11880872.6	-534370.9	1254254	-1022680	408451.2	2557400	246611.168	271927.959	288209.845	300227.088	146978.55	322974.32	178872.55	356347.28
29.296875	-816827.6	9625092.647	-12286425.6	1691711.7	2078233	1178387	1701101	2010712	115434.126	144856.105	143624.369	111412.881	192185.7	107593.09	164957.28	110749.27
39.0625	-653787.1	9983162.974	-12043994.5	907608.28	3275905	78241.04	798018.6	4727466	135541.004	76732.1539	158896.506	75774.4565	89415.179	103396.89	125542.62	91922.166
48.828125	-598390.3	10275200.37	-11785992	1243217	4633288	-546880.7	900841.5	4970633	93184.8573	75211.2058	82867.7183	64494.4554	75356.196	85140.165	109802.13	77477.987
58.59375	-544871.6	10026209.08	-11746982.8	1231682.1	5619859	-307880.2	714628.4	5732086	175664.664	75536.1285	103471.93	62570.2809	117869.25	91531.252	164237.3	62566.421
68.359375	-361161.1	10025728.34	-11901249.9	1554181.1	5954359	-25974.68	1238971	7212042	86353.0246	73191.2414	44843.9807	65077.5624	119815.53	75206.946	143354.67	55511.417
78.125	-13279.93	10592264.89	-11486513.6	1976334.2	7711938	-733390.5	1159607	7509459	157555.924	95289.6912	195214.047	88238.0368	122067.61	113357.52	135222.6	84620.778
87.890625	45743.159	10414900.09	-12324575.3	2193979.5	8469441	-596837.2	853261.7	9419573	84686.9145	75843.6507	106490.875	63108.1169	74660.177	81508.83	100229.51	68480.489
97.65625	334687.65	10085957.74	-11909115.4	2670789	8822941	-1016214	1142838	10247596	117504.344	61233.4837	147408.017	71616.3929	86096.063	90593.812	53263.762	71013.392
107.42188	-7369525	6075663.147	-18739403.9	177928.63	5661063	-3525926	-903575.6	9683649	123368.338	85535.3689	183194.94	101407.466	160106.49	85468.888	211719.92	84129.495
117.1875	737496.6	9890173.007	-12288280.4	3474529.1	11196208	-685047.2	991068.6	11838743	65449.9404	70838.2669	125114.169	73050.4389	182276.54	99337.287	137750.4	65720.509
126.95313	1132575.5	9895861.632	-13054032.2	4446059.2	11413829	-204982.4	2032974	12880220	90598.6815	74998.4592	100733.726	81394.8951	99465.793	82644.906	137899.28	46562.257
136.71875	1984388.3	9721972.728	-13132143.5	4737871.6	11936663	78132.15	1958688	12853041	97146.6973	58942.4106	87395.5871	54456.1004	73126.527	55078.747	84508.247	62714.473
146.48438	2030912.5	9290211.181	-13004779.4	5188542.1	10858286	1163760	4712718	12285517	146502.324	86744.4245	122434.817	63124.7436	116741.21	82219.118	101746.8	81682.867
156.25	1960971.6	9778298.013	-12820762.9	5210805.6	13785880	-850087.5	1304851	15590322	48780.6643	77480.8606	110742.948	67096.3484	131498.56	50551.79	95014.216	77595.708
166.01563	-2723219	14816289.09	-8473814.72	2371859.9	13865291	-693208.8	3529026	16918307	101341.313	85981.9949	145886.923	116829.767	66558.509	144206.83	97198.602	111713.39
175.78125	4076033.9	9653691.359	-14911044.9	6207289.6	17150332	-1143437	1899574	17049488	221027.176	74614.8023	179002.558	63176.1974	99857.319	141295.65	86411.903	97696.689
185.54688	2003501.7	10824301.16	-12482311	6290367.7	17332266	-606369.3	3606956	17320781	126812.039	101428.112	179268.738	88984.2558	185535.87	58749.176	183789.87	99906.222
195.3125	2182622.3	11537260.27	-12399498	7048177.9	17576824	-1775064	3350349	17769572	154205.598	59866.4266	102686.175	89960.1794	92238.348	93955.814	82280.639	74005.111
205.07813	2631037.8	11663937.61	-12240691.7	6927113.5	17895597	-1308045	3978728	19020775	148319.826	90194.5304	136337.875	71575.0949	166210.43	93804.605	154504.34	85786.133
214.84375	1512785.7	11389921.33	-10934523.1	7701109.6	17431519	-1690169	3784142	19204818	137421.671	137153.609	146352.318	108502.854	124825.6	172432.75	174796.76	85061.155
224.60938	-987114.9	10826819.32	-11896547.8	7898084	19267623	-1902736	2629994	20638616	242331.634	101849.322	202717.047	83987.2784	185696.44	113084.68	161925.92	114501.43
234.375	-1284481	11436114.06	-11784570.3	8890743.5	24233836	-1572179	6013341	22804822	208908.167	187126.218	197860.656	182190.871	261628.79	179181.56	278521.19	164367.05
244.14063	-1420679	10363668.96	-12556302.1	8677478.7	24057515	-2253776	2515526	22457934	141208.093	124246.028	285613.201	182478.084	161283.01	122415.71	248010.18	261211.09
253.90625	-1449820	9720918.735	-13509186.9	9325560.2	25635225	-2157622	2169188	24258853	126278.049	104274.391	352658.964	203550.428	163930.95	112704.75	222425.32	175079.96
263.67188	-2091716	9880459.537	-15476863.4	10204686	26477629	-2899428	2087139	24497986	119082.635	50493.6134	135407.29	71288.8511	88913.554	49087.716	150017.46	50691.562
273.4375	-2405211	8671954.371	-16677623.7	12437760	29999667	-1673820	3922890	25852935	67945.8229	59743.6444	71642.4421	46799.7399	44249.578	65089.103	108503.14	55463.333
283.20313	-3282889	7885920.527	-15614552.3	10946448	32041458	-2219825	6657381	24646358	122532.835	51163.0839	61615.797	40099.4576	64399.749	53280.298	89310.226	48920.829
292.96875	-5106056	6166219.621	-14932136.1	10078343	34411537	-1399397	6126656	25285965	112829.573	62306.7252	78035.1764	34482.0776	127381.05	48173.874	68825.63	43401.422
302.73438	-7138190	1550150.709	-17285939	6092518.5	38304397	3599168	3544658	28096402	107671.448	53489.3463	116703.495	56944.379	88479.78	67914.288	103914.58	63049.83
312.5	-7922082	-2848550.21	-20314281.2	-1668474	36442493	1124406	-2690137	23125814	82807.3701	74522.6139	124668.79	66210.3931	115093.31	58133.515	101767.23	74738.483
322.26563	-1.44E+08	-122461855	-148464202	-1.08E+08	1.79E+08	2.39E+08	1.52E+08	2.89E+08	2482746.18	2550075.23	2904204.46	2936644.27	2814986.4	2697432.4	3129095.3	2970942
332.03125	1730200.2	26786169.7	-14456254.2	28999639	68742967	-10118810	28739336	31442488	147460.001	131663.698	135718.943	109660.055	132792.33	147317.9	91640.482	135583.86
341.79688	8019057.8	21186096.45	-11349788.3	30492358	67080326	-8827816	21489099	31807518	106476.429	75776.7734	154435.109	69342.5241	82942.999	76761.245	97073.949	94598.476

