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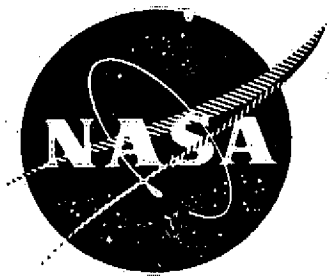

ACOUSTIC AND AERODYNAMIC PERFORMANCE INVESTIGATION OF INVERTED VELOCITY PROFILE COANNULAR PLUG NOZZLES

Comprehensive Data Report

VOLUME II

P. R. Knott
J. T. Blozy
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NASA CONTRACT: NAS3-19777

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
CR-159575		

4. Title and Subtitle	5. Report Date
ACOUSTIC AND AERODYNAMIC PERFORMANCE INVESTIGATION OF INVERTED VELOCITY PROFILE COANNULUAR PLUG NOZZLES -- COMPREHENSIVE DATA REPORT -- VOLUME II	May 1979
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
P. R. Knott, J. T. Blozy, and P. S. Staid	R79AEG166
	10. Work Unit No.
9. Performing Organization Name and Address	11. Contract or Grant No.
General Electric Company Aircraft Engine Group Cincinnati, Ohio 45215	NAS3-19777
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Contractor Report
National Aeronautics and Space Administration Washington, D.C. 20546	14. Sponsoring Agency Code

15. Supplementary Notes

Final report. Project Manager, Orlando A. Gutierrez, V/STOL and Noise Division, NASA Lewis Research Center, Cleveland, Ohio 44135.

16. Abstract

This Comprehensive Data Report, comprising three volumes, includes the basic test description and test results which are analyzed and documented in the comparison Final Reports, NASA CR-3149 and CR-2990. Volume I contains a description of the acoustic configurations, test facilities, data reduction techniques, test conditions, and detailed test results from the hot, static acoustic tests at the General Electric Anechoic Chamber. Volume II presents acoustic data comparisons in graphical form. Volume III contains the detailed aerodynamic test results plus the "concept screening and model design report."

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Supersonic jet noise; Noise suppression; Coannular plug nozzles; Inverted velocity profile; Variable-cycle engine; Acoustic tests; Aerodynamic performance tests	Unclassified - unlimited STAR Category 71

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
Unclassified	Unclassified	523	

* For sale by the National Technical Information Service, Springfield, Virginia 22161 75%

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7.0 ACOUSTIC DATA COMPARATIVE PLOTS

7.1 INTRODUCTION

In the following sections data plots are presented which examine the noise characteristics of the coannular nozzle. The effect of changes in both the nozzle flow parameters (i.e., velocity, temperature, pressure ratio) and the coannular nozzle geometry are presented. All data are normalized except for PWL spectra and the first 10 points, which are comparisons with JENOTS data.

Unless otherwise specified, the following plots are presented for each study.

For full size (513 $in.^2$) at the 2400-ft sideline:

1. PNL directivity, normalized

For model size (29.399 $in.^2$) at the 40-ft arc:

1. OASPL directivity, normalized
2. 1/3-octave band PWL spectra, unnormalized
3. 1/3-octave band SPL spectra at angles of 50°, 90°, 130°, and 140° to the inlet, normalized

The following normalization factors have been used in the plots:

1. PNL - $10 \log(FT/F_{REF})$

   where:
   PNL perceived noise level
   FT total ideal thrust
   F_{REF} reference ideal thrust (F_{REF} = 5130 lbf)

2. OASPL - A

   where:
   $A = 10 \log(AT/R^2) + 10 \log(FT/(AT*F_{REF}))$
   OASPL overall sound pressure level
   AT total area
   R distance
   FT total ideal thrust
   F_{REF} reference thrust/reference area (F_{REF} = 10 lbf/$in.^2$)

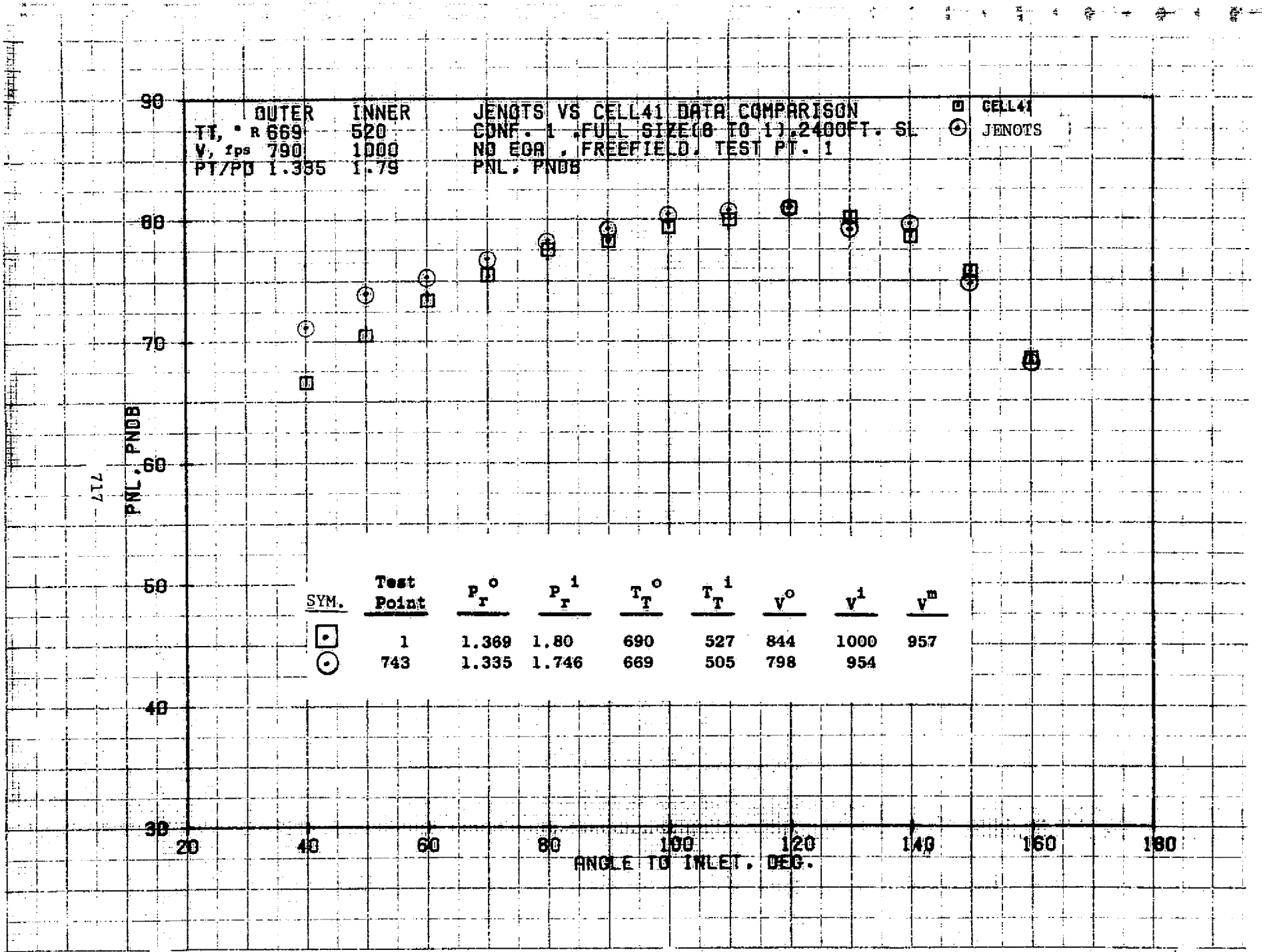
3. SPL - $10 \log(A/R^2) - 10 \log(FT/(A*F_{REF}))$

   where:
   SPL sound pressure level
   A total area
   R distance
   FT total ideal thrust
   F_{REF} reference thrust/reference area (F_{REF} = 10 lbf/$in.^2$)

Only a presentation of the data is made in this report. Data analysis is addressed in the main final report. On each plot the measured flow conditions are shown for all data points in the comparison.

7.2 COMPARISON OF ANECHOIC CHAMBER AND OUTDOOR TEST SITE (JENOTS) DATA

The purpose of this data analysis group is to compare data measured previously in the General Electric outdoor acoustic test site (JENOTS) with the acoustic measurements in the General Electric Anechoic Jet Noise Facility (Cell 41). Ten test points were chosen for this comparison. For these points the full-size comparison was made at 1812 $in.^2$ and both full-size and model-size data were not normalized since the test model was exactly the same in size and geometry. The JENOTS data was previously reported in NASA CR-135239.



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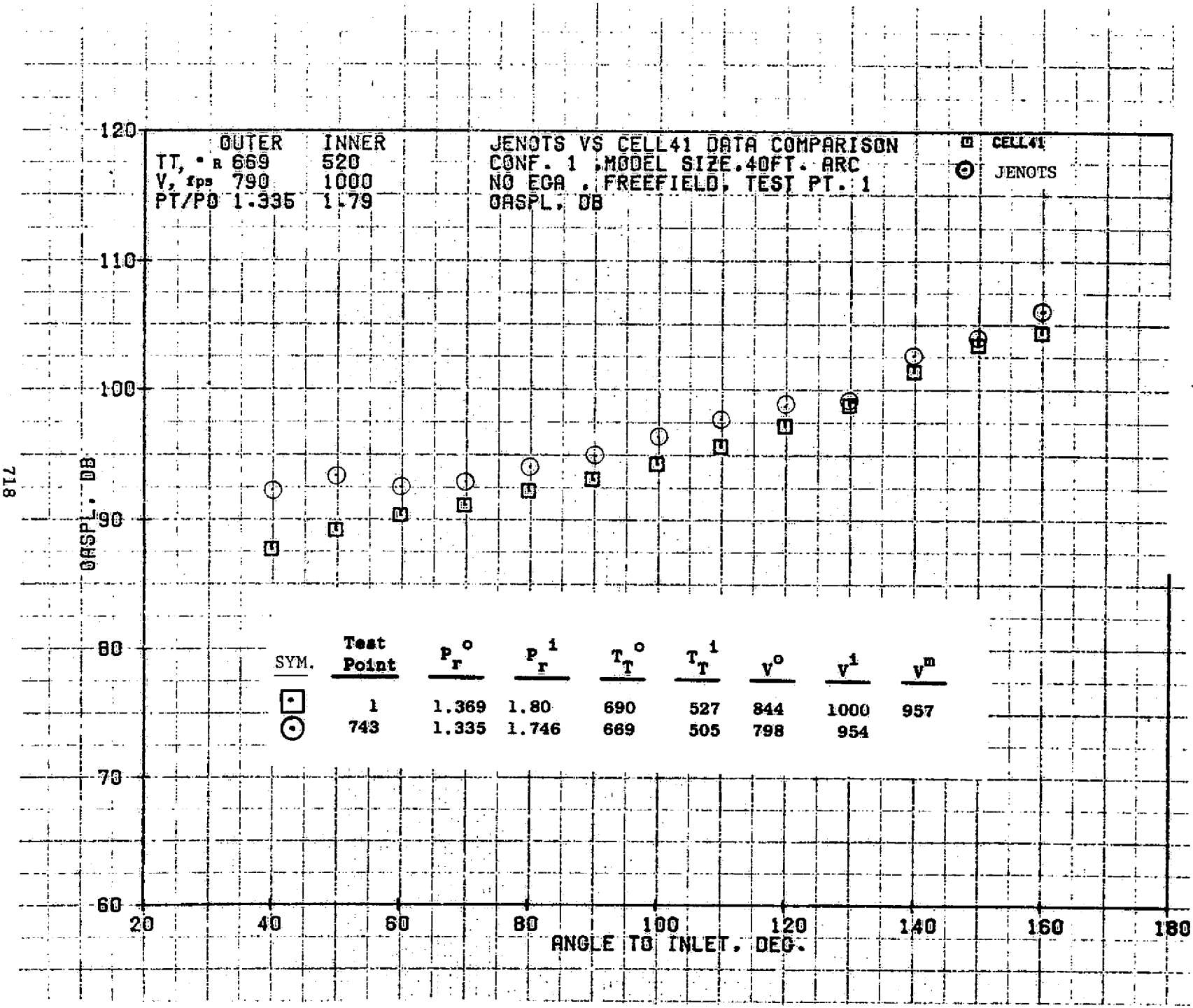
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NO EGA , FREEFIELD, TEST PT. 1
OASPL. DB
CELL41
JENOTS
OASPL. DB
120
110
100
90
80
70
60
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point P_r^0 P_r^i T_T^0 T_T^i V^0 V^i V^m
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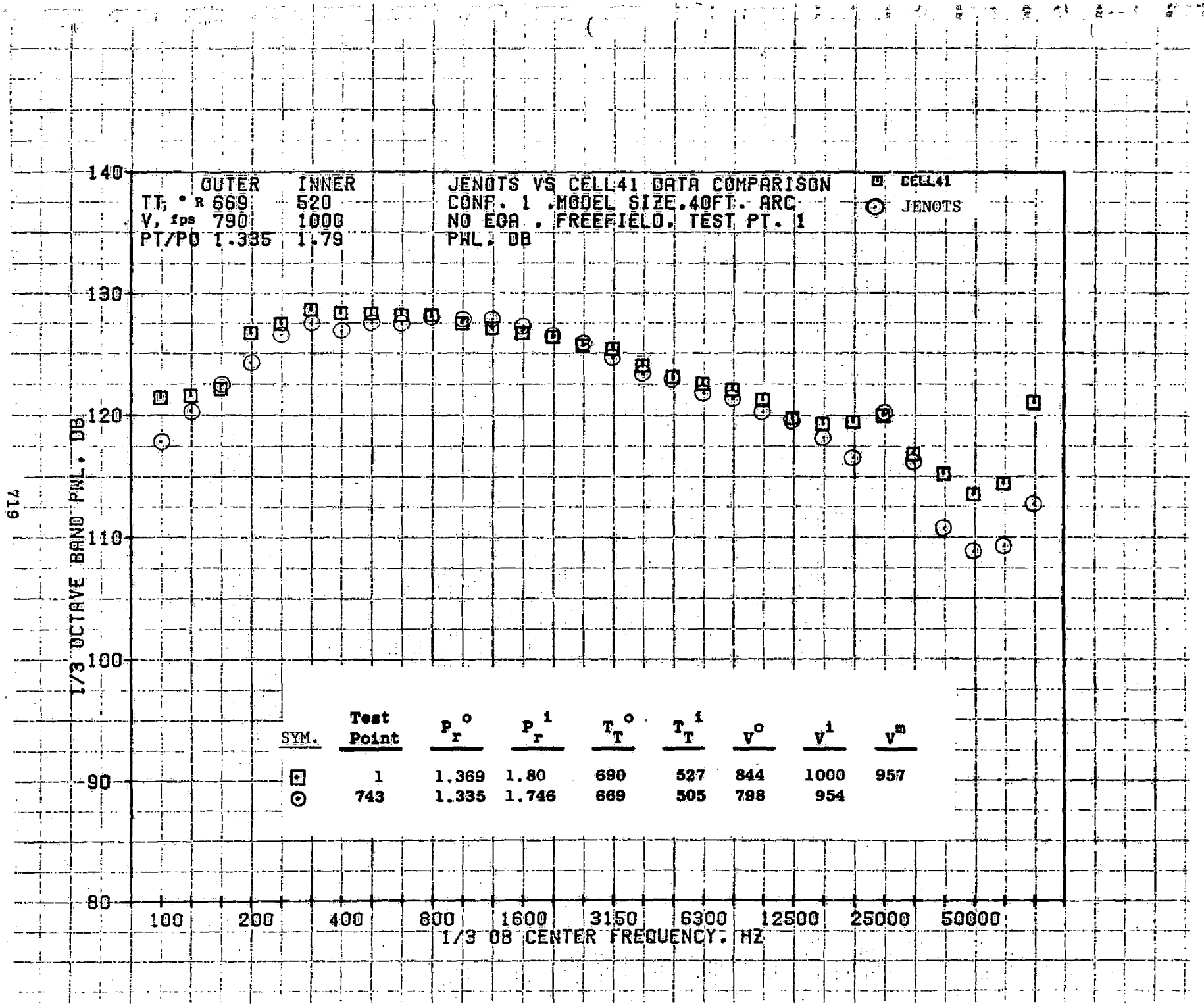
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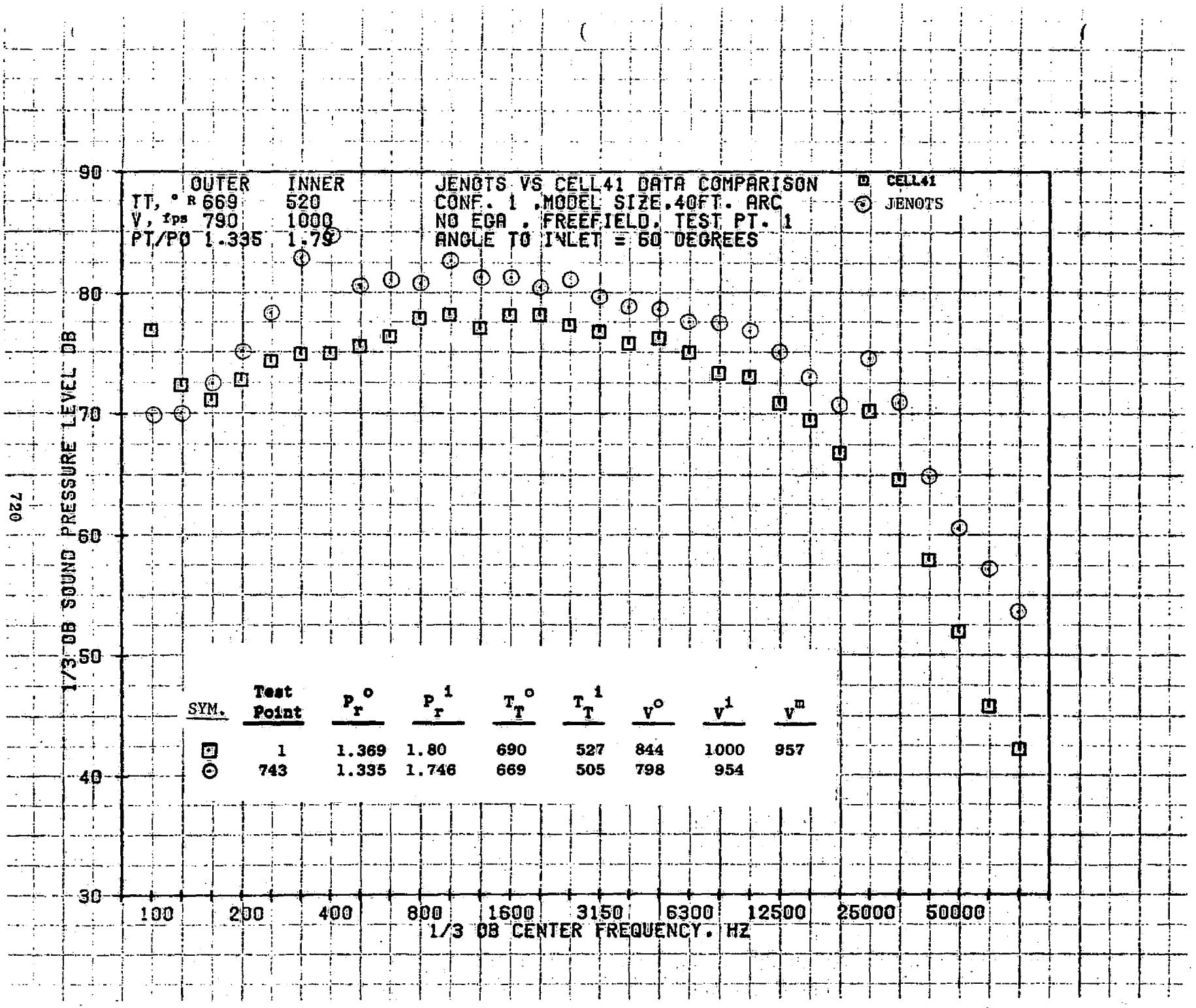
PWL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 669 520
V, fps 790 1000
PT/PO 1.335 1.79
1/3 OCTAVE BAND PWL. DB
140
130
120
110
100
90
80
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
1 1.369 1.80 690 527 844 1000 957
743 1.335 1.746 669 505 788 954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ANGLE TO INLET = 60 DEGREES
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JENOTS
OUTER INNER
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V, fps 790 1000
PT/P0 1.335 1.79
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
90
80
70
60
50
40
30
100
200
400
800
1600
3150
6300
12500
25000
50000
720
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
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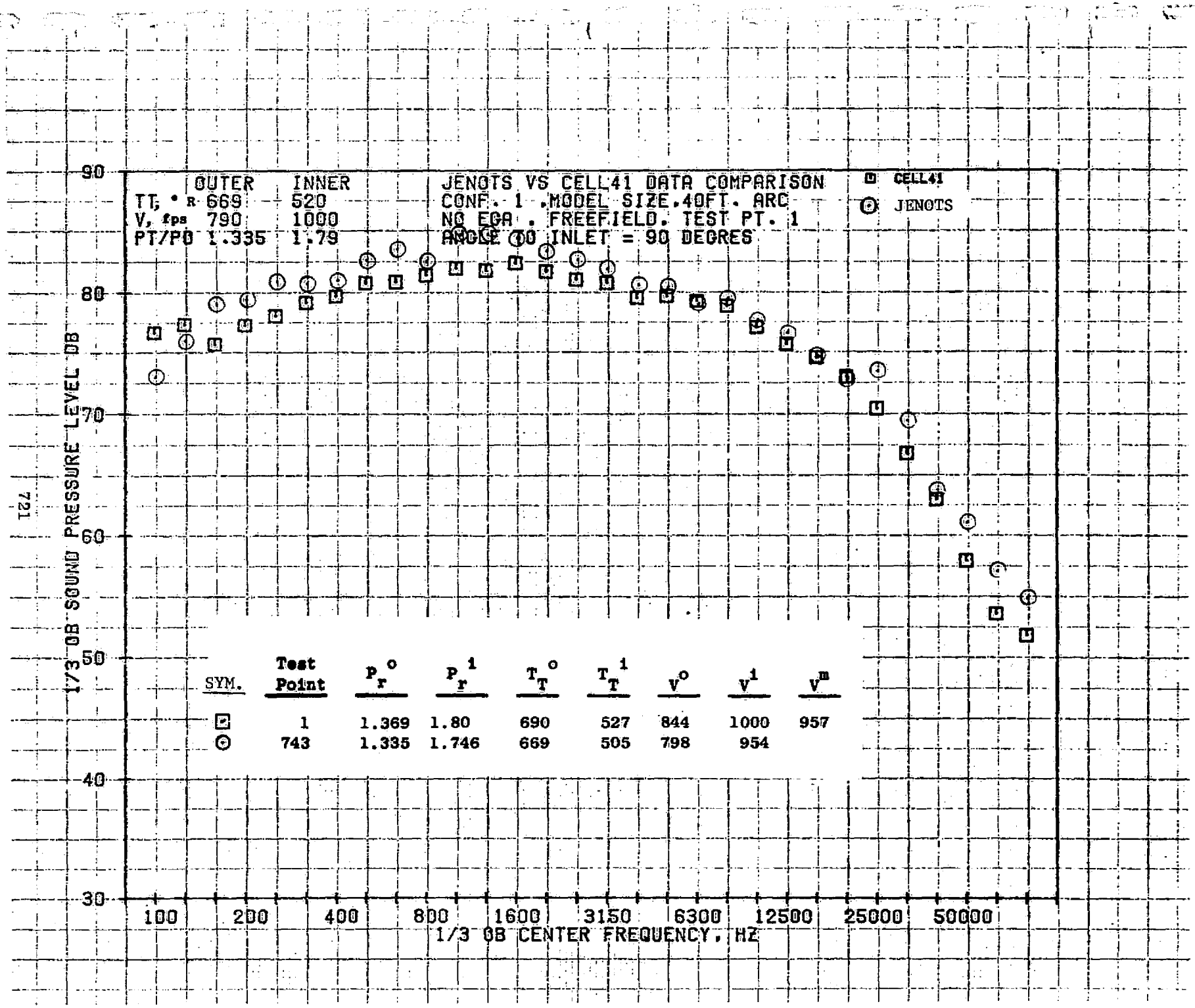
743 1.335 1.746 669 505 798 954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OUTER INNER
TT, °R 669 520
V, fps 790 1000
PT/P0 1.335 1.79
1/3 OB SOUND PRESSURE LEVEL DB
90
80
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60
50
40
30
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^0 P_r^1 T_T^0 T_T^1 V^0 V^1 V^m
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743 1.335 1.746 669 505 798 954

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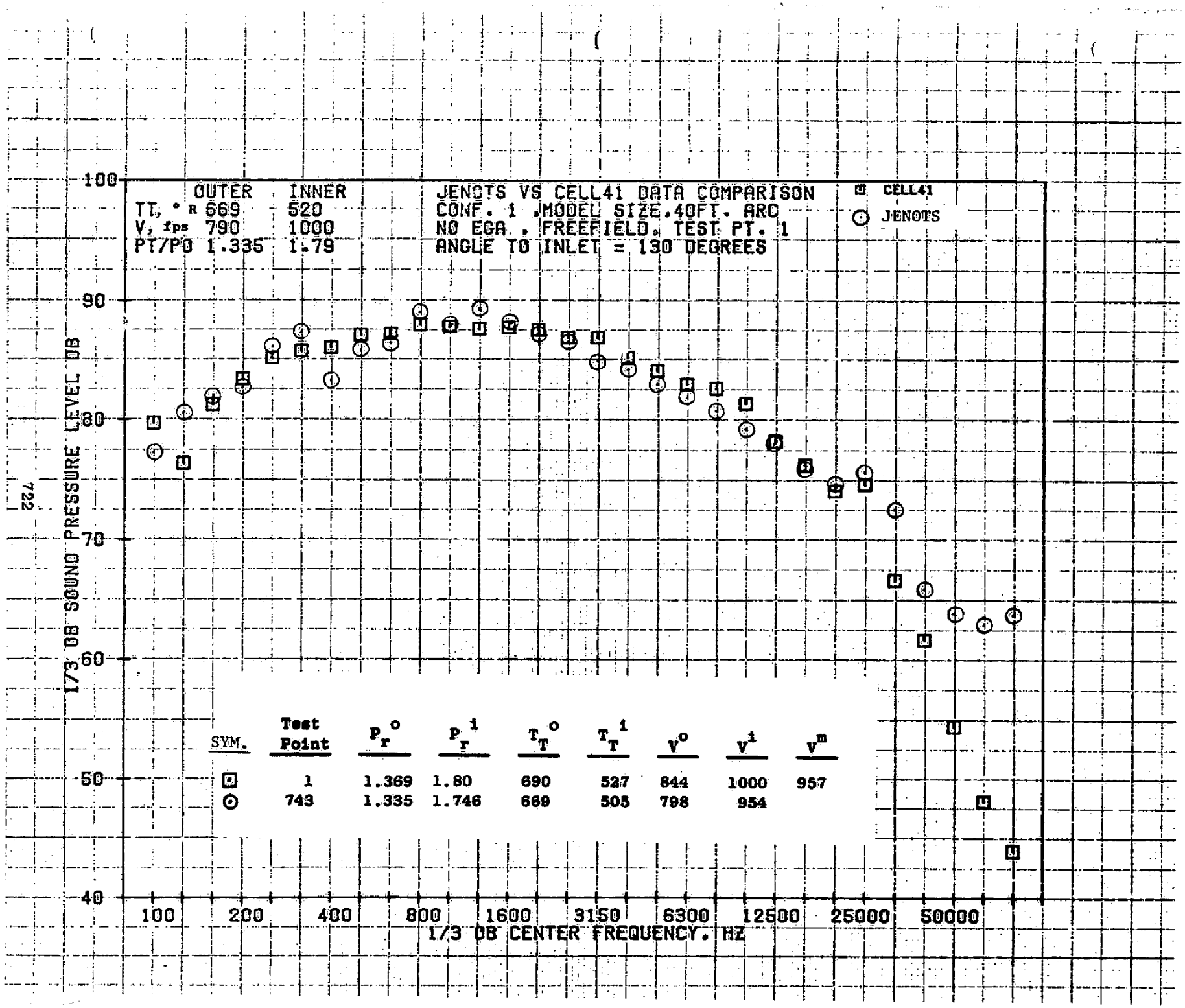
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OUTER INNER
TT, °R 669 520
V, fps 790 1000
PT/P0 1.335 1.79
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
100
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200
400
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3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
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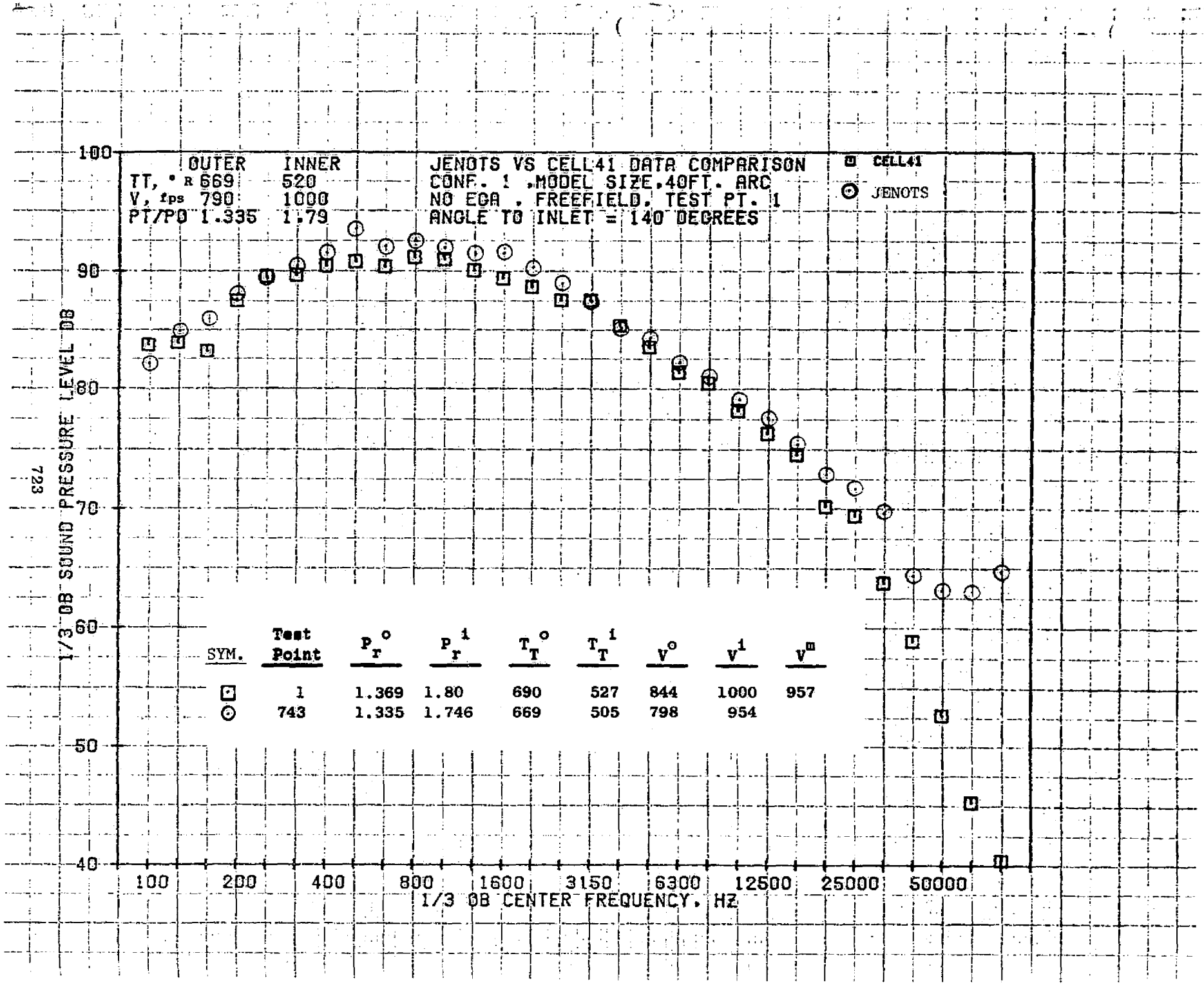
743 1.335 1.746 669 505 798 954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NO EGA . FREEFIELD. TEST PT. 1
ANGLE TO INLET = 140 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 669 520
V, fps 790 1000
PT/P0 1.335 1.79
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
100
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12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
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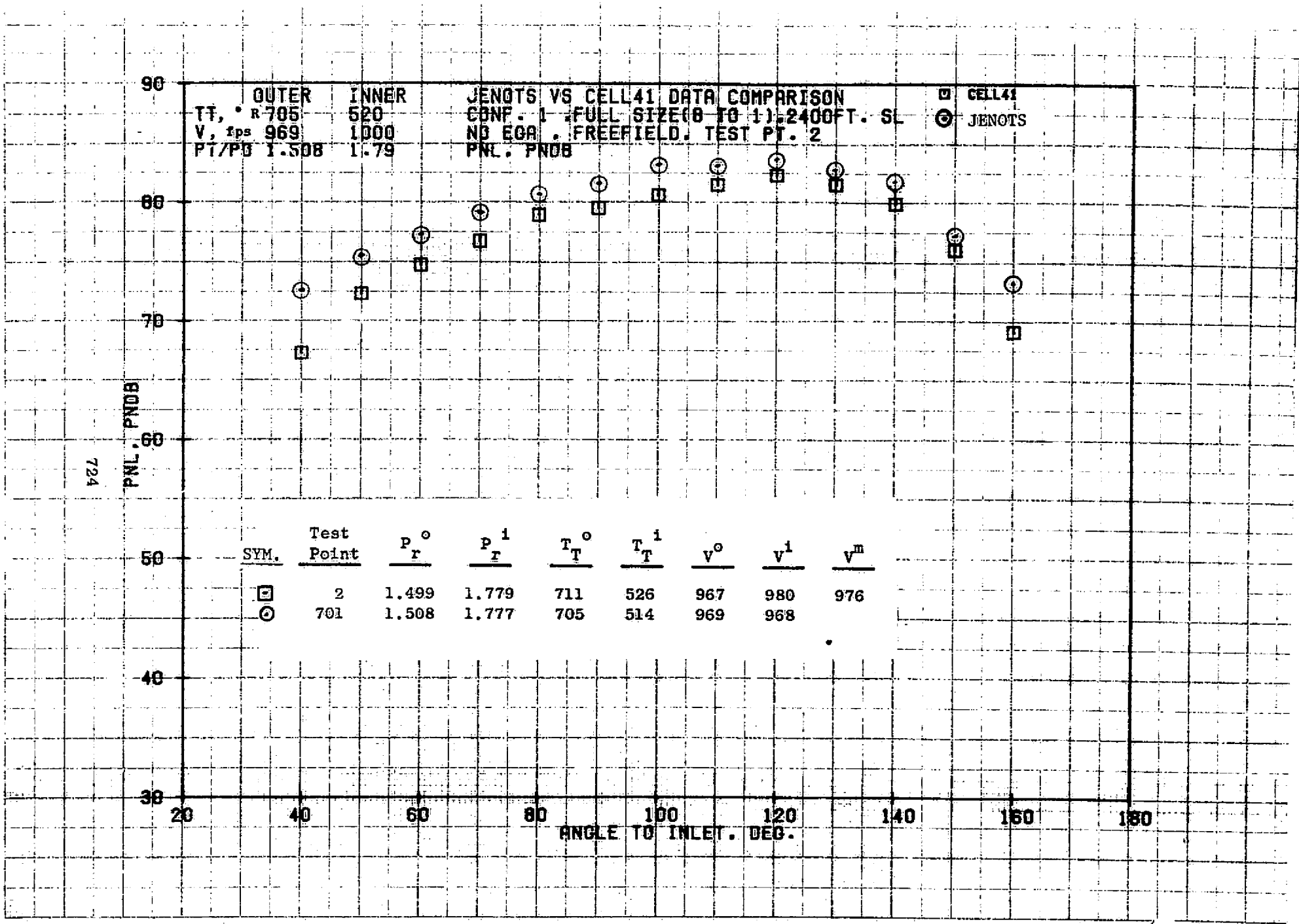

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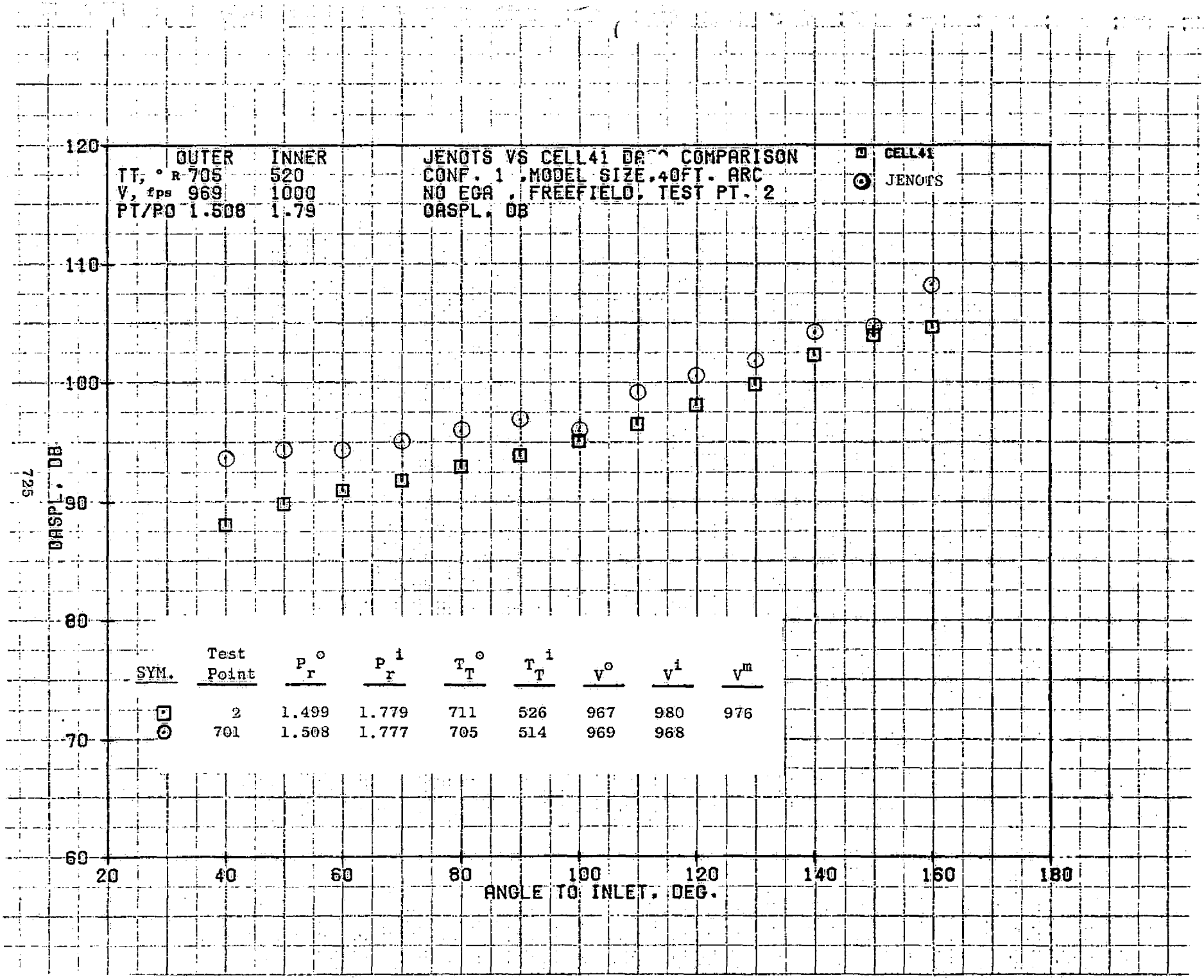
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CONF. 1 ,MODEL SIZE,40FT. ARC
NO EGA , FREEFIELD, TEST PT. 2
OASPL, DB
CELL41
JENOTS
OASPL, DB
725
120
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100
90
80
70
60
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80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
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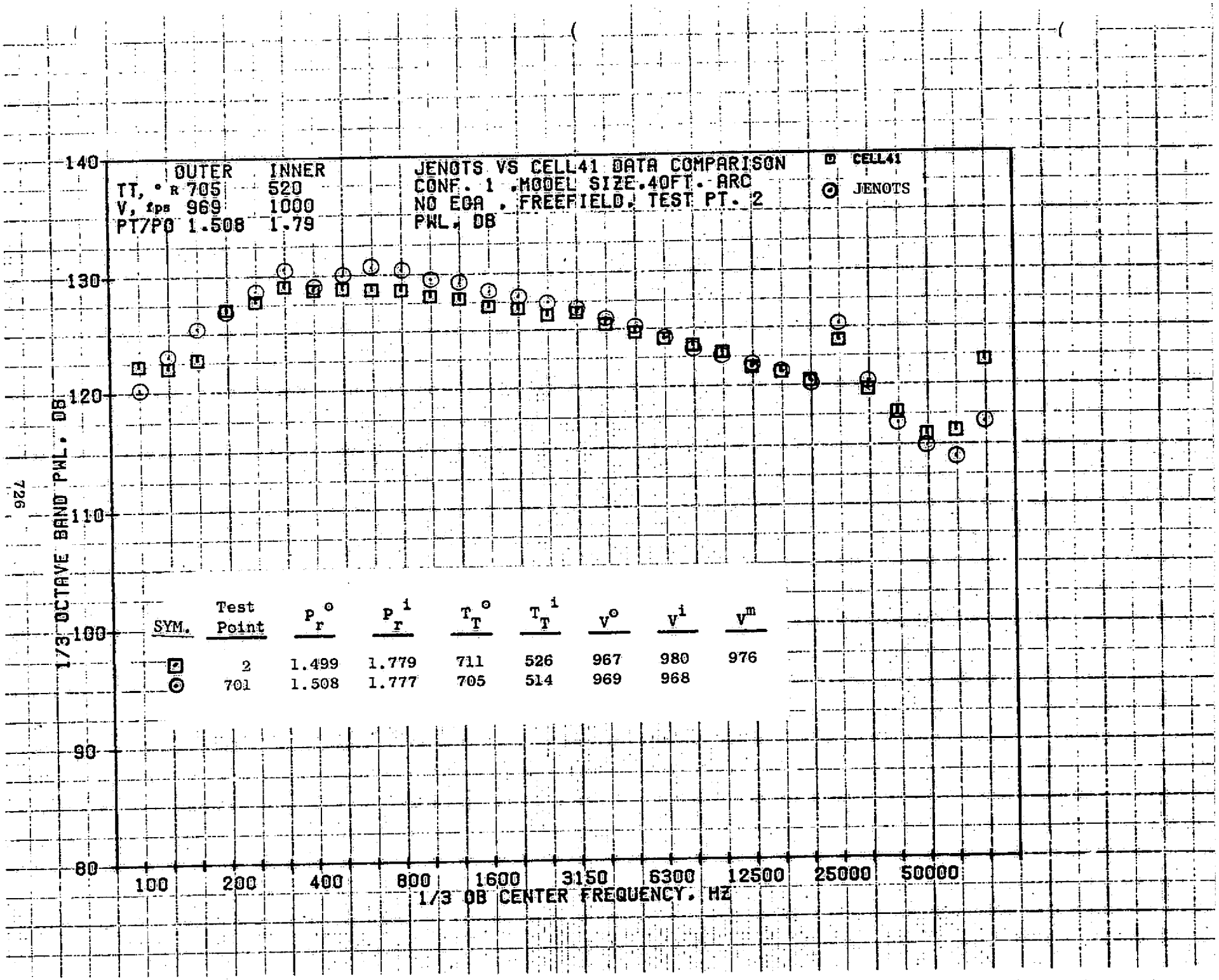
701 1.508 1.777 705 514 969 968