Table 30 Test condition: High Preswirl-20 krpm-50% Pressure Ratio-100% GVF

2220	Test Data								Uncertainties							
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**
9.765625	-599863.4	10544230.48	-13696012.7	711763.73	708058.3	-622136.8	290404.4	1430268	467084.118	277181.354	460276.014	400628.128	232900.85	379770.59	548170.45	471633.67
19.53125	-414563.2	9727569.862	-14184713.1	1618251.7	1155488	-297792.1	1207529	2712279	292030.826	285695.864	263714.551	225111.179	261875.52	306035.51	229007.35	292559.24
29.296875	-296193.1	10491444.29	-14184106.6	2276171.5	2016668	676050.2	2062504	2828161	108848.785	124283.149	173957.996	114049.519	187807.96	88736.802	165759.78	99211.413
39.0625	-167466	11292789.99	-13887554.6	1905258.1	4005221	-367083.6	971626.5	4609622	89496.5716	84773.2373	128904.396	108994.881	113087.96	85796.107	188501.52	90138.563
48.828125	-228402.5	11834070.85	-13629459.1	2127489.2	5275865	-455490.7	860351.2	5381867	94779.6653	115725.636	100942.126	87060.8882	88749.357	77535.425	59532.516	81918.487
58.59375	78232.793	11508676.28	-14175213.9	2365295	6225711	-687594.2	1129133	6217630	167216.876	84481.4578	183944.026	95435.6288	110215.85	86444.213	201406.84	94964.269
68.359375	382040.44	11642936.56	-13395707.5	2700089.3	6848629	-332624.4	1576474	7695910	147358.92	108406.757	89383.3728	82066.4629	102557.03	69443.092	94291.272	64142.688
78.125	463171.48	11717163.44	-13343809.9	3022464.7	7859402	-942472.1	1598527	8257586	138862.61	89736.4724	143890.871	90063.9973	157704.95	85122.338	94824.798	76222.946
87.890625	917336.35	11704047.35	-13797793	3389766.6	8590852	-1079555	1233928	9693022	104798.724	79241.5732	72343.7	98559.1814	106084.1	82071.364	136000.6	61883.569
97.65625	987256.82	11305845.92	-13747923.1	3704230.6	9465591	-1054706	1663326	10658218	114871.076	62442.9812	142874.542	90503.4068	99967.629	84791.548	119798.45	96803.754
107.42188	-4888944	8220084.375	-18439758.9	2447881.4	7556644	-4809216	1198905	9193594	124751.071	74212.8418	175740.408	64180.4651	128363.44	74019.781	141807.68	69781.099
117.1875	1570184.5	10999969.84	-13975182.1	4823217.8	11210810	-1001659	2192251	12092916	59379.8773	63961.3993	148047.662	92739.3115	104207.33	93433.759	174775.8	101033.26
126.95313	2146428.7	11000119.38	-14323408.8	5928407.2	11896578	-640728.8	3073578	13206439	86616.805	66889.4517	79927.5496	69224.7981	96389.753	68553.178	93356.111	78654.692
136.71875	2572003.9	10912260.49	-14727588	6448288.8	12861622	-345421.9	3106072	13483610	103390.751	69487.1155	161715.323	92821.2633	115022.61	81782.271	100469.96	113769.78
146.48438	2455701.2	10632763.7	-14532989.4	7019905.4	11850267	1061524	5584585	12725965	97564.4591	90761.2704	116787.667	91631.6156	107143.71	121448.08	146436.52	93352.039
156.25	2581566.8	11123543.89	-14131792.8	7121978.6	14100671	-1528062	2755218	15997277	65119.5863	69110.5127	134445.212	81147.924	109892.65	82990.076	127127.16	84916.241
166.01563	-3052477	17160970.74	-10796118	2794767.9	15132239	507305.8	3991668	16629433	139678.032	81866.7	196657.274	77139.2784	118533.19	99772.22	122128.2	124549.76
175.78125	5627552.5	10679305.44	-16174099.9	7885247.9	17936699	-1935195	2351788	17726554	152584.819	99724.8366	253923.325	119660.651	119677.64	84092.819	185473.85	93223.182
185.54688	3997935.4	12282667.44	-13896540.6	8705438.8	18150367	-1308211	4885705	17936611	178760.123	84639.5973	145694.987	108871.07	102932.52	101329.81	224624.73	119380.97
195.3125	3859407.3	12546581.09	-13356296.4	8662466	18590590	-2341477	3685685	18107470	161863.376	83769.8684	129720.967	99024.9573	124195.24	92858.296	86764.683	63901.563
205.07813	3387881.6	12554085.98	-13036977.1	8660040.4	18597774	-1516739	3988942	19009073	91726.7326	86401.7679	189135.25	57535.8257	151997.1	80231.81	117025.22	100473.25
214.84375	2945148.3	12516141.14	-11924964.6	9682998	18345684	-2221087	4282494	19251588	201717.509	143433.568	102304.307	102917.59	182378.46	111570.77	113229.04	89686.535
224.60938	431228.89	11974510.33	-12383311.1	10642884	19505651	-2356571	4332601	20549947	150007.004	78966.9425	171271.303	108105.122	107121.74	96964.534	184563.1	103218.01
234.375	182330.93	11631994.49	-11241478.5	10582789	23872052	-2697773	6034436	21452604	127392.502	102095.95	144460.584	118997.82	147401.87	112339.13	222217.89	77571.637
244.14063	-358941.8	11529880.61	-13488202.7	11538174	24906165	-2459625	3200290	22133785	188280.16	83658.3064	221589.74	107359.427	158878.05	109626.05	132934.75	137573.33
253.90625	-982108.7	11454979.8	-14650152.5	12539841	26970677	-2354527	3332587	23477273	203857.593	55506.9267	210284.5	85029.504	118499.04	87888.84	130009.88	72390.364
263.67188	-409653.1	11346118.44	-15933581.2	12584506	28073778	-3698972	3507918	23168559	128303.595	62159.1513	148063.59	51495.3024	121959.54	55201.562	142386.32	68407.991
273.4375	-929575.9	10853459.84	-17430789.3	14129078	31415810	-2698907	5230698	24296444	76578.3363	54776.5736	80149.8836	52543.9462	92235.921	59873.793	106701.95	70198.878
283.20313	-1325015	9582206.707	-16338981.4	13119452	33214739	-3401815	7946214	24520022	74145.79	55350.0134	77134.5769	49710.4383	119778.23	55789.362	106972.64	48390.796
292.96875	-4113887	7053938.305	-16053739.5	12159866	35414390	-1748766	7645980	25663152	102304.552	51804.9568	81968.0007	54519.2013	112442.18	55833.89	67595.819	39675.6
302.73438	-6086557	7189108.179	-18341744.9	13099735	43184408	4707966	9181871	30288514	106654.839	69915.8685	69587.9169	49999.1401	78437.447	53374.929	96820.557	50249.907
312.5	-11297537	-2309505.93	-26048540.8	585487.91	40457072	6292556	2755930	29944519	95522.2821	85218.13	132938.027	93602.1915	164068.76	130951.53	103799.24	111414.41
322.26563	32320564	61729876.98	36879153.71	81501430	1.98E+08	1.73E+08	1.52E+08	1.99E+08	2491055.73	2151041.79	2282719.85	1980069.05	2461009.5	1936093.4	2097435	1730451.7
332.03125	-137680.8	17214972.97	-17108259.9	19293572	68928521	-1914335	27975519	36919586	983644.822	1172511.64	1698964.38	1985612.66	969065.52	1218986.6	1614497.7	1995269.9
341.79688	7032437.8	19130784.24	-13223000.2	29515476	67991364	-5245388	23225667	34671136	83808.9155	108853.119	240884.594	162288.456	160940.88	96703.607	232252.36	181500.92