JENOTS VS CELL41 DATA COMPARISON
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NO EGA . FREEFIELD. TEST PT. 2
PWL, DB
CELL41
JENOTS
OUTER INNER
TT, °R 705 520
V, fps 969 1000
PT/P0 1.508 1.79
SYM. Test Point Pr° Pri TT° TTi V° Vi Vm
2 1.499 1.779 711 526 967 980 976
701 1.508 1.777 705 514 969 968
1/3 OCTAVE BAND PWL, DB
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1/3 OB CENTER FREQUENCY, HZ
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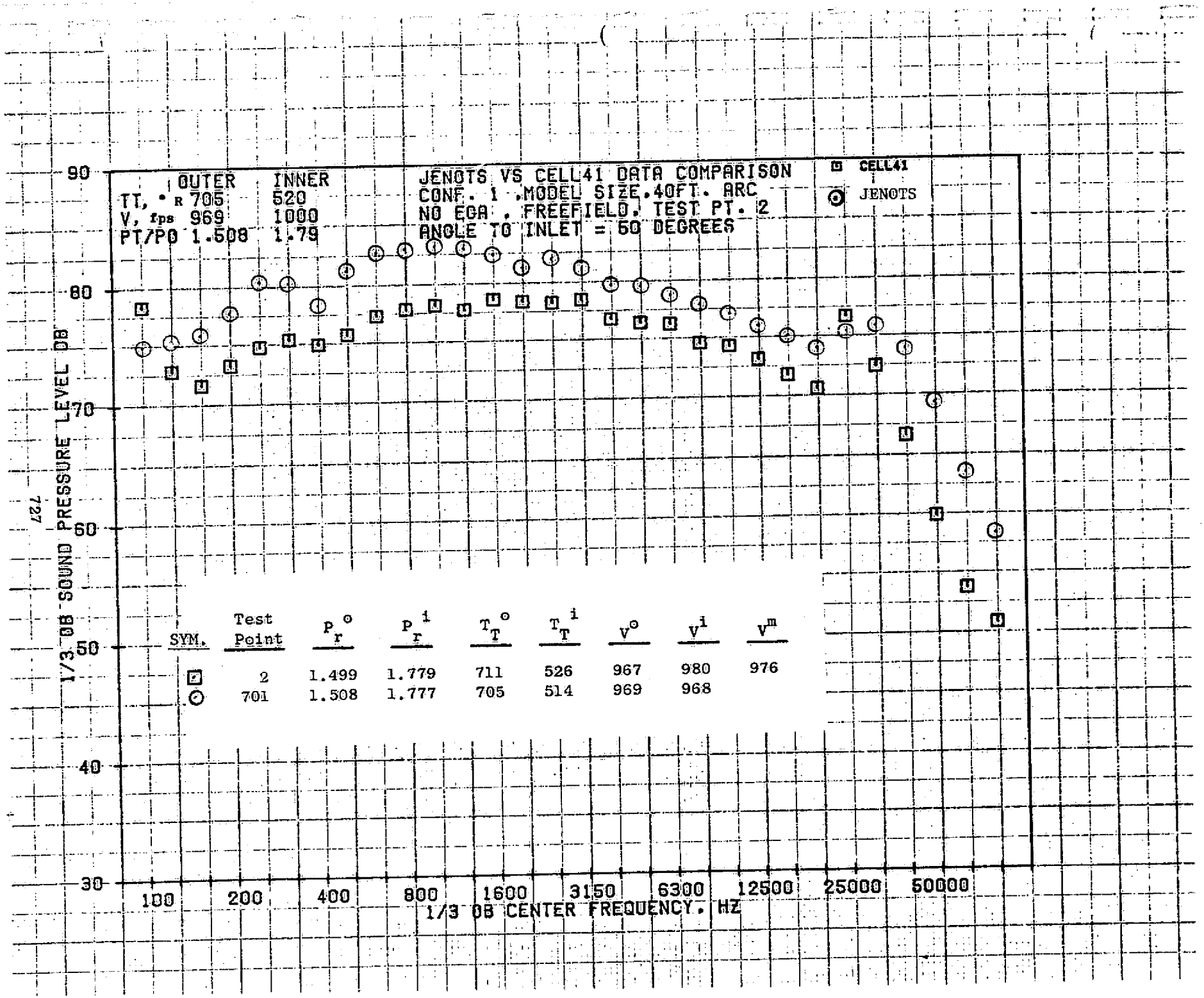
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NO EGA . FREEFIELD. TEST PT. 2
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CELL41
JENOTS
OUTER INNER
TT, °R 705 520
V, fps 969 1000
PT/P0 1.508 1.79
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
2 1.499 1.779 711 526 967 980 976
701 1.508 1.777 705 514 969 968
1/3 OB SOUND PRESSURE LEVEL DB
90
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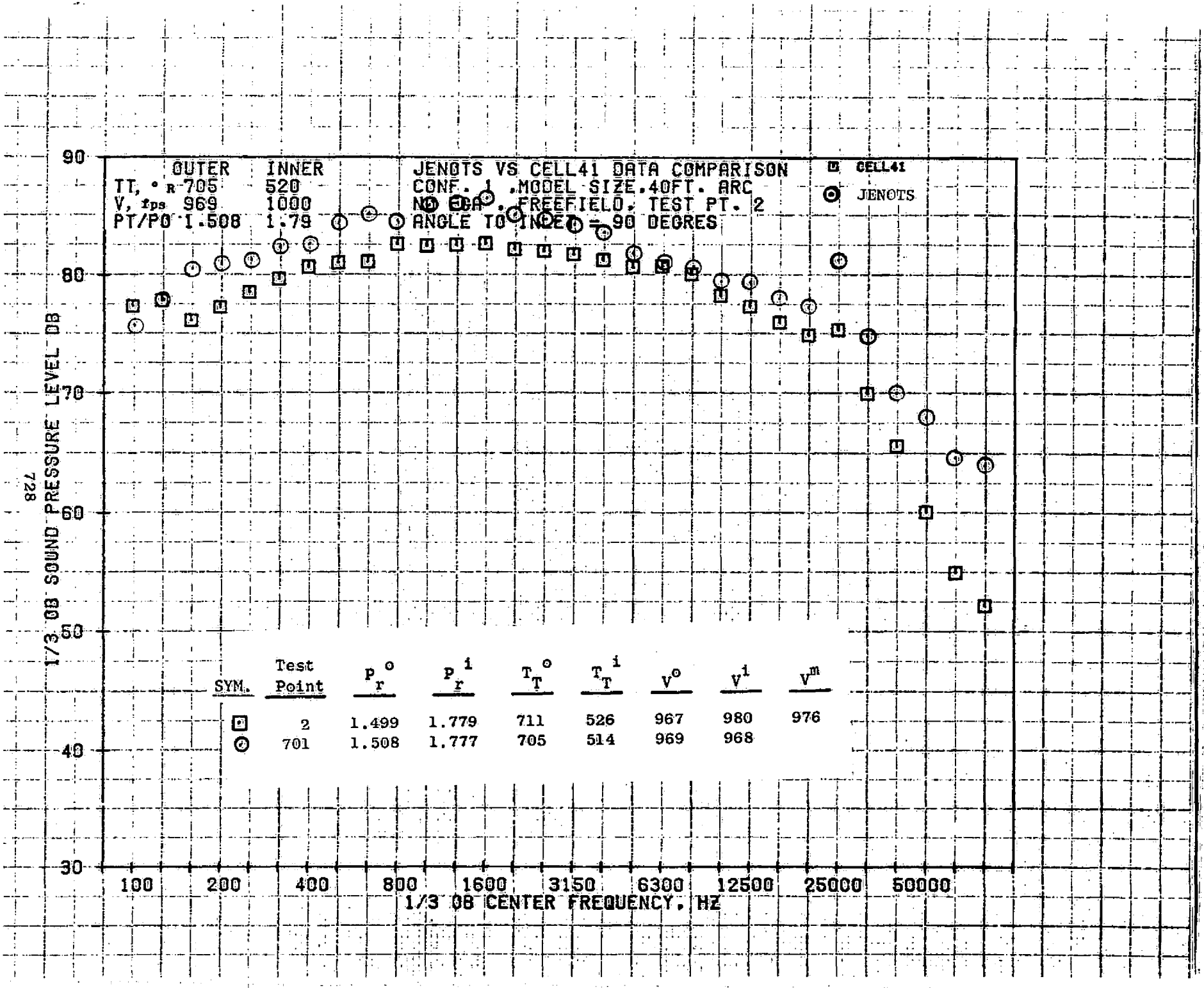
1/3 OB CENTER FREQUENCY, HZ
727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NO. OGA . FREEFIELD. TEST PT. 2
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 705 520
V, fps 969 1000
PT/P0 1.508 1.79
1/3 OB SOUND PRESSURE LEVEL DB
728
90
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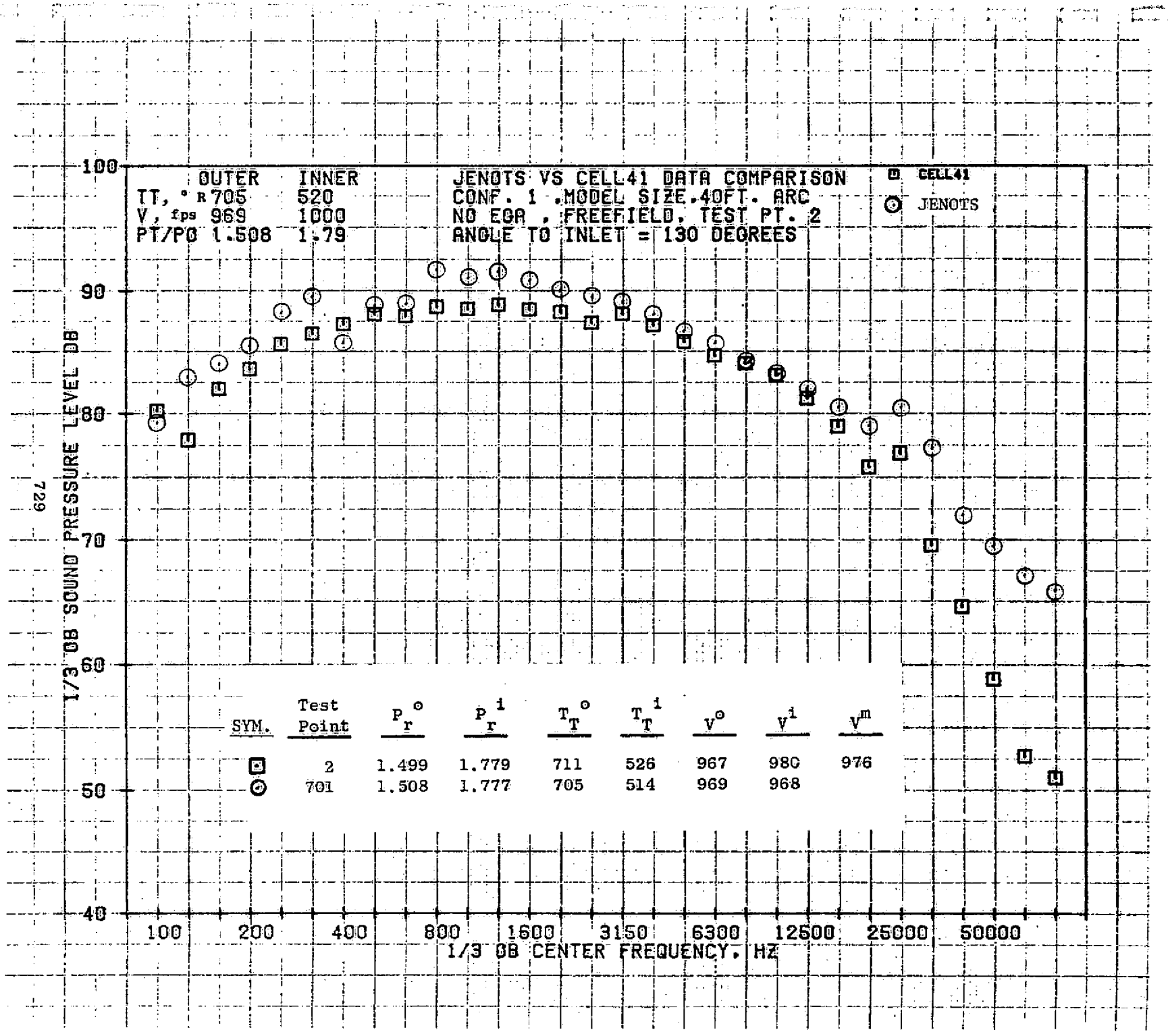
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
2 1.499 1.779 711 526 967 980 976
701 1.508 1.777 705 514 969 968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ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 705 520
V, fps 969 1000
PT/P0 1.508 1.79
1/3 OB SOUND PRESSURE LEVEL DB
100
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1/3 OB CENTER FREQUENCY, HZ
729
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
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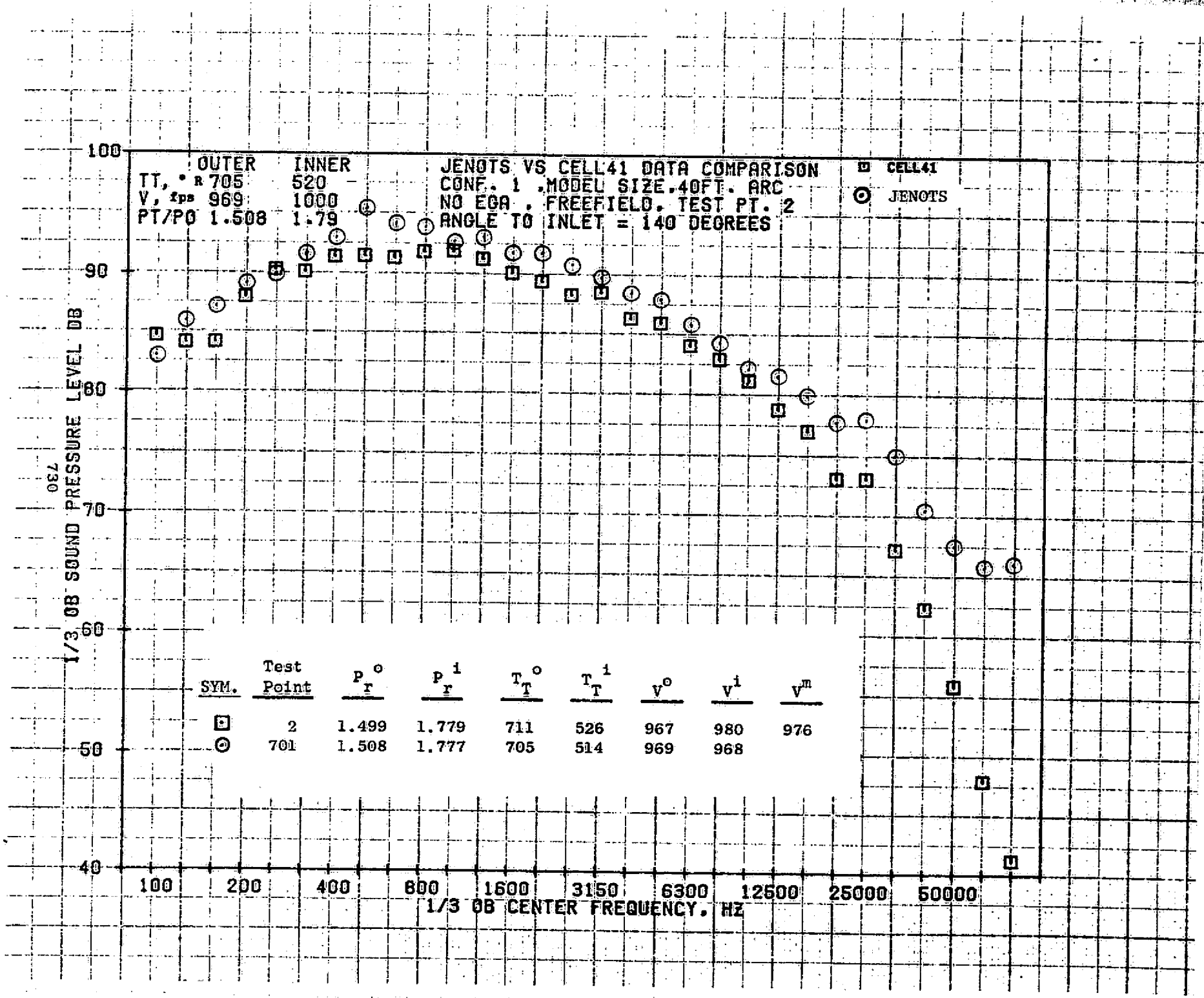
701 1.508 1.777 705 514 969 968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NO EGA . FREEFIELD. TEST PT. 2
ANGLE TO INLET = 140 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 705 520
V, fps 969 1000
PT/PO 1.508 1.79
1/3 OB SOUND PRESSURE LEVEL DB
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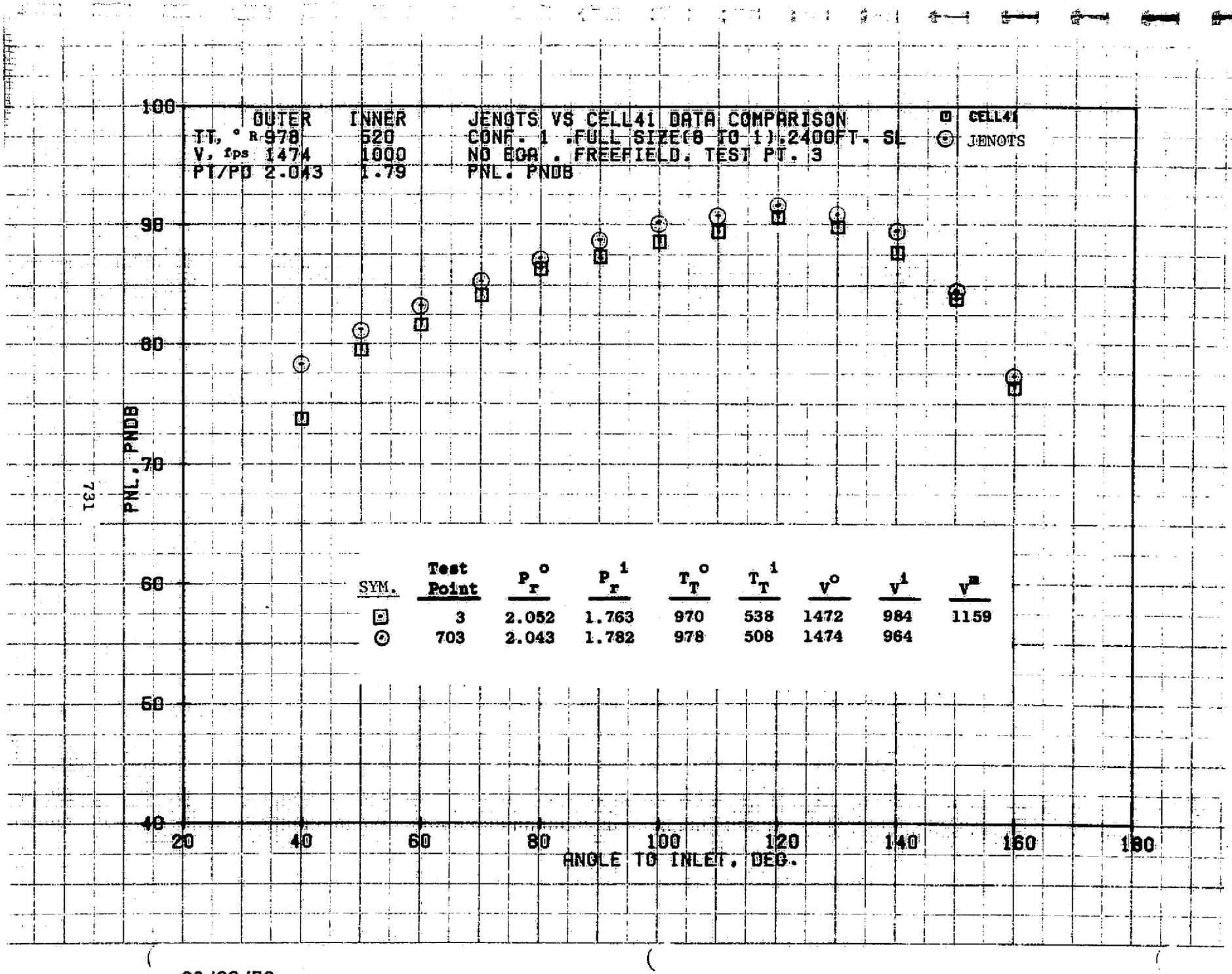

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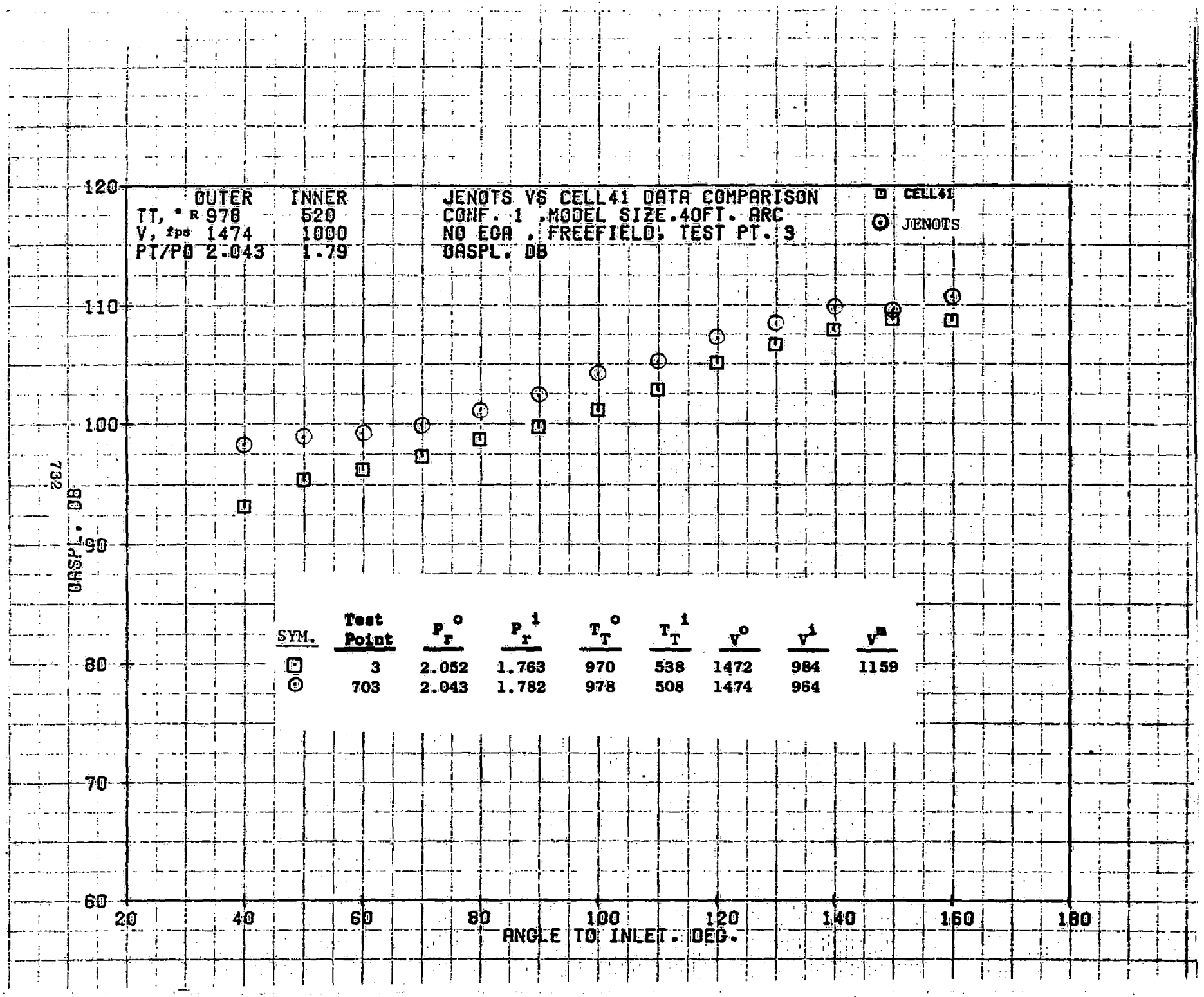
JENOTS VS CELL41 DATA COMPARISON
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OASPL, DB
CELL41
JENOTS
OUTER INNER
TT, °R 978 520
V, fps 1474 1000
PT/P0 2.043 1.79
732
OASPL, DB
120
110
100
90
80
70
60
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
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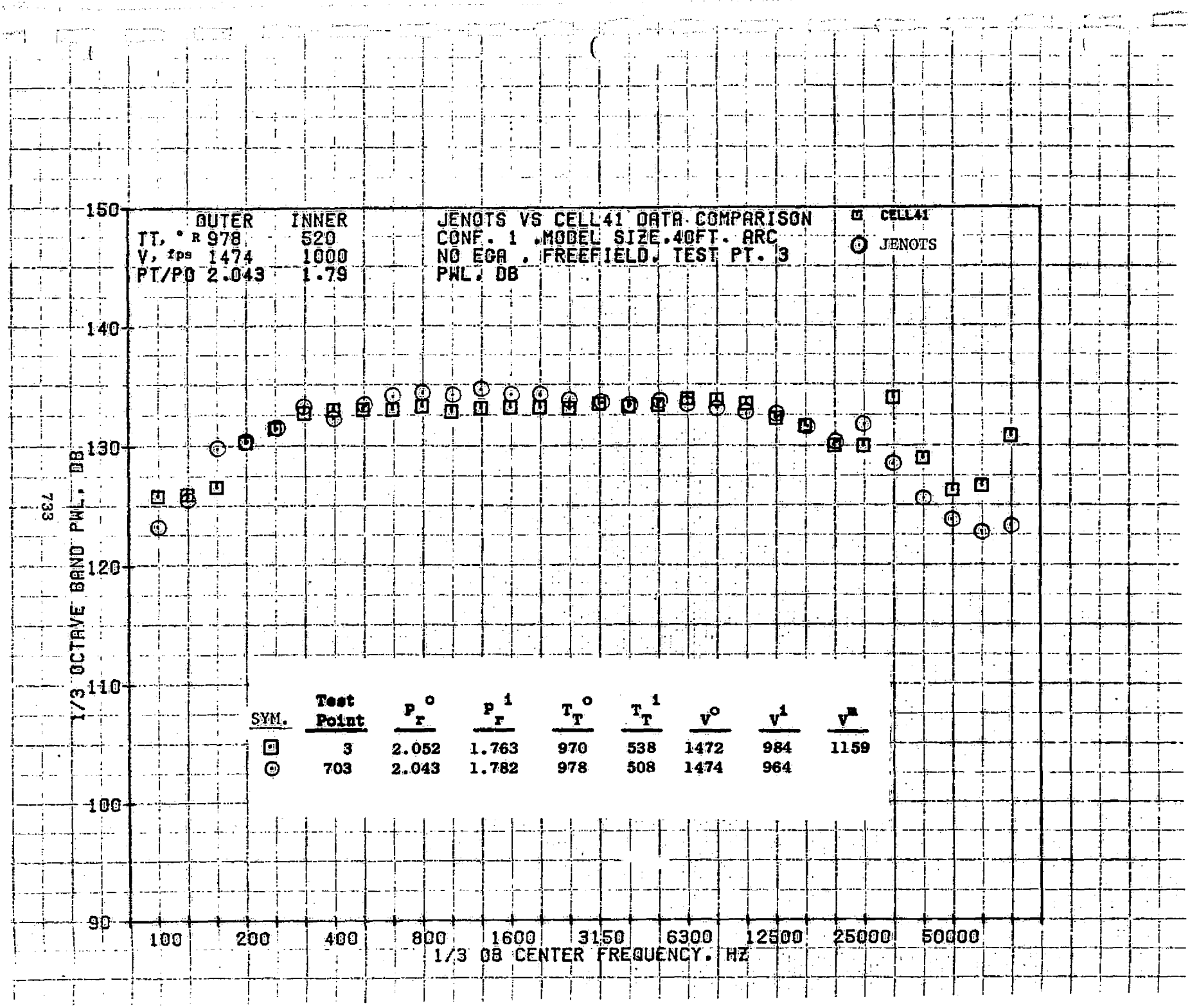
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 3
PWL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 978 520
V, fps 1474 1000
PT/P0 2.043 1.79
1/3 OCTAVE BAND PWL. DB
150
140
130
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50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^0 P_r^1 T_T^0 T_T^1 V^0 V^1 V^m
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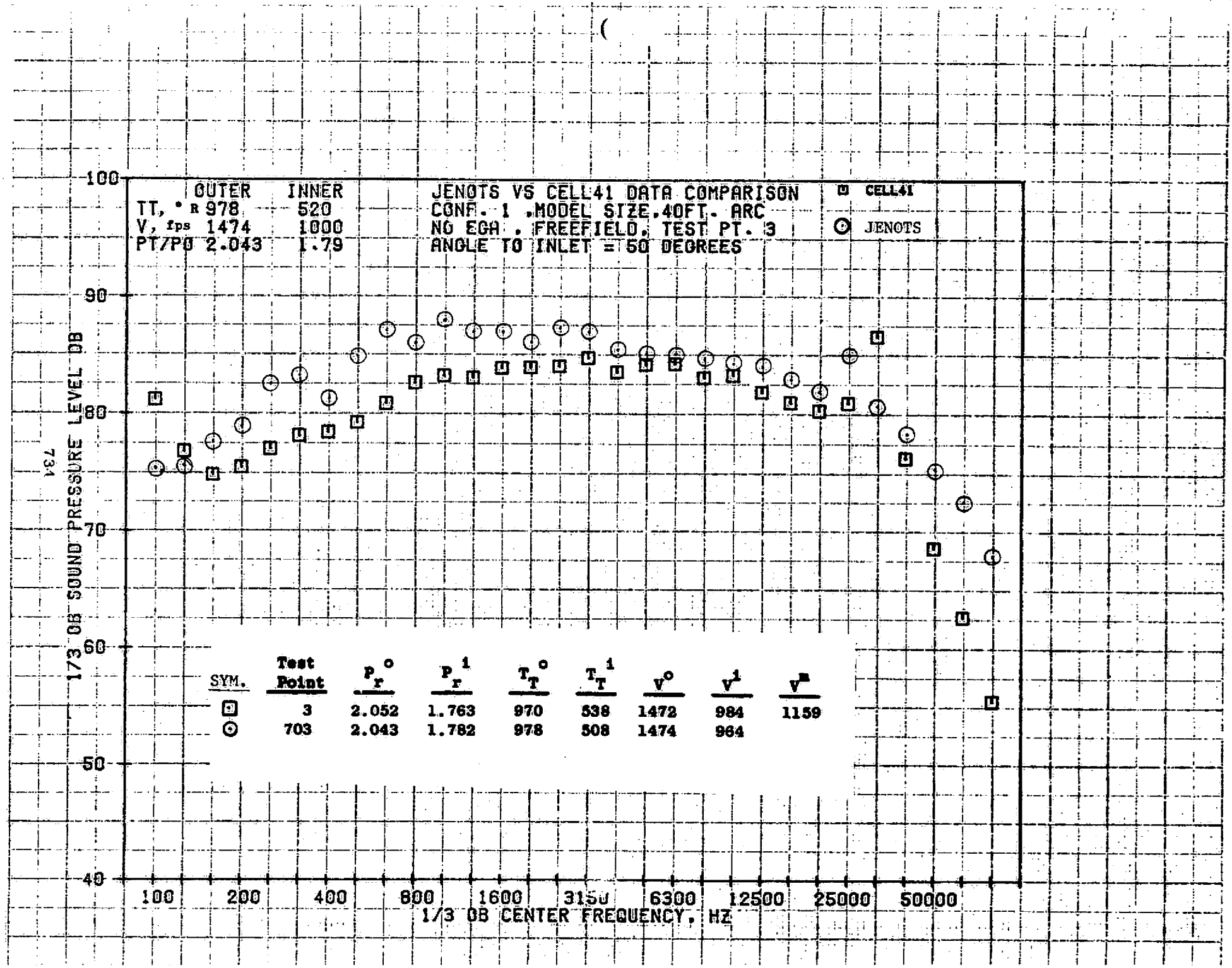
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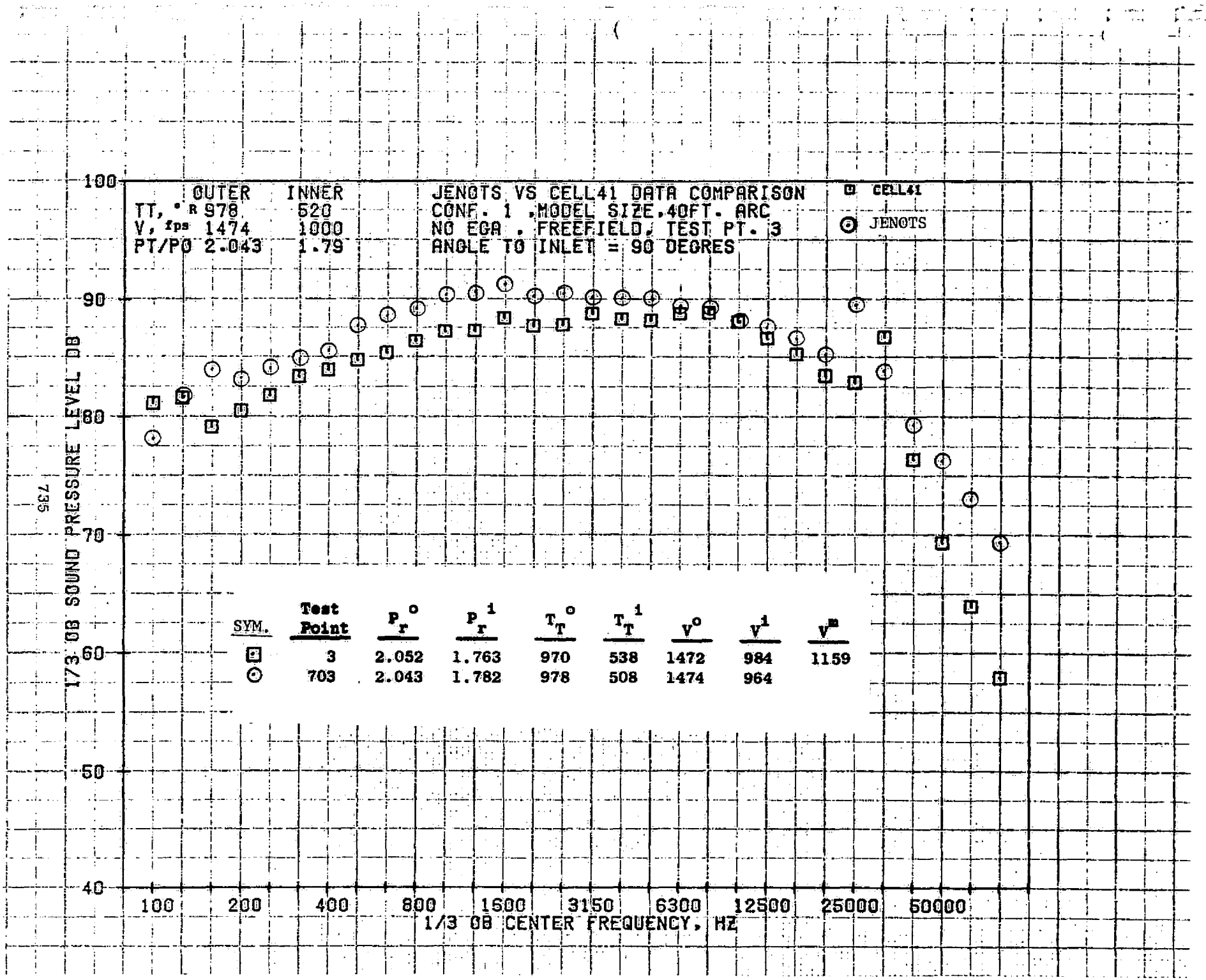
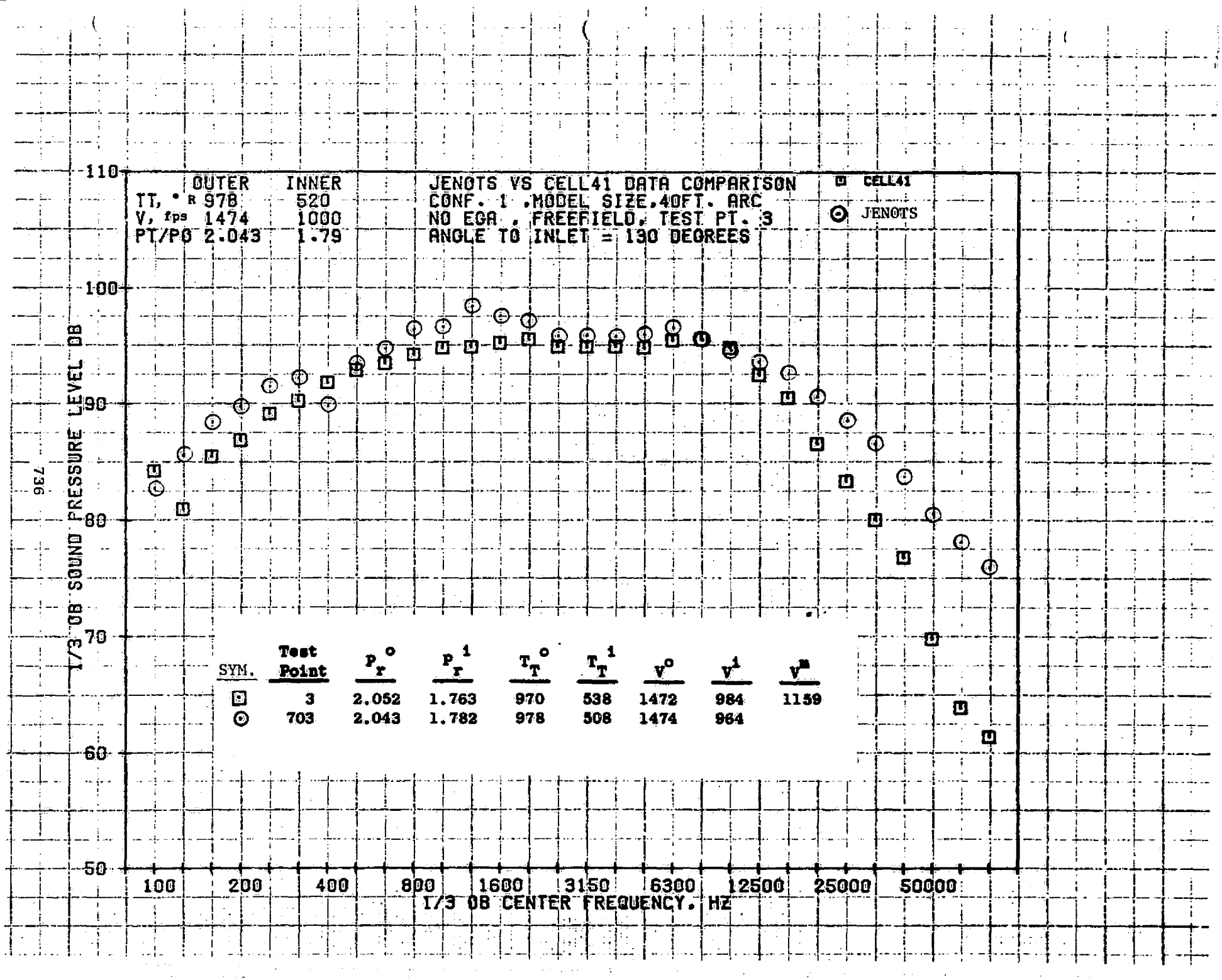
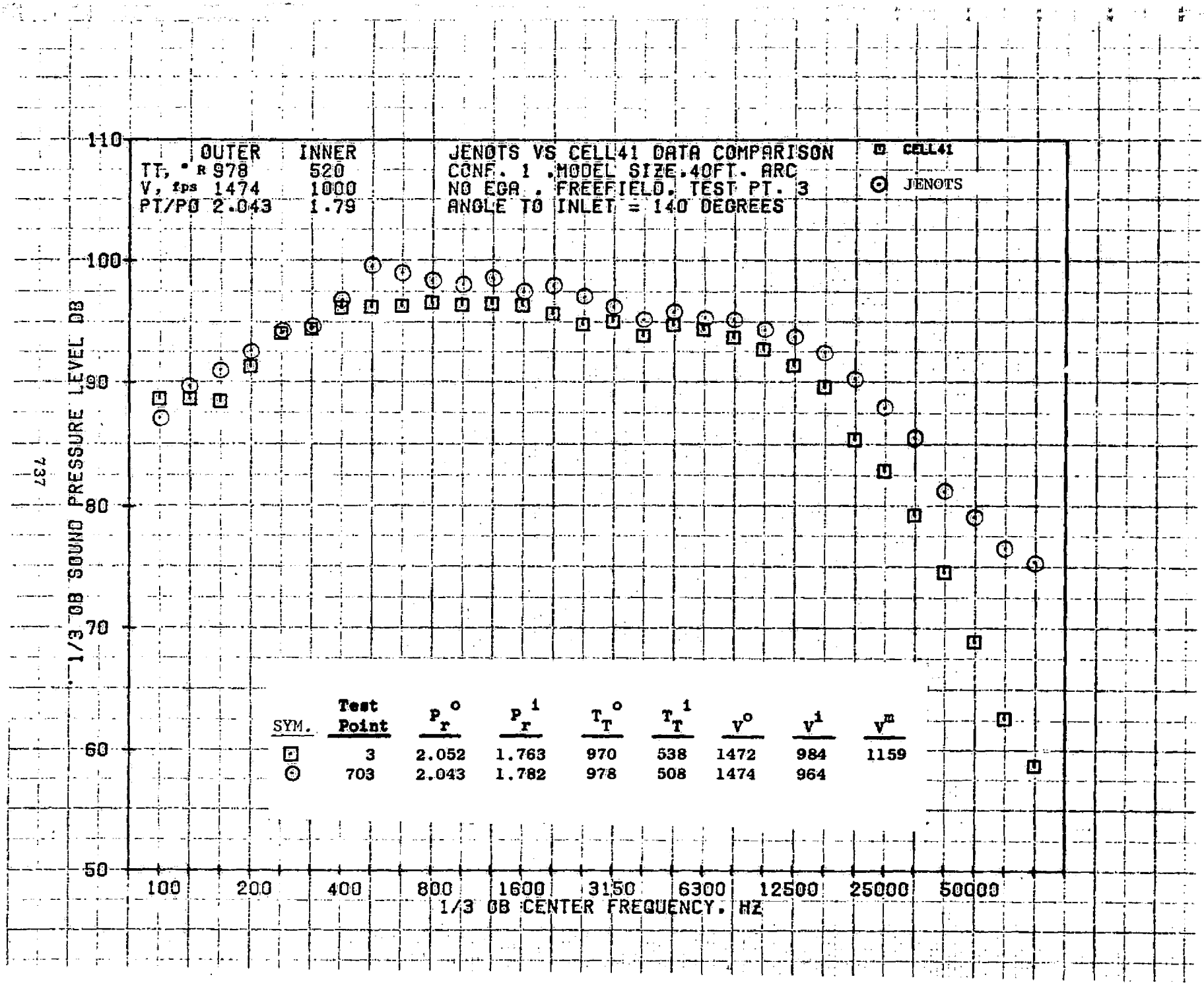
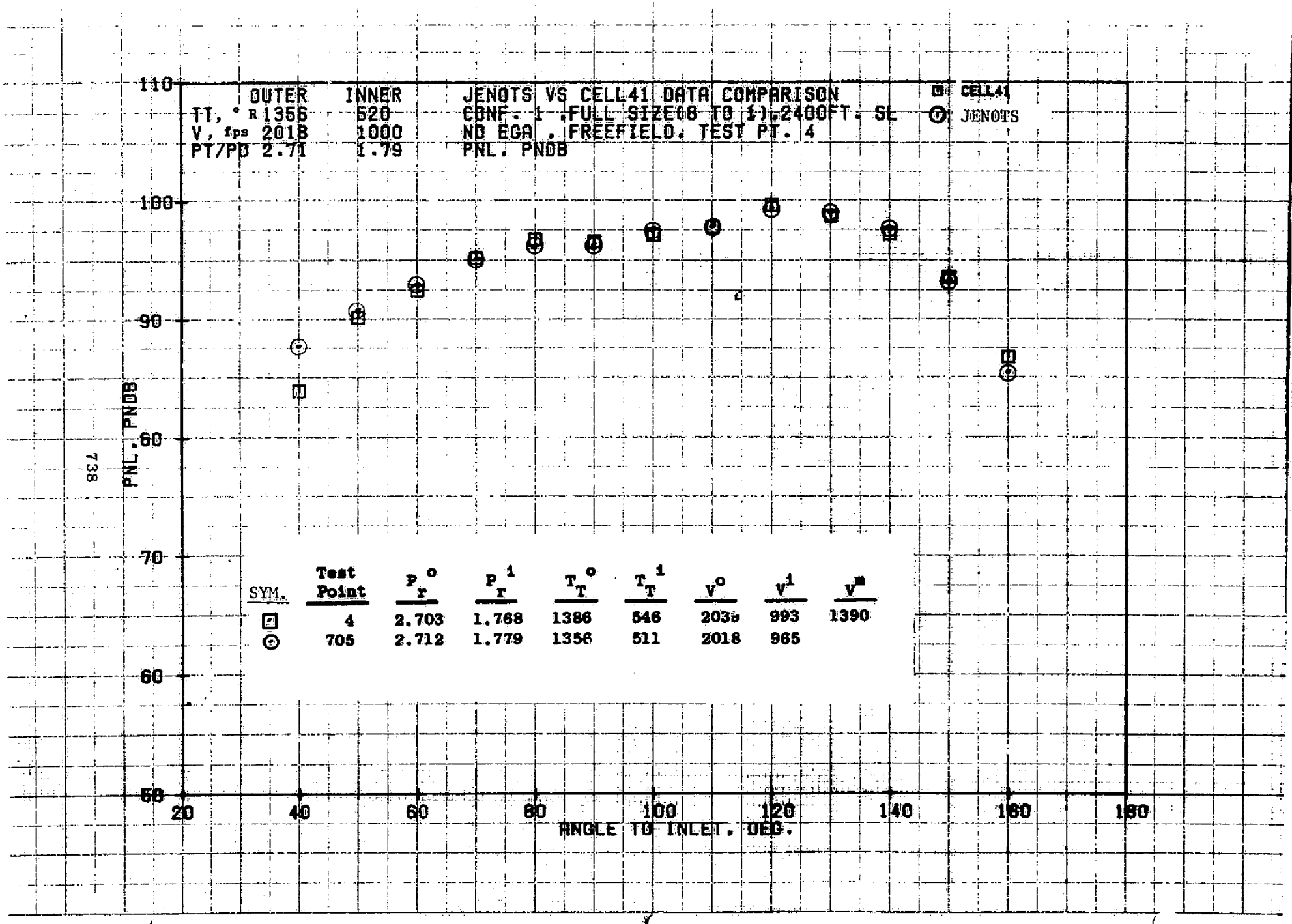
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 3
ANGLE TO INLET = 50 DEGREES
CELL41
JENOTS
SYM. Test Point P_r^0 P_r^1 T_T^0 T_T^1 V^0 V^1 V^m
3 2.052 1.763 970 538 1472 984 1159
703 2.043 1.782 978 508 1474 964
1/3 OB SOUND PRESSURE LEVEL DB
100
90
80
70
60
50
40
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
734


OUTER INNER
TT, °R 978 520
V, fps 1474 1000
PT/PO 2.043 1.79
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE,40FT. ARC
NO EGA . FREEFIELD, TEST PT. 3
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
3 2.052 1.763 970 538 1472 984 1159
703 2.043 1.782 978 508 1474 964
1/3 OB SOUND PRESSURE LEVEL DB
100
90
80
70
60
50
40
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
735


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 3
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 978 520
V, fps 1474 1000
PT/P0 2.043 1.79
SYM. Test Point P_r^0 P_r^1 T_T^0 T_T^1 V^0 V^1 V^m
3 2.052 1.763 970 538 1472 984 1159
703 2.043 1.782 978 508 1474 964
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
736


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 3
ANGLE TO INLET = 140 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 978 520
V, fps 1474 1000
PT/P0 2.043 1.79
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^1 V^o V^i V^m
3 2.052 1.763 970 538 1472 984 1159
703 2.043 1.782 978 508 1474 964



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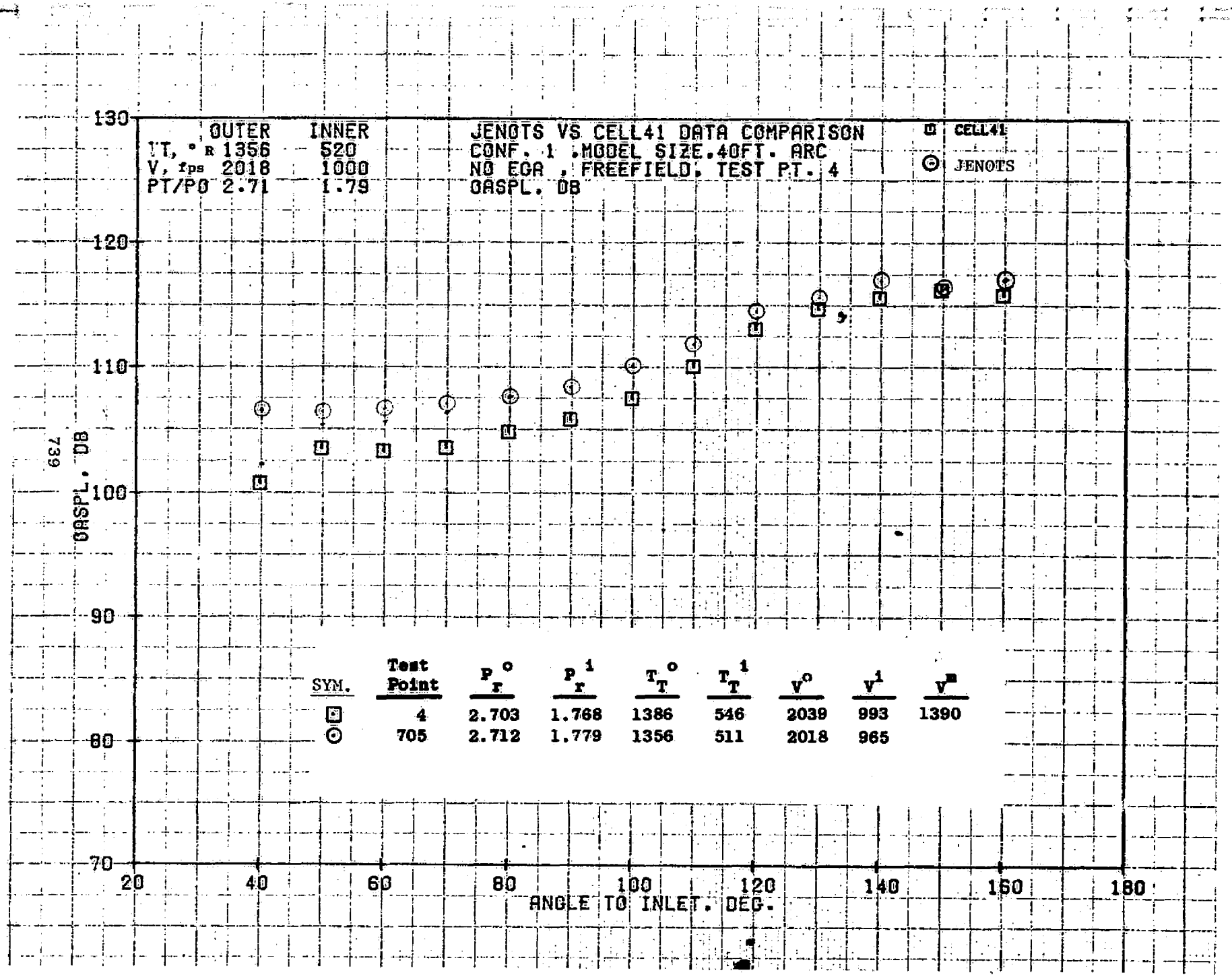
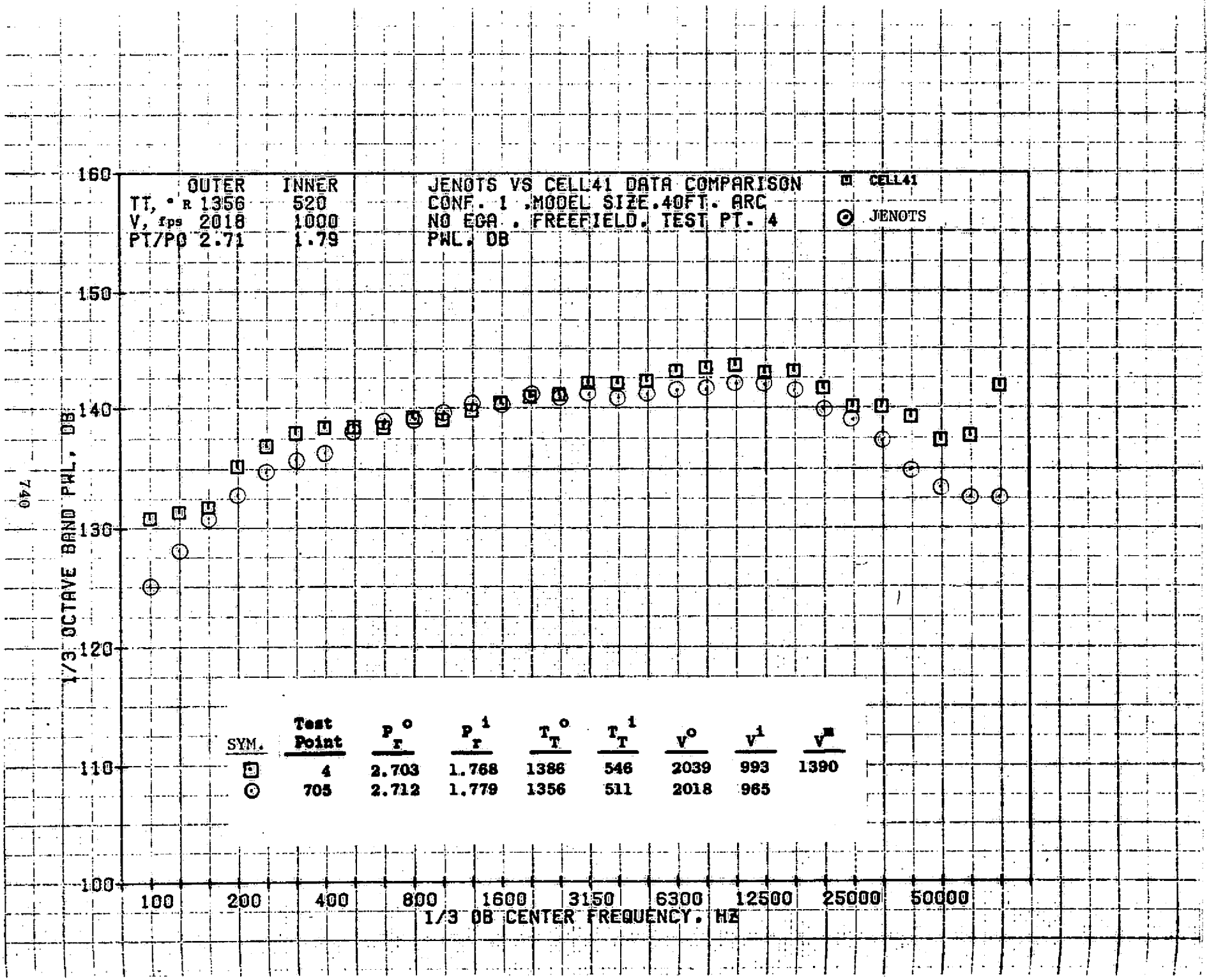
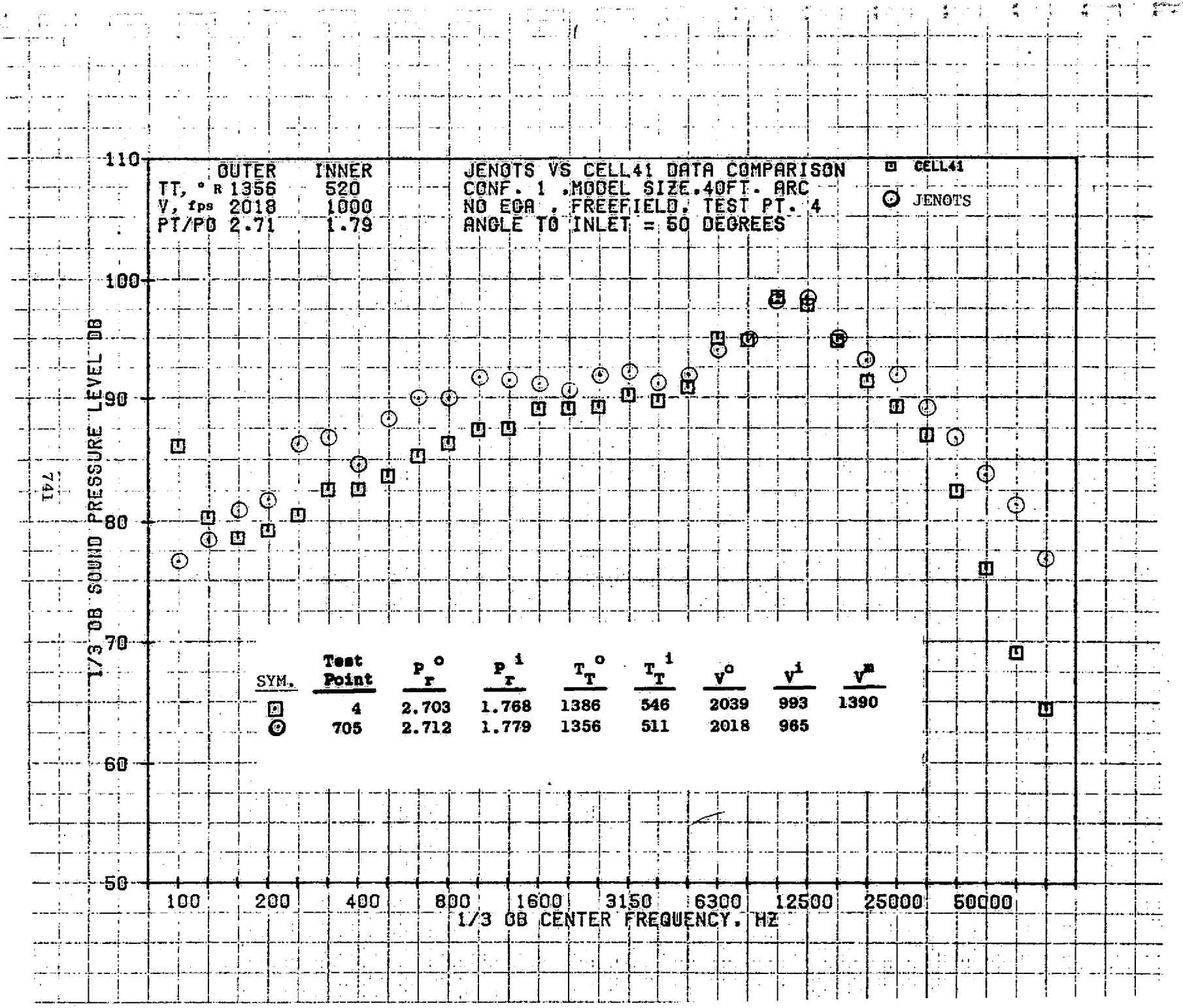
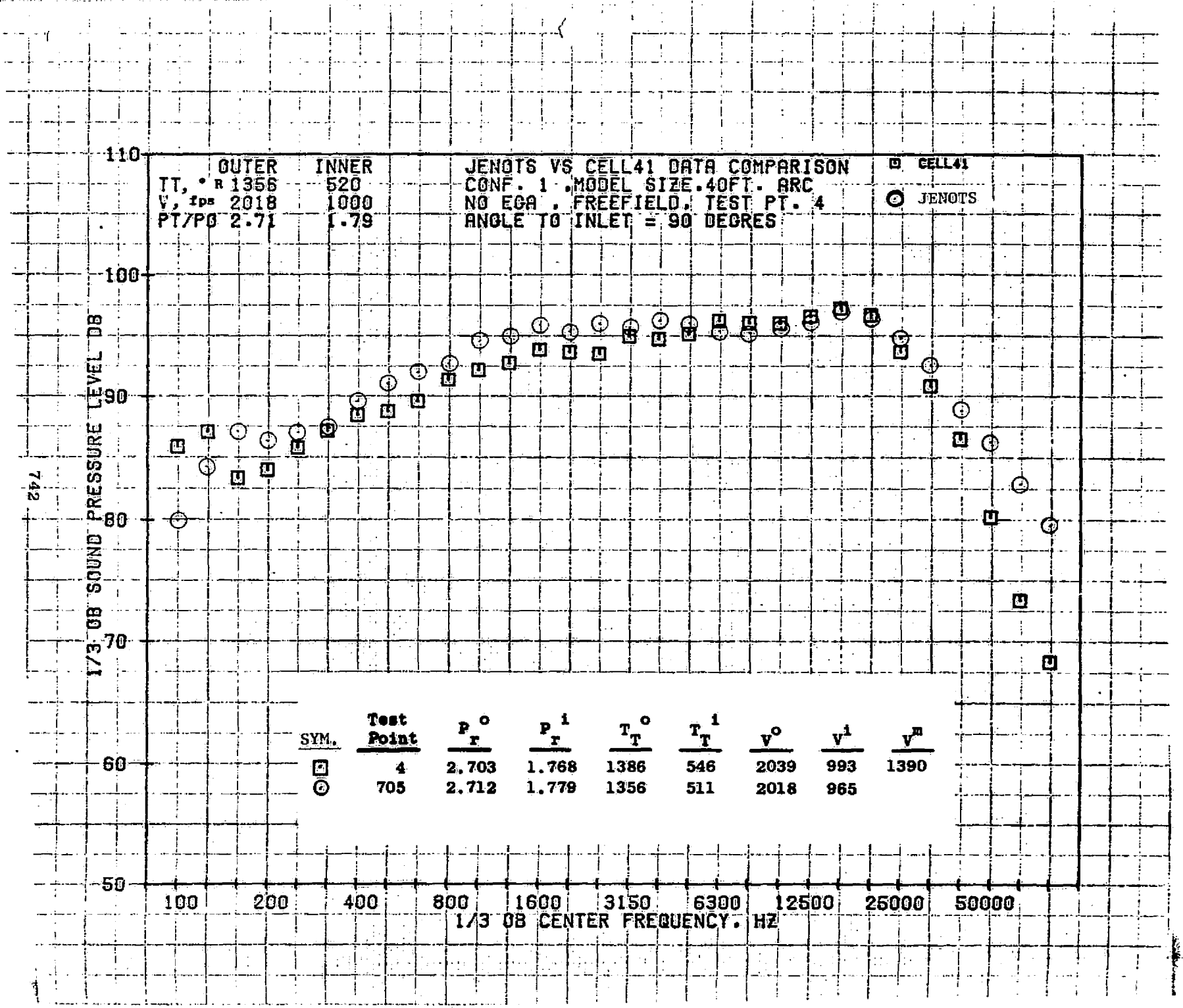
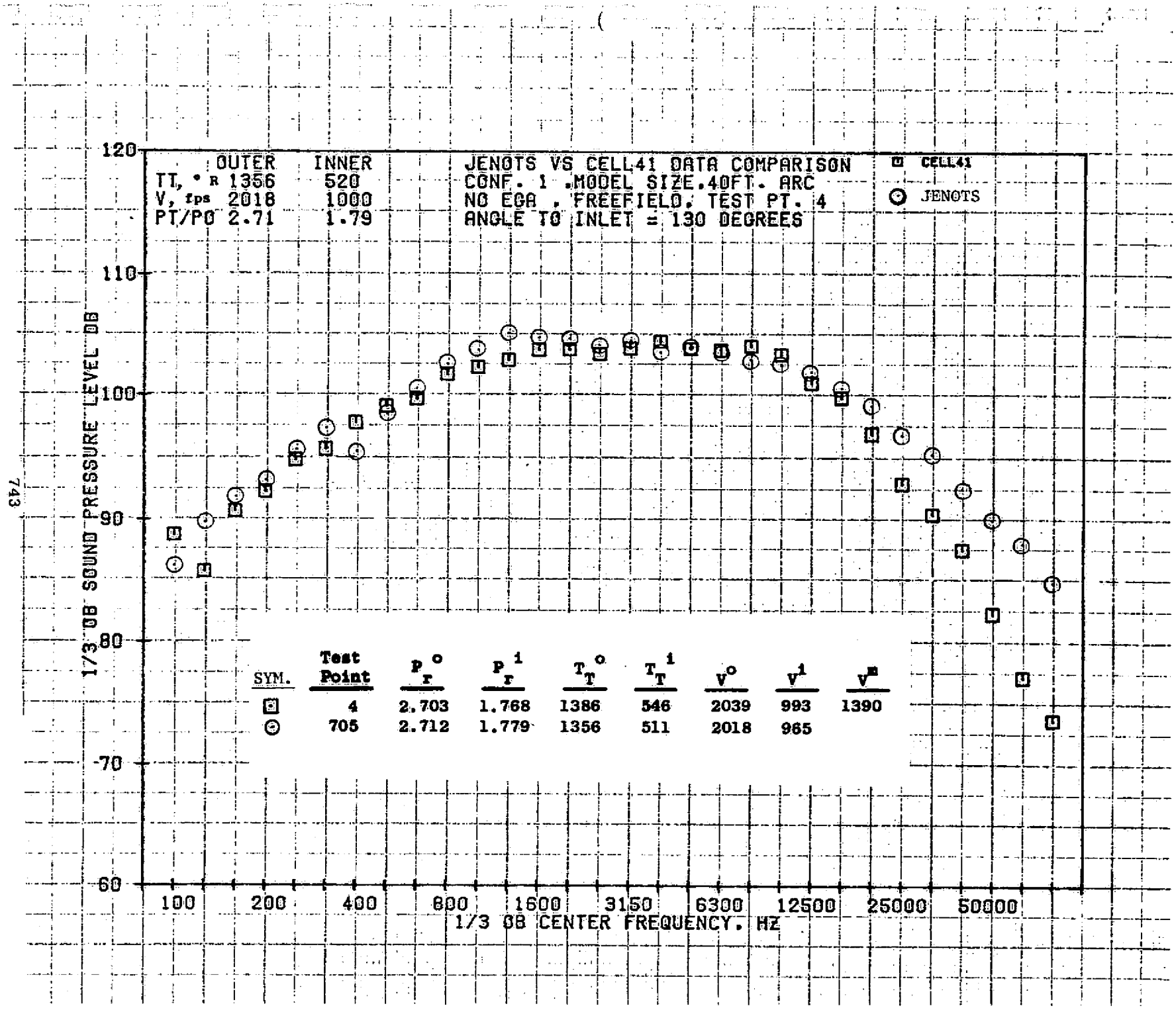
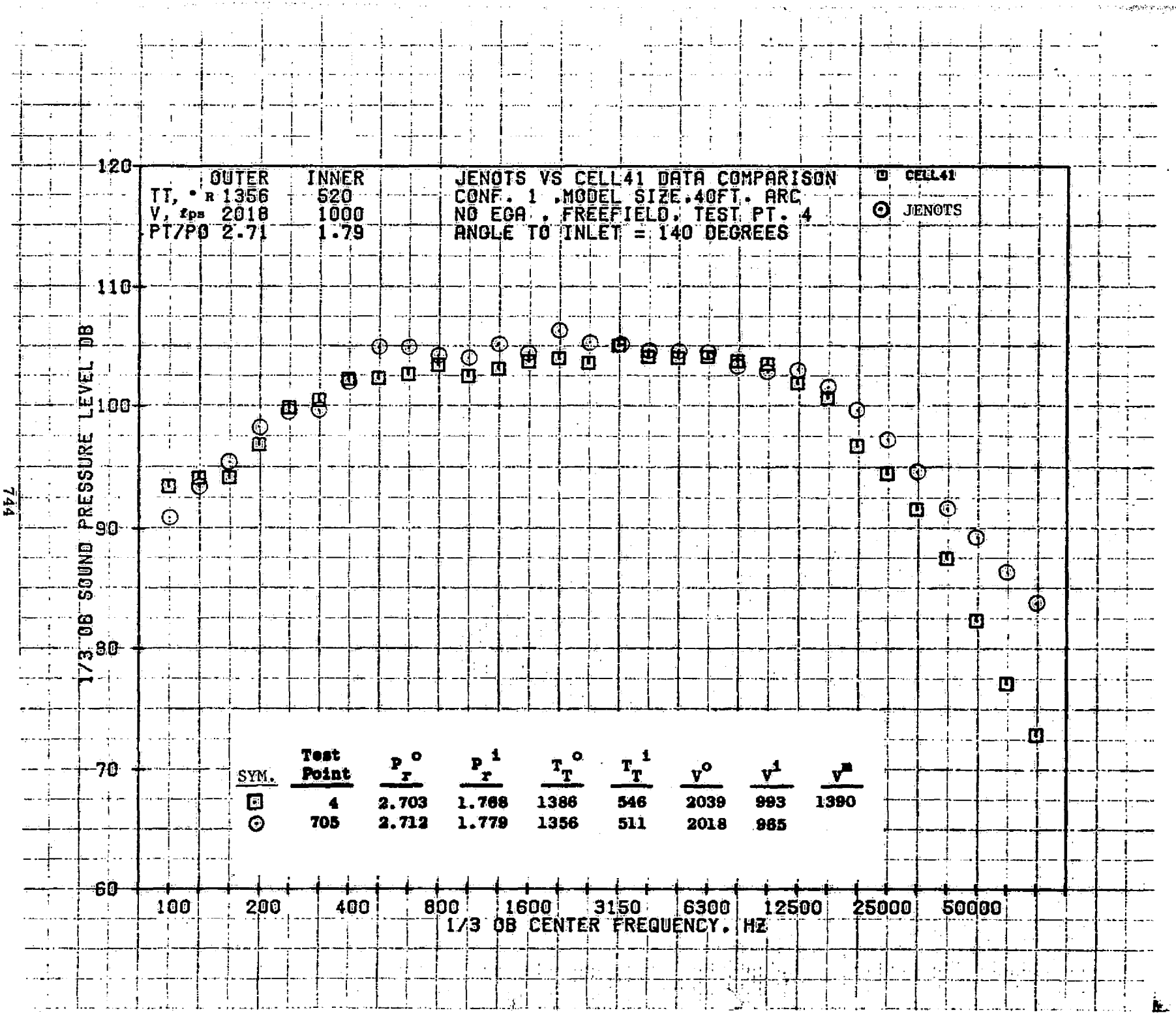

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD. TEST PT. 4
OASPL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 1356 520
V, fps 2018 1000
PT/P0 2.71 1.79
OASPL, DB
130
120
110
100
90
80
70
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
4 2.703 1.768 1386 546 2039 993 1390
705 2.712 1.779 1356 511 2018 965

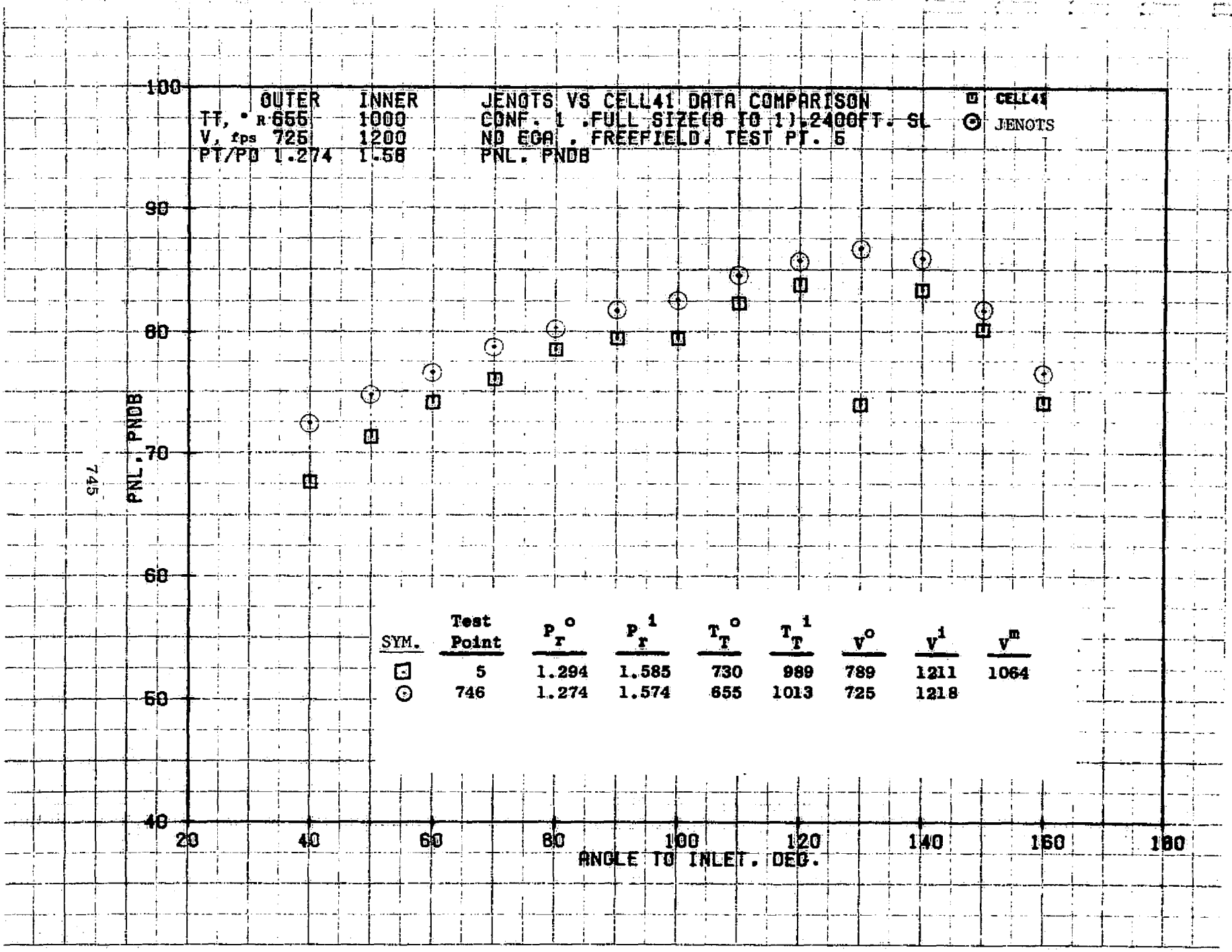

OUTER INNER
TT, °R 1356 520
V, fps 2018 1000
PT/P0 2.71 1.79
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 4
PWL. DB
CELL41
JENOTS
1/3 OCTAVE BAND PWL, DB
160
150
140
130
120
110
100
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
4 2.703 1.768 1386 546 2039 993 1390
705 2.712 1.779 1356 511 2018 965


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD, TEST PT. 4
ANGLE TO INLET = 50 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1356 520
V, fps 2018 1000
PT/P0 2.71 1.79
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
4 2.703 1.768 1386 546 2039 993 1390
705 2.712 1.779 1356 511 2018 965
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
741


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 4
ANGLE TO INLET = 90 DEGRES
CELL41
JENOTS
OUTER INNER
TT, °R 1356 520
V, fps 2018 1000
PT/P0 2.71 1.79
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
4 2.703 1.768 1386 546 2039 993 1390
705 2.712 1.779 1356 511 2018 965


OUTER INNER
TT, °R 1356 520
V, fps 2018 1000
PT/PO 2.71 1.79
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 4
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
120
110
100
90
80
70
60
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
4 2.703 1.768 1386 546 2039 993 1390
705 2.712 1.779 1356 511 2018 965


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD. TEST PT. 4
ANGLE TO INLET = 140 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1356 520
V, fps 2018 1000
PT/P0 2.71 1.79
1/3 OB SOUND PRESSURE LEVEL DB
120
110
100
90
80
70
60
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
4 2.703 1.768 1386 546 2039 993 1390
705 2.712 1.779 1356 511 2018 985



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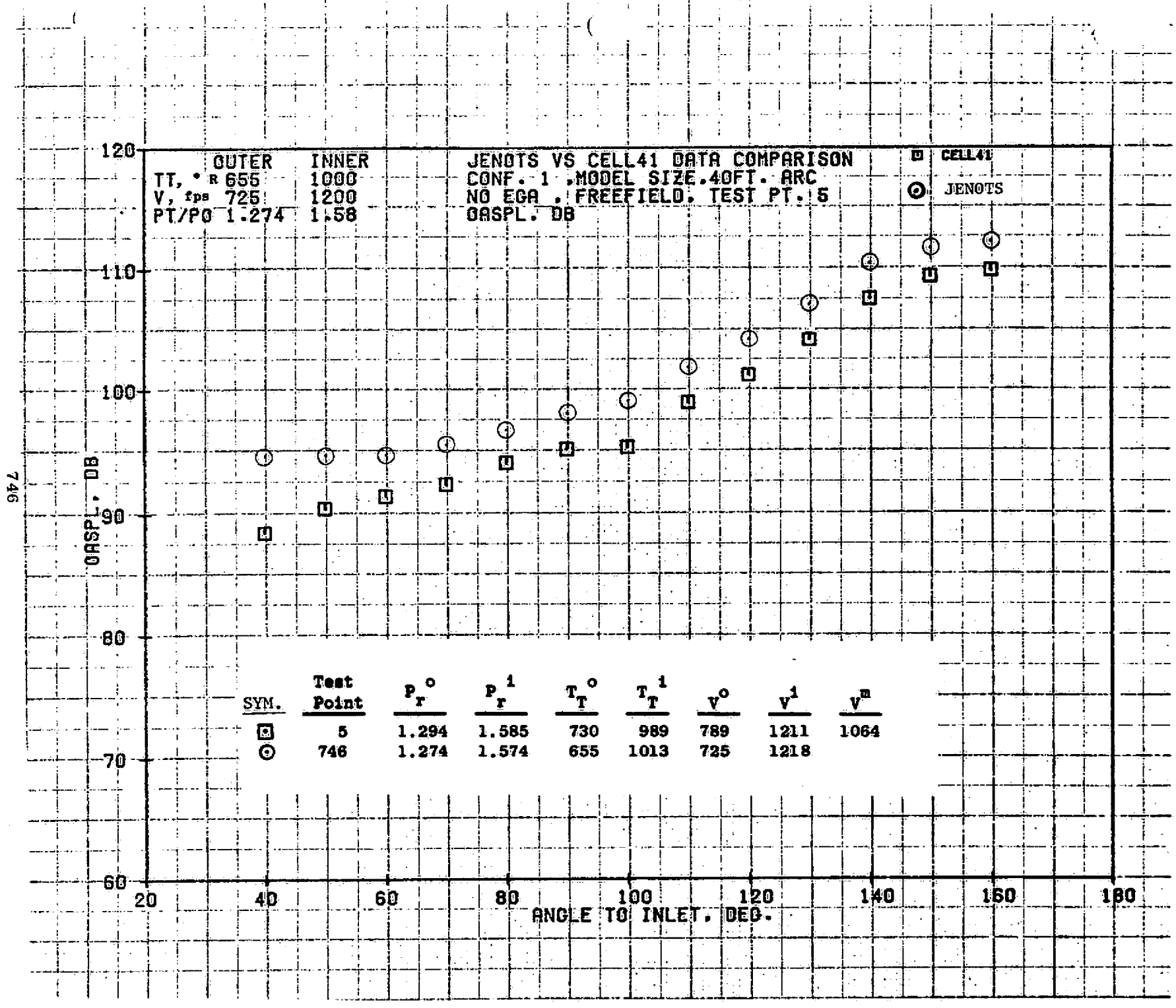
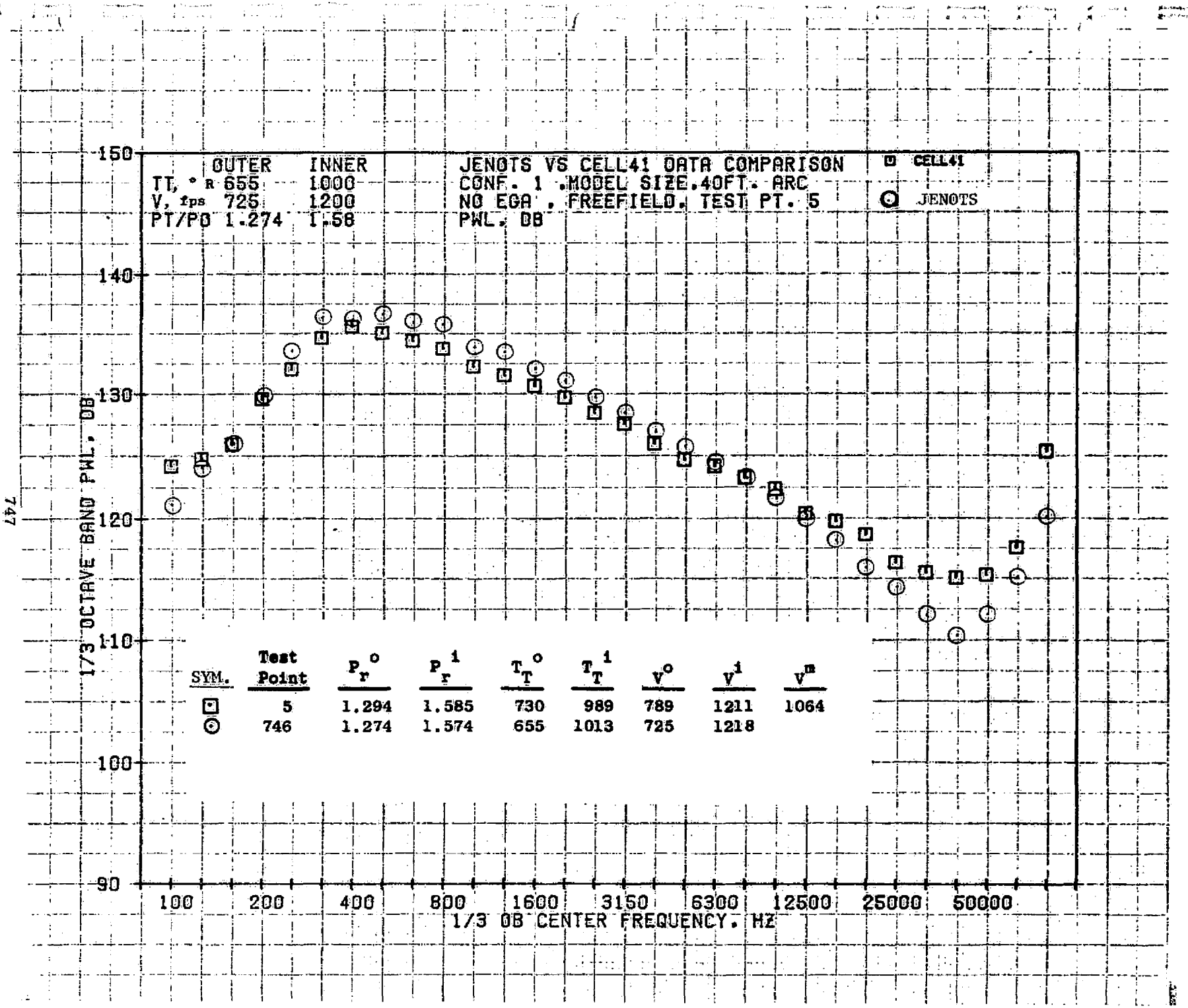
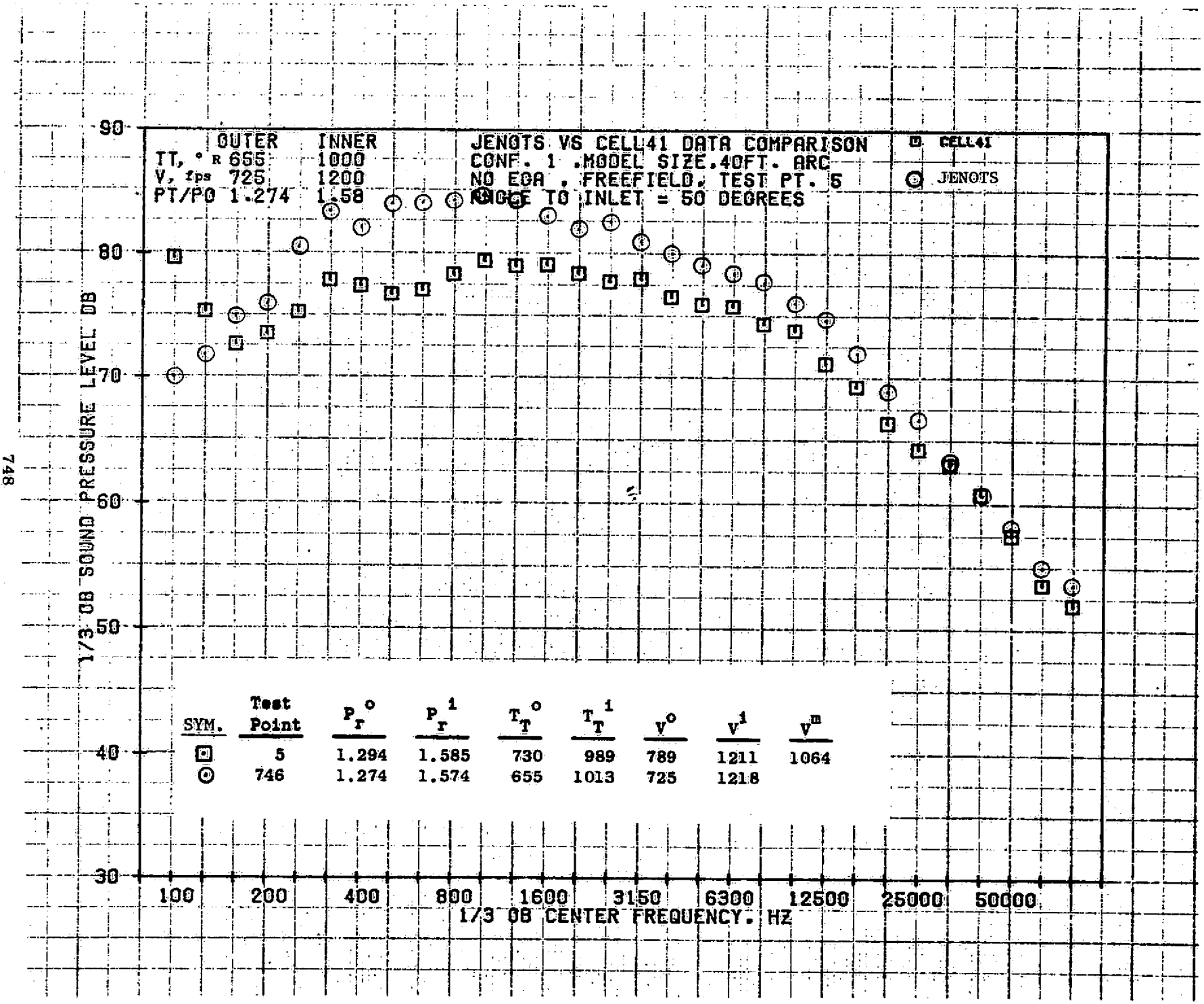
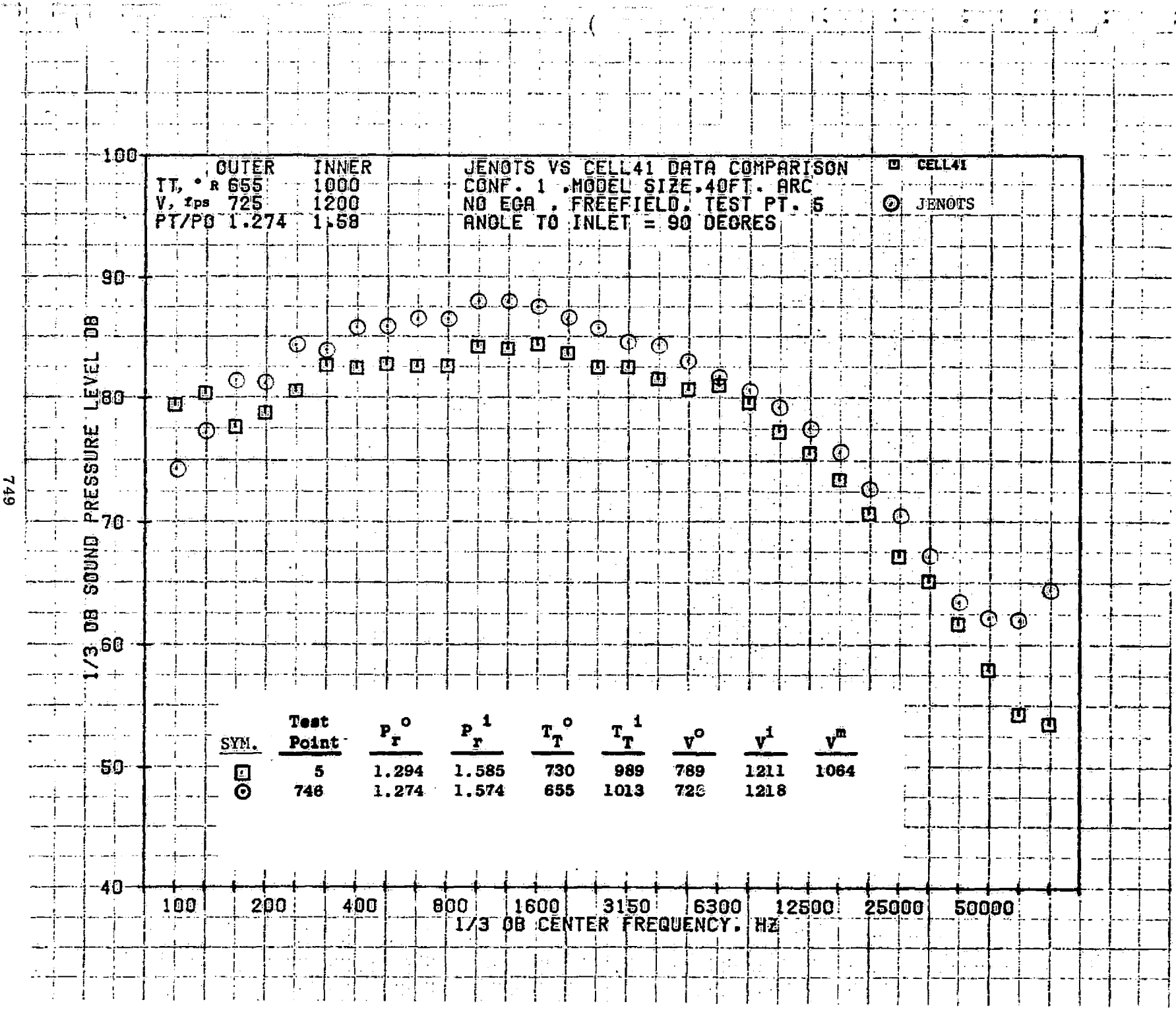
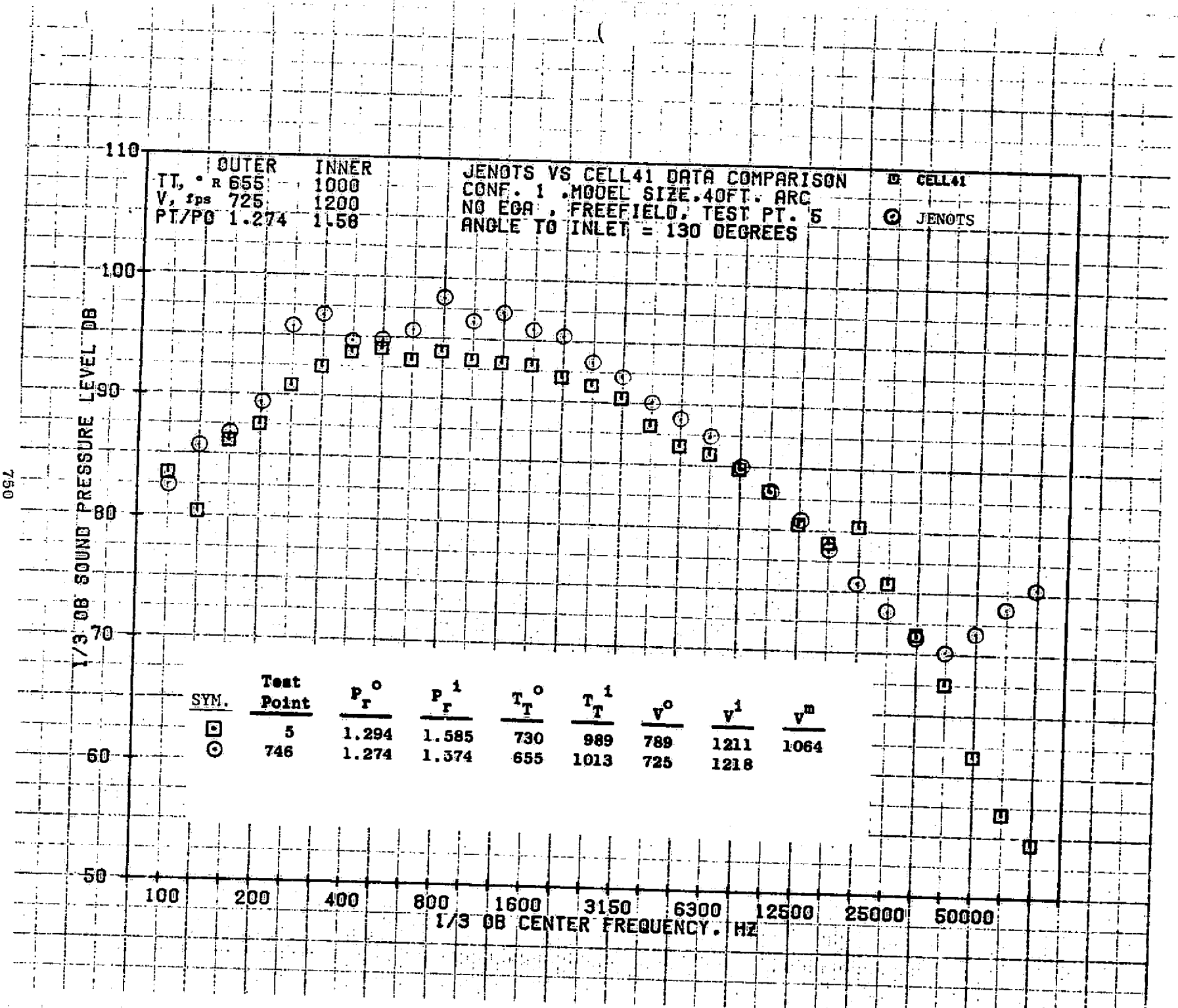