Table 31 Test condition: High Preswirl-10 krpm-65% Pressure Ratio-100% GVF

2030	Test Data								Uncertainties							
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**
9.765625	-181427	5908551.765	-7472904.38	669466.87	-11521.13	-400004.6	534428.8	670718.8	253593.847	304329.148	709143.911	545068.17	300154.73	243057	592276.8	639797.16
19.53125	-185622	6168168.748	-8294371.97	-147132.1	1530474	-334849.1	-75175.04	2302290	82848.1256	98207.0379	113794.981	64630.1994	166746.15	102713.32	112027.99	108220.47
29.296875	-450700.6	6085829.536	-8316119.4	1251967.1	1693393	1364339	1100022	2382695	156364.647	85351.2354	93937.415	73452.3759	106013.19	82344.182	84230.213	50671.719
39.0625	-430380.5	6446005.56	-7941742	464280.64	2852030	140840.1	-47107.95	3882264	86890.041	46230.1373	118967.231	78347.4454	98512.865	54564.519	102331.76	63732.474
48.828125	-254539.9	7000076.774	-8217185.72	645461.02	4000180	42069.61	321782	4403781	142274.473	96374.8411	78177.0426	59491.4606	84739.013	59384.096	50329.452	66216.455
58.59375	14296.908	6799437.991	-8006879.85	902067.62	5325500	31844.8	310167.5	4987092	84052.2076	52157.121	105463.214	50733.015	110424.34	64143.935	129657.22	54327.921
68.359375	-189566.2	6785973.01	-8013637.23	1169076.5	5158085	466864.7	401689.5	6289649	87566.3199	70353.4381	65143.0354	38713.3807	88543.138	69458.809	86178.795	55093.953
78.125	-442.1837	7271849.752	-7964115.23	1005050.9	6551421	277910.6	480965.2	6965926	93090.9999	62695.226	89328.6443	67169.6424	68717.925	64665.474	108387.85	67408.296
87.890625	-278550.9	7172562.087	-8134661.67	1513061.6	7093484	206106.1	146991.2	8360754	81401.9259	41654.8995	109636.148	82020.3052	81445.905	102110.23	95590.249	68339.118
97.65625	-275610	7071150.577	-8437344.52	1490041.5	7956644	322652.6	28310.35	8955608	95652.1995	62495.9504	65194.2206	42328.8624	52025.624	71800.714	85897.466	37813.136
107.42188	-6601913	3786094.288	-13672825.3	-586717.5	4992992	-4186307	-1020440	7143743	162322.442	77885.6926	129299.788	52730.7852	132872.48	57771.243	181924.02	107702.09
117.1875	460884.46	6780611.08	-8549851.28	2052046.7	9366093	496568.5	408235.1	10889737	43514.8999	58102.774	86038.293	52329.5068	52098.595	48537.659	64230.357	51686.468
126.95313	335810.41	7013139.277	-8778433.74	2626740.3	9772208	731275.2	612849.9	11522822	45848.2776	46291.33	58147.8287	38908.0146	58116.584	48459.358	56589.772	30613.094
136.71875	438484.37	6938089.474	-9043310.89	2580126.1	10614405	949494.5	644801.6	12084200	63627.931	77248.703	52567.8104	40633.2574	79775.413	39990.177	52922.18	64851.946
146.48438	274141.04	6602640.159	-8411792.91	3336468.9	10028858	1365129	2954986	12357206	71701.0759	63257.7547	83929.8729	53569.1758	115612.98	55914.241	84602.23	54102.695
156.25	1620894.5	6001738.993	-10783410.5	4008185	11399048	1134501	601141.6	13479432	113025.523	61940.9377	119212.043	67423.5972	105786.87	77383.196	96743.921	101875.69
166.01563	-7143631	12861242.73	-2853829.88	-1393577	15365551	989151.6	-1171342	15423678	201210.154	168156.057	486725.83	354060.402	229028.69	208965.52	490514.43	354547.63
175.78125	100522.28	7660191.936	-10046203.2	3007399.6	15030937	231559.4	384510.3	15681901	193908.449	93918.4764	314114.037	120780.715	188114.04	105208.83	185739.55	193748.28
185.54688	-366023.2	7544478.072	-9702312.36	3338710.2	15007904	409118.4	1962390	16752780	167190.513	67845.1461	221405.43	79624.8955	177634.35	69761.781	246411.59	98575.074
195.3125	-185524.8	8867005.648	-9319332.69	3409648.9	16278191	-77199.05	1185246	17062002	88170.1529	51807.663	54616.8095	44687.0343	106671.02	63182.924	67117.523	67169.937
205.07813	-239936.9	8956581.882	-9347817.95	3075220	16760281	372150.6	1680186	18483337	80668.216	52399.5098	97166.8821	65548.853	80091.714	60078.857	122074.44	60246.559
214.84375	-1194252	9282666.165	-8445525.13	3831629.5	16719552	160339.8	1770435	19069931	97729.4634	84736.1303	71078.8207	79688.2696	99842.463	74512.53	84414.386	76961.385
224.60938	-3609175	8141483.451	-8681308.81	3926176.9	17698991	-369623.7	977501.9	20201751	139426.154	65563.0284	82016.3369	46665.5259	76842.158	79263.62	82283.695	48844.177
234.375	-4905772	7638766.342	-8516553.85	3252727.5	21629861	138333.6	3429870	22606419	117651.615	55619.6816	137418.092	87177.9319	69432.816	83649.89	117674.85	87529.142
244.14063	-5192903	7737387.96	-9597154.63	4096473.3	22893518	-356888.7	805370	22664395	131968.716	54772.8566	138745.367	49751.5491	133884.4	60106.021	102606.97	78571.99
253.90625	-5663532	7366322.538	-10444729.9	4667162.1	25349447	-237450.2	1189389	24807680	63458.8918	35351.3244	57864.0658	34559.1381	58633.707	35170.062	76114.26	43811.965
263.67188	-4451482	8019972.057	-11257484.8	5883486.9	26142552	-1195895	-282287.6	25450869	104553.797	46064.6625	89347.1055	37928.3703	86078.429	45292.641	104376.23	34473.481
273.4375	-5601533	6176577.107	-13035641.5	7366373	29355837	89775.88	678613.1	27194843	68561.2139	47717.9409	80009.6751	54539.0032	65834.583	65355.839	59208.258	56211.689
283.20313	-6385144	6306948.159	-13488473.2	6630679	31624017	419365.9	3838938	25847617	96223.8874	42672.5423	64271.275	64929.1192	66632.341	46422.86	78429.186	50202.865
292.96875	-7424733	5925071.842	-11931210.4	4952836.1	33852996	45832.44	3775516	26929876	60237.3153	44529.6544	72869.4478	38859.9376	67924.158	38930.493	51073.221	59952.636
302.73438	-9180770	2919955.378	-14612686.4	4890594.7	38136294	5539773	3324564	31083149	72239.5525	140949.181	83752.9704	223926.004	117865.58	146431.37	143322.86	126943.77
312.5	-8639098	-3411671.36	-16418778.8	-7280982	33695136	-1207899	-4055241	23982217	119867.977	112188.971	99947.0385	63154.1196	73318.039	111081.26	100248.97	109597.98
322.26563	-61508351	-48722131.8	-40445559.6	-25561444	1.34E+08	1.45E+08	78260606	1.66E+08	3205241.06	3679632.7	3280099.12	3600838.76	1398547.2	1797470.3	1218115	1941521
332.03125	-4587319	20673144.42	-11847717.9	19858585	73923774	2256448	33446145	41310796	150256.267	163993.456	202140.016	257636.648	219185.94	295295.01	282979.89	328890.22
341.79688	3576780.7	15482390.24	-8640072.66	19930582	65803792	-1160034	19735338	40271175	149993.265	184958.432	206555.936	278919.508	189943.31	200626.7	480836.36	201058.03