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD. TEST PT. 5
OASPL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 655 1000
V, fps 725 1200
PT/P0 1.274 1.58
OASPL, DB
ANGLE TO INLET, DEG.
120
110
100
90
80
70
60
20
40
60
80
100
120
140
160
180
SYM. Test Point P_r^0 P_r^1 T_T^0 T_T^1 V^0 V^1 V^m
5 1.294 1.585 730 989 789 1211 1064
746 1.274 1.574 655 1013 725 1218


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 5
PWL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 655 1000
V, fps 725 1200
PT/PO 1.274 1.58
1/3 OCTAVE BAND PWL, DB
150
140
130
120
110
100
90
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
5 1.294 1.585 730 989 789 1211 1064
746 1.274 1.574 655 1013 725 1218

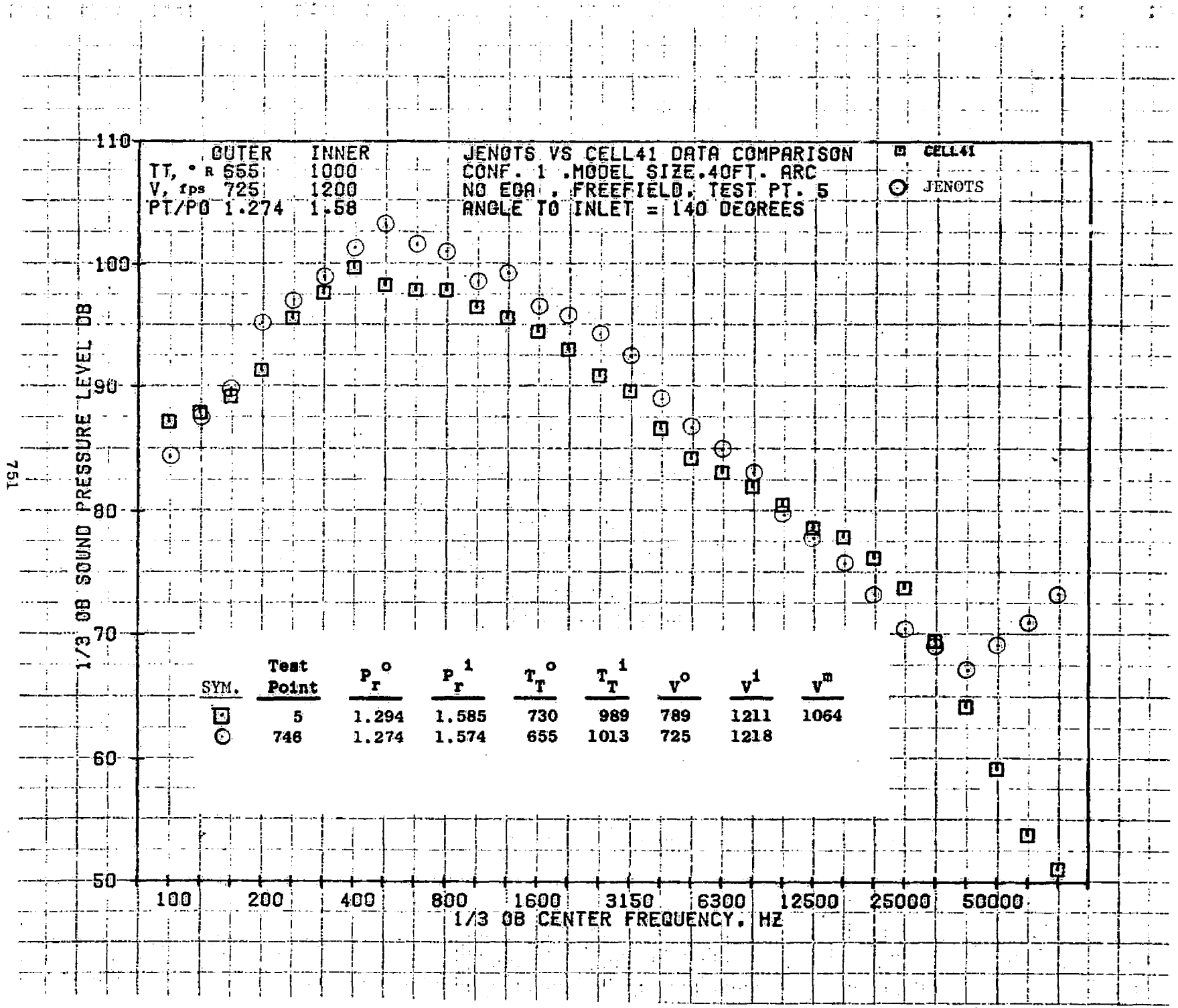

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 5
INLET TO INLET = 50 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 655 1000
V, fps 725 1200
PT/P0 1.274 1.58
1/3 OB SOUND PRESSURE LEVEL DB
90
80
70
60
50
40
30
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
5 1.294 1.585 730 989 789 1211 1064
746 1.274 1.574 655 1013 725 1218

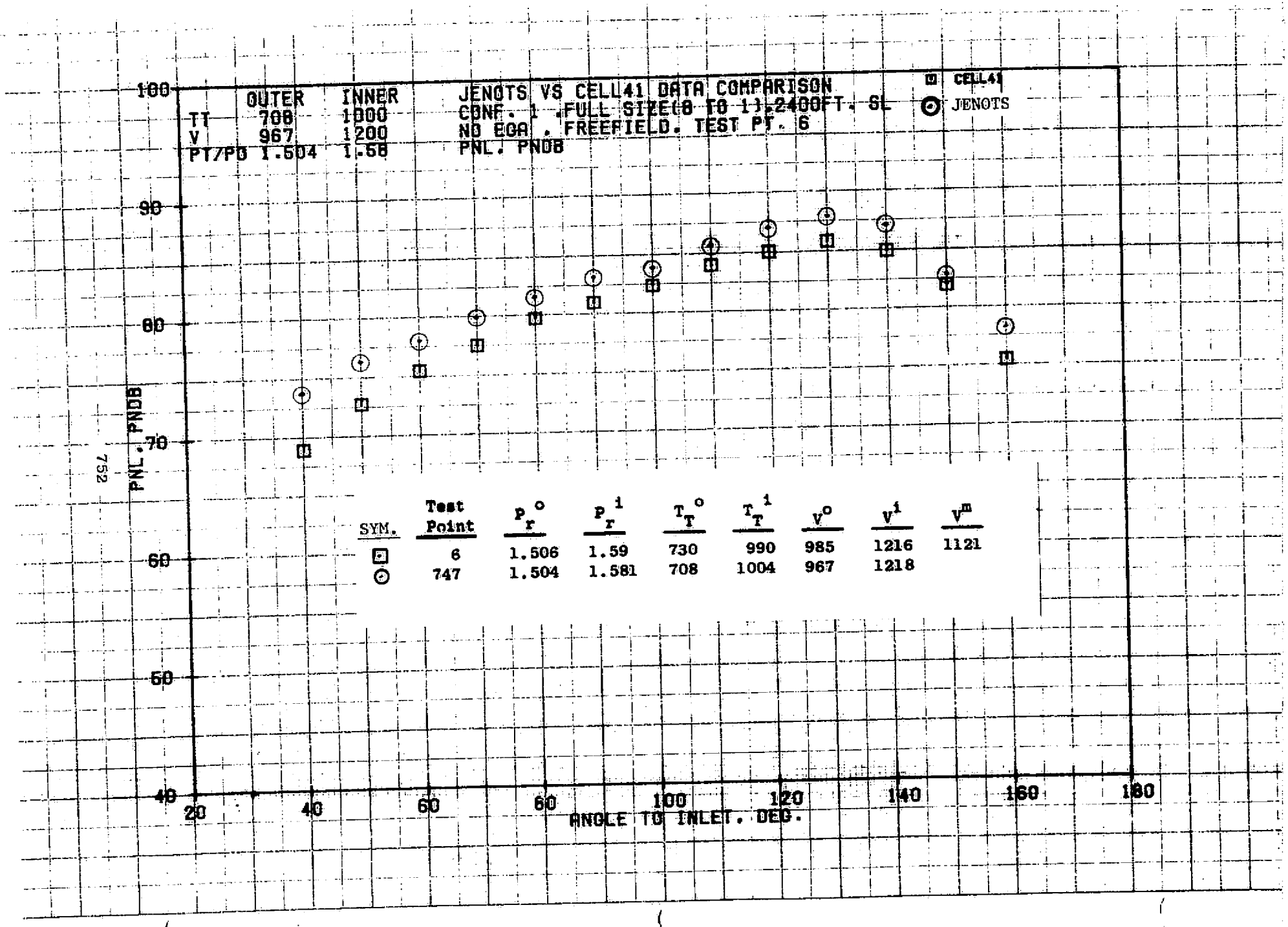
748


OUTER INNER
TT, °R 655 1000
V, fps 725 1200
PT/PO 1.274 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE,40FT. ARC
NO EGA , FREEFIELD, TEST PT. 5
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
100
90
80
70
60
50
40
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
5 1.294 1.585 730 989 789 1211 1064
746 1.274 1.574 655 1013 728 1218


OUTER INNER
TT, °R 655 1000
V, fps 725 1200
PT/PO 1.274 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD, TEST PT. 5
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
5 1.294 1.585 730 989 789 1211 1064
746 1.274 1.374 655 1013 725 1218

750


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 5
ANGLE TO INLET = 140 DEGREES
OUTER INNER
TT, °R 555 1000
V, fps 725 1200
PT/P0 1.274 1.58
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
5 1.294 1.585 730 989 789 1211 1064
746 1.274 1.574 655 1013 725 1218


OUTER INNER
TT 708 1000
V 967 1200
PT/PO 1.504 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .FULL SIZE(8 TO 1)2400FT. SL
NO EGA . FREEFIELD. TEST PT. 6
PNL. PNDB
CELL41
JENOTS
PNL. PNDB
100
90
80
70
60
50
40
20
40
60
80
100
120
140
160
180
ANGLE TO INLET. DEG.
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218
752
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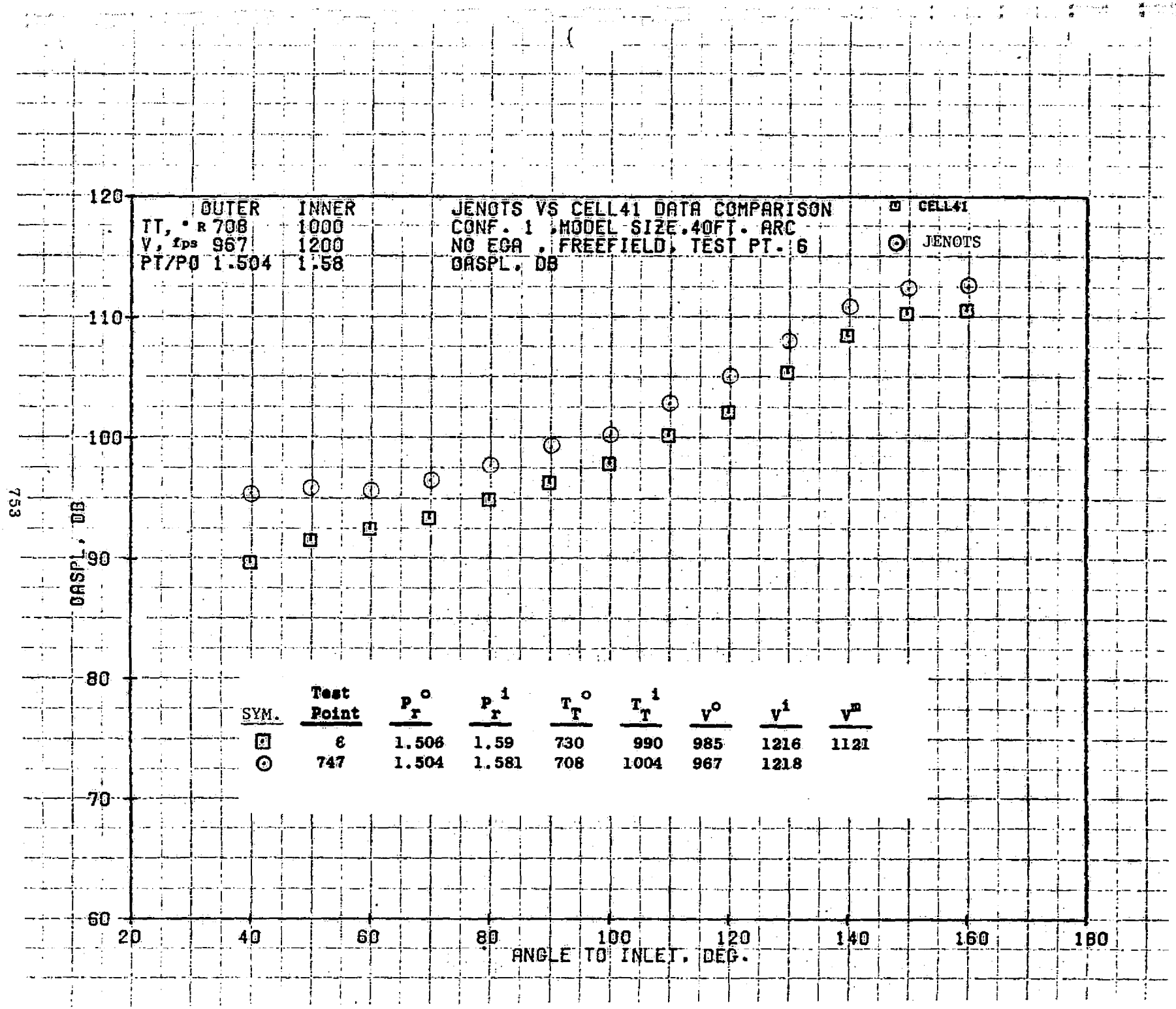
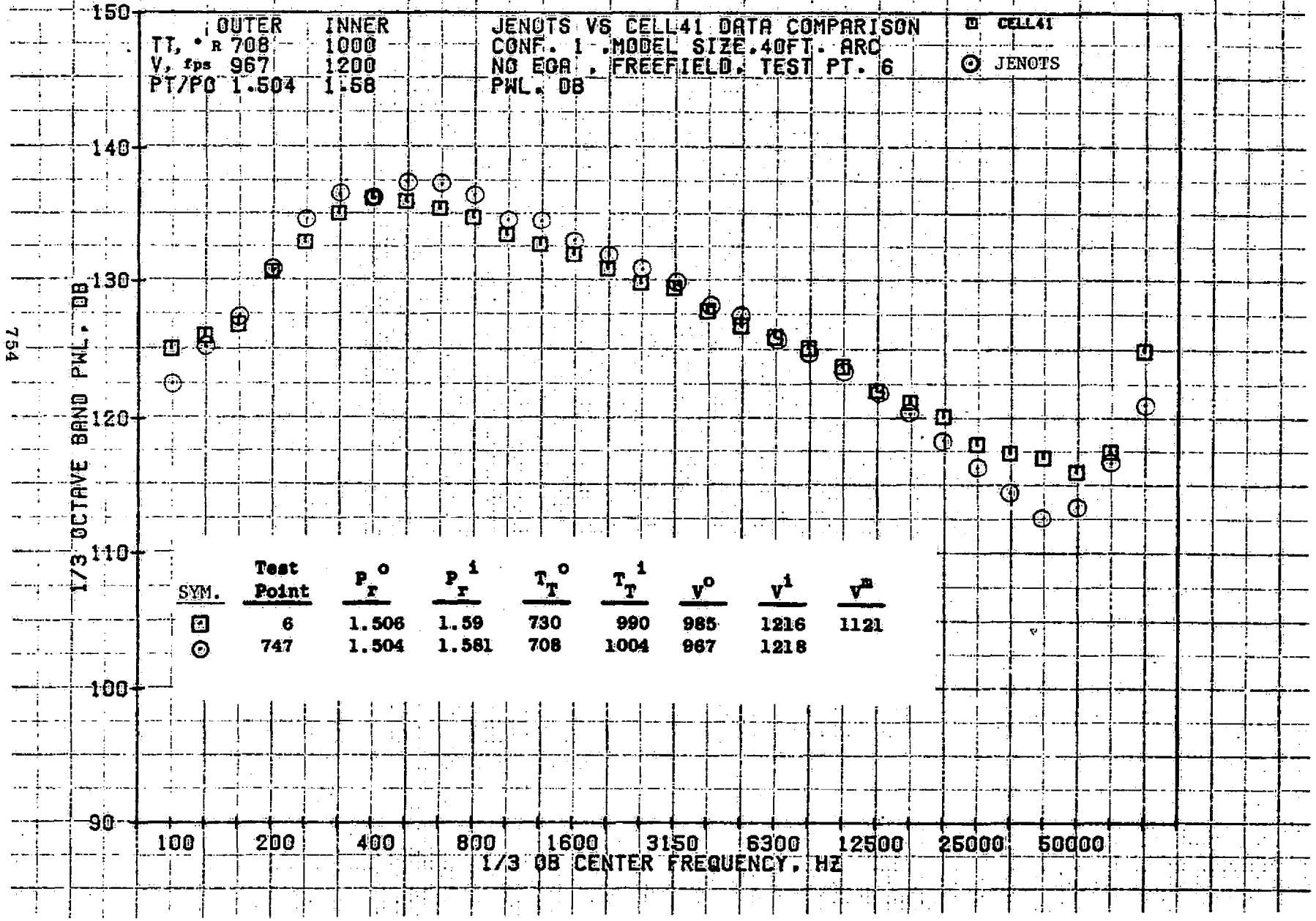
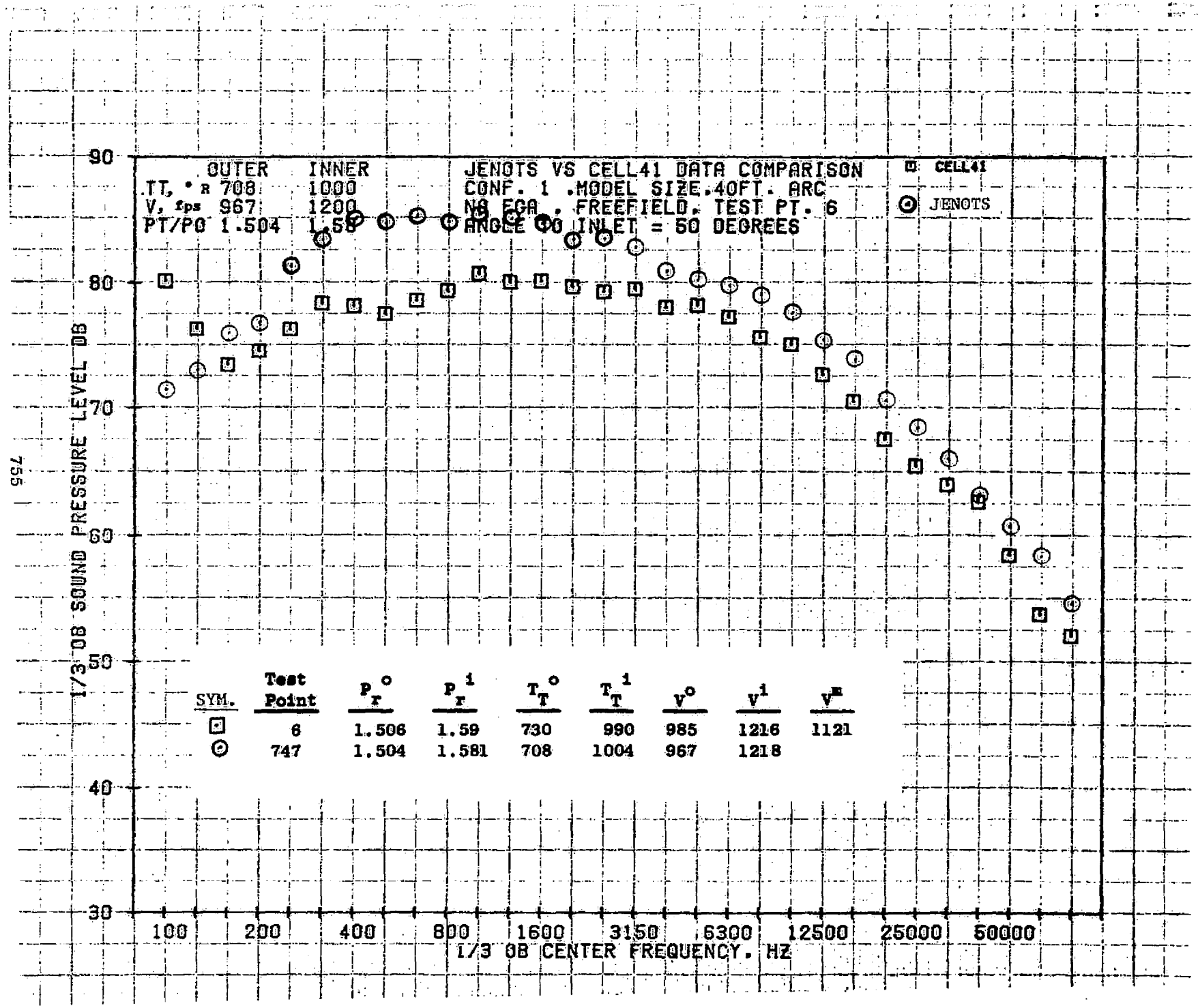
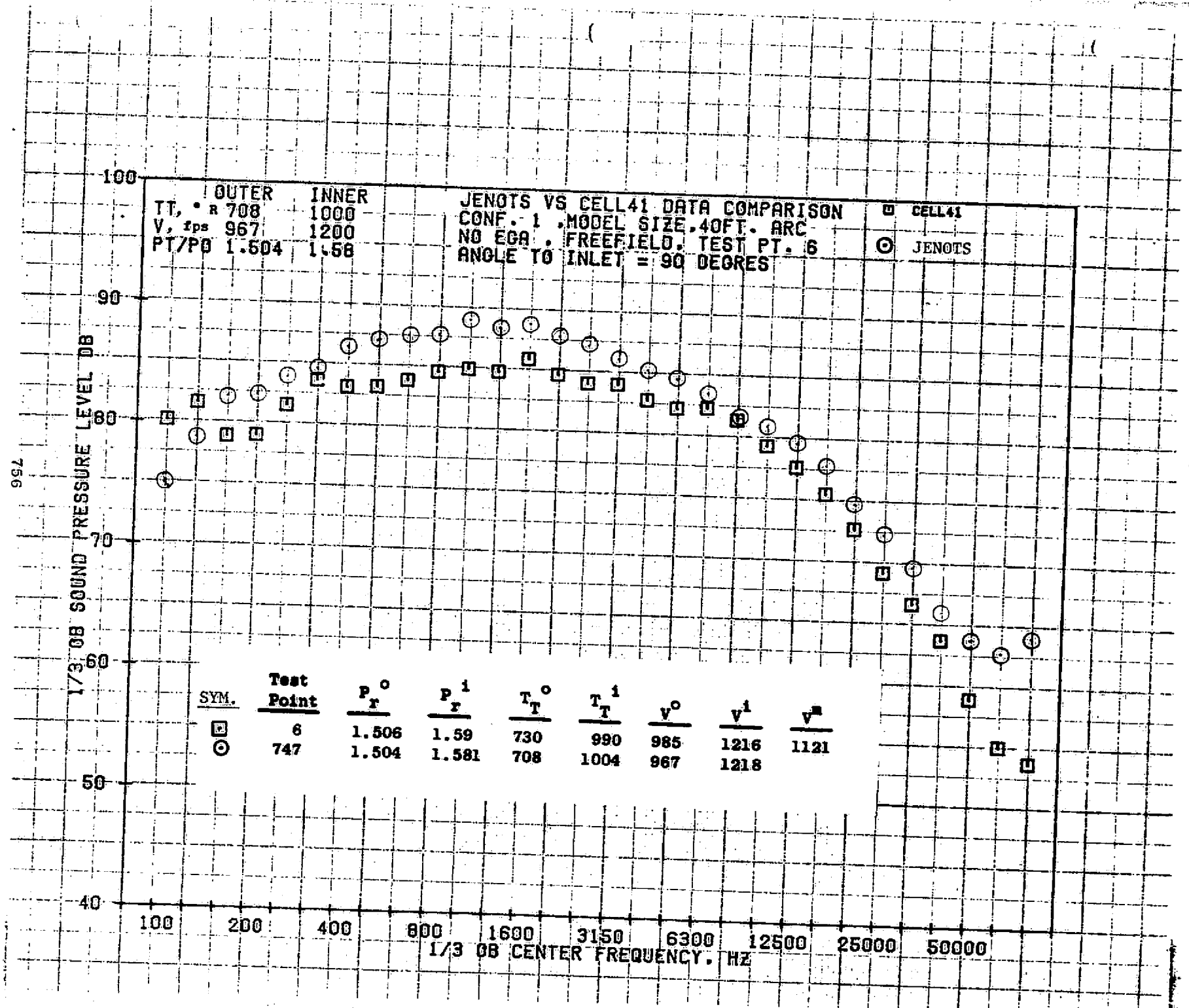
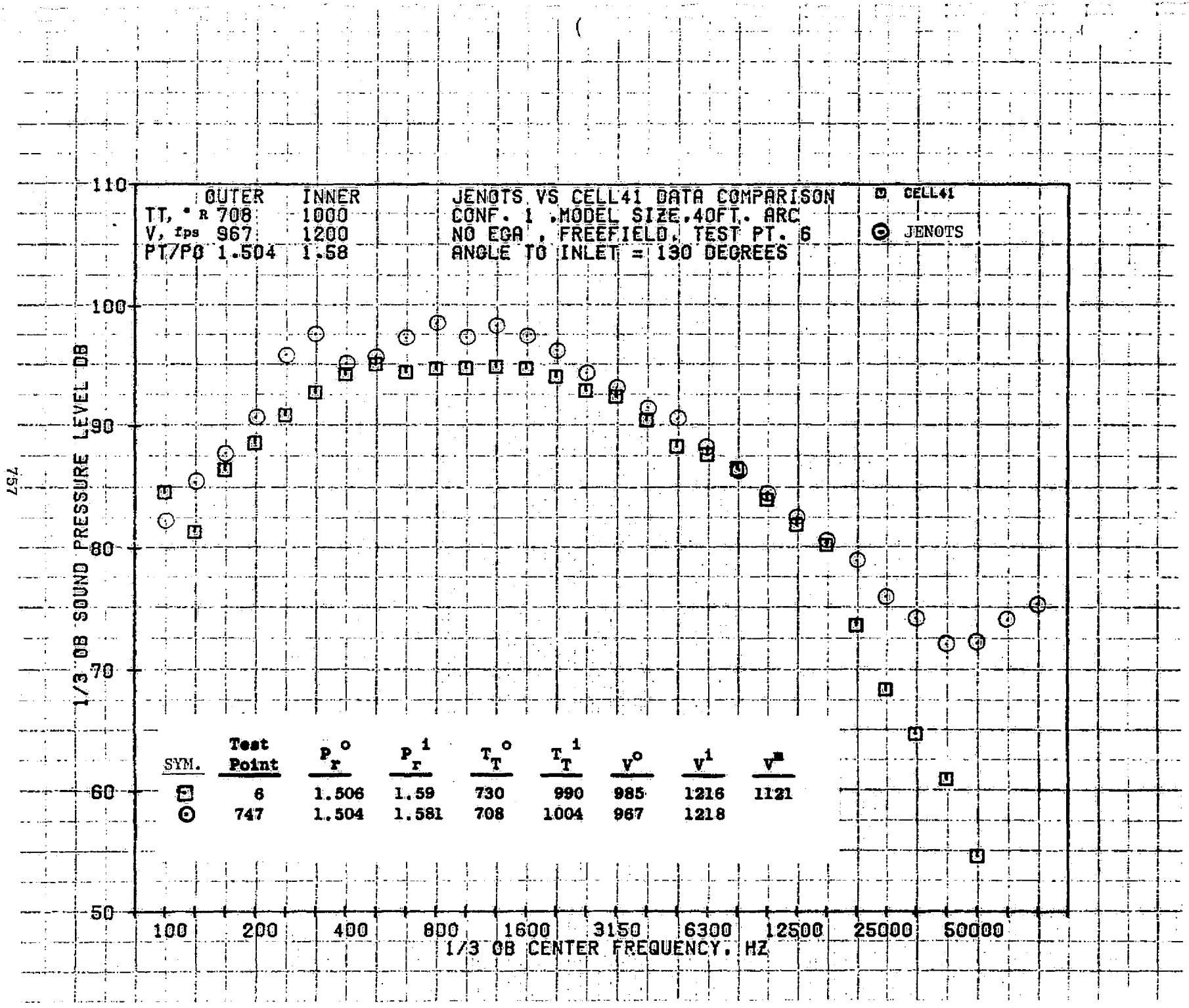

OUTER INNER
TT, °R 708 1000
V, fps 967 1200
PT/P0 1.504 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD, TEST PT. 6
OASPL, DB
CELL41
JENOTS
OASPL, DB
120
110
100
90
80
70
60
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218

753

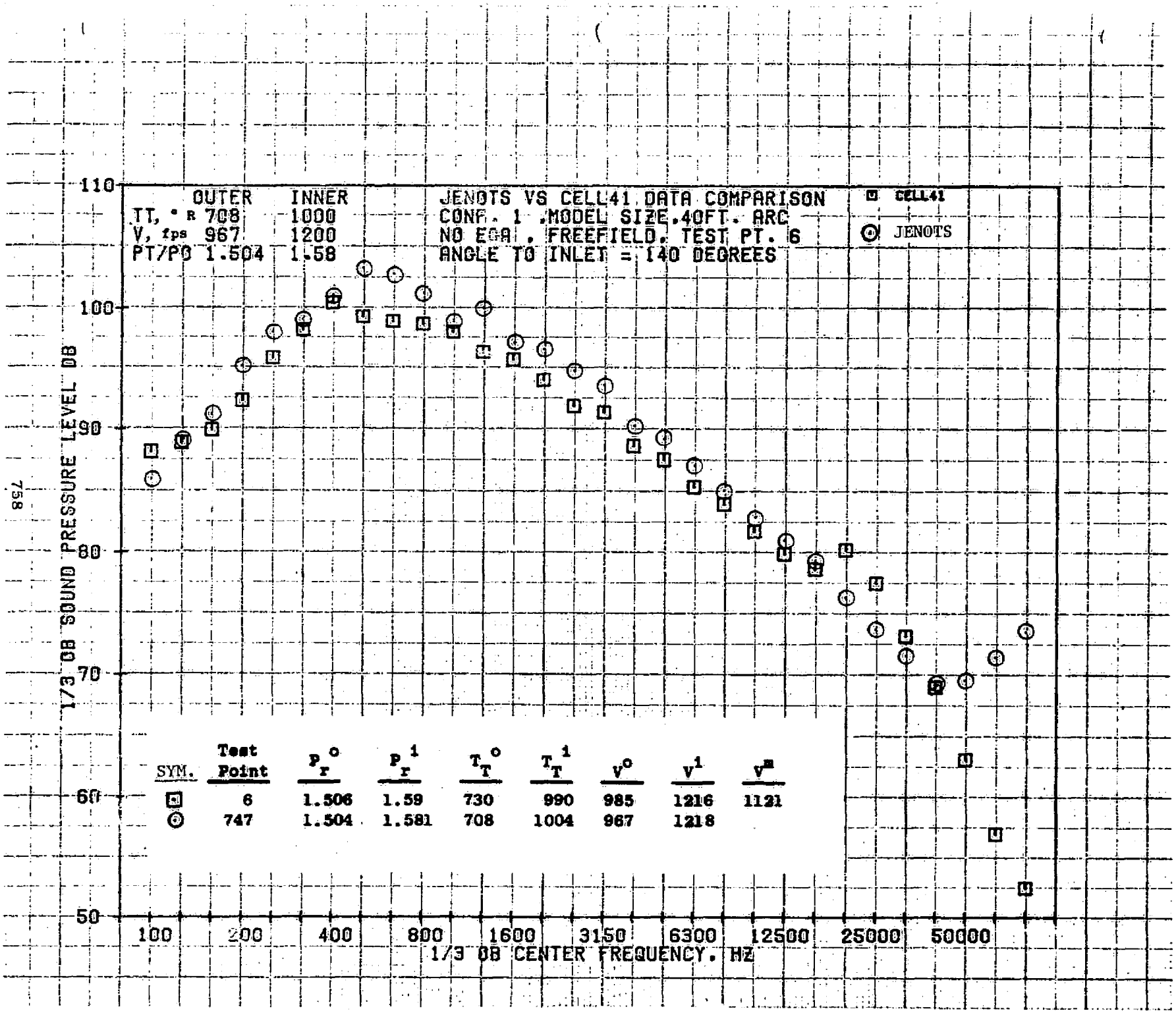

OUTER INNER
TT, °R 708 1000
V, fps 967 1200
PT/PO 1.504 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD, TEST PT. 6
PWL, DB
CELL41
JENOTS
1/3 OCTAVE BAND PWL, DB
150
140
130
120
110
100
90
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218


OUTER INNER
TT, °R 708 1000
V, fps 967 1200
PT/P0 1.504 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NB EGA . FREEFIELD. TEST PT. 6
ANGLE TO INLET = 50 DEGREES
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
90
80
70
60
50
40
30
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218

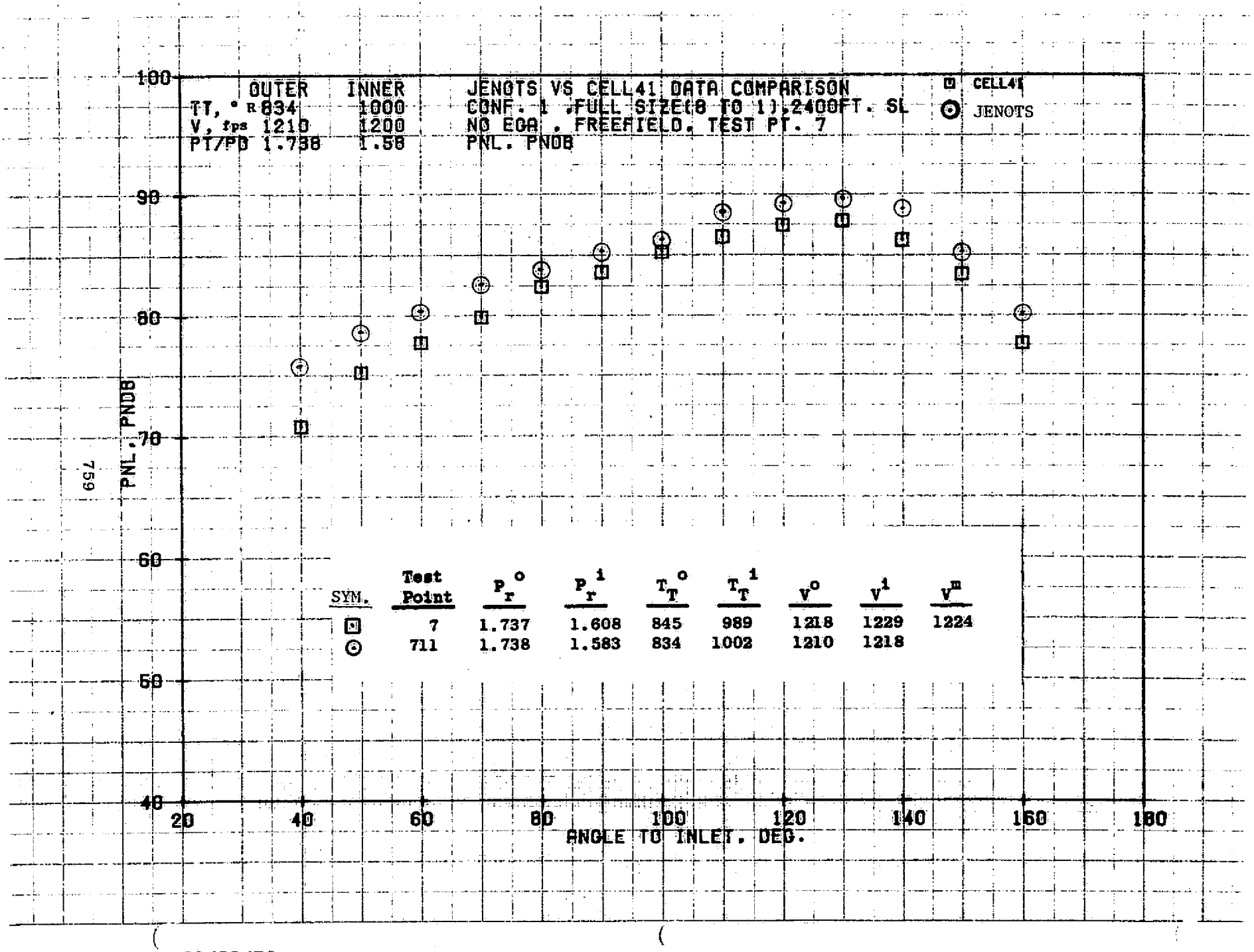

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 , MODEL SIZE .40FT. ARC
NO EGA , FREEFIELD, TEST PT. 6
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 708 1000
V, fps 967 1200
PT/P0 1.504 1.58
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
100
90
80
70
60
50
40
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD. TEST PT. 6
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 708 1000
V, fps 967 1200
PT/P0 1.504 1.58
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i $V^{\blacksquare}$
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218

757


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 6
ANGLE TO INLET = 140 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 708 1000
V, fps 967 1200
PT/P0 1.504 1.58
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^0 P_r^1 T_T^0 T_T^1 V^0 V^1 V^m
6 1.506 1.59 730 990 985 1216 1121
747 1.504 1.581 708 1004 967 1218