Table 32 Test condition: High Preswirl-15 krpm-65% Pressure Ratio-100% GVF

2130	Test Data								Uncertainties							
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**
9.765625	-444810.1	8222023.405	-9757322.23	-90945.59	1211018	-812846.7	-640370.5	1032088	144960.555	156325.534	333504.87	346401.245	193189.6	207411.8	357681.27	338750.82
19.53125	-67651.13	7030931.206	-9864813.5	460144.44	1451957	-107542.8	374945	2798838	149762.317	140566.414	97487.6621	130861.121	150455.47	126492.5	132464.48	122746.94
29.296875	-98022.82	7711364.737	-9825585.52	1781247.3	2385377	868010.8	573992.5	3024806	115658.788	81866.8887	143129.777	85294.0085	140938.1	74131.77	163112.81	93783.984
39.0625	-58902.09	7980243.437	-9620486.93	1117383.6	3443858	83495.51	109091.8	4740499	107549.458	62966.2238	45834.3519	52367.9153	114552.28	53210.395	92761.69	44395.648
48.828125	-184860.9	8104448.87	-9411813.35	1522491	4571265	-148662.8	365248.4	4918237	117251.374	88731.933	75294.0586	55459.1655	116839.21	65099.211	127810.55	55214.941
58.59375	-236307.5	8151010.742	-9523948.33	1805730.5	5531120	-90667.26	375560.1	5534863	162153.294	60807.4212	104044.907	47238.458	164698.82	60889.15	115147.95	42064.201
68.359375	313348.29	8271320.025	-9620230.02	1907184.6	5873774	520059.3	613574.6	6924541	67213.9816	66242.8023	68851.223	49552.8733	97956.388	63831.345	79390.593	59056.691
78.125	-7867.262	8557205.883	-9862967.77	1983660.2	7139619	-75526.86	548925.6	7582446	92548.5671	69072.8402	91855.5711	60914.5248	84081.92	70913.355	81847.783	69429.043
87.890625	292274.41	8549388.472	-9869602.13	2467215.8	8064150	27769.12	137464.8	8938851	58285.6895	87264.462	54767.4463	71304.704	101042.76	76574.767	108199.28	72654.969
97.65625	685626.75	8182823.348	-10038171.2	2591635.9	8281981	-133482.2	439008.7	9792156	77300.513	56911.0209	67969.0338	58170.2069	78688.677	55511.098	68775.058	57755.773
107.42188	-6561664	4672619.196	-16251845.5	237138.42	5202940	-4000684	-1730257	8759555	124410.934	80158.9047	166311.516	68714.6216	133675.94	68281.266	181458.24	84603.864
117.1875	1014468.5	8248313.153	-10079136.8	3404340.7	10519013	-8156.855	766682	11731472	85588.7001	59505.6731	60356.4999	62356.0509	114395.85	67146.351	78402.009	52317.399
126.95313	1003887.2	8023082.654	-10404618.3	4194894.2	10823134	561772.4	952008.5	12244184	79883.3296	52416.6788	81963.292	56346.0385	45911.241	56148.661	60891.024	62066.702
136.71875	1838271.4	7945337.541	-10920673.3	4199274.9	11529233	719649.1	1135926	12730402	50804.2031	59386.9866	67901.3854	68798.1629	57050.552	55345.474	61869.402	49255.497
146.48438	1422335.7	7567903.16	-10883769.5	4665011.2	10602671	2246795	3690508	12060177	68499.4712	58931.3441	125316.539	52727.4384	86770.592	50592.393	95347.855	64750.21
156.25	1222515.6	8372284.586	-10459621.1	4398327.7	13252994	251415.9	734535.1	15309707	57309.4637	50310.7975	94046.9708	50757.7407	73330.031	59179.745	69937.88	60226.386
166.01563	-4477350	13905174.16	-7164819.72	-226128.7	13594318	2683020	1775125	15574532	84831.1807	65734.7375	91933.7666	56279.0603	68011.279	65297.597	97928.212	61243.311
175.78125	4003469	7651783.147	-13126312.5	5851203.1	17525466	-700308.3	556260.5	17169125	76707.6193	58910.1643	93343.8516	51178.8792	122567.15	64730.424	140867.02	56058.862
185.54688	1067651.6	8798654.295	-10866163.3	5427519.2	16787738	149324.1	2802830	17558703	190499.632	87410.279	205602.824	84942.3778	193115.76	94556.248	188072.76	101116.14
195.3125	677162.37	9874957.813	-10517875.3	5841275.8	17715039	-140323.6	1974490	17780194	86219.9319	54469.2268	59120.4161	73165.0673	84272.997	91959.51	101115.94	71229.709
205.07813	795010.54	9963059.85	-10560370.4	5212566.7	18115013	159122.9	2231932	19224745	65062.2535	52178.4518	71466.6117	54239.1653	134542.36	62491.953	116863.94	59571.271
214.84375	127503.49	10189605.33	-9538892.05	6083602	17980196	-315905.5	2368137	19598374	89901.0142	113269.295	146930.75	100429.954	90293.993	90408.824	136992.81	126731.53
224.60938	-2377091	9445885.197	-10077645.1	6139881.3	19016981	-660652.4	1283185	21198120	182227.653	83272.2319	152261.032	115249.779	108527.23	85777.08	142148.36	101399.38
234.375	-3680529	8886234.934	-9128600.54	6054534.5	23089808	-9784.478	3829310	23308713	169930.604	213258.23	468826.083	192709.613	331309.25	151118.74	296411.82	292629.42
244.14063	-3902189	9103913.483	-10497204.3	6596422.7	24327091	-814727	383855.3	23163686	459231.965	171914.289	502310.742	365643.498	340124.9	218393.29	735412.38	304387.37
253.90625	-4871393	8495627.463	-11166334.5	7234855.8	26859010	-703591.5	1159367	25216060	334871.185	164093.538	694506.918	346001.791	365425.12	175940.46	728376.16	307065.63
263.67188	-4348326	9077252.613	-11643963.2	8384355.2	29070771	-1575406	271588.3	25151054	239914.442	93947.7045	330565.462	91635.4465	202446.43	82534.137	250720.17	94776.755
273.4375	-5123093	7546988.103	-14149042.8	10012876	31577868	-395422.8	1003852	26416322	90749.3939	43158.625	95317.4296	56636.3584	66137.012	66027.947	97614.889	82155.854
283.20313	-5785082	6780855.328	-14169543	8165800.7	33784267	-650545.8	4064102	25546250	118872.262	44309.6341	35031.2139	57973.6484	115266.69	46875.029	122568.44	45210.428
292.96875	-7764907	5455563.342	-13092453.4	7037197.3	36357832	-242953.5	3304967	26824834	79328.1192	36368.2501	53247.1016	43575.0255	76362.599	48032.207	47937.188	32309.734
302.73438	-10034416	1152967.48	-17102933	4278381.7	39814227	5542660	2356052	30210069	112705.091	75967.7511	69242.5806	61241.096	120908.03	76532.361	77670.101	48835.303
312.5	-11476331	-3500271.78	-18877810.2	-4808545	38348365	1631381	-4444139	23190799	133745.373	90897.0128	64647.8701	47538.9467	129481.89	97082.538	65482.644	55403.018
322.26563	-89166946	-67356028	-86088135.8	-59678661	1.74E+08	1.95E+08	1.31E+08	2.33E+08	2856102.17	2756030.1	3021273.61	2901851.56	2742350.6	2363405.3	2514981	2206424.7
332.03125	-3478442	23545913.11	-14045008.9	21129818	74338024	-1156122	28050506	41821617	102322.024	102726.261	140987.112	140104.955	102896.36	111908.84	141590.86	139790
341.79688	2777305.2	20530037.89	-11603969.6	23774552	72624652	-1918592	19935724	40541715	134133.204	78949.8049	168560.684	78447.8476	93748.919	83343.475	125591.7	93664.519