758



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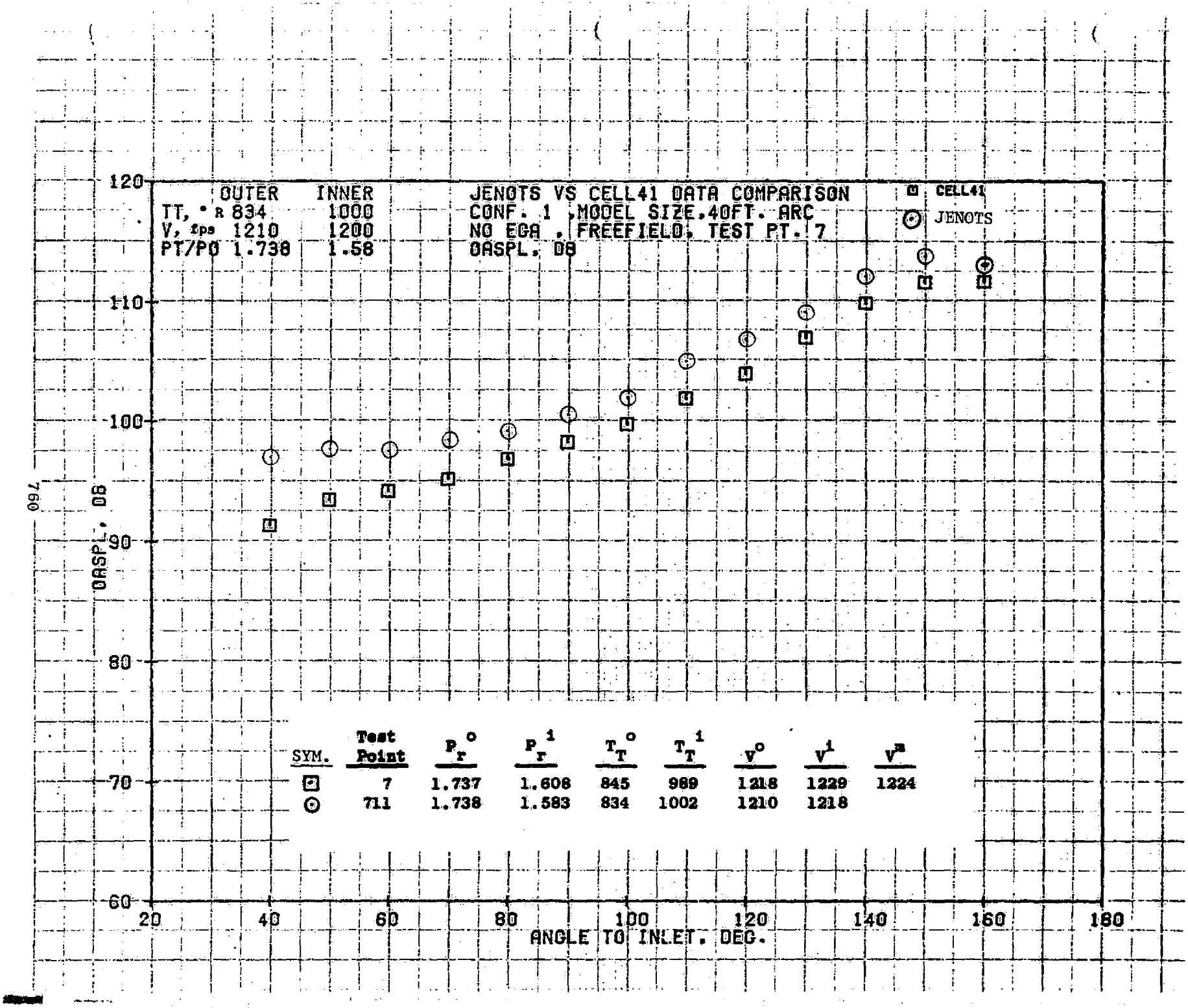
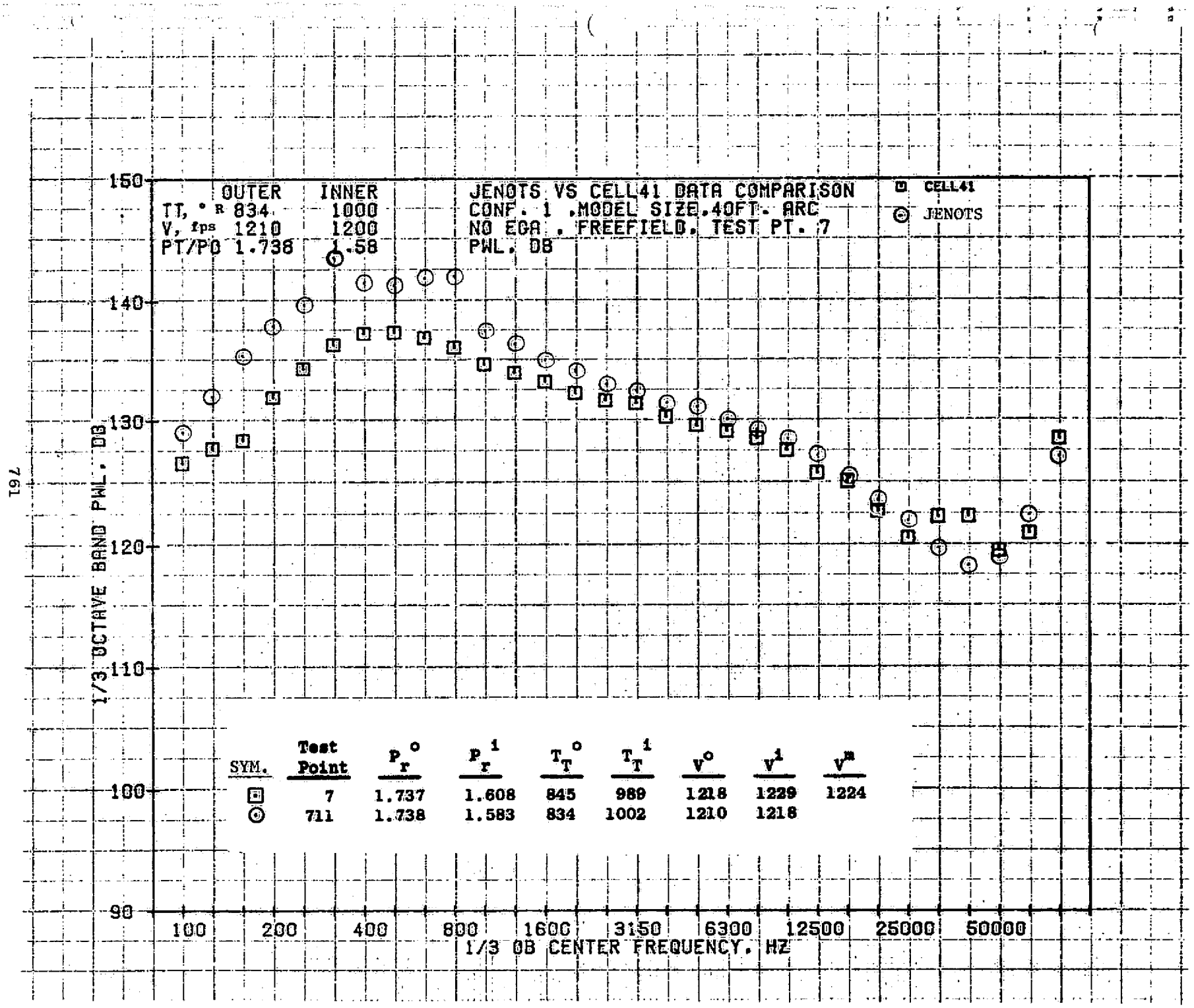
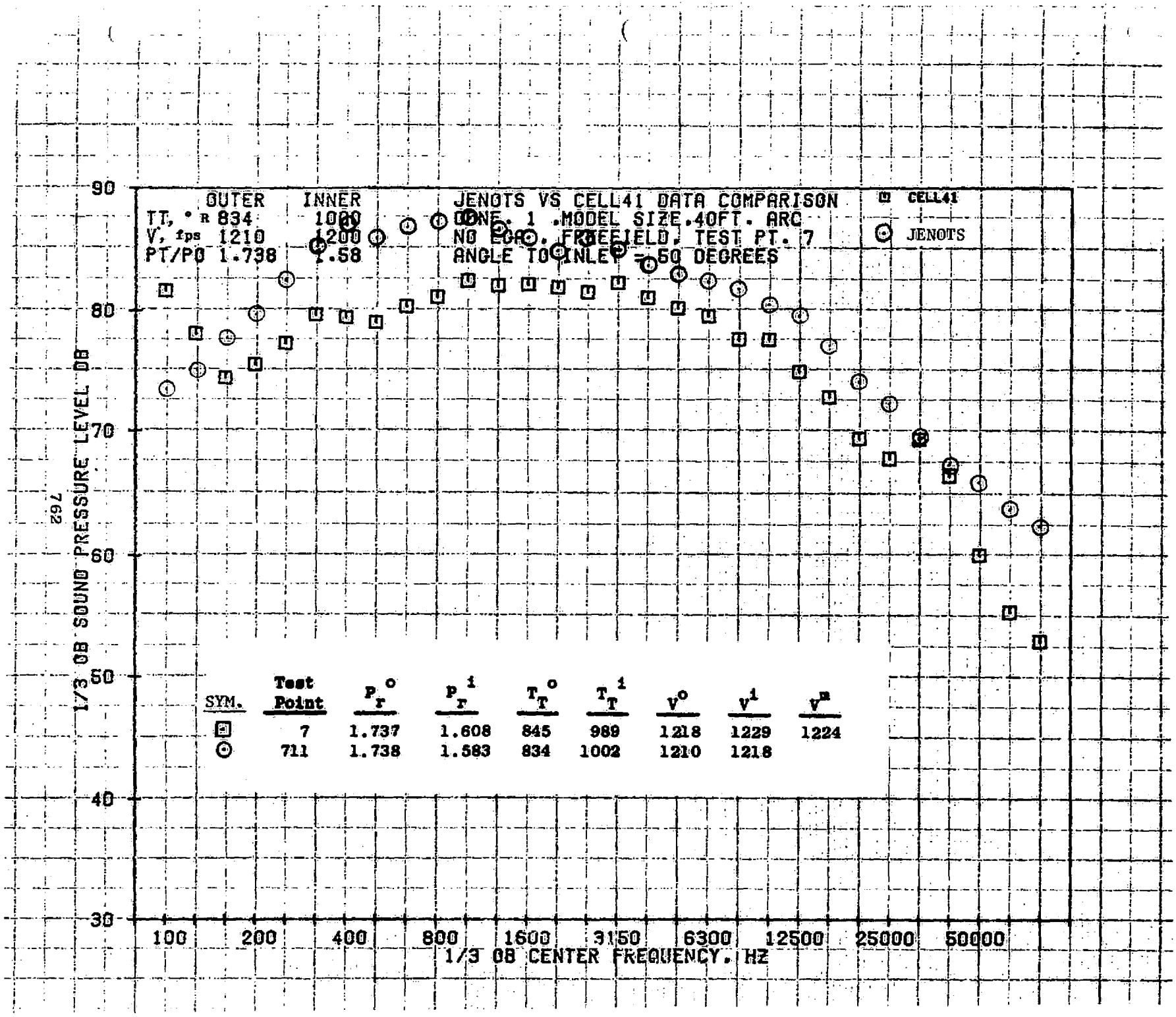
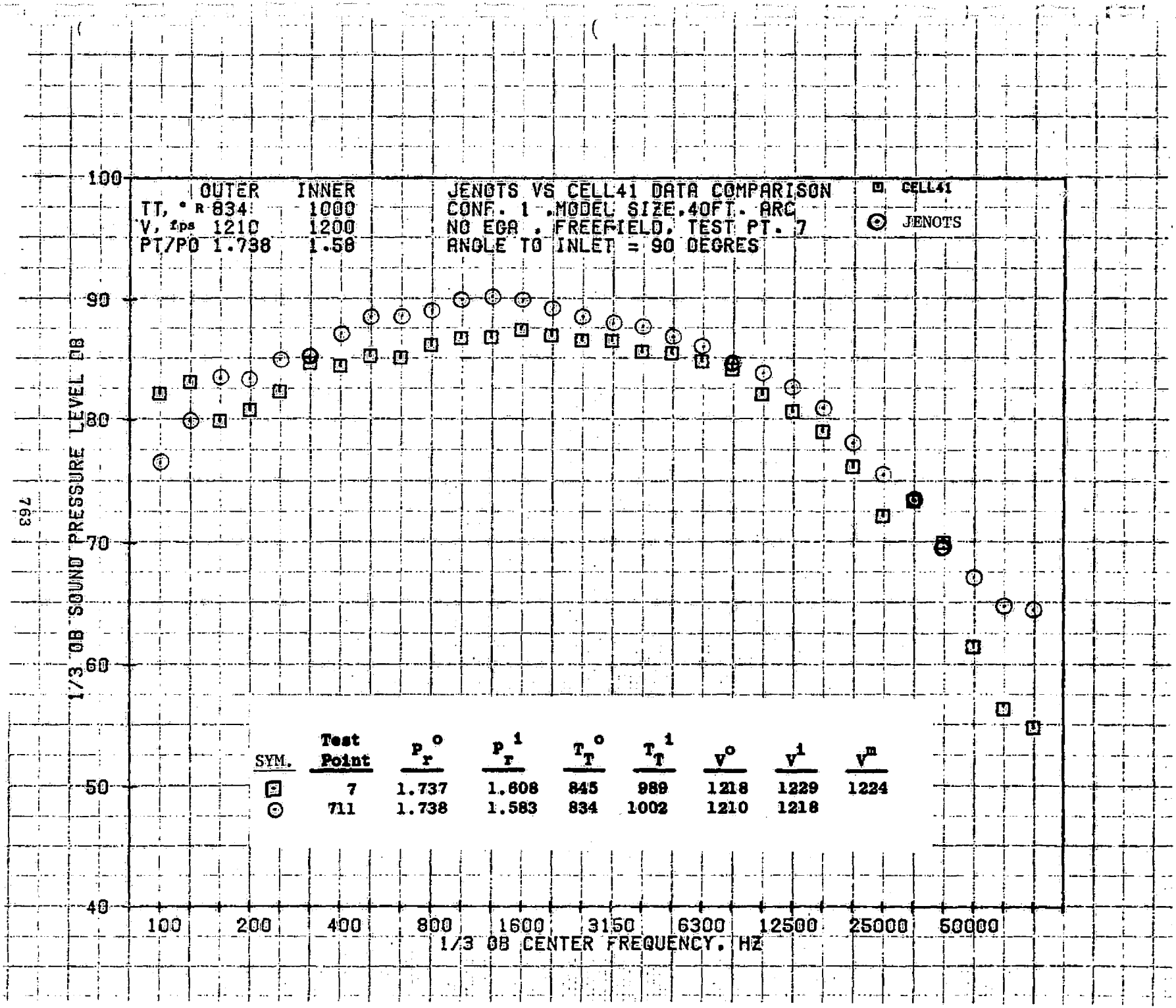


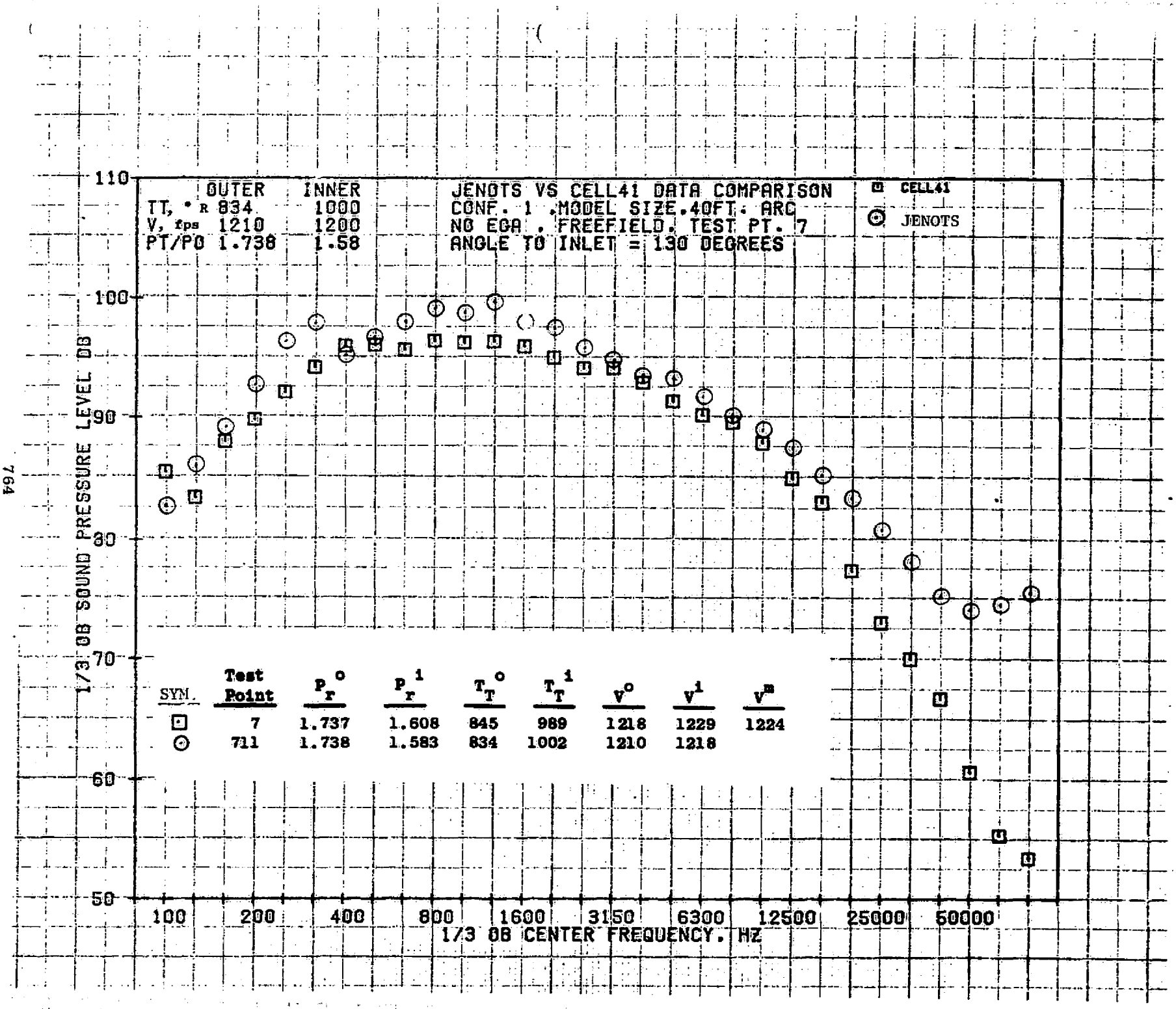
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
⊡	7	1.737	1.608	845	989	1218	1229	1224
⊙	711	1.738	1.583	834	1002	1210	1218	

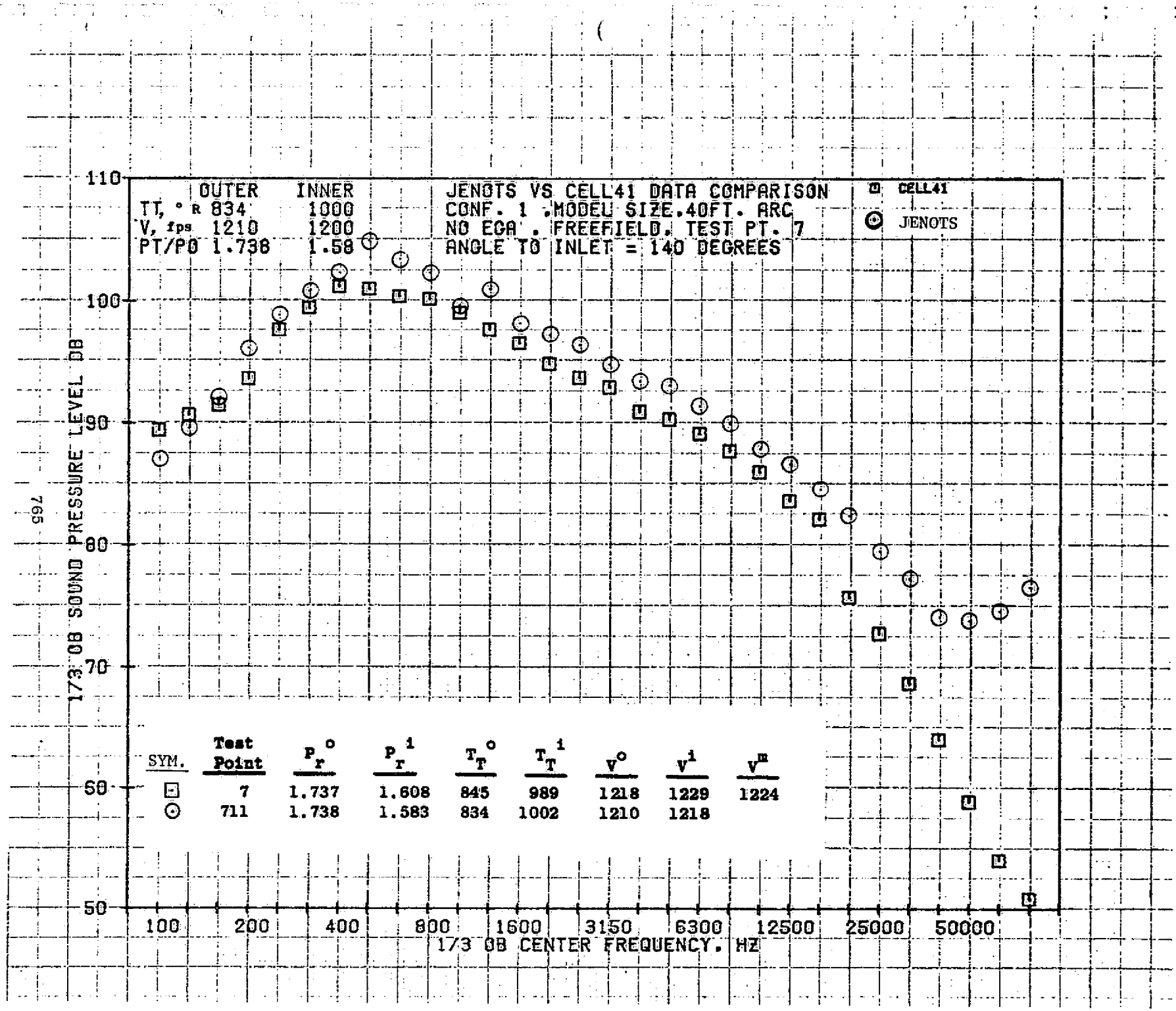
760

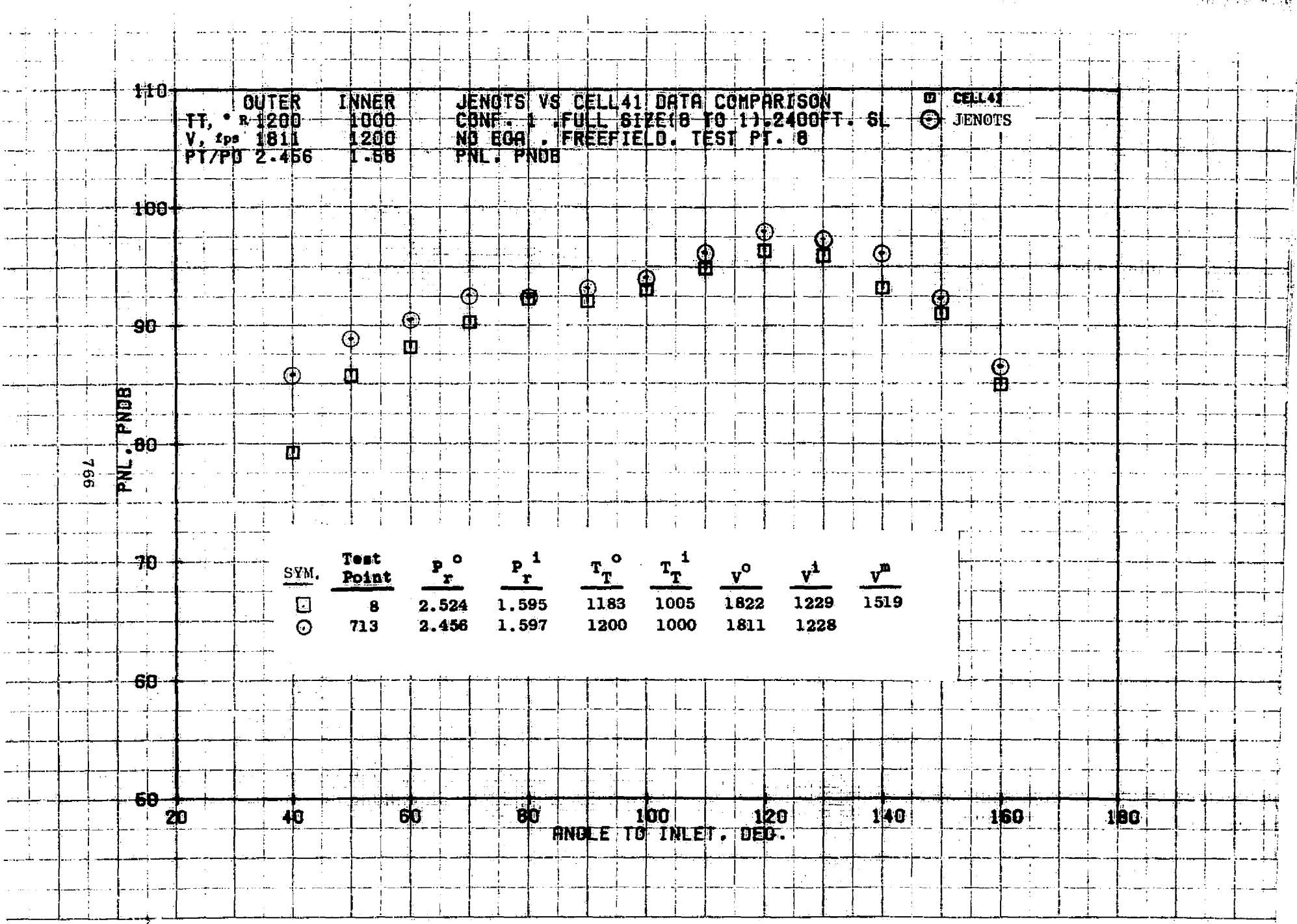

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 7
PWL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 834 1000
V, fps 1210 1200
PT/PO 1.738 1.58
1/3 OCTAVE BAND PWL. DB
1/3 OB CENTER FREQUENCY. HZ
150
140
130
120
110
100
90
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
7 1.737 1.608 845 989 1218 1229 1224
711 1.738 1.583 834 1002 1210 1218


JENOTS VS CELL41 DATA COMPARISON
CONE. 1 .MODEL SIZE.40FT. ARC
NO ECAO. FREEFIELD. TEST PT. 7
ANGLE TO INLET = 50 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 834 1000
V, fps 1210 1200
PT/P0 1.738 1.58
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
90
80
70
60
50
40
30
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
7 1.737 1.608 845 989 1218 1229 1224
711 1.738 1.583 834 1002 1210 1218
762


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 7
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 834 1000
V, fps 1210 1200
PT/PO 1.738 1.58
1/3 OB SOUND PRESSURE LEVEL DB
100
90
80
70
60
50
40
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point p_r^o p_r^i T_T^o T_T^i V^o V^i V^m
7 1.737 1.608 845 989 1218 1229 1224
711 1.738 1.583 834 1002 1210 1218


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 7
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 834 1000
V, fps 1210 1200
PT/P0 1.738 1.58
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY. HZ
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
7 1.737 1.608 845 989 1218 1229 1224
711 1.738 1.583 834 1002 1210 1218


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEU SIZE.40FT. ARC
NO ECA . FREEFIELD. TEST PT. 7
ANGLE TO INLET = 140 DEGREES
OUTER INNER
TT, °R 834 1000
V, fps 1210 1200
PT/P0 1.738 1.58
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
765
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
7 1.737 1.608 845 989 1218 1229 1224
711 1.738 1.583 834 1002 1210 1218
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ



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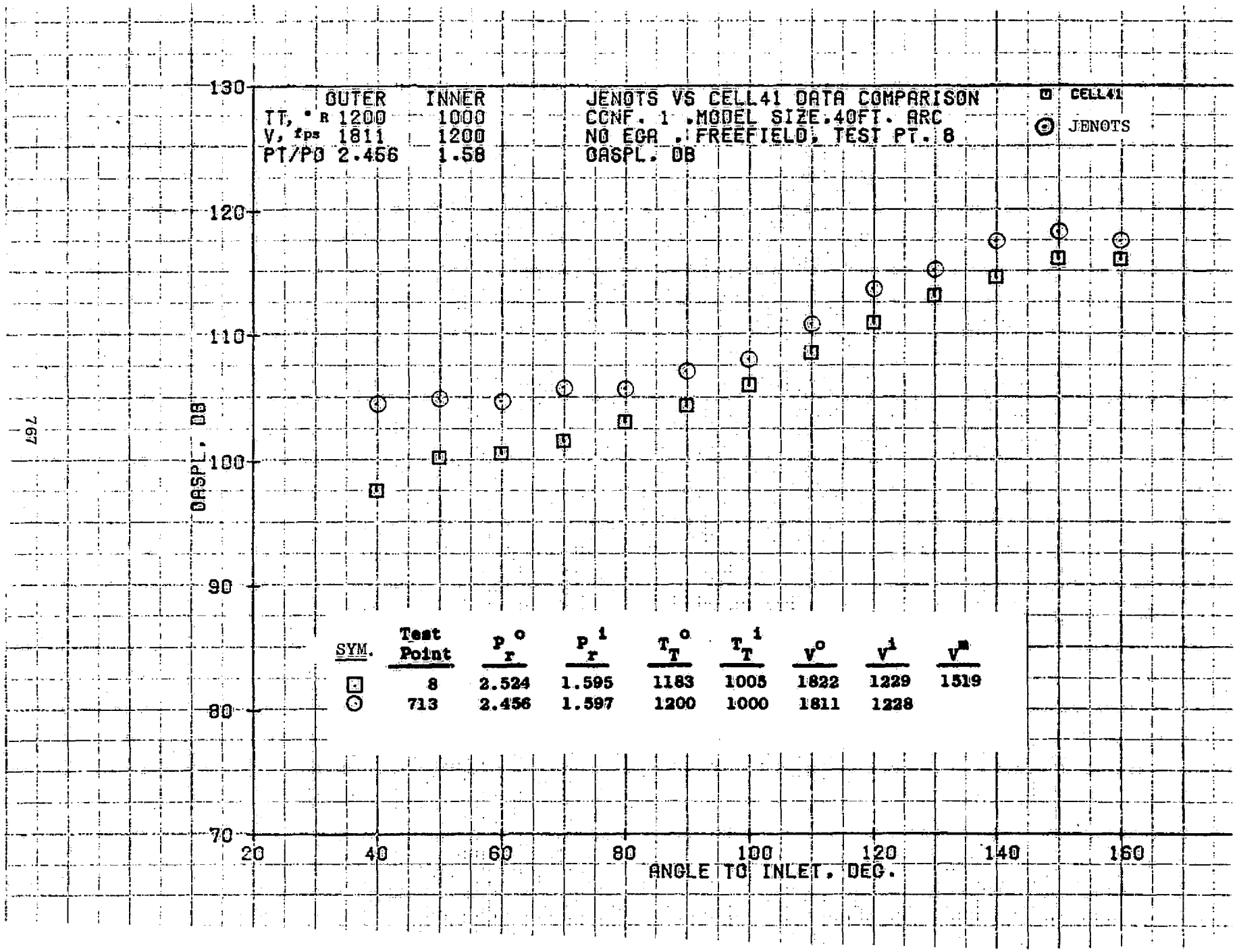
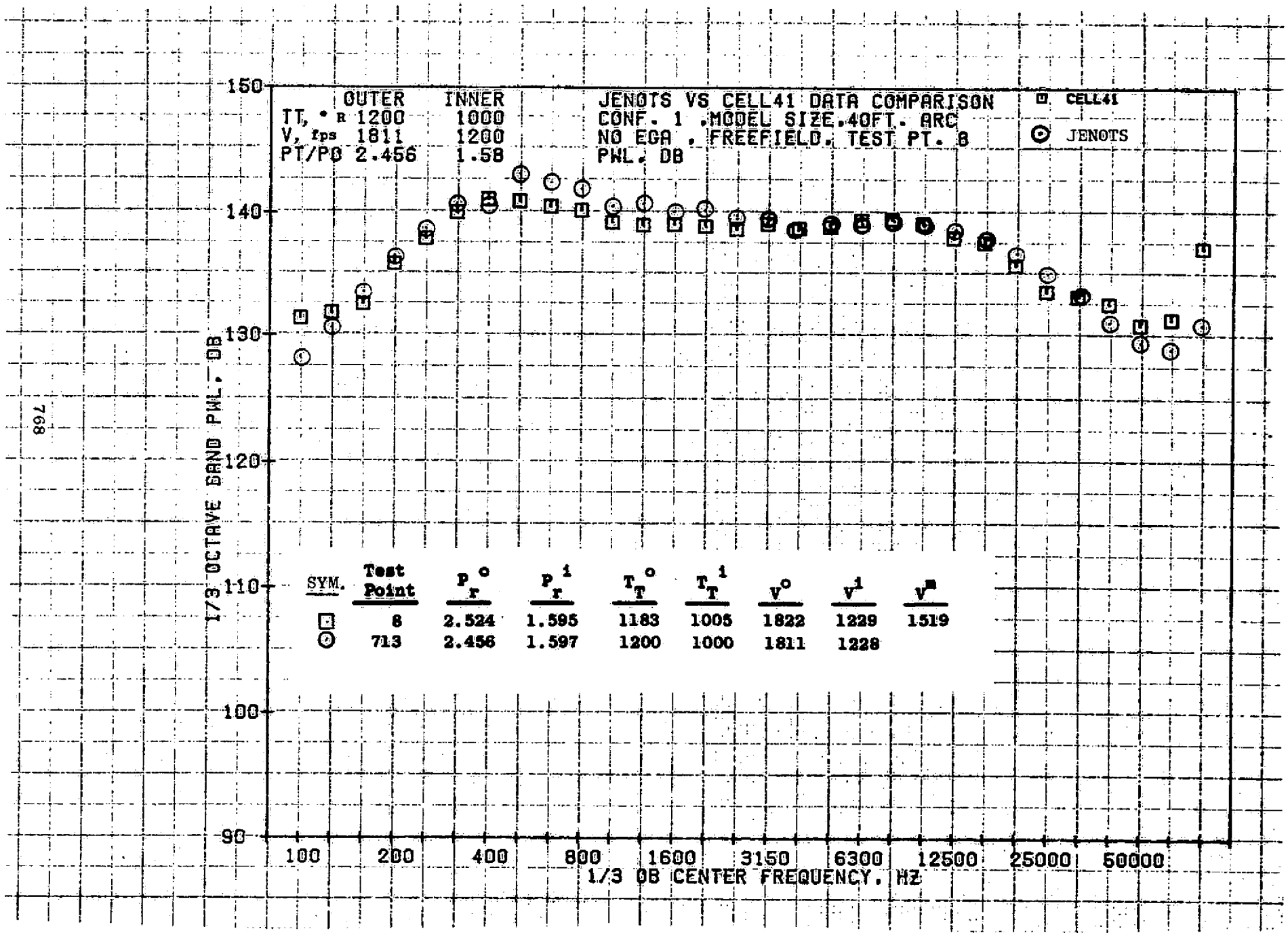
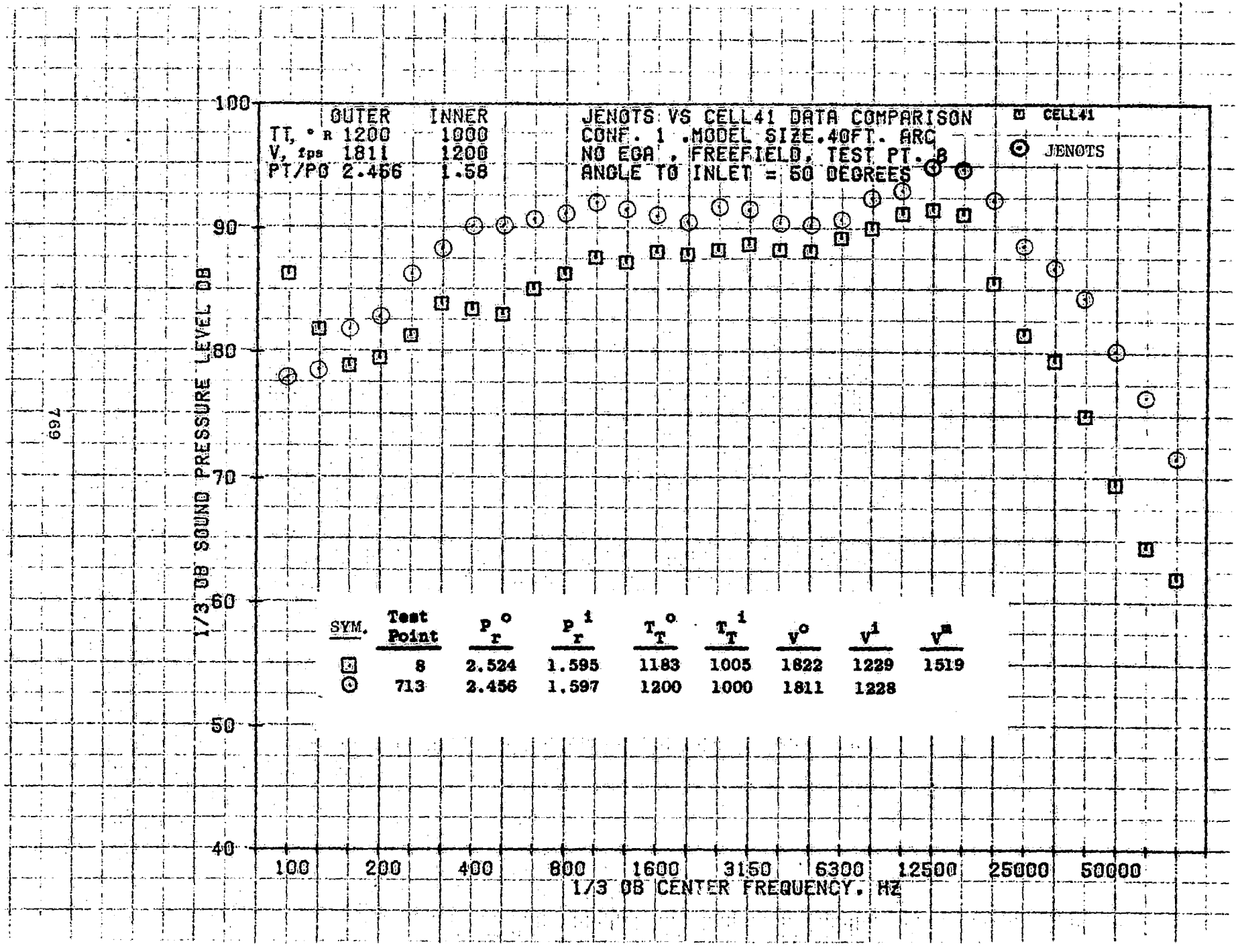
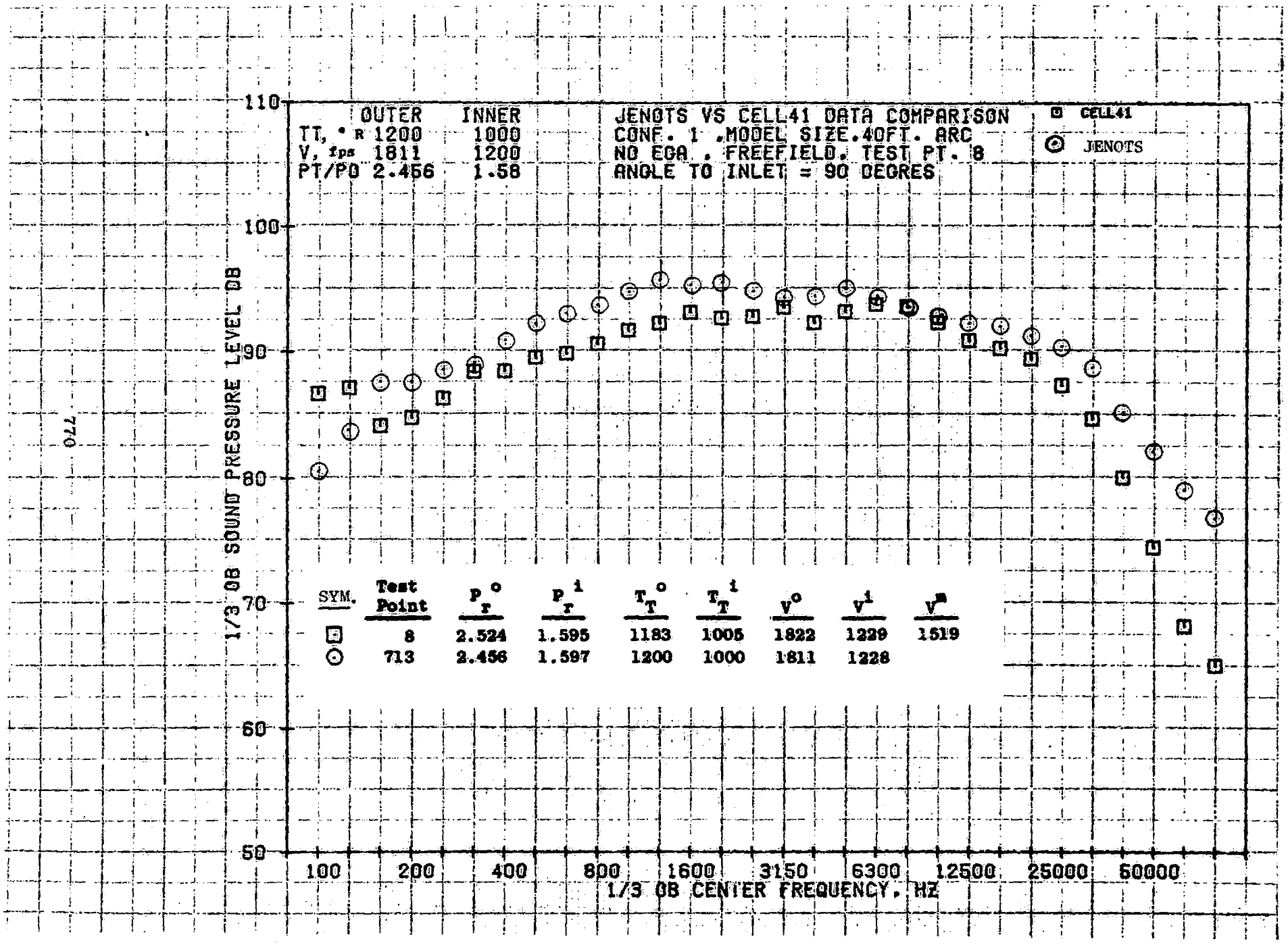
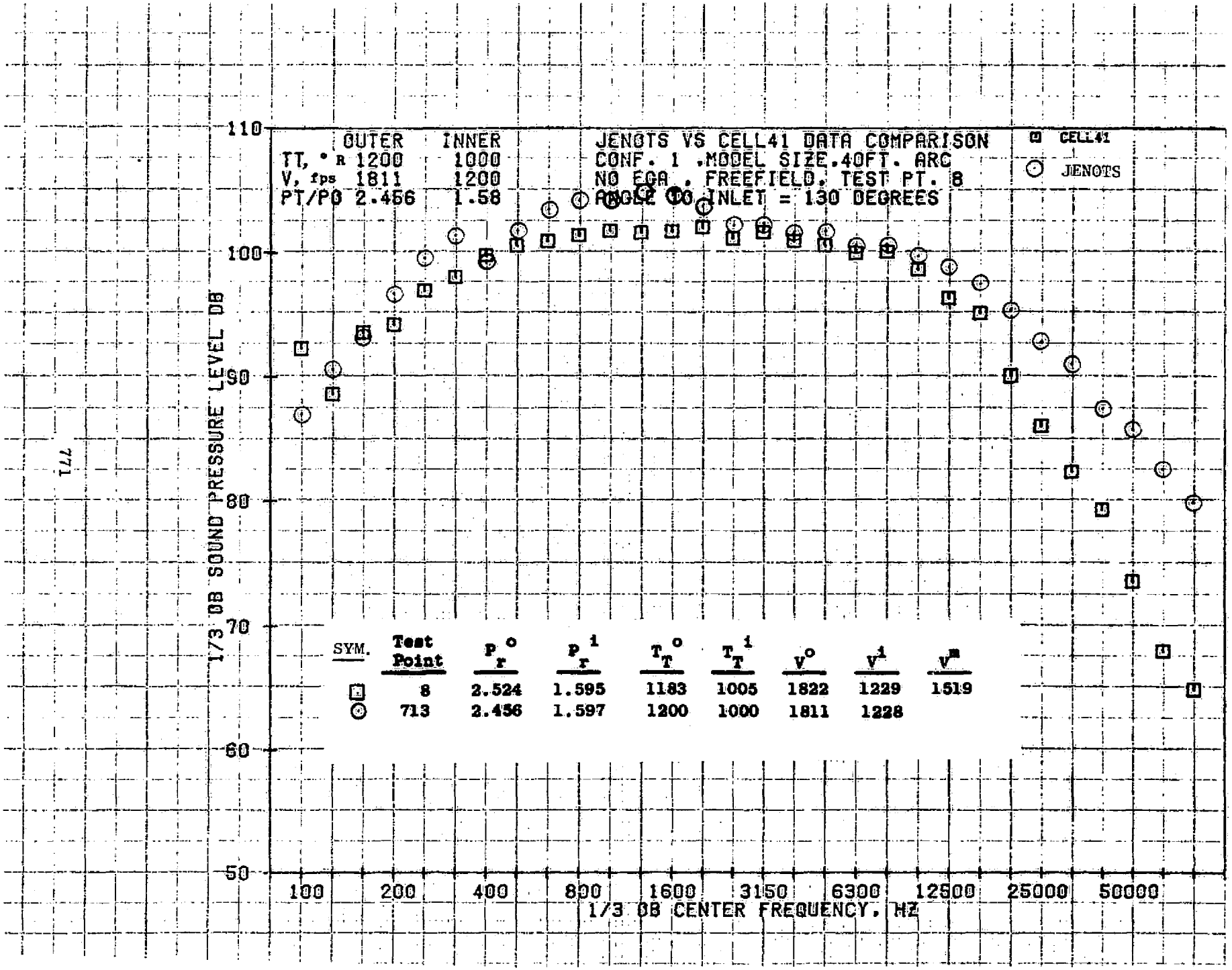
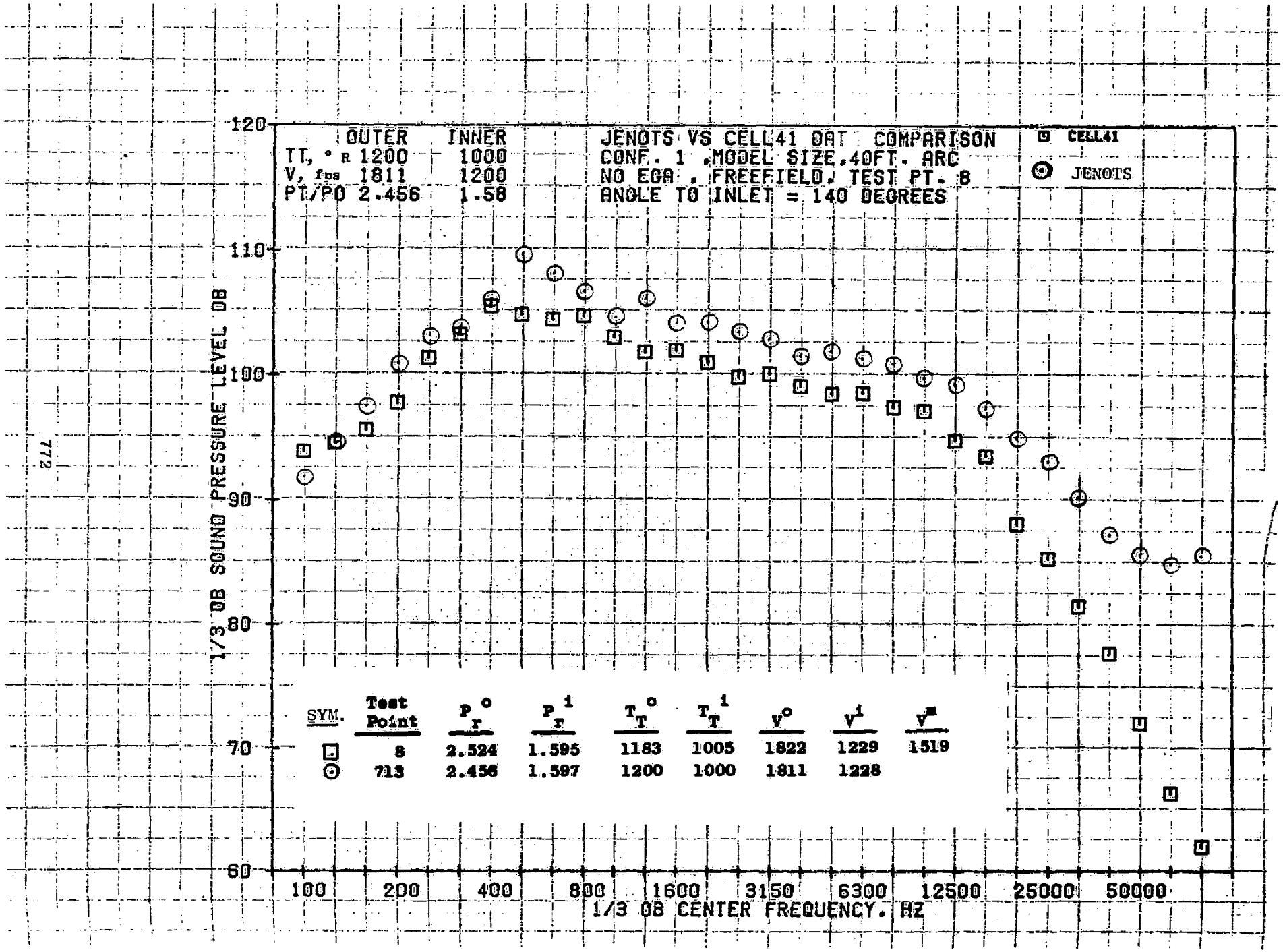