Table 33 Test condition: High Preswirl-20 krpm-65% Pressure Ratio-100% GVF

2230	Test Data								Uncertainties							
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**
9.765625	851697.51	10428004.92	-13097536.3	937843.2	1978981	-1064981	155544.5	3060770	506142.262	408830.675	454483.879	248035.028	413269.75	559172.61	232214.61	440225.77
19.53125	5915.83	9366368.207	-11605949.9	1772542.6	2493020	-316039.4	832028.5	2496628	131225.348	89926.1151	162208.071	129788.52	104584.68	154313.81	218046.44	166169.48
29.296875	272816.81	9084395.216	-11495538	2076738.6	2645547	660868.6	1116937	3027764	105477.164	64718.0474	167335.804	76731.9993	126288.02	79607.597	140572.68	83630.151
39.0625	407668.54	9394102.698	-11408085.1	2140207.8	3752338	-318662.6	320218.4	4194562	111570.91	71254.1776	126900.185	92305.801	127270.77	87580.694	146134.11	79439.677
48.828125	84799.607	9547292.482	-11143491.5	2218332.8	4979301	-227263.1	505037.2	5096472	73319.5393	60468.8516	98237.4127	48594.7872	103681.85	98954.818	35591.828	90082.785
58.59375	795348.57	9598123.97	-11402438.9	2575194.7	5866040	-403366.9	832552.3	5914047	113189.095	92855.7935	126794.366	76305.5447	70454.296	74902.637	72254.664	62914.865
68.359375	475788.46	9667855.824	-11330246.5	2877811.7	6428836	116014.9	776321	7135915	102512.768	64812.112	131088.26	70851.3044	115004.55	79115.599	144519.71	86261.161
78.125	1039687.6	9648656.441	-11560250.7	2945376.3	7731135	-316444.4	786641.2	8034568	107168.873	66471.9336	96975.8035	58439.6233	90948.681	91221.596	67334.765	49964.903
87.890625	972000.49	9562848.213	-11723734.3	3589162	8271983	-373402.8	1217742	9415437	80245.4565	53887.8387	70975.36	73123.7769	79584.759	84553.563	99885.744	79793.911
97.65625	1129961.4	9419920.149	-11289417.6	3666021.9	9252676	-209446.2	822838.2	10107267	98154.7344	86568.8351	69642.1221	64430.0234	83070.057	76108.983	99972.442	66106.175
107.42188	-3945734	6600679.187	-16130341.6	1968677.6	7720347	-4431126	-245807.7	8264718	222050.989	87120.5807	205784.565	99139.2692	149341.76	72635.699	150606.25	76833.419
117.1875	1628833.2	9299118.138	-11997248.7	4463028.4	11320290	-197.1762	1010886	11876300	100766.722	47391.2127	105054.004	52984.1882	129900.81	76019.739	158488.81	89391.83
126.95313	1959058.3	9150743.841	-11987007.7	5149471.4	11542747	300290.1	1847660	12442584	75371.1316	67251.2023	77220.0774	43480.827	94598.368	60283.402	65737.516	49150.242
136.71875	2423199.9	9277669.35	-12691672.2	5573766.4	12429147	694793.1	1938702	13076054	72171.2637	56442.9308	99944.0054	54795.0863	50478.218	58871.853	65061.515	55766.586
146.48438	2307861.4	8965267.28	-12650520.7	5930051.1	11380592	2505573	3895836	12388159	94121.274	56659.4751	117920.066	76813.117	84988.497	68771.72	62853.164	68819.398
156.25	1757068.3	9818358.174	-11408995	5552522.7	13723694	-192388.6	1128421	15547423	71499.5693	57497.925	82621.4257	69071.3878	79979.563	63150.512	77007.234	45673.688
166.01563	-3160164	15722006.08	-8605924.47	2102848.2	15128684	770440	2942312	17146711	68621.5121	49236.9057	136980.143	77566.7126	64685.801	90868.146	146550.94	130101.43
175.78125	4540115.7	9323252.223	-14484201.3	6861507.1	16931244	-522879	1385759	16976644	149284.838	82837.0725	173499.161	87983.6867	136875.48	95137.578	123370.25	65619.149
185.54688	2808005.1	10715885.15	-13200358.7	6964734.6	17825175	-220087	3506737	18186164	117518.579	67946.4224	148210.724	92923.8131	120583.92	106021.52	294533.47	78418.167
195.3125	2670005.7	11424531.92	-11854111.4	7046361.2	18314018	-1121094	2455500	17986144	94468.5617	50481.5548	147251.741	70638.1791	85863.282	70152.5	162489.02	69833.414
205.07813	2663398.8	11320037.03	-12009288.1	6852636.7	18437783	-489902.6	2885542	19303448	79437.315	49664.2259	111969.114	56504.6729	62977.792	60097.179	123738.06	78944.413
214.84375	1814027.4	11317793.22	-10839057.7	7665429	18227518	-986061.6	3205291	19716152	100438.883	81840.3078	76112.4852	69871.6757	98127.51	81502.544	78046.663	66800.797
224.60938	-834484.2	10878428.2	-11466358.2	8294115	19458921	-1144865	2473178	21389301	173393.264	93092.5743	160097.393	98286.7779	163914.76	80438.012	156266.34	70575.728