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGR . FREEFIELD, TEST PT. 8
OASPL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 1200 1000
V, fps 1811 1200
PT/P0 2.456 1.58
OASPL, DB
ANGLE TO INLET, DEG.
130
120
110
100
90
80
70
20
40
60
80
100
120
140
160
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
8 2.524 1.595 1183 1005 1822 1229 1519
713 2.456 1.597 1200 1000 1811 1228

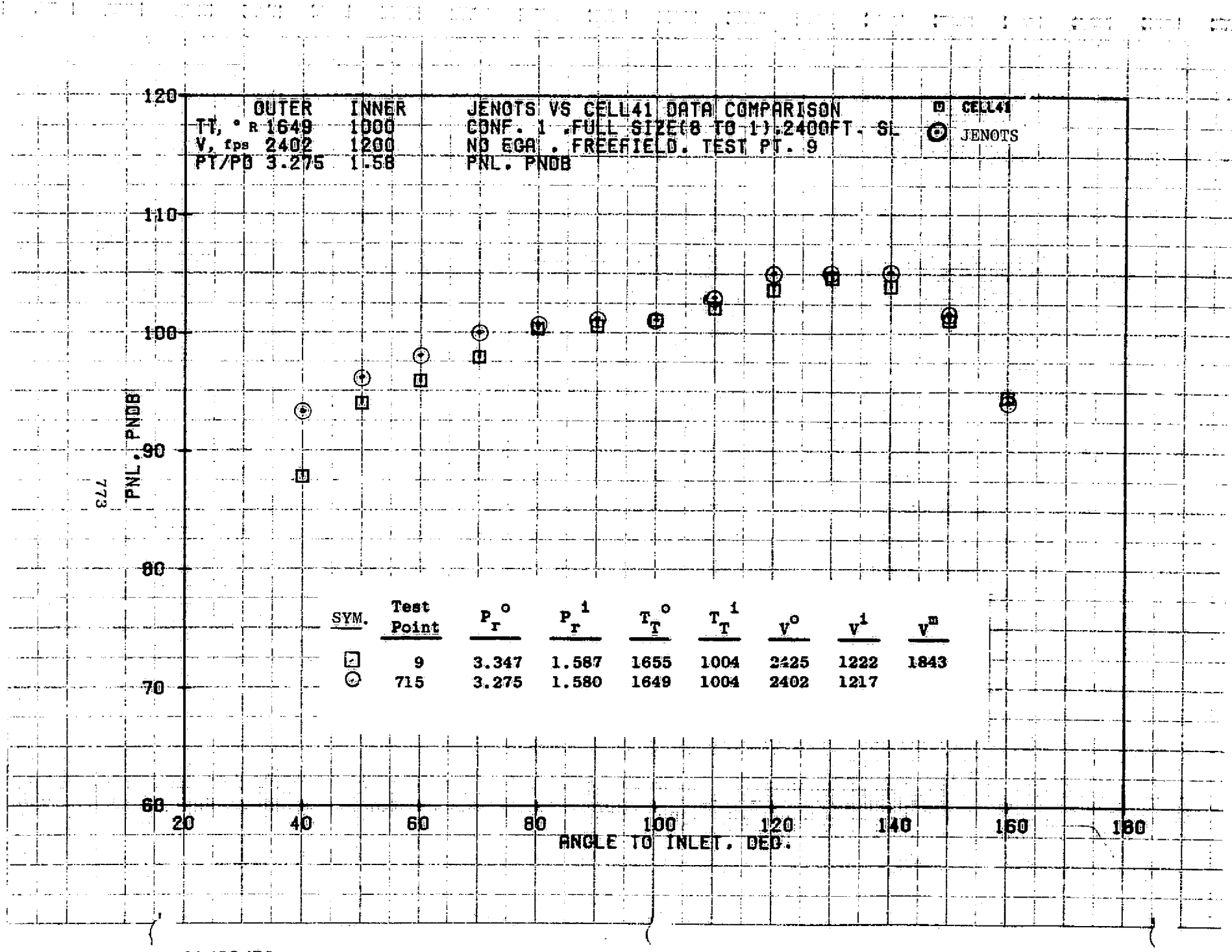

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 8
PWL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 1200 1000
V, fps 1811 1200
PT/P0 2.456 1.58
1/3 OCTAVE BAND PWL. DB
1/3 OB CENTER FREQUENCY. HZ
150
140
130
120
110
100
90
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
8 2.524 1.595 1183 1005 1822 1229 1519
713 2.456 1.597 1200 1000 1811 1228


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 8
ANGLE TO INLET = 50 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1200 1000
V, fps 1811 1200
PT/PO 2.466 1.58
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
8 2.524 1.595 1183 1005 1822 1229 1519
713 2.456 1.597 1200 1000 1811 1228
1/3 OB SOUND PRESSURE LEVEL DB
100
90
80
70
60
50
40
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
769


OUTER INNER
TT, °R 1200 1000
V, fps 1811 1200
PT/P0 2.456 1.58
JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 8
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
8 2.524 1.595 1183 1005 1822 1229 1519
713 2.456 1.597 1200 1000 1811 1228


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 8
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1200 1000
V, fps 1811 1200
PT/P0 2.456 1.58
1/3 OB SOUND PRESSURE LEVEL DB
1/3 OB CENTER FREQUENCY, HZ
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
8 2.524 1.595 1183 1005 1822 1229 1519
713 2.456 1.597 1200 1000 1811 1228


JENOTS VS CELL41 OAT COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 8
ANGLE TO INLET = 140 DEGREES
OUTER INNER
TT, °R 1200 1000
V, fps 1811 1200
PT/P0 2.456 1.58
CELL41
JENOTS
1/3 OB SOUND PRESSURE LEVEL DB
120
110
100
90
80
70
60
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY. HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
8 2.524 1.595 1183 1005 1822 1229 1519
713 2.456 1.597 1200 1000 1811 1228



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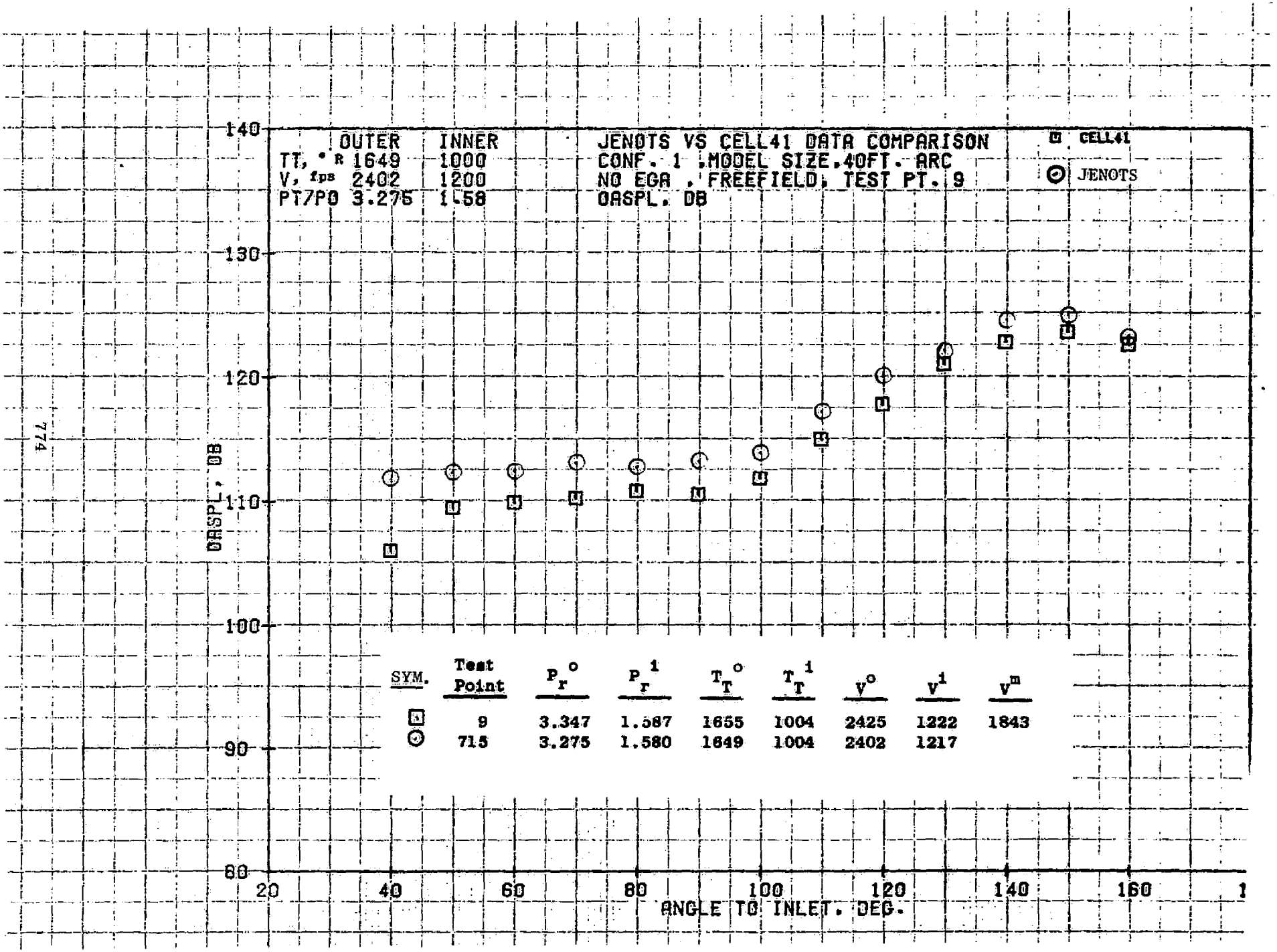
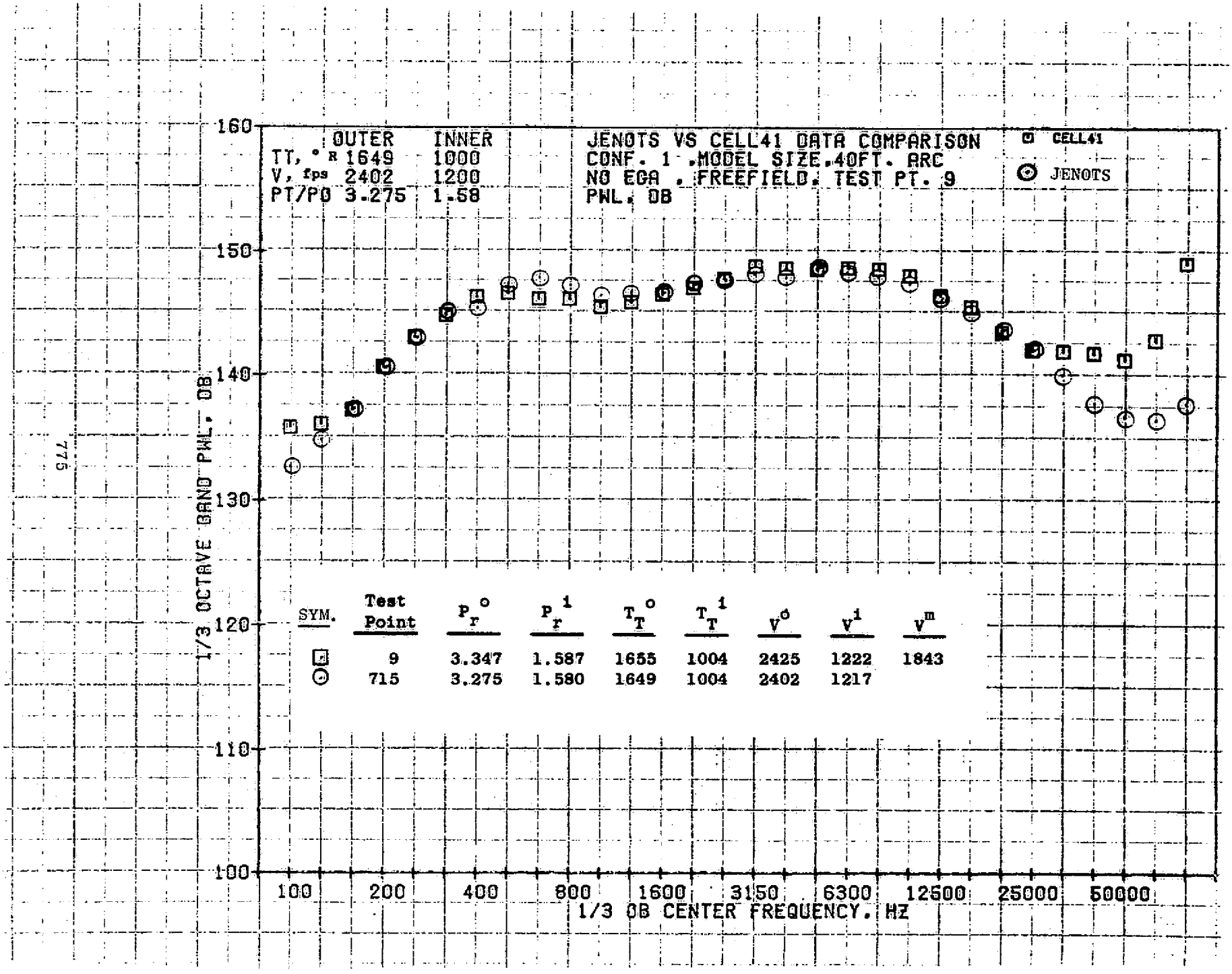
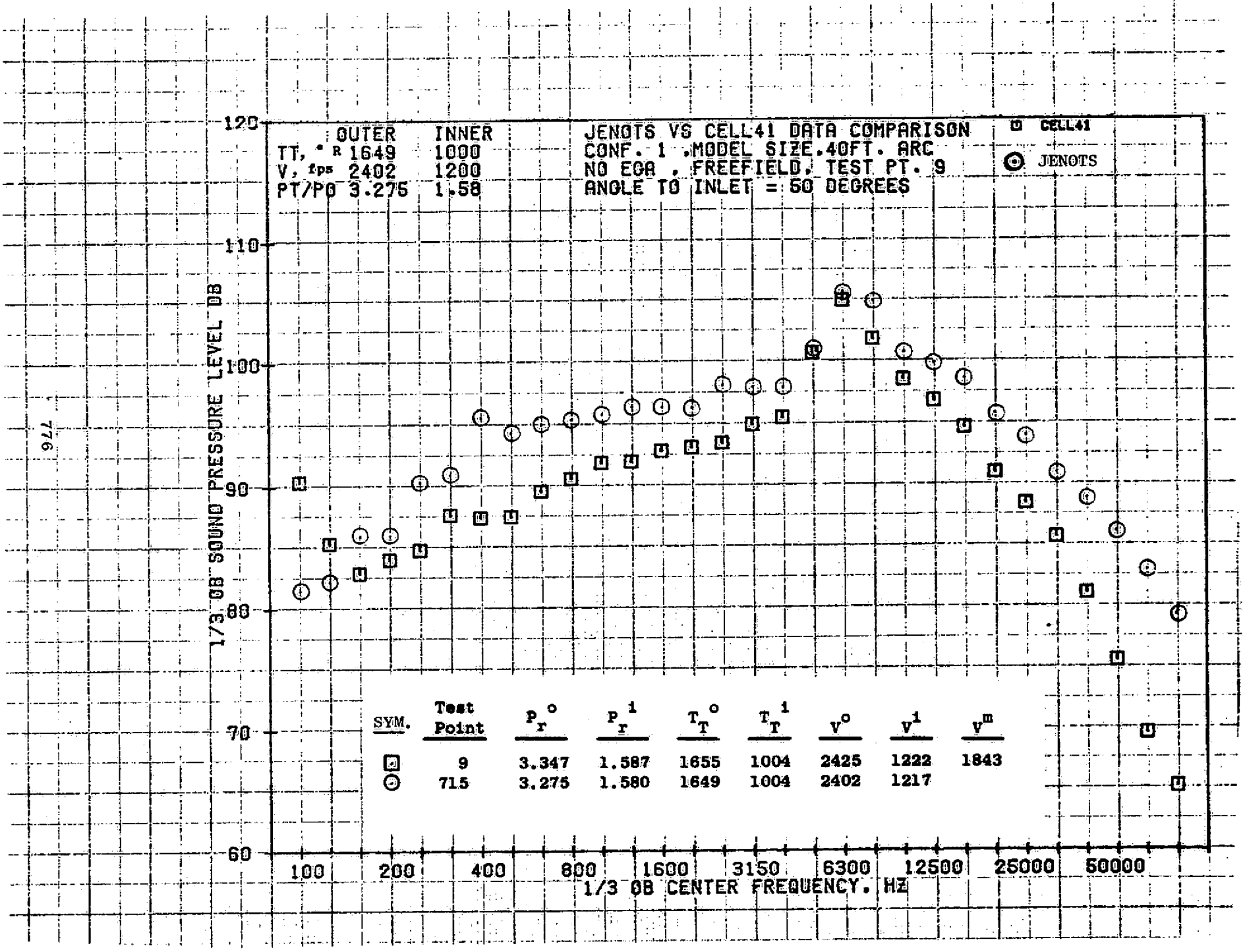
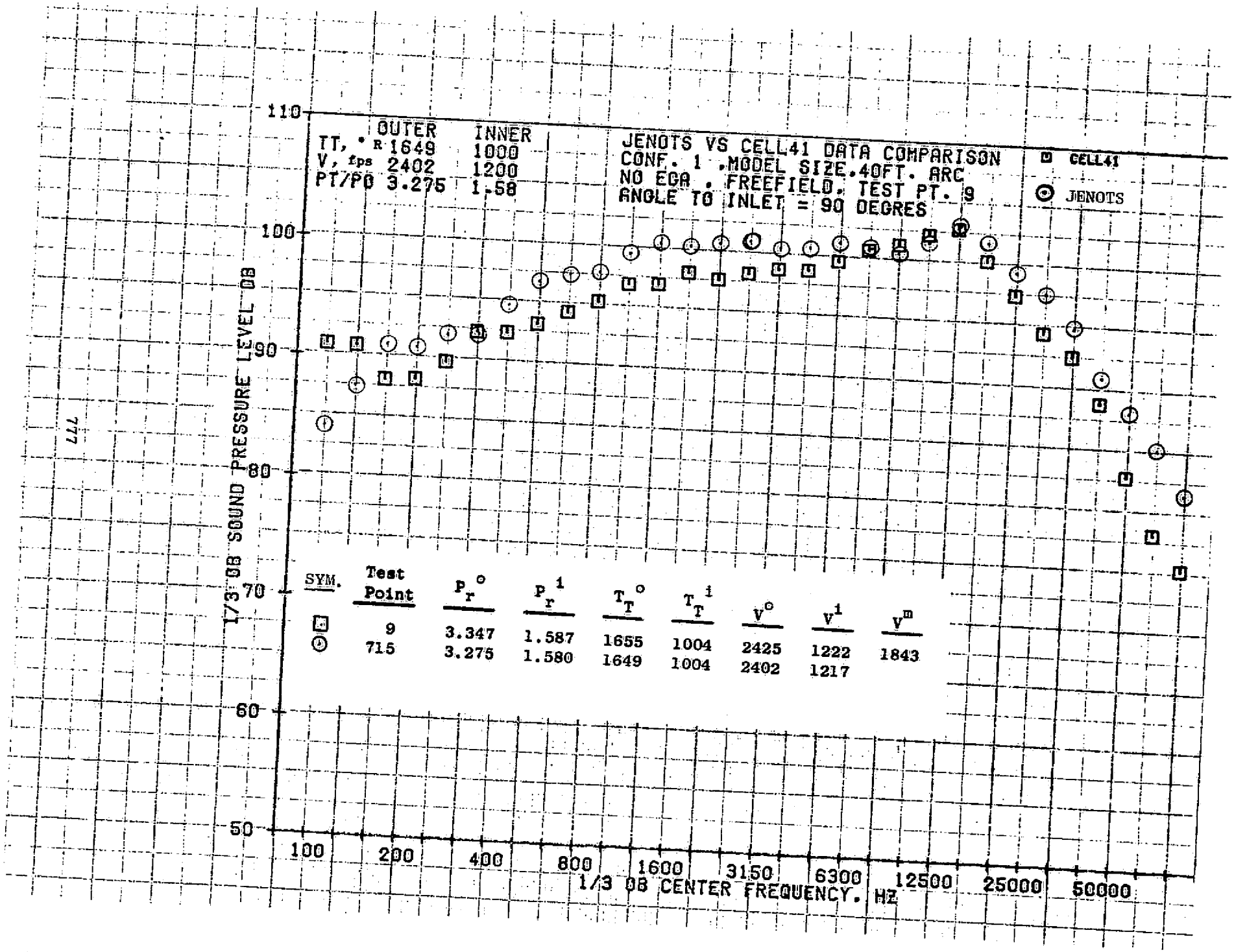
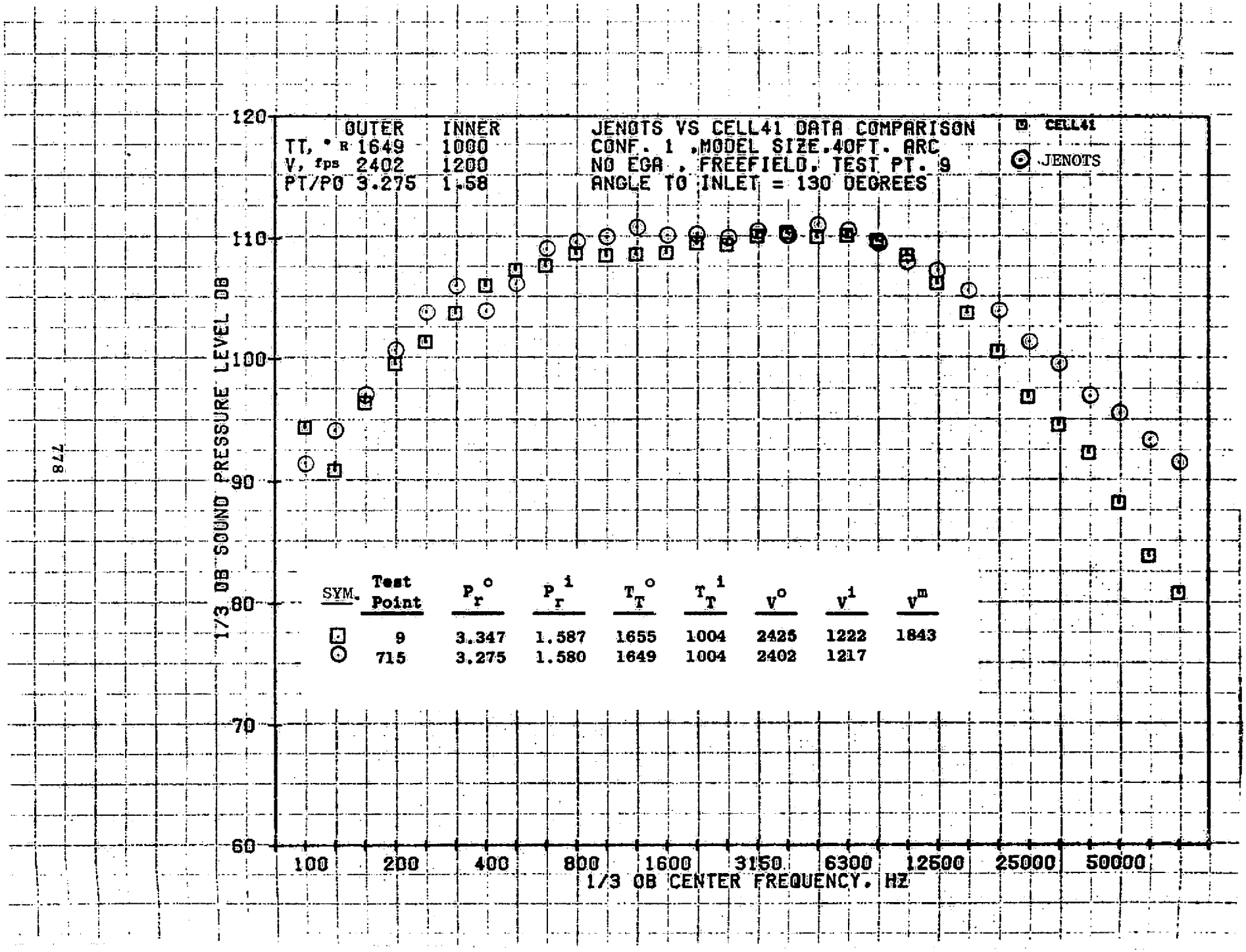
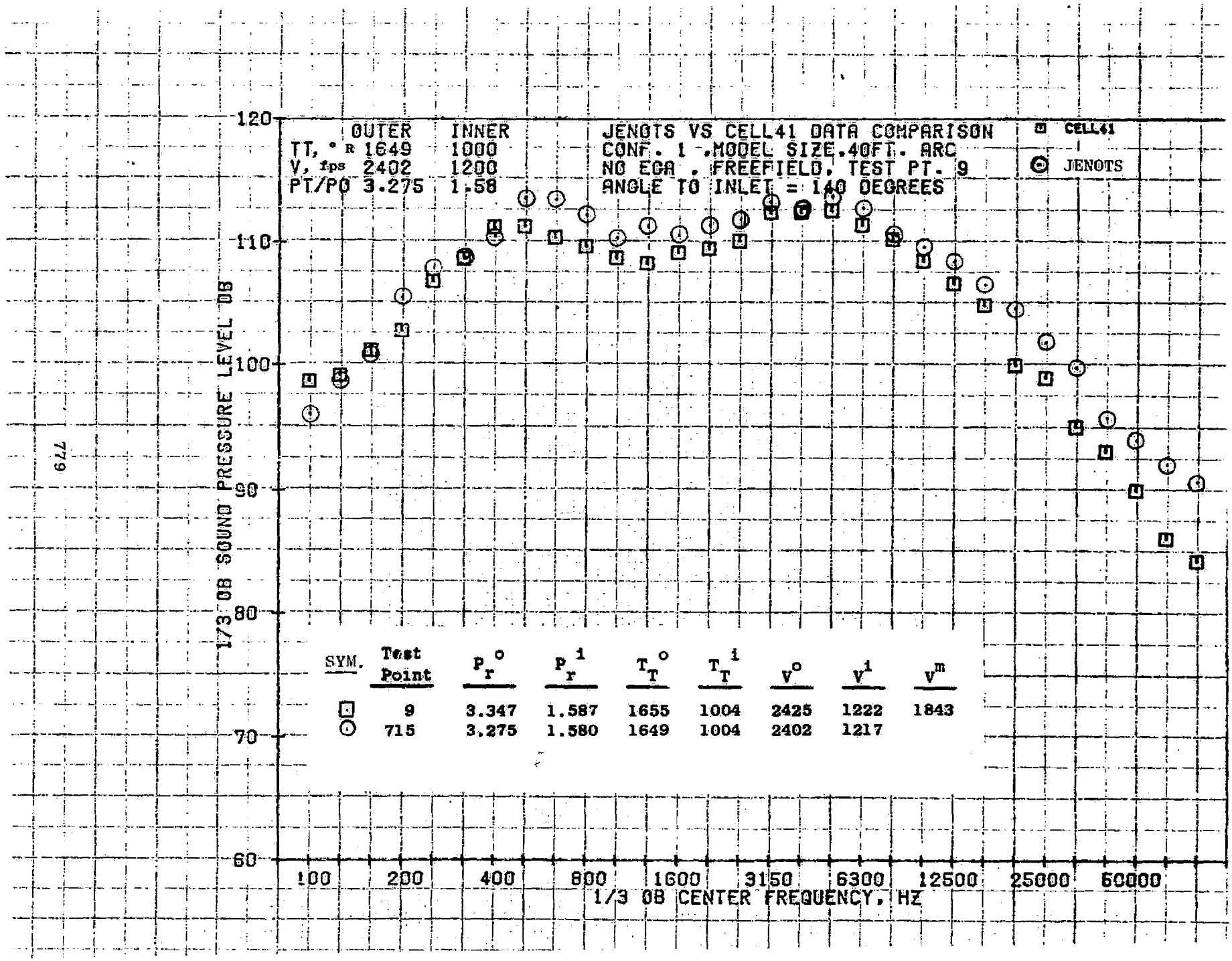

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD, TEST PT. 9
OASPL, DB
CELL41
JENOTS
OUTER INNER
TT, °R 1649 1000
V, fps 2402 1200
PT7P0 3.275 1.58
OASPL, DB
ANGLE TO INLET, DEG.
140
130
120
110
100
90
80
20
40
60
80
100
120
140
160
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
9 3.347 1.587 1655 1004 2425 1222 1843
715 3.275 1.580 1649 1004 2402 1217

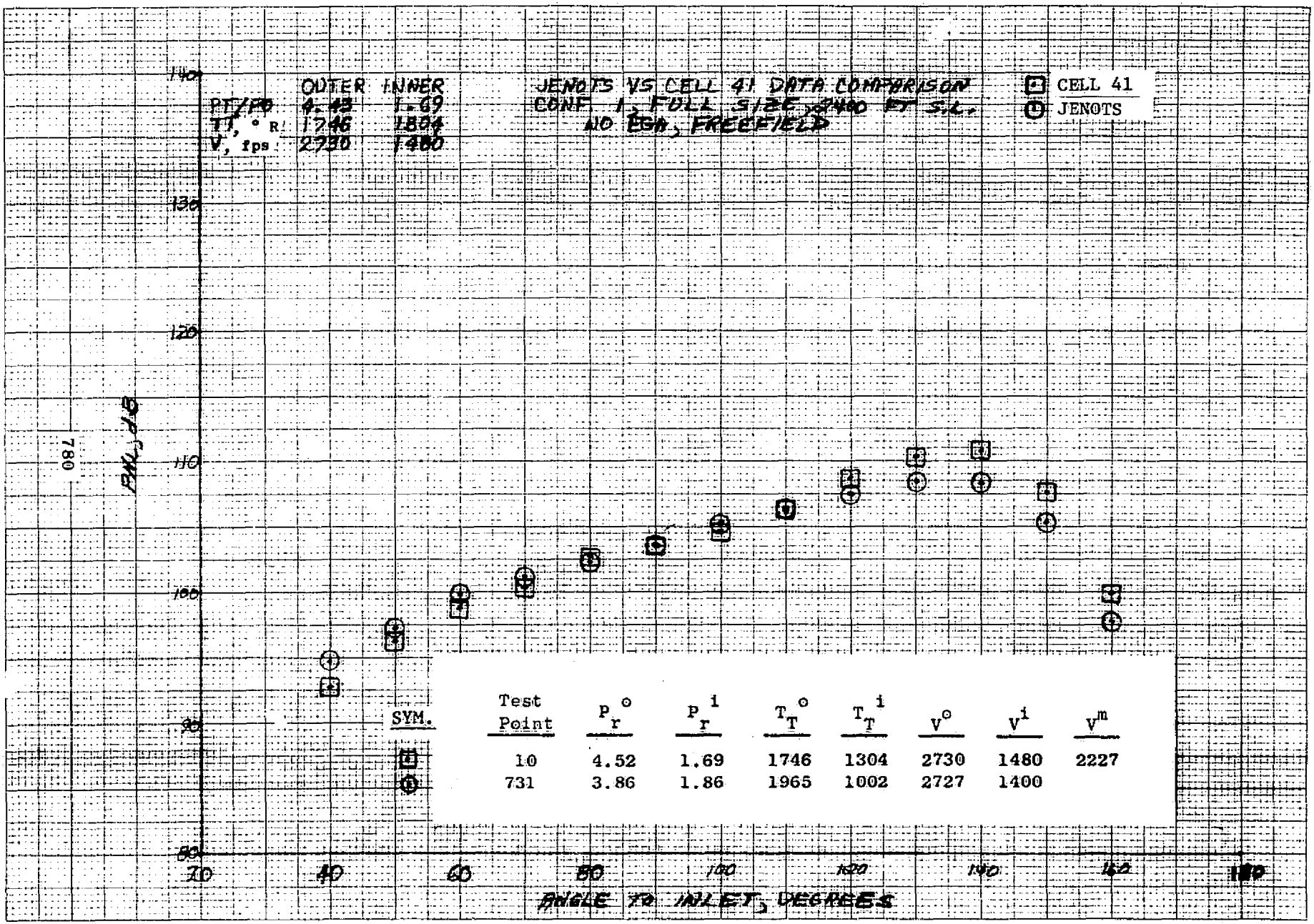

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD. TEST PT. 9
PWL. DB
CELL41
JENOTS
OUTER INNER
TT, °R 1649 1000
V, fps 2402 1200
PT/P0 3.275 1.58
1/3 OCTAVE BAND PWL, DB
160
150
140
130
120
110
100
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
9 3.347 1.587 1655 1004 2425 1222 1843
715 3.275 1.580 1649 1004 2402 1217


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD, TEST PT. 9
ANGLE TO INLET = 50 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1649 1000
V, fps 2402 1200
PT/P0 3.275 1.58
1/3 OB SOUND PRESSURE LEVEL DB
120
110
100
90
80
70
60
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
9 3.347 1.587 1655 1004 2425 1222 1843
715 3.275 1.580 1649 1004 2402 1217


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE.40FT. ARC
NO ECA , FREEFIELD, TEST PT. 9
ANGLE TO INLET = 90 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1649 1000
V, fps 2402 1200
PT/P0 3.275 1.58
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
9 3.347 1.587 1655 1004 2425 1222 1843
715 3.275 1.580 1649 1004 2402 1217
1/3 OB SOUND PRESSURE LEVEL DB
110
100
90
80
70
60
50
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ

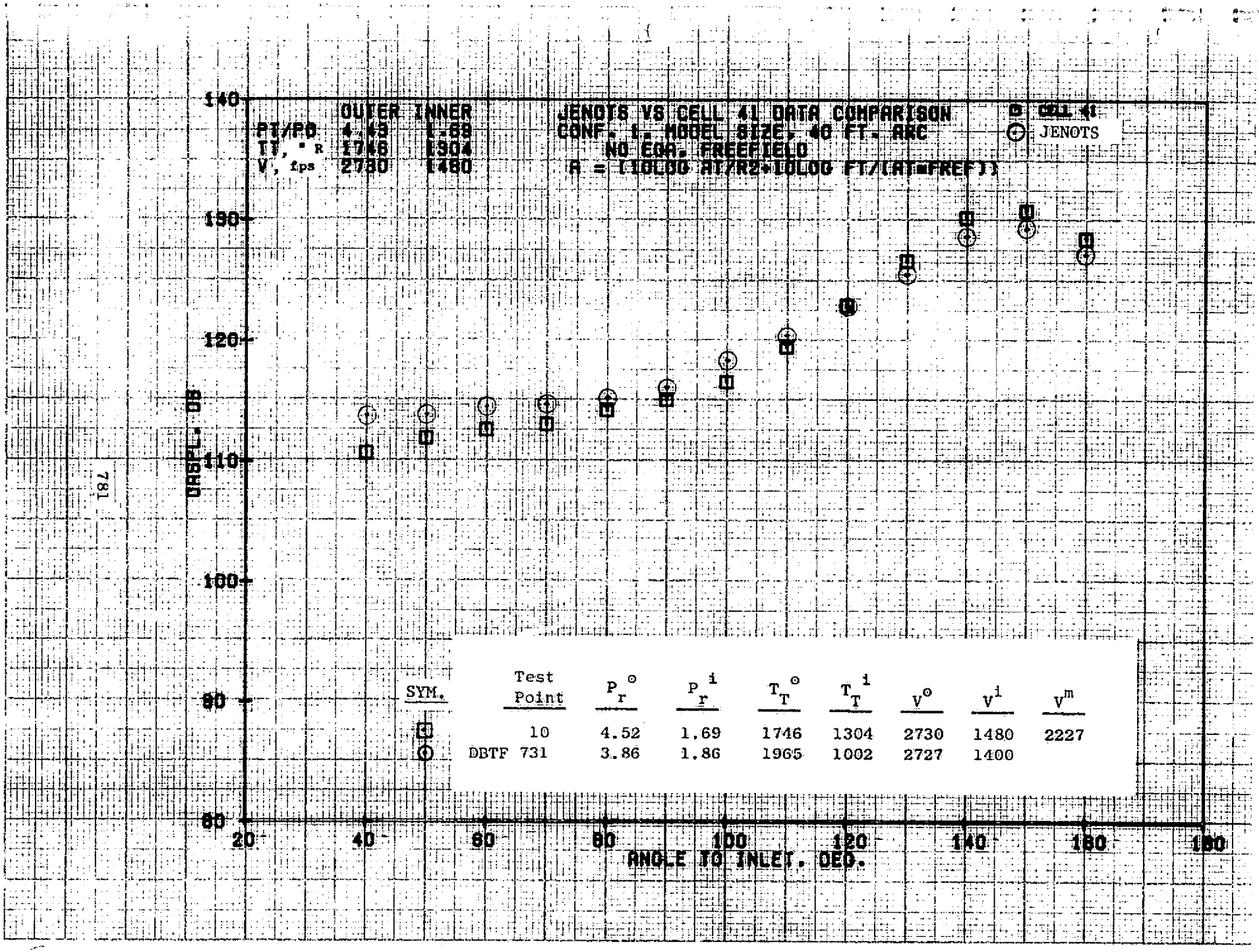

JENOTS VS CELL41 DATA COMPARISON
CONF. 1 ,MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD. TEST PT. 9
ANGLE TO INLET = 130 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1649 1000
V, fps 2402 1200
PT/P0 3.275 1.58
1/3 OB SOUND PRESSURE LEVEL DB
120
110
100
90
80
70
60
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
9 3.347 1.587 1655 1004 2425 1222 1843
715 3.275 1.580 1649 1004 2402 1217
778


JENOTS VS CELL41 DATA COMPARISON
CONF. 1 .MODEL SIZE.40FT. ARC
NO ECA . FREEFIELD. TEST PT. 9
ANGLE TO INLET = 140 DEGREES
CELL41
JENOTS
OUTER INNER
TT, °R 1649 1000
V, fps 2402 1200
PT/PO 3.275 1.58
1/3 OB SOUND PRESSURE LEVEL DB
120
110
100
90
80
70
60
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
9 3.347 1.587 1655 1004 2425 1222 1843
715 3.275 1.580 1649 1004 2402 1217
779



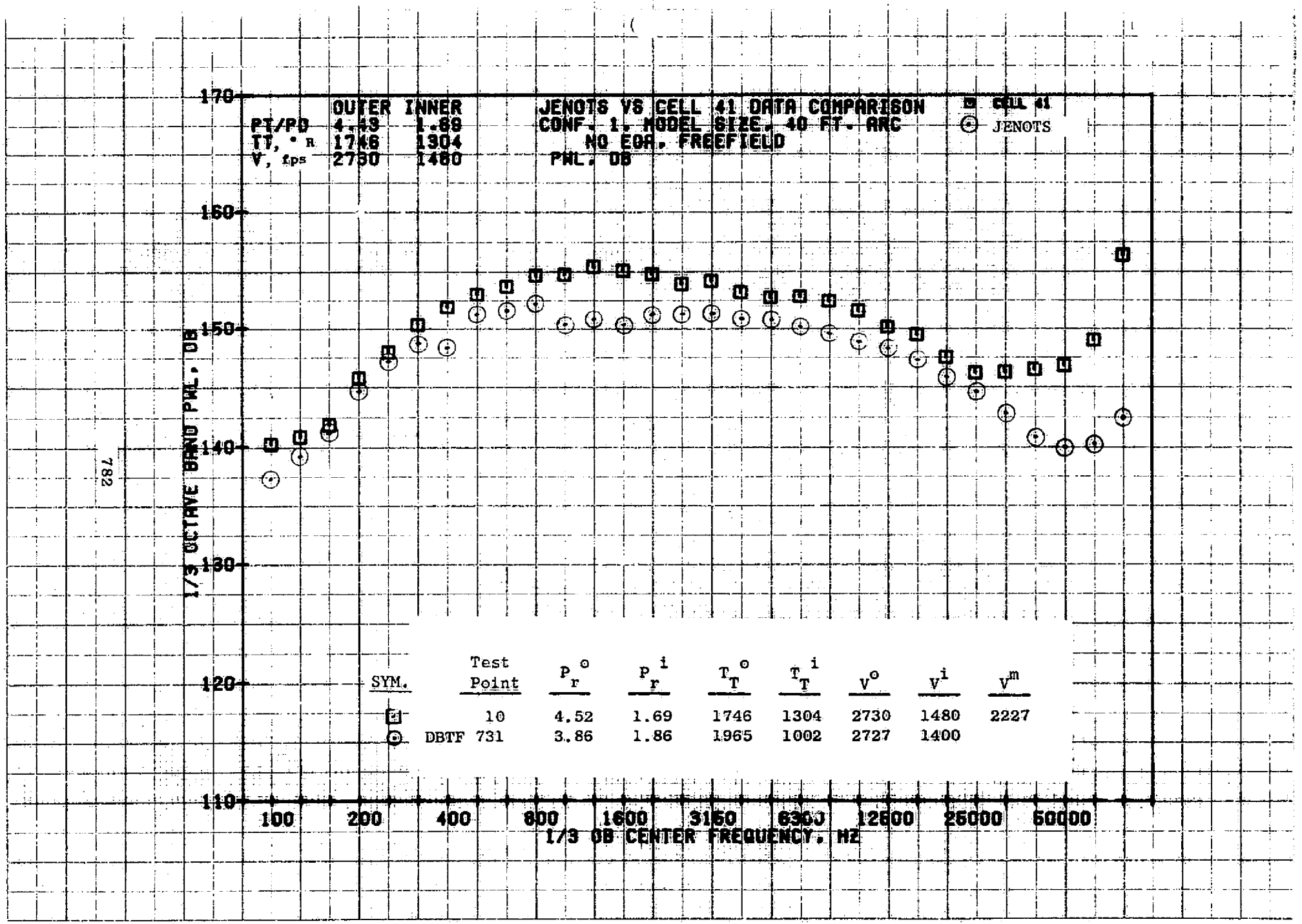
Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
10	4.52	1.69	1746	1304	2730	1480	2227
731	3.86	1.86	1965	1002	2727	1400	

SYM.



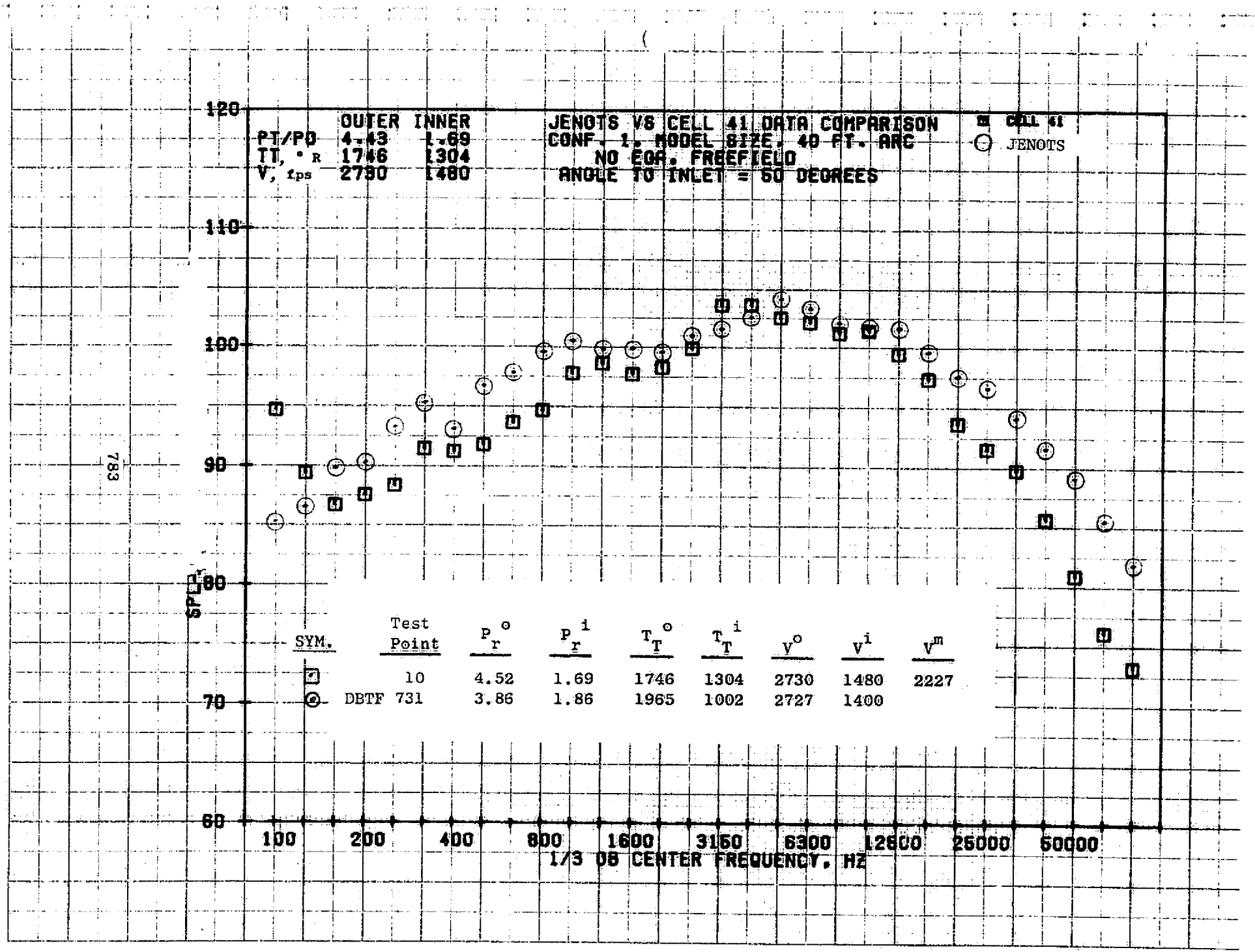
11/09/76
18343-001

79 AUBURN A...



11/01/76
18391-001

79 BURCH A.



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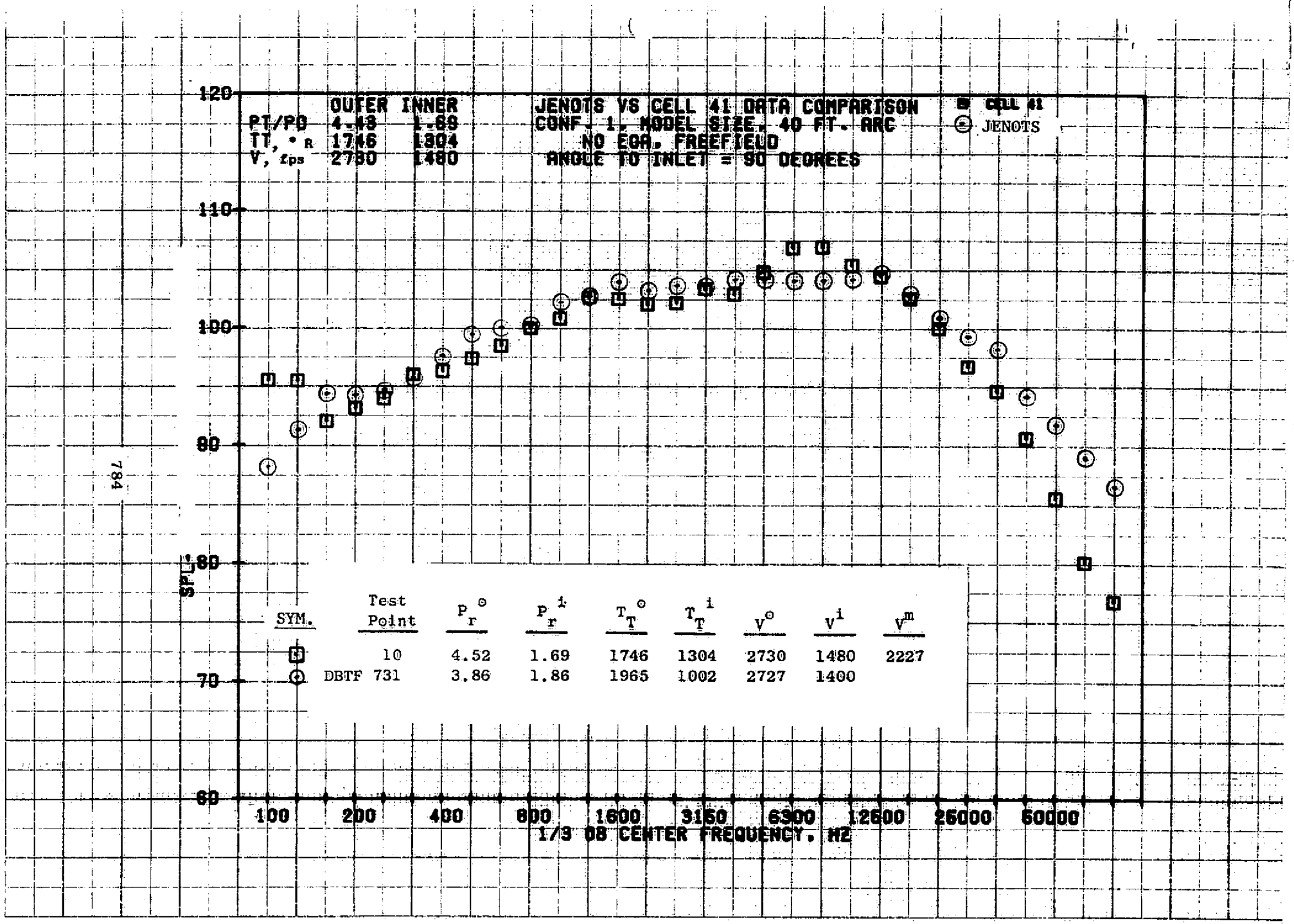
18391-001

79 BURCH A.



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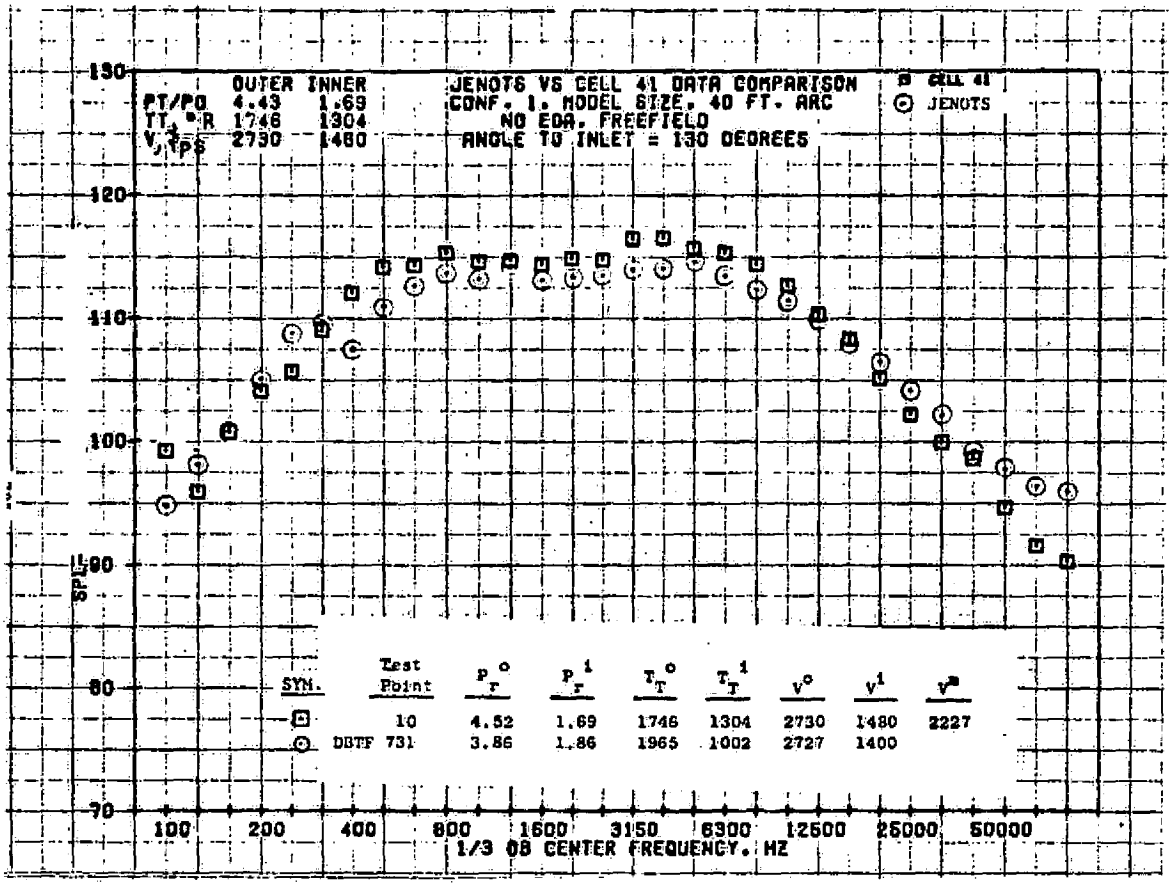
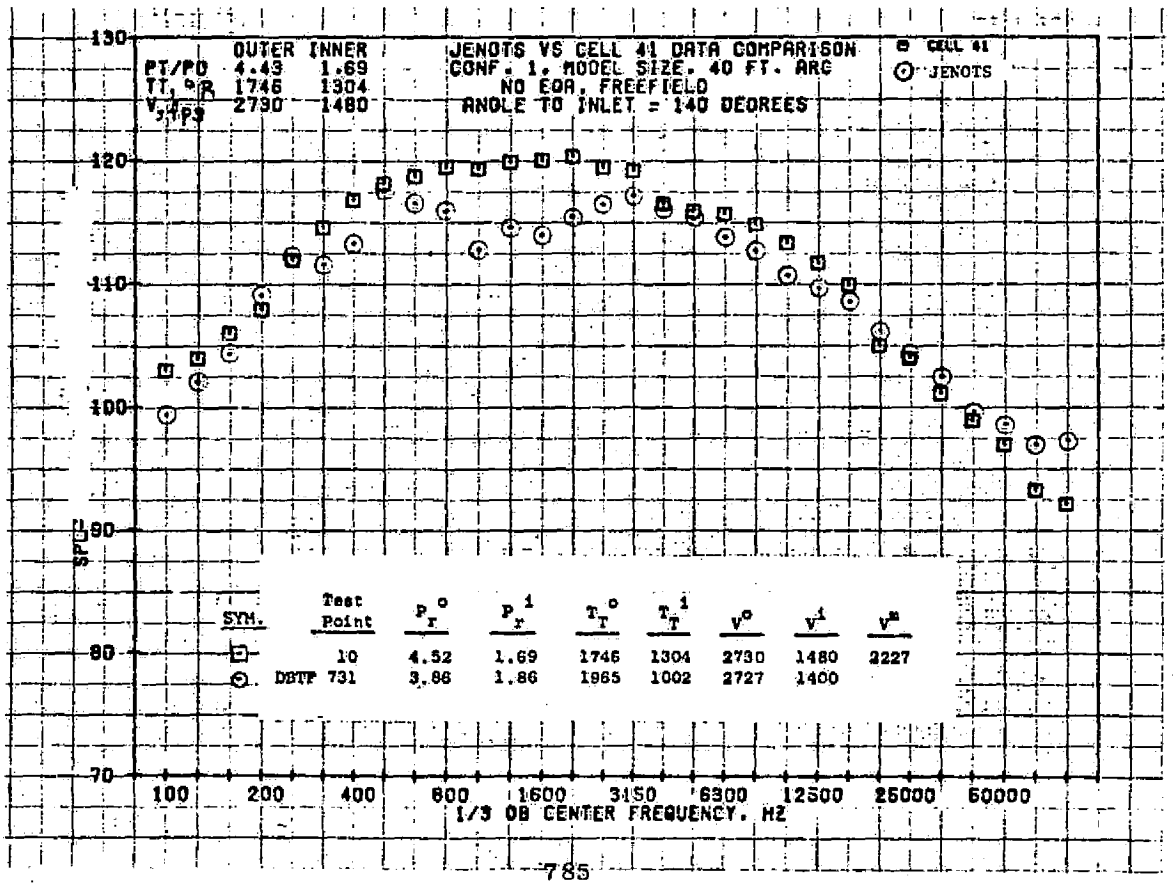
18391-001

79 BURCH A.

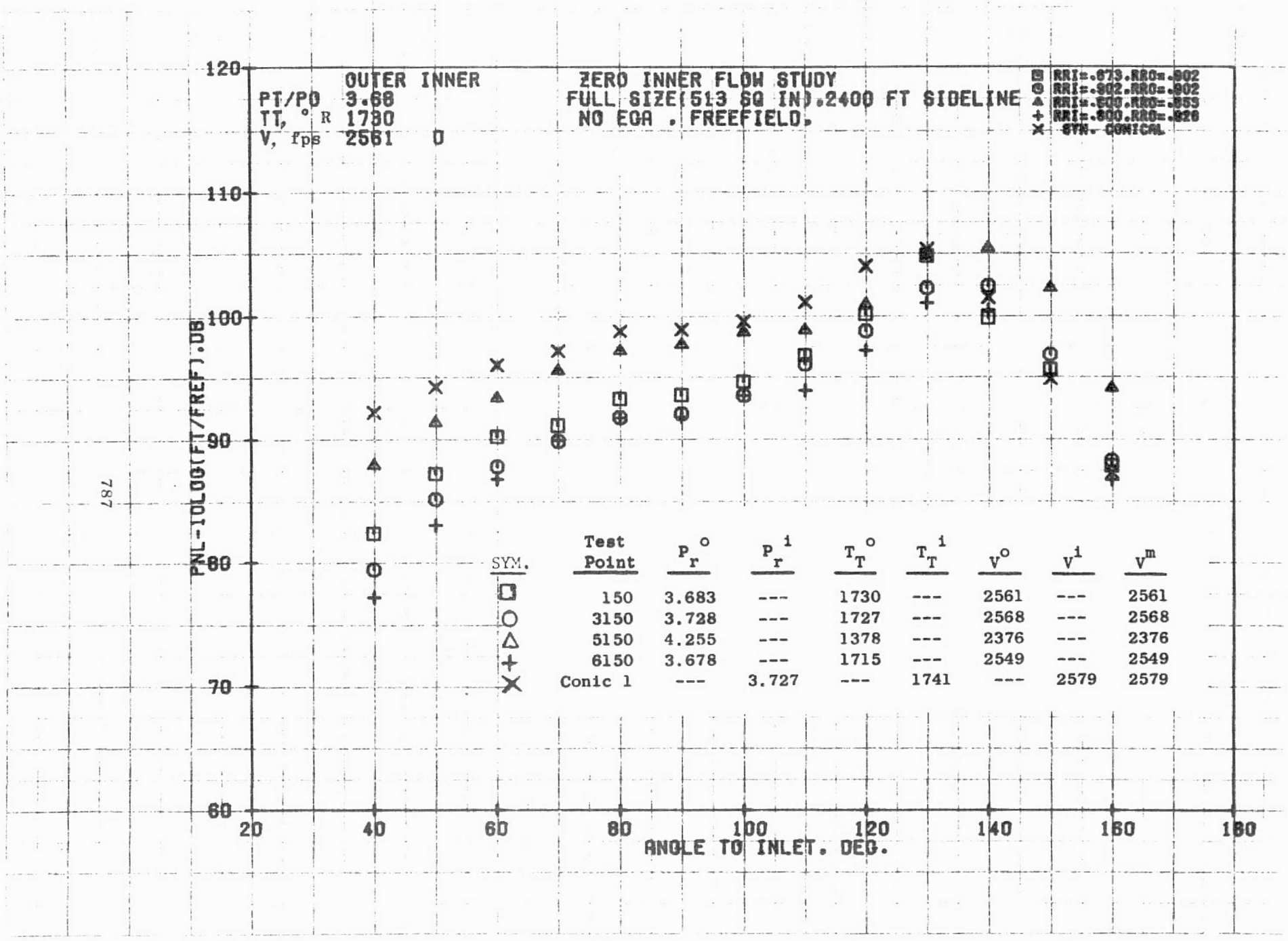

OUTER INNER
PT/PO 4.43 1.69
TT, °R 1746 1304
V, FPS 2730 1480
JENOTS VS CELL 41 DATA COMPARISON
CONF. 1, MODEL SIZE, 40 FT. ARC
NO EDA, FREEFIELD
ANGLE TO INLET = 130 DEGREES
CELL 41
JENOTS
SPL
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^a
10 4.52 1.69 1746 1304 2730 1480 2227
DBTF 731 3.86 1.86 1965 1002 2727 1400
130
120
110
100
90
80
70
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ


OUTER INNER
PT/PO 4.43 1.69
TT, °R 1746 1304
V, FPS 2730 1480
JENOTS VS CELL 41 DATA COMPARISON
CONF. 1, MODEL SIZE, 40 FT. ARC
NO EDA, FREEFIELD
ANGLE TO INLET = 140 DEGREES
CELL 41
JENOTS
SPL
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^a
10 4.52 1.69 1746 1304 2730 1480 2227
DBTF 731 3.86 1.86 1965 1002 2727 1400
130
120
110
100
90
80
70
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ

7.3 COMPARISON OF DATA FOR IVP NOZZLES WITH LOW AMOUNTS OF INNER FLOW

7.3.1 Zero Inner Flow Study

For configurations 1, 3, 5, and 6, acoustic measurements were made with no inner flow. For configurations 1 and 3 the outer radius ratio was 0.902 while for configurations 5 and 6, it was 0.853 and 0.926, respectively. The effect of the outer radius ratio on noise levels with zero inner flow is demonstrated in the following plots.



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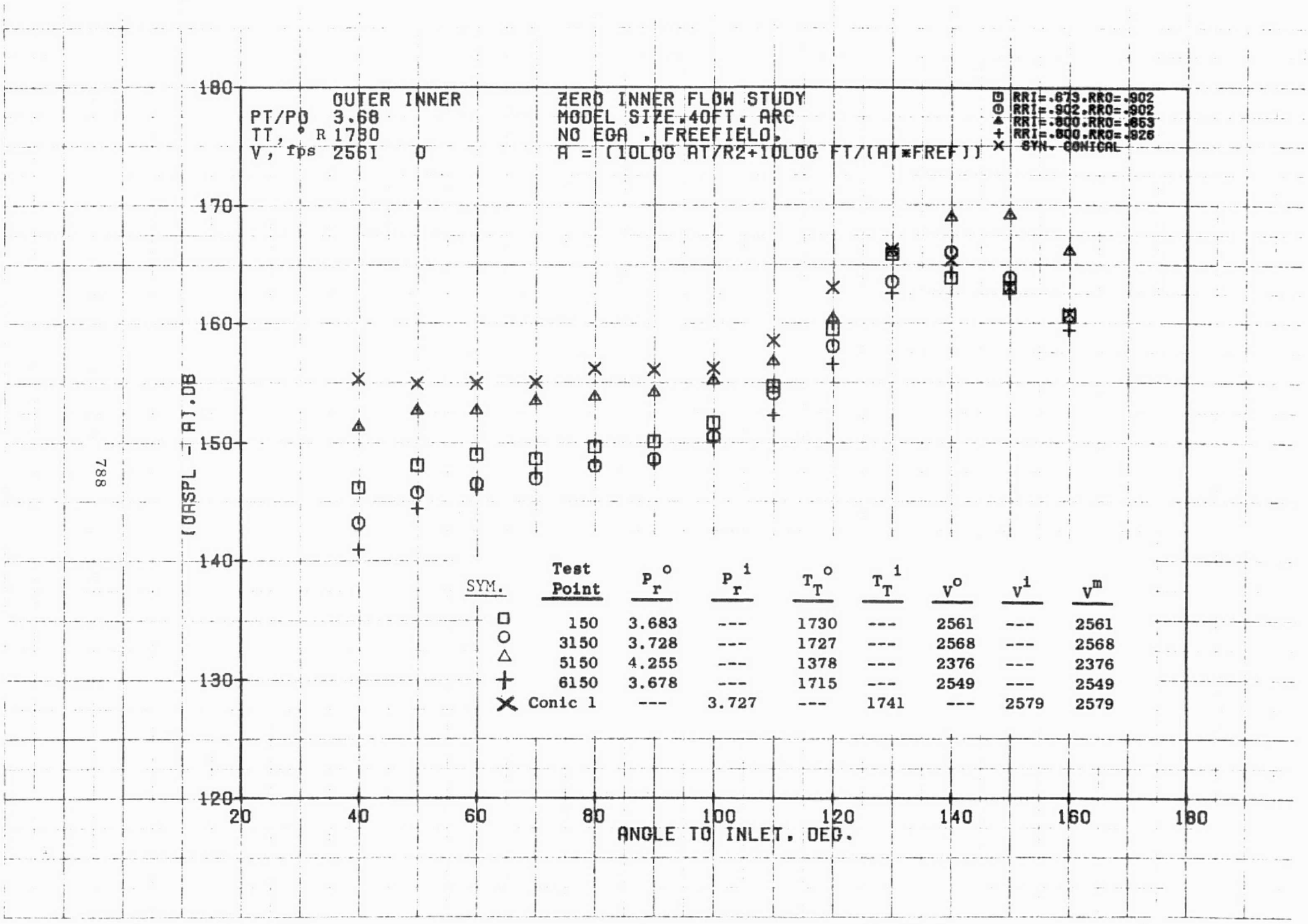
73KOLLSTEDT



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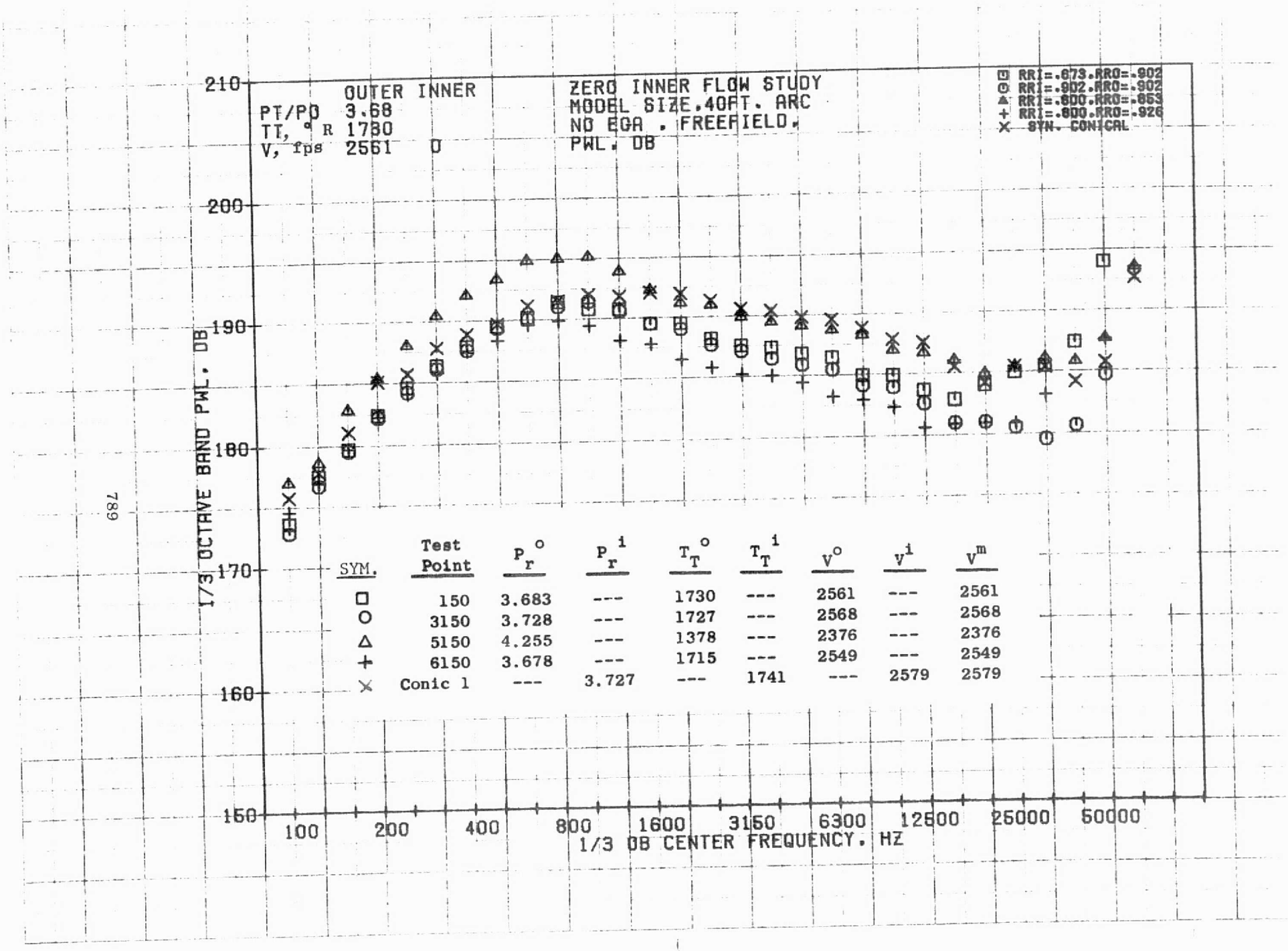
1X409-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	150	3.683	---	1730	---	2561	---	2561
○	3150	3.728	---	1727	---	2568	---	2568
△	5150	4.255	---	1378	---	2376	---	2376
+	6150	3.678	---	1715	---	2549	---	2549
×	Conic 1	---	3.727	---	1741	---	2579	2579

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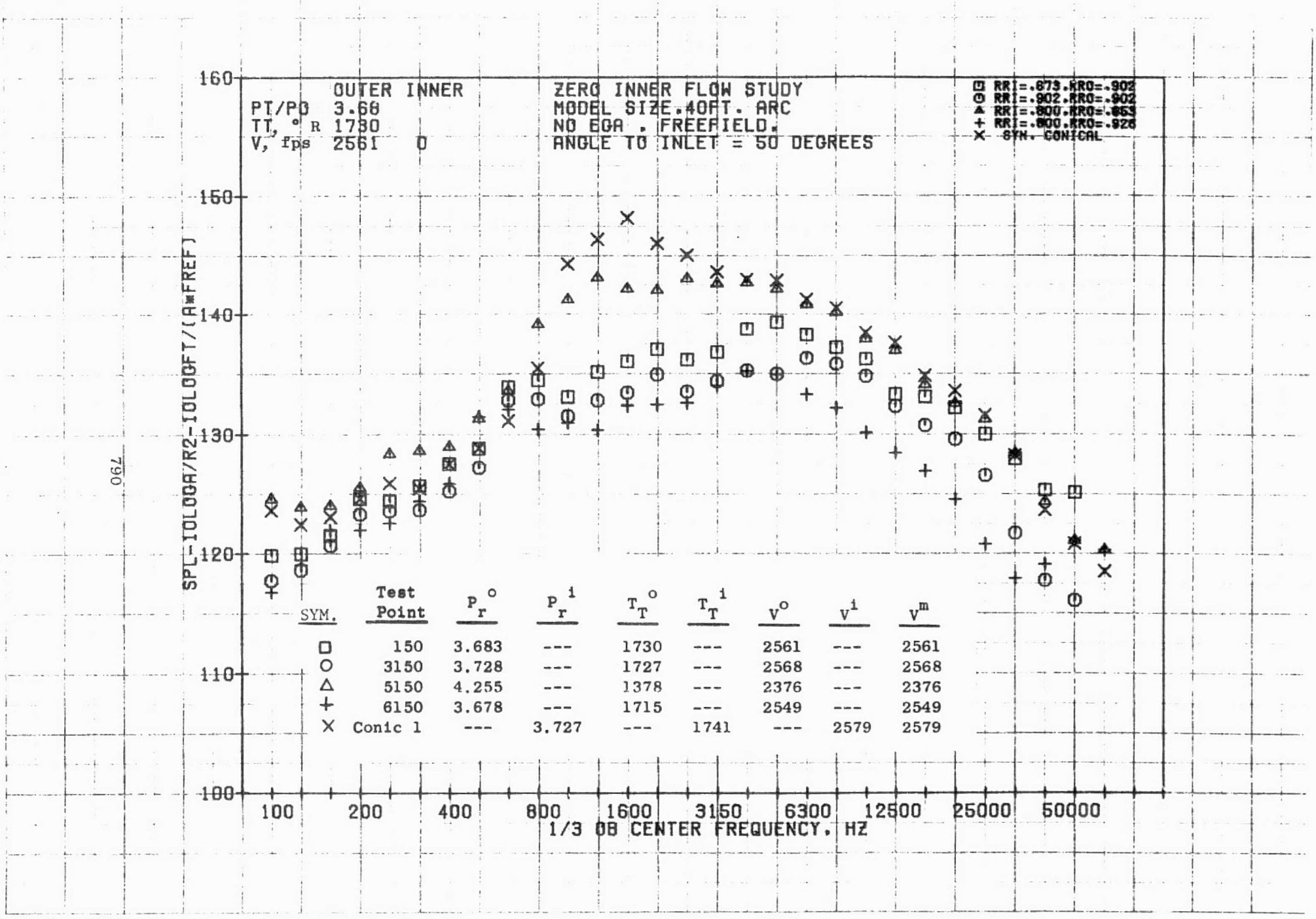
1X409-001

73KOLLSTEDT



790

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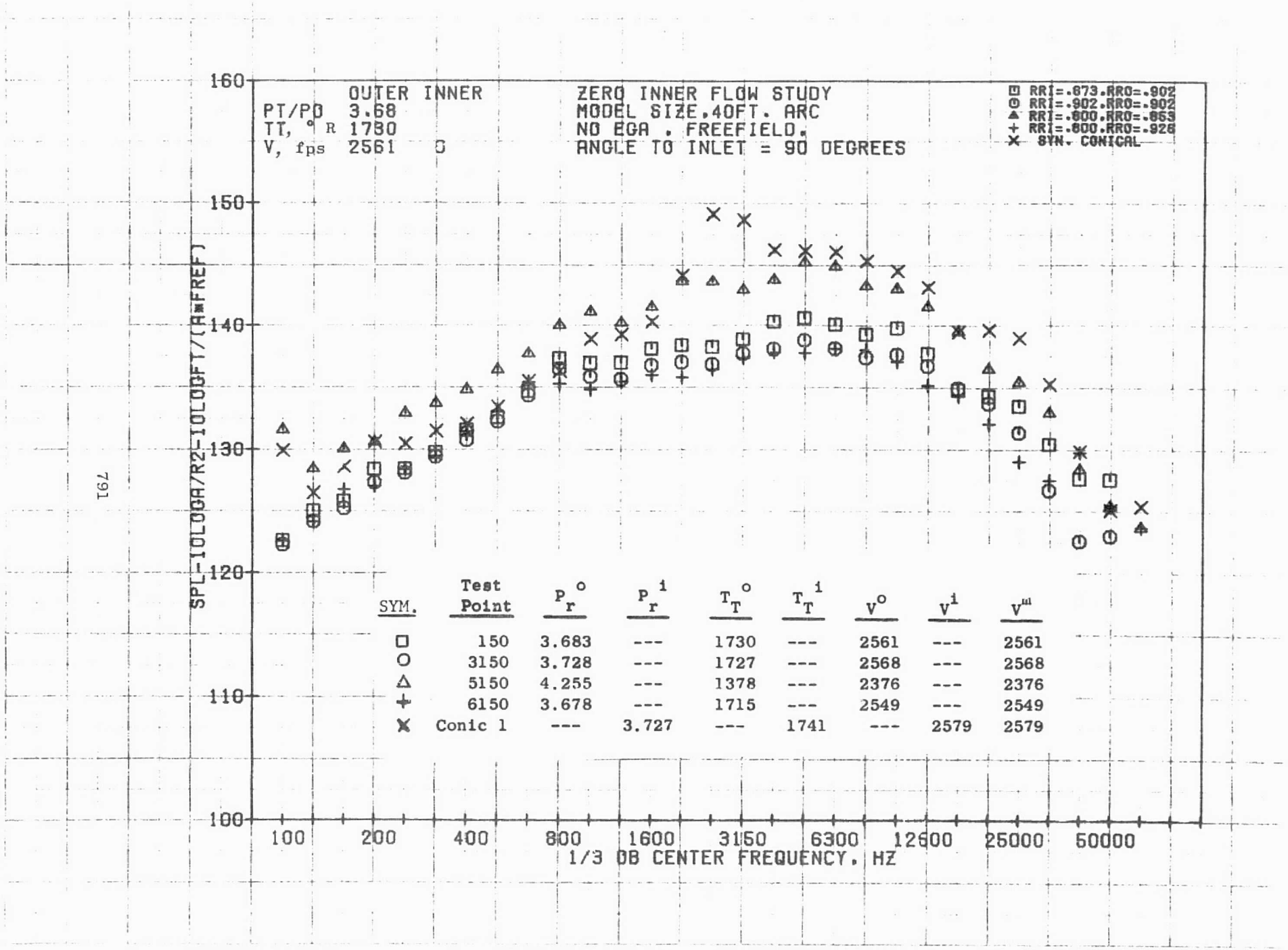
1X409-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	150	3.683	---	1730	---	2561	---	2561
○	3150	3.728	---	1727	---	2568	---	2568
△	5150	4.255	---	1378	---	2376	---	2376
+	6150	3.678	---	1715	---	2549	---	2549
×	Conic 1	---	3.727	---	1741	---	2579	2579

791

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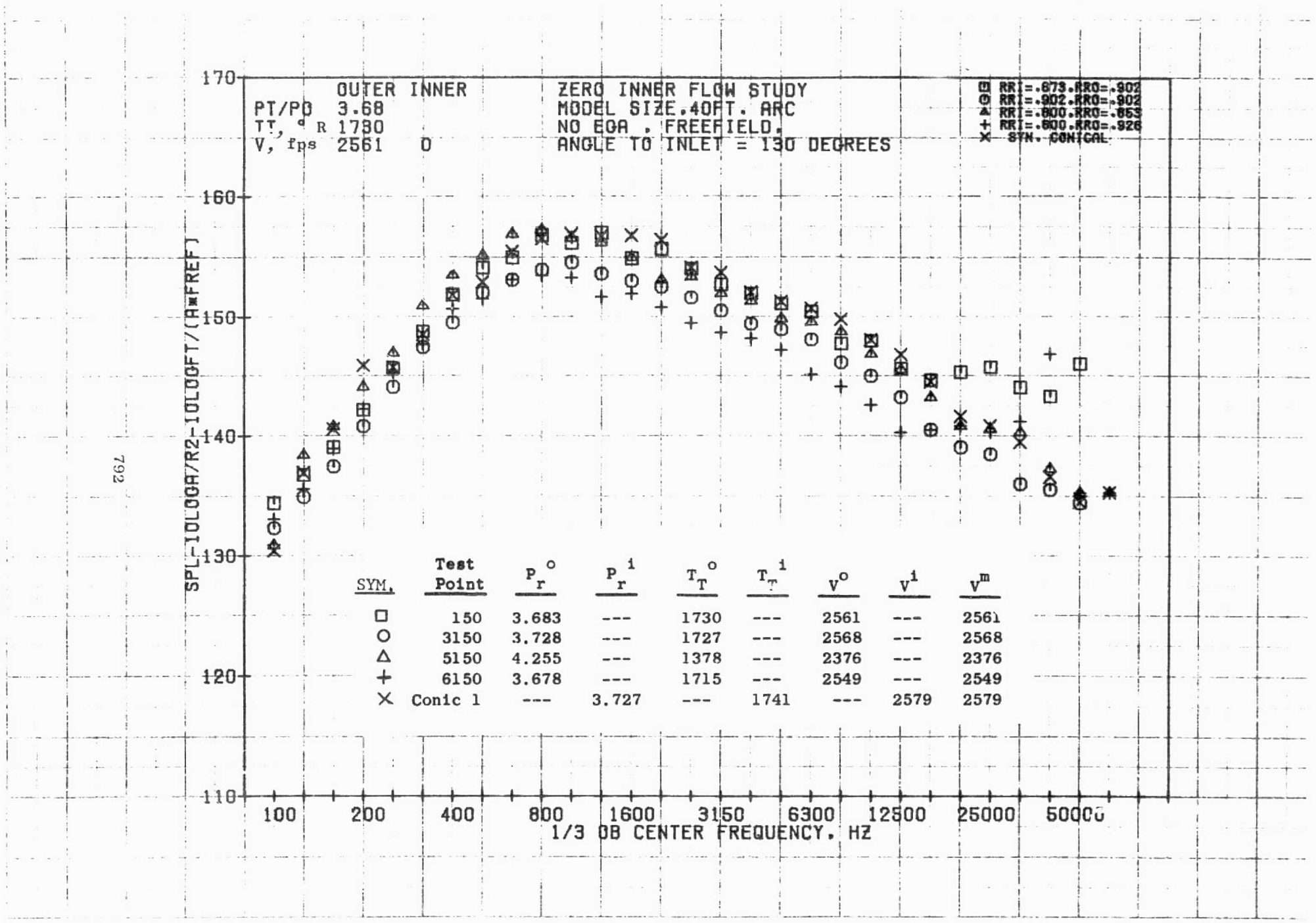
1X409-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	150	3.683	---	1730	---	2561	---	2561
○	3150	3.728	---	1727	---	2568	---	2568
△	5150	4.255	---	1378	---	2376	---	2376
+	6150	3.678	---	1715	---	2549	---	2549
×	Conic 1	---	3.727	---	1741	---	2579	2579