234.375	-1384225	10367495.75	-10156465.9	7957491.3	23429160	-1493483	4724972	22388637	120697.061	76015.5655	148874.836	61642.575	129648.76	92474.582	119590.36	98207.759
244.14063	-2795465	10519468.45	-12091875.5	8787761.6	24680080	-1082988	1759270	23177799	108909.971	60436.3952	152797.925	66247.3287	127980.21	80304.487	148804.52	68001.697
253.90625	-3183337	10107698.92	-12858725.3	10151275	27143821	-1247073	2498907	24767120	141271.474	44357.1145	69028.8818	61112.1933	105633.04	70418.634	137479.29	73468.461
263.67188	-2445843	10118261.55	-13603869.5	10574753	28558905	-2246755	1655572	24834484	116573.712	37449.3074	126887.089	42067.1531	69460.948	38959.233	162523.81	49795.706
273.4375	-3236575	9462399.51	-15299113.3	11952278	31707723	-1374110	2625305	25298479	55789.7837	42202.9049	63921.4926	58748.4676	69453.977	63804.205	59419.873	45624.412
283.20313	-3840222	8502990.497	-14745831	10282317	34199435	-2013182	5542816	25461474	57507.6161	41717.0146	91336.0984	43344.8155	65219.419	50636.555	61733.486	40292.663
292.96875	-6092570	6497903.995	-14738674.6	8882760.7	36483920	-739108.6	4798382	26977996	75683.9051	41123.8608	72230.9126	38702.2401	64544.249	51313.645	62724.992	49243.1
302.73438	-8508131	5641052.419	-18087098.4	9567449	42966126	5371162	6076206	31336842	80184.7285	50550.625	110153.16	51511.9017	105349.37	63351.679	77398.919	57410.922
312.5	-13470676	-2641529.17	-24311971.2	-2690948	40350467	6204334	-91236.99	29881575	120424.598	128803.457	203374.758	131127.257	239881.83	153274.86	135377.57	96205.795
322.26563	29611929	53387270.67	33324898.47	65020393	1.86E+08	1.62E+08	1.37E+08	1.91E+08	3536716.57	3074730.19	3164917.52	2876161.32	4642789.1	3591057	4105164	3142361.1
332.03125	-6317032	18523330.67	-19803284.3	19515147	74841709	7122930	31619383	50814528	1487025.53	1645742.07	2386648.88	3229476.76	1812117.8	1554195.1	3541567.6	2560571.9
341.79688	4353670.1	18369725.46	-12664266.3	24522347	70472428	-2245791	19663158	40890209	203725.437	118691.856	564094.848	275866.14	168571.24	113052.27	410843.33	300878.91

APPENDIX D: ESTIMATED PRESWIRL

This appendix details the calculation of the preswirl ratio from experimental measurements. Readings from the flowmeter, pressure sensor before the flowmeter, pressure sensor after the flowmeter, pressure sensor at the stator inlet, temperature at the flowmeter, temperature at the stator inlet, and the rotor speed are all converted to SI units and combined into calculating the preswirl ratio. The last equation provides variables for inserting measurement readings with US units.

Flowmeter actual volumetric flow (converted to SCFM):

$$[x_1]ACFM \rightarrow [x_1]\frac{P_A T_S}{P_S T_A}SCFM \tag{D1}$$

$$ACFM(Actual\ Cubic\ Feet\ per\ Minute)$$

$$SCFM(Standard\ Cubic\ Feet\ per\ Minute)$$

Converting average pressure between before and after flowmeter to Pascals:

$$[x_2]psig \rightarrow ([x_2] + 14.696)psia \rightarrow \frac{([x_2] + 14.696)(4.448222)}{(0.0254)^2}\ Pa \tag{D2}$$

Temperature at Flowmeter (converted to Kelvin):

$$[x_3]°\mathrm{F} \rightarrow ([x_3] + 459.67)°R \rightarrow ([x_3] + 459.67)\frac{5}{9}K \tag{D3}$$

Assignment of variables:

$$\Rightarrow P_A = \frac{([x_2] + 14.696)(4.448222)}{(0.0254)^2}\ Pa \tag{D4}$$

$$\Rightarrow T_A = ([x_3] + 459.67)\frac{5}{9}\ K \tag{D5}$$

$$\Rightarrow P_s = 101325\ Pa \tag{D6}$$

$$\Rightarrow T_S = 293.15\ K \tag{D7}$$

Density for air at standard conditions:

$$\rho_S = \frac{P_S}{R\ T_S} \tag{D8}$$

Density for air at inlet (Brown pressure sensor):

$$\rho_I = \frac{P_I}{R\ T_I} \tag{D9}$$

Air specific gas constant:

$$R = 287.058 \frac{J}{kgK} \tag{D10}$$

Pressure at inlet (Brown sensor):

$$\Rightarrow P_I = \frac{([x_4] + 14.696)(4.448222)}{(0.0254)^2}\ Pa \tag{D11}$$

Temperature at inlet:

$$\Rightarrow T_I = ([x_5] + 459.67)\frac{5}{9}\ K \tag{D12}$$

Total area from 32 holes of the preswirl ring:

$$A = (32)\pi\left(\frac{0.130 * 0.0254}{2}\right)^2\ m^2 \tag{D13}$$

Converting SCFM to $\frac{m^3}{s}$:

$$\frac{ft^3}{min}\left(\frac{12\ in * 0.0254\ m}{ft * in}\right)^3 \frac{min}{60\ s} = \left(\frac{12 * 0.0254}{60}\right)^3 \frac{m^3}{s} \tag{D14}$$

Fluid velocity normal to holes in preswirl ring:

$$V_N = SCFM\left(\frac{12 * 0.0254}{60}\right)^3 \rho_S \frac{1}{\rho_I\ A} \tag{D15}$$

Fluid velocity tangent to holes in preswirl ring:

$$V_T = V_N \sin(60) \tag{D16}$$

Combining pressures (P_A and P_S) and temperatures (T_A and T_S) in SCFM equation:

$$[x_1]\frac{P_A T_S}{P_S T_A} = \frac{[x_1]([x_2] + 14.696)(4.448222)(293.15)(9)}{(0.0254)^2(101325)([x_3] + 459.67)(5)}\ \frac{ft^3}{min}$$
$$= \frac{[x_1]([x_2] + 14.696)(4.448222)(293.15)(9)(12 * 0.0254)^3}{(0.0254)^2(101325)([x_3] + 459.67)(5)(60)}\ \frac{m^3}{s} \tag{D17}$$

Metric volumetric flow:

$$\Rightarrow VolumetricFlow = \frac{(4.448222)(0.0254)(9)(12)^3(293.15)[x_1]([x_2] + 14.696)}{(5)(60)(101325)([x_3] + 459.67)}\ \frac{m^3}{s} \tag{D18}$$

Mass flow rate:

$$Massflowrate = Metric\ volumetric\ flow * \rho_S \tag{D19}$$

Combining volumetric flow with standard density:

$$Mass\ flow\ rate = \frac{(0.0254)(4.448222)(9)(12)^3(293.15)[x_1]([x_2] + 14.696)}{(5)(60)(287.058)([x_3] + 459.67)}\ \frac{\text{kg}}{s} \tag{D20}$$

Metric volumetric flow rate at inlet:

$$Metric\ Volumetric\ flow\ at\ inlet = Mass\ flow\ rate * \frac{1}{\rho_I} \quad \text{(D21)}$$

Combining volumetric flow with density at inlet:

$$Metric\ volumetric\ flow\ rate = \frac{(0.0254)^3(12)^3(293.15)[x_1]([x_2]+14.696)([x_5]+459.67)}{(60)(287.058)([x_3]+459.67)([x_4]+14.696)} \frac{m^3}{s} \quad \text{(D22)}$$

Fluid velocity from volumetric flow rate:

$$Fluidvelocity = volumetric\ flow\ rate * \frac{1}{A} = V_N = \frac{V_T}{\sin(60)} \quad \text{(D23)}$$

Combining equations for Fluid velocity:

$$Fluid\ Velocity = \frac{(0.0254)^3(12)^3(293.15)[x_1]([x_2]+14.696)([x_5]+459.67)(4)}{(60)([x_3]+459.67)([x_4]+14.696)(32)(0.130)^2\pi} \frac{m}{s}$$

$$= \frac{(0.0254)^3(12)^3(293.15)[x_1]([x_2]+14.696)([x_5]+459.67)}{\pi(60)([x_3]+459.67)([x_4]+14.696)(8)(0.130)^2} \frac{m}{s} \quad \text{(D24)}$$

$$= \frac{(0.0254)^3(12)^3(293.15)[x_1]([x_2]+14.696)([x_5]+459.67)}{\pi(0.130)^2(480)([x_3]+459.67)([x_4]+14.696)} \frac{m}{s}$$

Tangent Velocity for fluid:

$$V_T = \frac{(0.0254)^3(12)^3(293.15)[x_1]([x_2]+14.696)([x_5]+459.67)\sin(60)}{\pi(0.130)^2(480)([x_3]+459.67)([x_4]+14.696)} \frac{m}{s} \quad \text{(D25)}$$

Rotor speed converted into rad/s:

$$[x_6]rpm \rightarrow [x_6]\frac{rev}{min} * \frac{2\pi\ rad\ min}{rev\ 60\ s} \quad \text{(D26)}$$

$$\omega = \frac{\pi}{30}[x_6]\frac{rad}{s} \quad \text{(D27)}$$

Rotor surface speed:

$$V_R = R\omega \tag{D28}$$

$$\Rightarrow R = \frac{D}{2} m \tag{D29}$$

$$\Rightarrow D = 4.5125\ in = (4.5125)(0.0254)\ m \tag{D30}$$

Combining into Rotor Surface Speed:

$$V_R = \frac{(4.5125)(0.0254)}{2} \frac{\pi}{30} [x_6] \frac{m}{s} = \pi \frac{(0.0254)(4.5125)}{60} [x_6] \frac{m}{s} \tag{D31}$$

Preswirl equation:

$$Preswirl = \frac{V_T}{V_R} \tag{D32}$$

Combining Tangent Velocity and Rotor Surface Speed:

$$\begin{aligned} &= \frac{(12)^3 [x_1]([x_2] + 14.696)([x_5] + 459.67) \sin(60)}{\pi^2 (0.130)^2 (8)([x_3] + 459.67)([x_4] + 14.696)(4.5125)[x_6]} \\ &= \frac{(12)^3 [x_1]([x_2] + 14.696)([x_5] + 459.67) \sin(60)}{\pi^2 (0.130)^2 (4.5125)(8)([x_3] + 459.67)([x_4] + 14.696)[x_6]} \end{aligned} \tag{D33}$$

Resultant Estimate to Preswirl:

$$\Rightarrow Estimated\ Preswirl = \frac{(12)^3[x_1]([x_2] + 14.696)([x_5] + 459.67)\sin(60)}{\pi^2(0.130)^2(4.5125)(8)([x_3] + 459.67)([x_4] + 14.696)[x_6]}$$

$[x_1] \rightarrow Flowmeter[ACFM]$

$[x_2] \rightarrow Average\ pressure\ between\ before\ and\ after\ flowmeter[psig]$

$[x_3] \rightarrow Temperature\ at\ flowmeter[°F]$ (D34)

$[x_4] \rightarrow Pressure\ Inlet(Brown\ pressure\ sensor)[psig]$

$[x_5] \rightarrow Temperature\ at\ Inlet[°F]$

$[x_6] \rightarrow Rotor\ speed[rpm]$

APPENDIX E: MASS FLOW CALCULATION

This appendix details the calculation of the mass flow rate from the flowmeter. Readings from the flowmeter, pressure sensor at the flowmeter, and the temperature sensor at the flowmeter are all converted to SI units and combined into calculating the mass flow rate. Equation (E13) provides variables for inserting measurement readings with US units.

Mass flow rate:

$$Mass\ flow\ rate = \rho_S * Volumetric\ flow(SCFM) \tag{E1}$$

Standard Density Equation:

$$\rho_S = \frac{P_s}{RT_s} \tag{E2}$$

$$\rightarrow P_s \rightarrow Standard\ Air\ Pressure \tag{E3}$$

$$\rightarrow T_S \rightarrow Standard\ Air\ Temperature \tag{E4}$$

$$\rightarrow R = 53.353 \frac{ft\ lb_f}{lb_m {^\circ}R} \rightarrow Air\ Specific\ Gas\ Constant \tag{E5}$$

Flowmeter actual volumetric flow (converted to SCFM):

$$[x_1]ACFM \rightarrow [x_1]\frac{P_A T_S}{P_S T_A} SCFM \tag{E6}$$

$$ACFM(Actual\ Cubic\ Feet\ per\ Minute)$$

$$SCFM(Standard\ Cubic\ Feet\ per\ Minute)$$

$$\rightarrow P_A \rightarrow Flowmeter\ Absolute\ Pressure \tag{E7}$$

$$\rightarrow T_A \rightarrow Flowmeter\ Absolute\ Temperature \tag{E8}$$

Converting Flowmeter reading ACFM to Actual Cubic Feet per Second:

$$[x_1]\frac{ft^3}{min}\frac{min}{60s} = \frac{[x_1]}{60}\frac{ft^3}{s} \tag{E9}$$

Converting Pressure Inlet psia to pounds-force per foot squared:

$$P_A = ([x_2] + 14.696)psia\frac{144in^2}{ft^2} = 144([x_2] + 14.696)\frac{lb_f}{ft^2} \tag{E10}$$

Converting Temperature Inlet °F to °R:

$$T_A = ([x_3] + 459.67)°R \tag{E11}$$

Combining standard density and volumetric flow rate:

$$\begin{aligned} massflowrate &= \frac{P_s}{RT_s}[x_1]\frac{P_A T_S}{P_S T_A} \\ &= \frac{144}{(60)(53.353)}\frac{[x_1]([x_2] + 14.696)}{([x_3] + 459.67)}\frac{\frac{ft^3}{s}\frac{lb_f}{ft^2}}{\frac{ft\ lb_f}{lb_m °R}} \\ &\approx \frac{1}{22.2304}\frac{[x_1]([x_2] + 14.696)}{([x_3] + 459.67)}\frac{lb_m}{s} \\ &\approx \frac{1}{22.2304}\frac{[x_1]([x_2] + 14.696)}{([x_3] + 459.67)}\frac{lb_m}{s}\frac{kg}{2.20462\ lb_m} \end{aligned} \tag{E12}$$

Resultant Mass Flow Calculation:

$$\Rightarrow MassFlowRate \approx \frac{1}{49.0096}\frac{[x_1]([x_2]+14.696)}{([x_3]+459.67)}\frac{kg}{s}$$

$[x_1] \rightarrow FlowmeterReading[ACFM]$

$[x_2] \rightarrow FlowmeterPressure[psig]$ (E13)

$[x_3] \rightarrow FlowmeterTemperature[°\mathrm{F}]$

APPENDIX F: PRESWIRL RATIO CALCULATION

This appendix details the calculation of the preswirl ratio from experimental measurements of the differential pressure sensor. Readings from the differential pressure sensor, pressure sensor at the stator inlet, temperature sensor at the stator inlet, and rotor speed are all combined into calculating the preswirl ratio. Equation (F21) provides variables for inserting measurement readings with US units.

Preswirl Ratio:

$$Preswirl = \frac{V_{Fluid}}{V_{Rotor}} \tag{F1}$$

Fluid velocity after it enters preswirl ring:

$$V_{Fluid} = \sqrt{\frac{2g\rho_W H_W}{\rho_a}}\ \frac{ft}{s} \tag{F2}$$

$$g = 32.174\frac{ft}{s} \rightarrow gravity \tag{F3}$$

$$\rho_w = 1.94\frac{slug}{ft^3} \rightarrow waterdensity \tag{F4}$$

$$H_w = [x_1]\ in \rightarrow water\ height\ measurement \tag{F5}$$

$$\rho_a = \frac{P_a}{R\ T_a}\frac{slug}{ft^3} \rightarrow air\ density \tag{F6}$$

Air Density Equation:

$$\rho_a = \frac{P_a}{R\ T_a}\frac{slug}{ft^3} \tag{F7}$$

$$\rightarrow P_a = ([x_2]psig + 14.696)psia = 144([x_2]psig + 14.696)\frac{lb_f}{ft^2} \quad \text{(F8)}$$

$$\rightarrow T_a = ([x_3]°\text{F} + 459.67)\ °R \quad \text{(F9)}$$

$$\rightarrow R = 1717\frac{ft * lb_f}{slug\ °R} \quad \text{(F10)}$$

$$\Rightarrow \rho_a = \frac{144([x_2]psig + 14.696)}{1717([x_3]°\text{F} + 459.67)}\frac{slug}{ft^3} \quad \text{(F11)}$$

Water Height:

$$\rightarrow H_w = \frac{[x_1]}{12}ft \quad \text{(F12)}$$

Combining variables into Fluid velocity:

$$V_{Fluid} = \sqrt{\frac{2g\rho_W H_W}{\rho_a}} = \sqrt{\frac{(2)(32.174)(1.94)(1717)[x_1]([x_3]°\text{F} + 459.67)}{(12)(144)([x_2] + 14.696)}}$$

$$\Rightarrow V_{Fluid} \approx \sqrt{\frac{(124.0405)[x_1]([x_3] + 459.67)}{([x_2] + 14.696)}}\ \frac{ft}{s} \quad \text{(F13)}$$

Rotor surface speed:

$$V_{Rotor} = R\omega \quad \text{(F14)}$$

$$\rightarrow [x_4]rpm \rightarrow \omega = [x_4]\frac{rev}{min} * \frac{2\pi\ rad\ min}{rev\ 60\ s} = \frac{2\pi}{60}[x_4]\frac{rad}{s} \quad \text{(F15)}$$

$$\rightarrow R = \frac{D}{2}in\ \frac{ft}{12\ in} = \frac{D}{24}\ ft \quad \text{(F16)}$$

$$\rightarrow D = 4.5125\ in \quad \text{(F17)}$$

$$V_{Rotor} = \frac{(4.5125)}{24}\frac{2\pi[x_4]}{60} = \frac{(4.5125)\pi}{720}[x_4]\frac{ft}{s} \quad \text{(F18)}$$

$$\Rightarrow V_{Rotor} \approx 0.01969[x_4]\frac{ft}{s} \tag{F19}$$

Combing Fluid and Rotor Velocity:

$$\frac{V_{Fluid}}{V_{Rotor}} = \frac{\sqrt{\frac{(124.0405)[x_1]([x_3] + 459.67)}{([x_2] + 14.696)}}}{0.01969[x_4]} \frac{\frac{ft}{s}}{\frac{ft}{s}} \tag{F20}$$

Resultant Preswirl Ratio Calculation:

$$\Rightarrow PreswirlRatio \approx \frac{50.7885\sqrt{\frac{(124.0405)[x_1]([x_3] + 459.67)}{(12)(144)([x_2] + 14.696)}}}{[x_4]}$$

$[x_1] \rightarrow Water\ Height\ Measurement\ [inchesH_2O]$

$[x_2] \rightarrow Pressure\ Inlet\ [psig]$ (F21)

$[x_3] \rightarrow Temperature\ Inlet\ [°F]$

$[x_4] \rightarrow Rotor\ Speed\ [rpm]$