792

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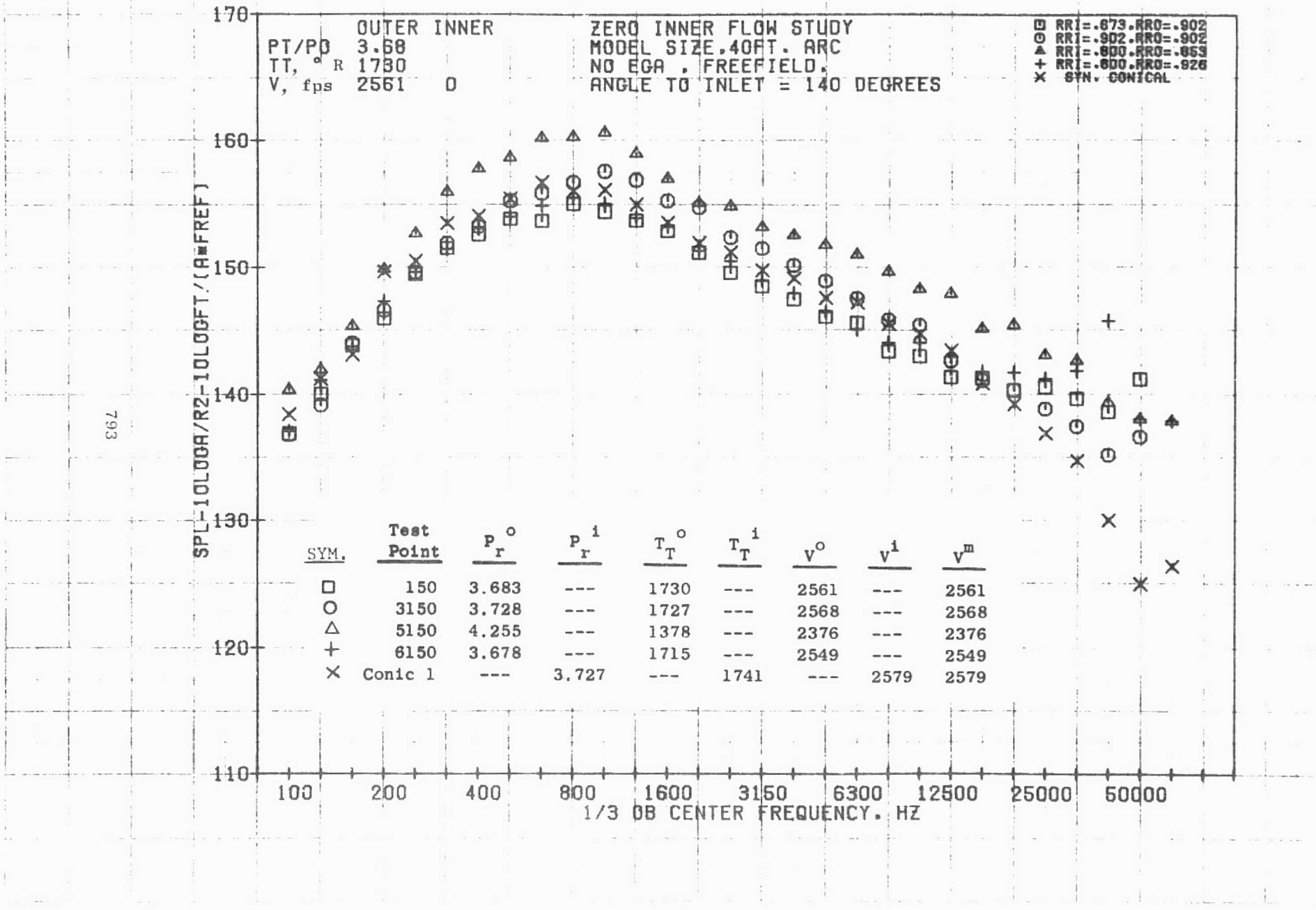
1X409-001

73KOLLSTEDT



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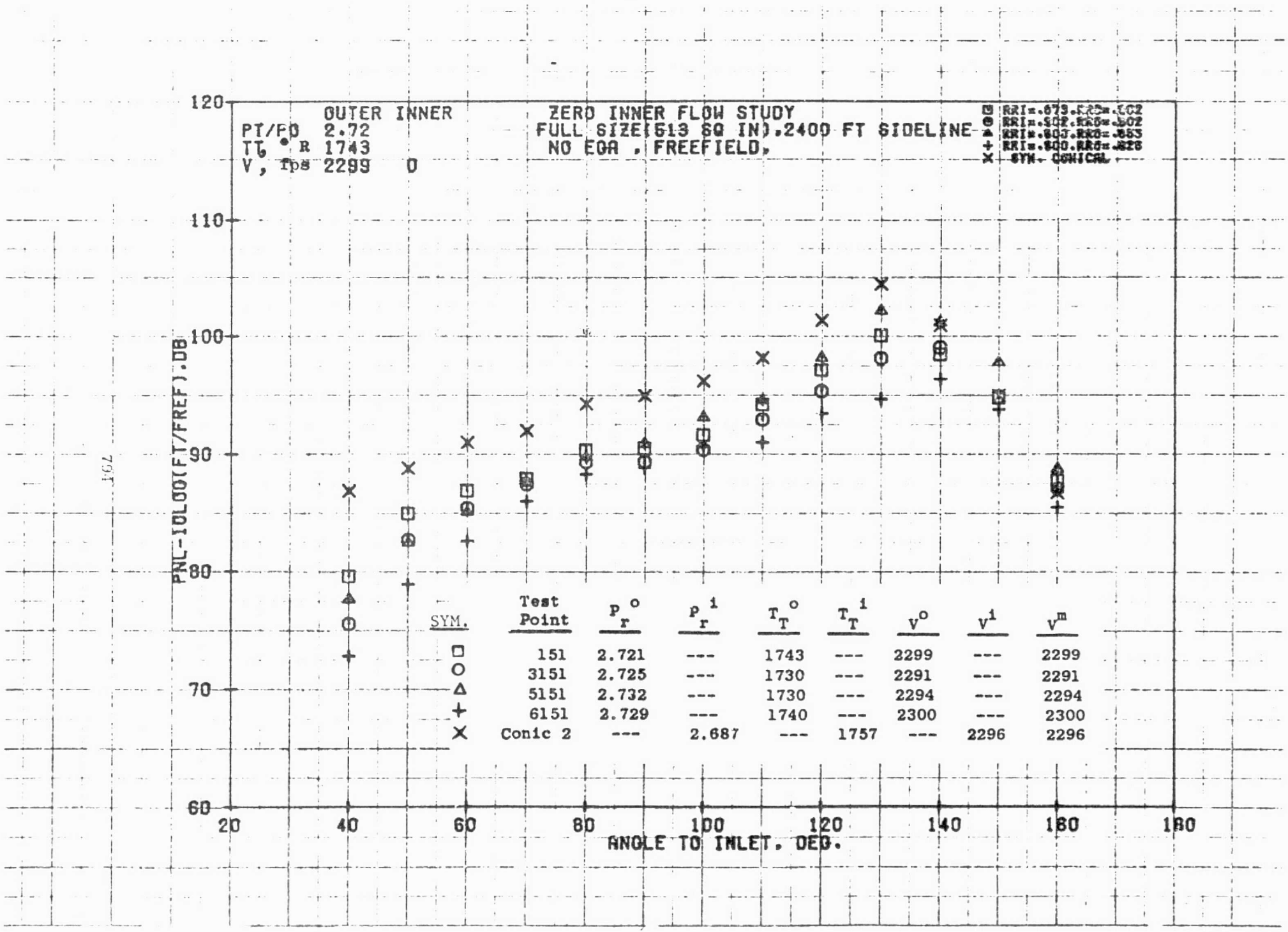
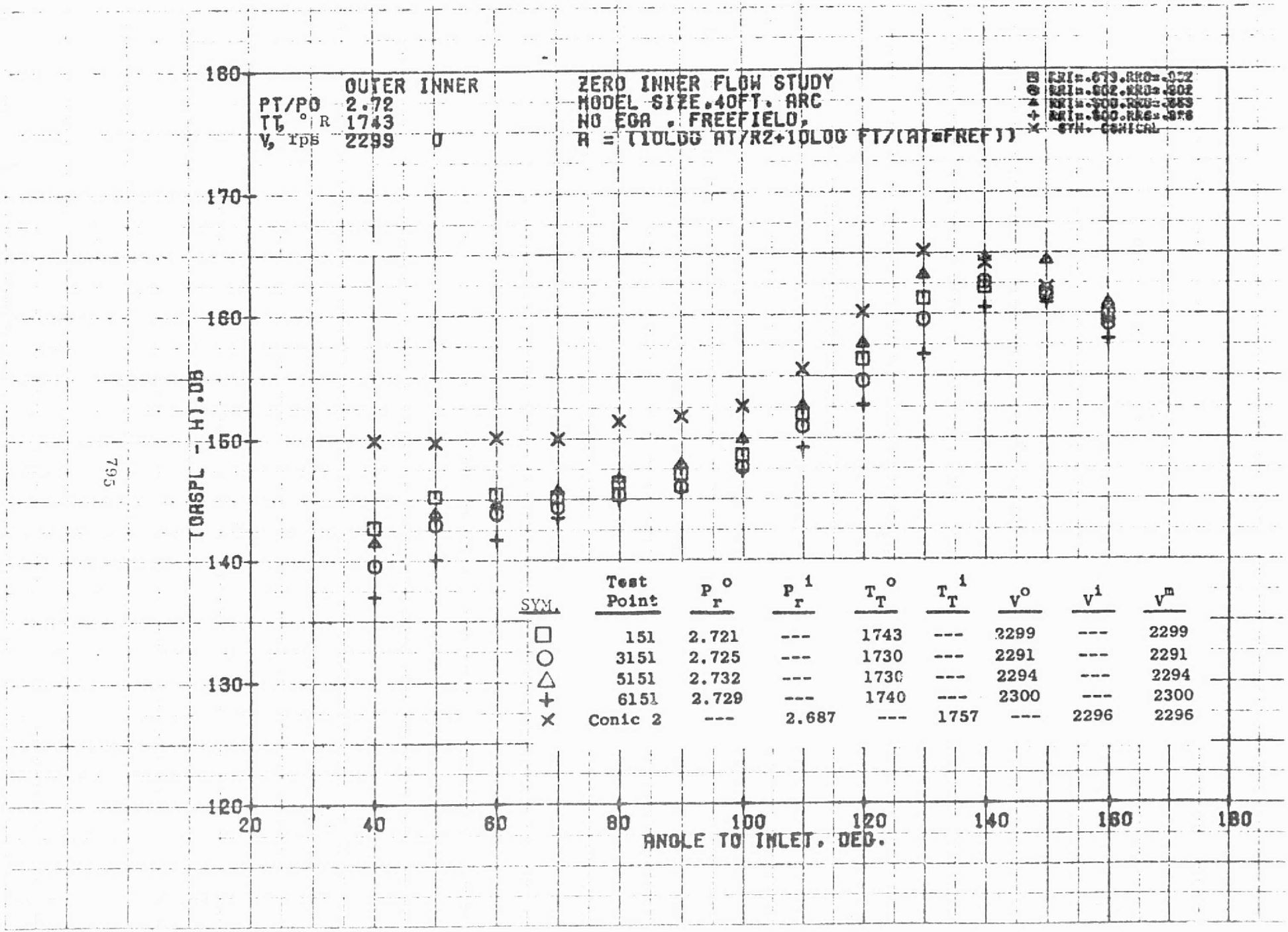
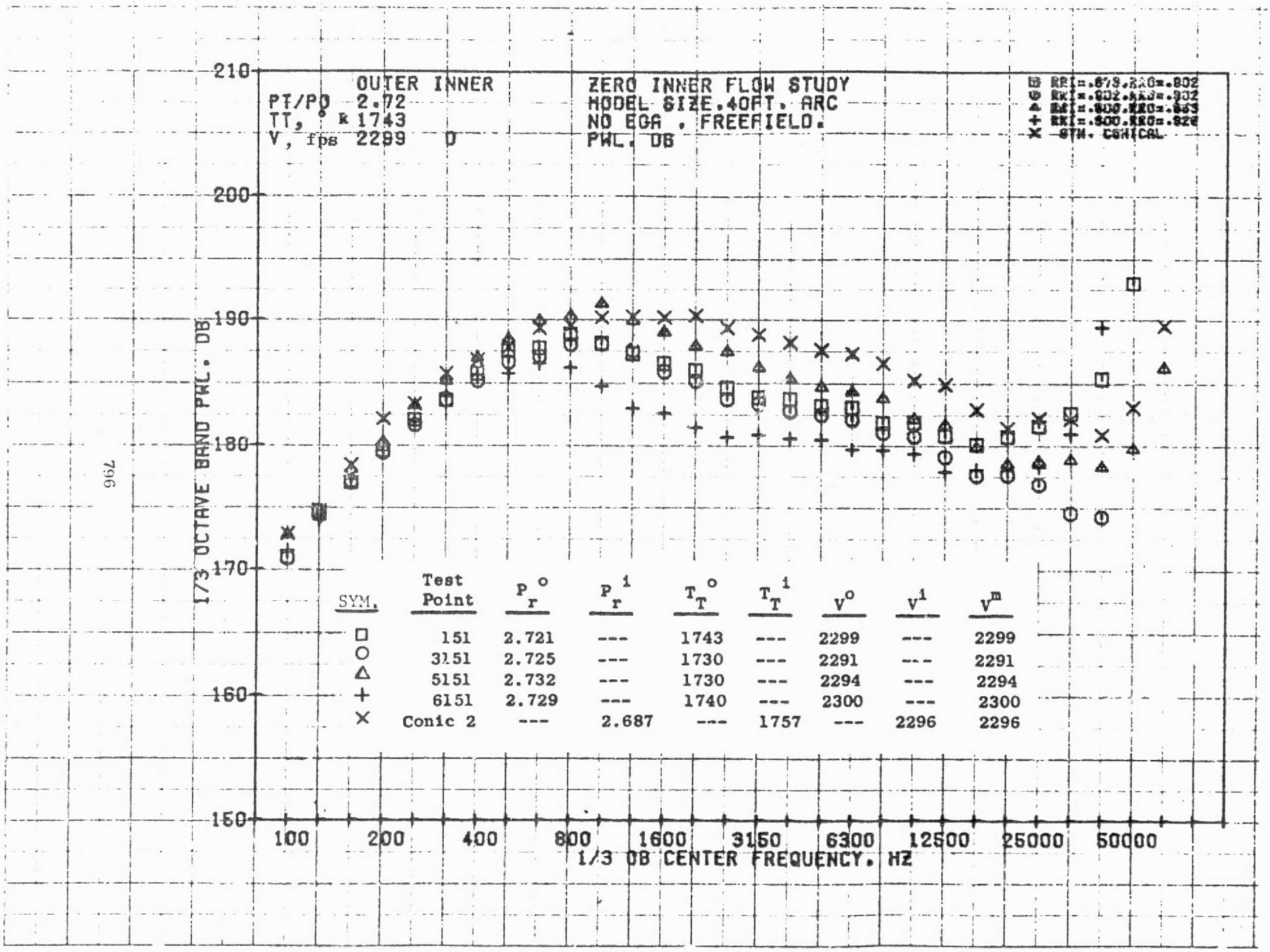
1X409-001

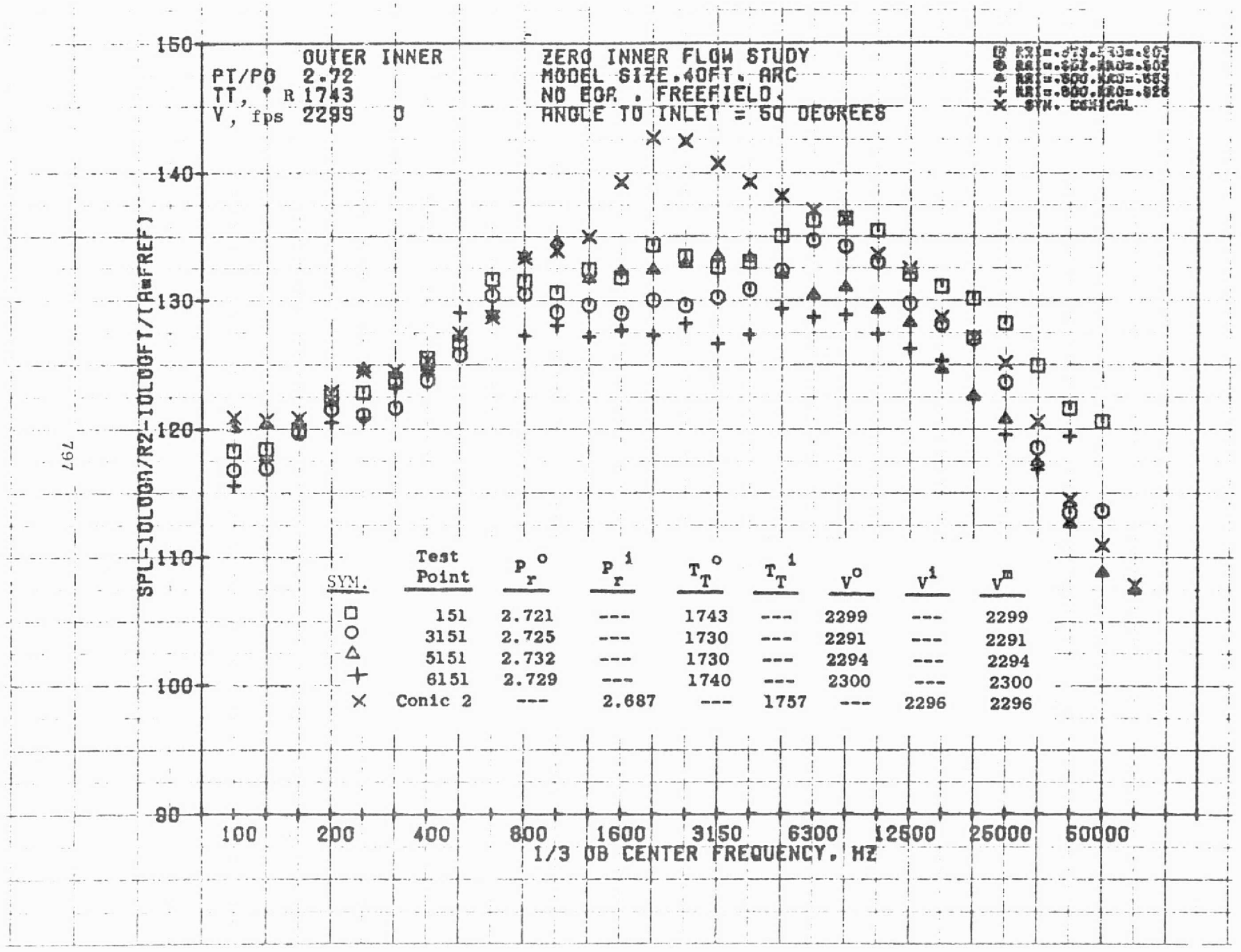
73KOLLSTEDT


OUTER INNER
PT/PD 2.72
Tt, °R 1743
V, fps 2299 0
ZERO INNER FLOW STUDY
FULL SIZE(613 SQ IN).2400 FT SIDELINE
NO EGA , FREEFIELD.
SYM. CONICAL
PNL-TOLOD(FT/FREF).DB
120
110
100
90
80
70
60
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
3151 2.725 --- 1730 --- 2291 --- 2291
5151 2.732 --- 1730 --- 2294 --- 2294
6151 2.729 --- 1740 --- 2300 --- 2300
Conic 2 --- 2.687 --- 1757 --- 2296 2296

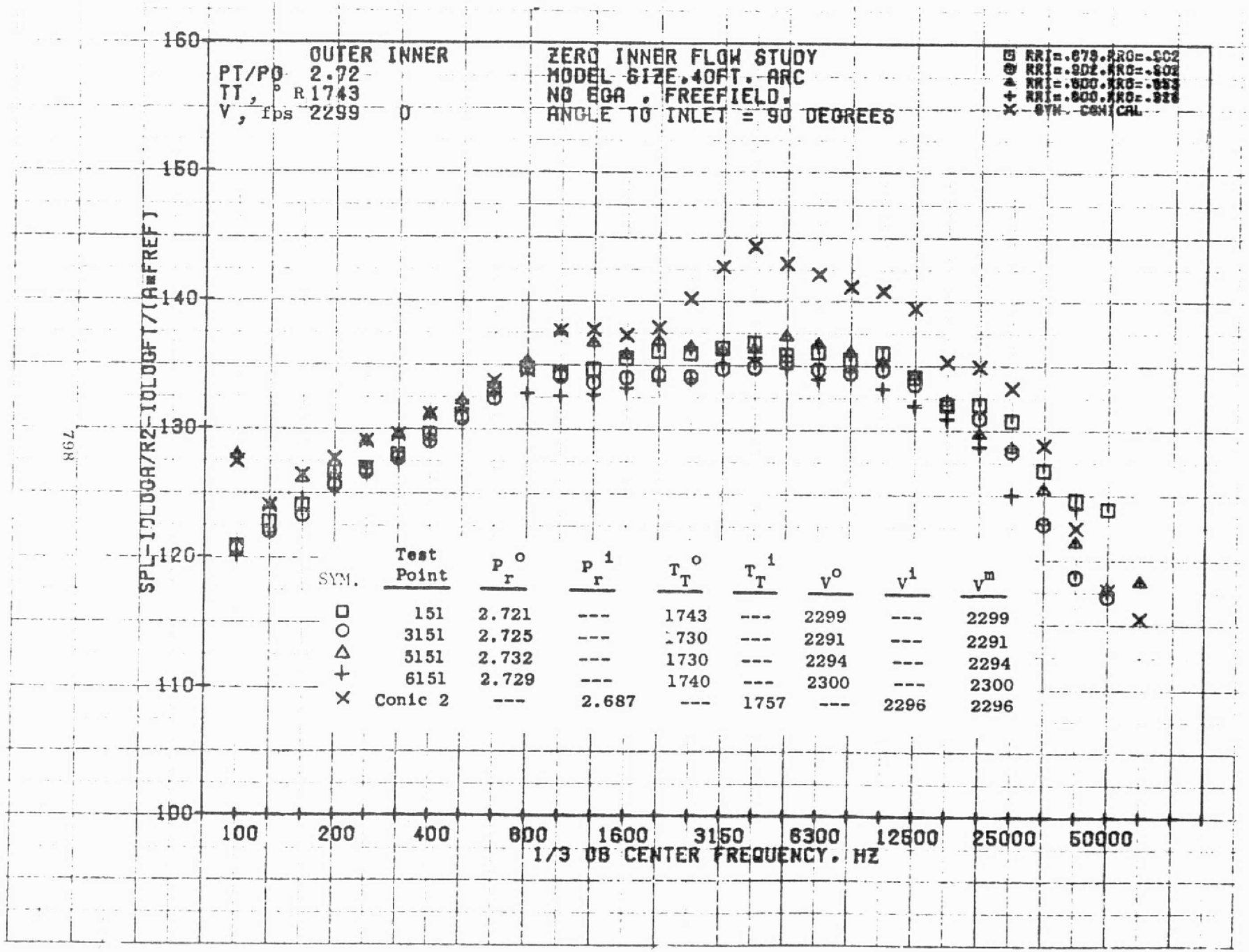

OUTER INNER
PT/P0 2.72
TT, °R 1743
V, rps 2299 0
ZERO INNER FLOW STUDY
MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD,
R = (10LOG AT/R2+10LOG FT/(AT=FREF))
160
170
160
150
140
130
120
TOASPL - HT.DB
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM.
Test Point
P_r^o
P_r^i
T_T^o
T_T^i
V^o
V^i
V^m
151 2.721 --- 1743 --- 2299 --- 2299
3151 2.725 --- 1730 --- 2291 --- 2291
5151 2.732 --- 1730 --- 2294 --- 2294
6151 2.729 --- 1740 --- 2300 --- 2300
Conic 2 --- 2.687 --- 1757 --- 2296 2296

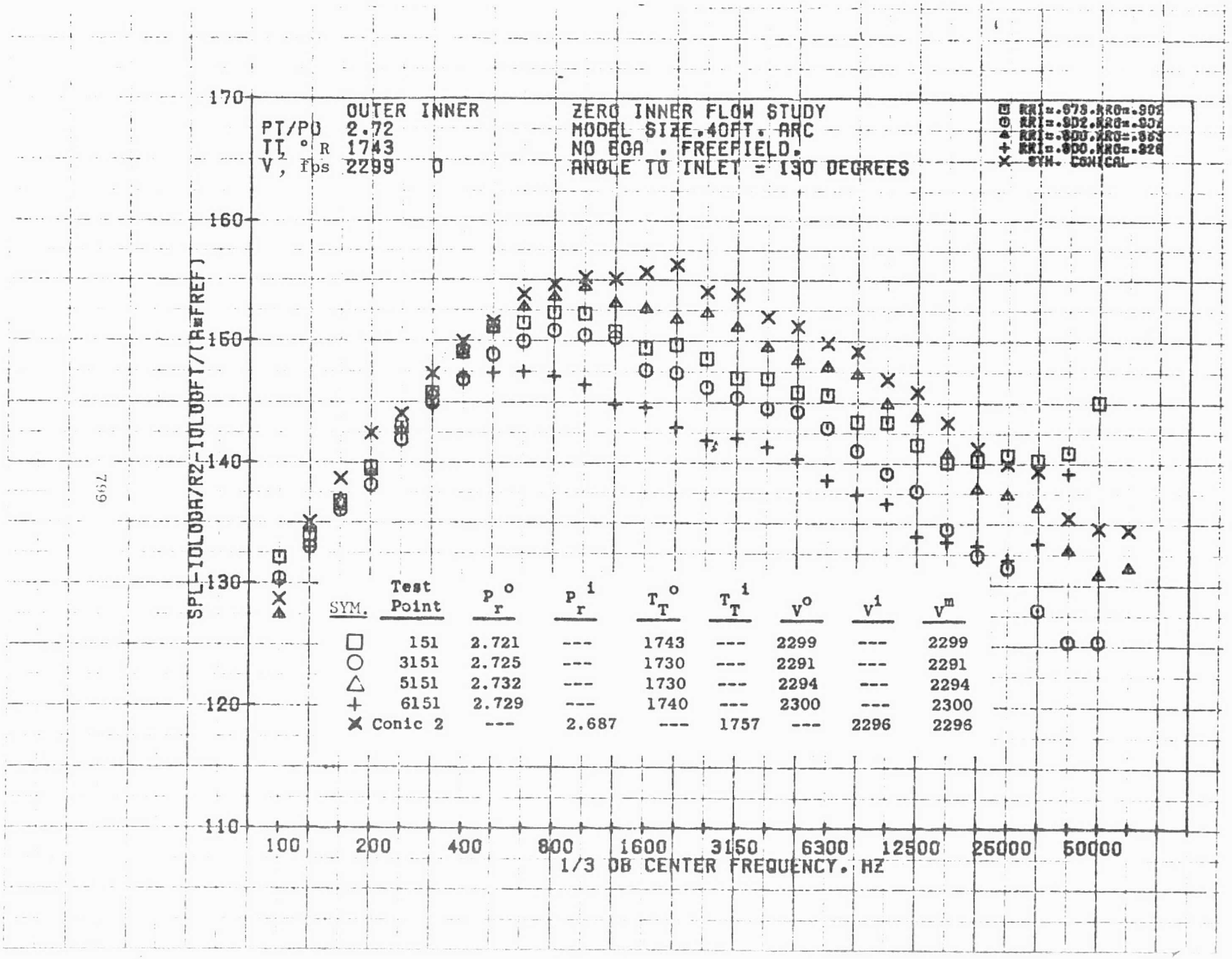


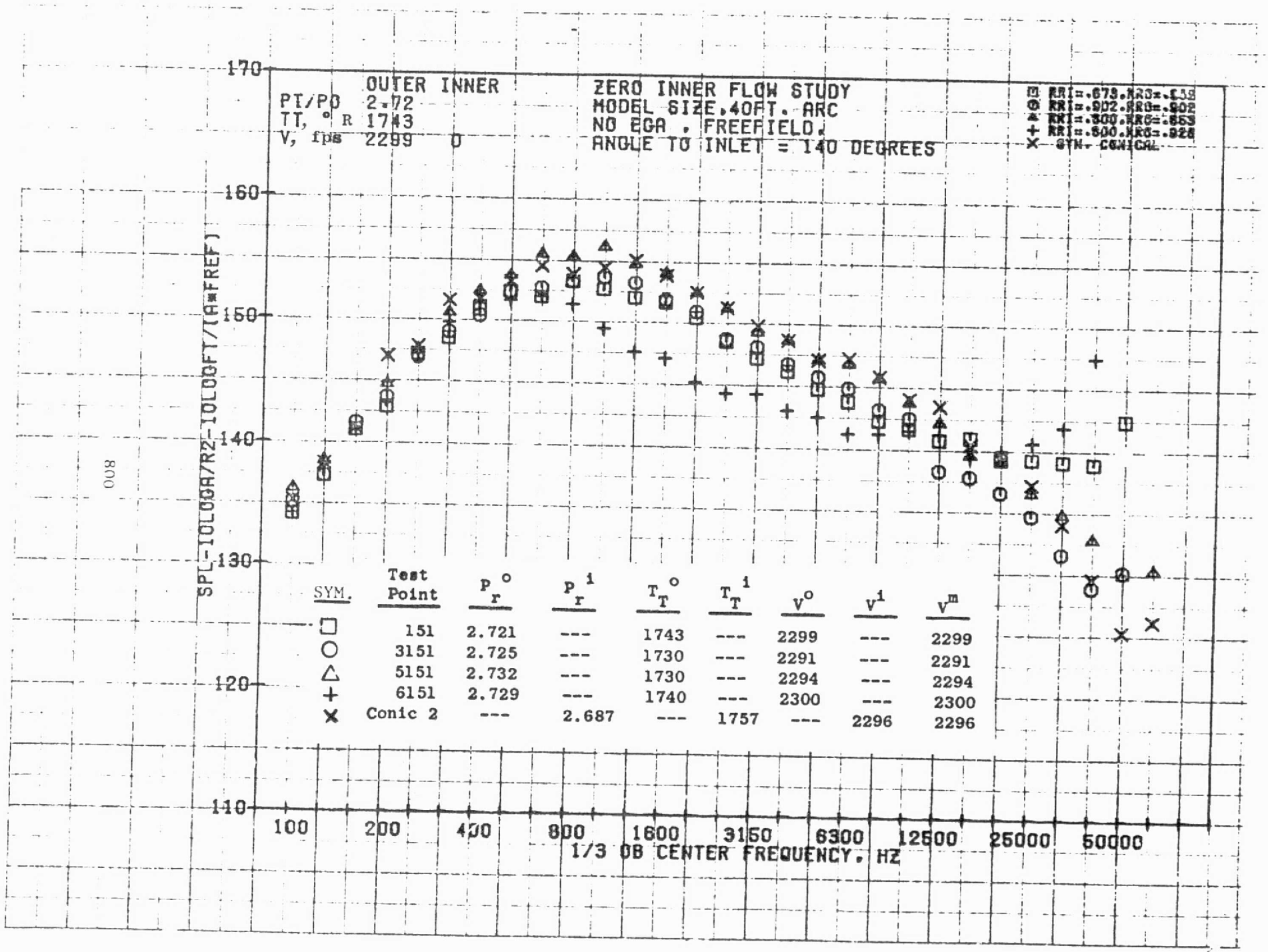
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	151	2.721	---	1743	---	2299	---	2299
○	3151	2.725	---	1730	---	2291	---	2291
△	5151	2.732	---	1730	---	2294	---	2294
+	6151	2.729	---	1740	---	2300	---	2300
×	Conic 2	---	2.687	---	1757	---	2296	2296

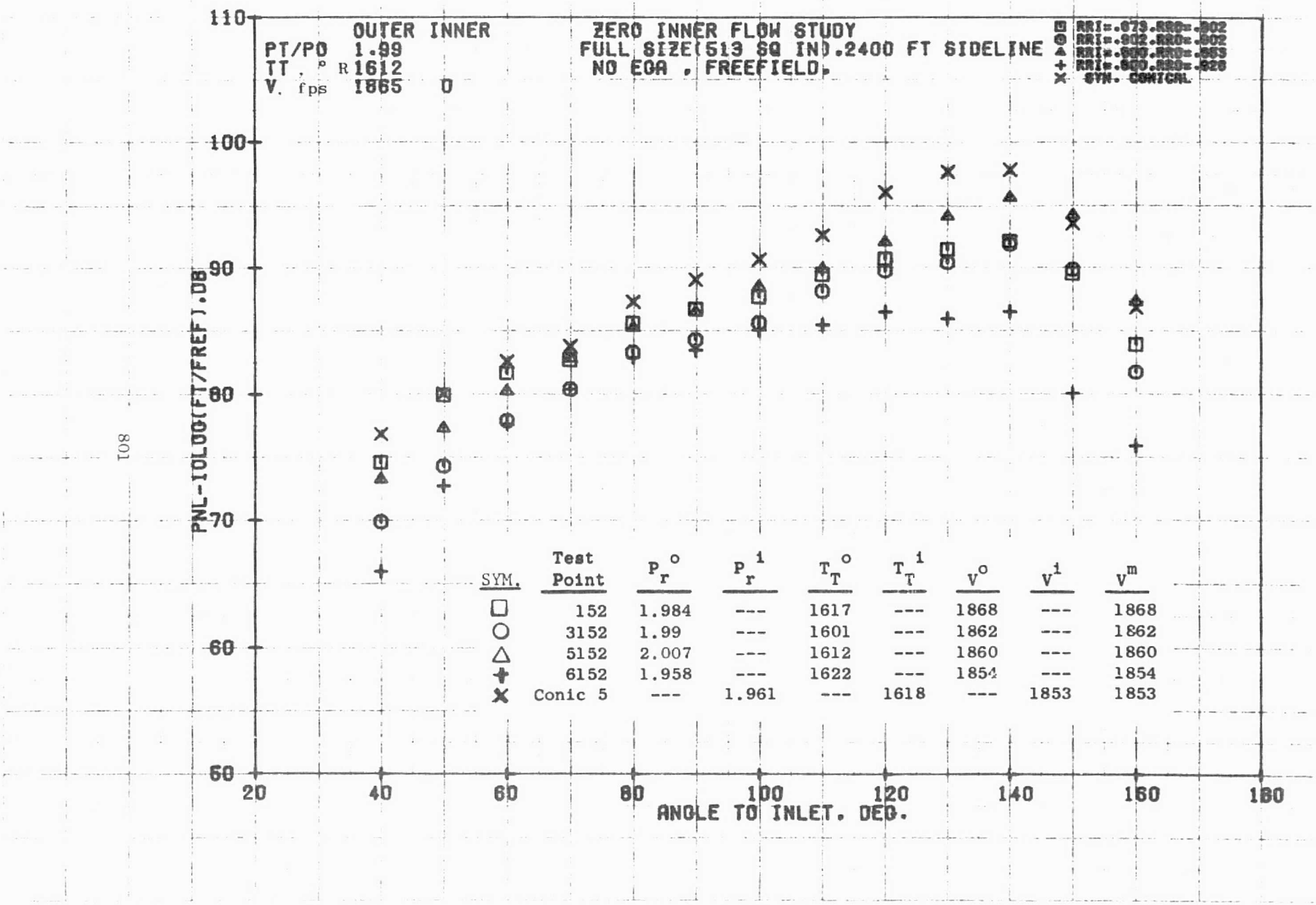


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	151	2.721	---	1743	---	2299	---	2299
○	3151	2.725	---	1730	---	2291	---	2291
△	5151	2.732	---	1730	---	2294	---	2294
+	6151	2.729	---	1740	---	2300	---	2300
×	Conic 2	---	2.687	---	1757	---	2296	2296


OUTER INNER
PT/PO 2.72
TT, °R 1743
V, fps 2299 0
ZERO INNER FLOW STUDY
MODEL SIZE,40FT. ARC
NO EGA , FREEFIELD.
ANGLE TO INLET = 90 DEGREES
RRI=.679,RRO=.902
RRI=.902,RRO=.902
RRI=.800,RRO=.953
RRI=.800,RRO=.926
SYM. CONICAL
SPL-10LOG(R/R2-10LOGFT/(A=FREF)
160
150
140
130
120
110
100
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
3151 2.725 --- 1730 --- 2291 --- 2291
5151 2.732 --- 1730 --- 2294 --- 2294
6151 2.729 --- 1740 --- 2300 --- 2300
Conic 2 --- 2.687 --- 1757 --- 2296 2296


OUTER INNER
PT/PO 2.72
TT, °R 1743
V, fps 2299 0
ZERO INNER FLOW STUDY
MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD.
ANGLE TO INLET = 130 DEGREES
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
3151 2.725 --- 1730 --- 2291 --- 2291
5151 2.732 --- 1730 --- 2294 --- 2294
6151 2.729 --- 1740 --- 2300 --- 2300
Conic 2 --- 2.687 --- 1757 --- 2296 --- 2296
SYM. CONICAL
SPL-10LOGA/R2-10LOGFT/(R=FREF)
170
160
150
140
130
120
110
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ


OUTER INNER
PT/P0 2.72
TT, °R 1743
V, fps 2299 0
ZERO INNER FLOW STUDY
MODEL SIZE,40FT. ARC
NO EGA , FREEFIELD.
ANGLE TO INLET = 140 DEGREES
SPL-10LOGA/R2-10LOGFT/(A*FREF)
170
160
150
140
130
120
110
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
3151 2.725 --- 1730 --- 2291 --- 2291
5151 2.732 --- 1730 --- 2294 --- 2294
6151 2.729 --- 1740 --- 2300 --- 2300
Conic 2 --- 2.687 --- 1757 --- 2296 2296



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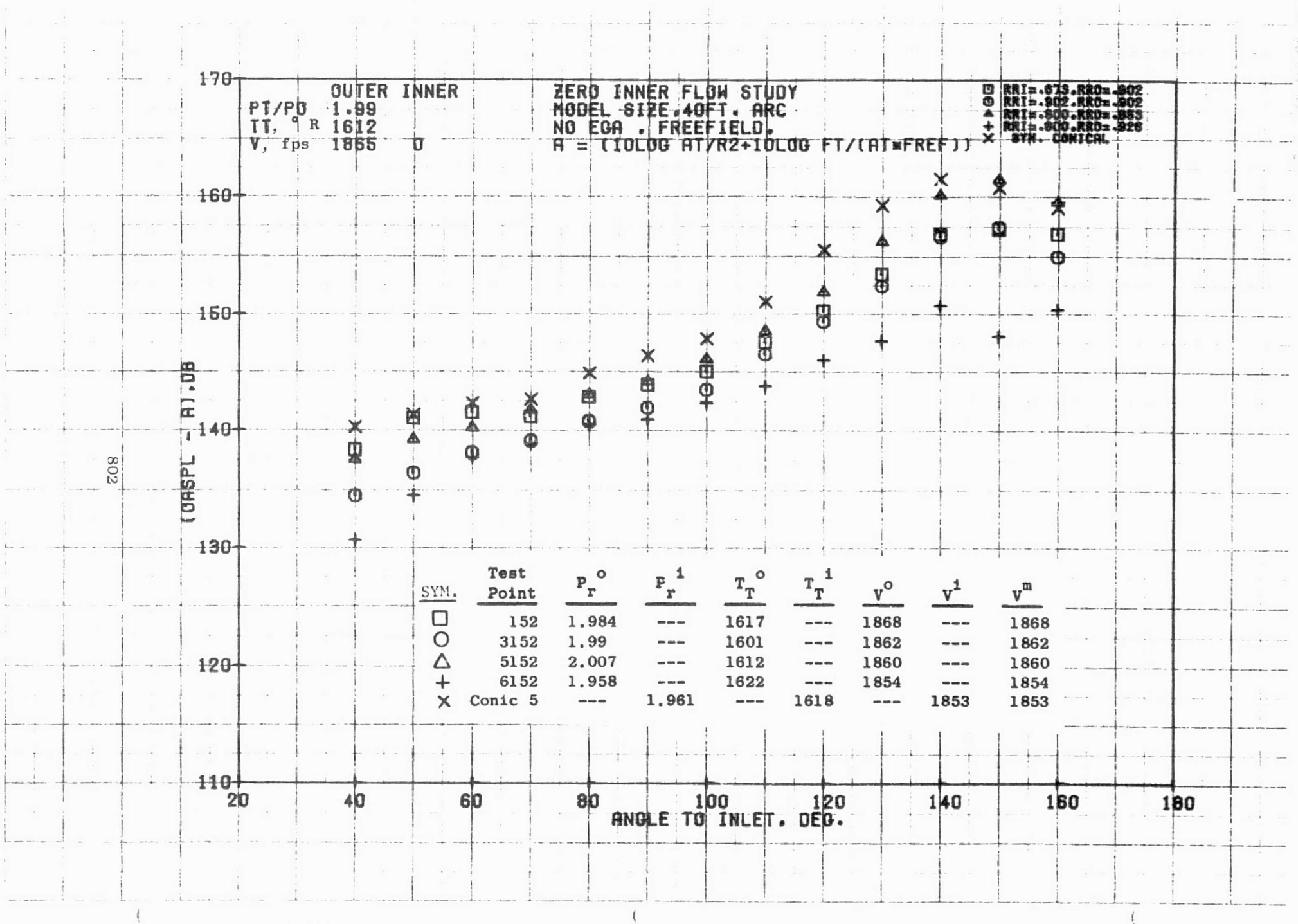
1X898-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	152	1.984	---	1617	---	1868	---	1868
○	3152	1.99	---	1601	---	1862	---	1862
△	5152	2.007	---	1612	---	1860	---	1860
+	6152	1.958	---	1622	---	1854	---	1854
×	Conic 5	---	1.961	---	1618	---	1853	1853

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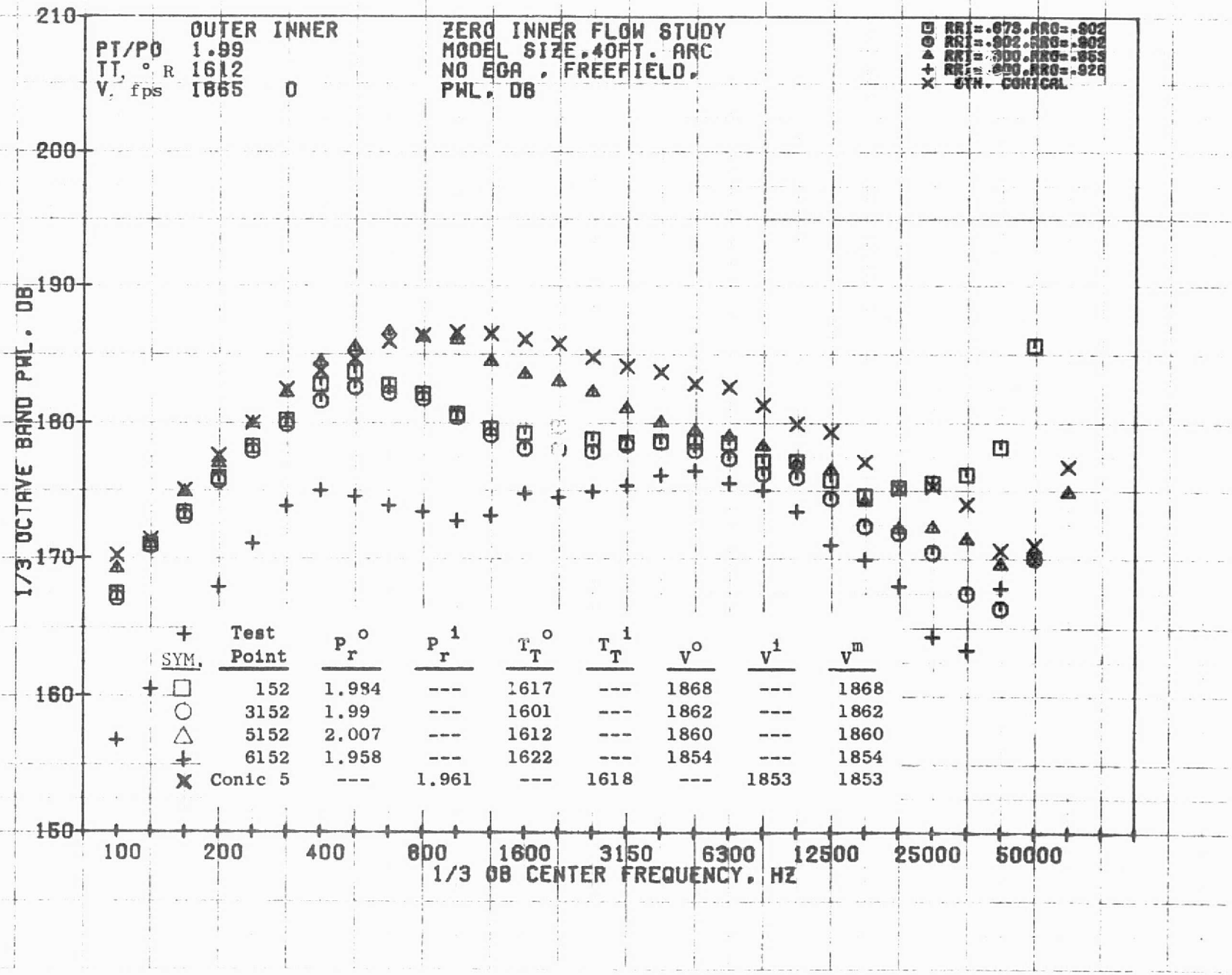
1X945-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	152	1.984	---	1617	---	1868	---	1868
○	3152	1.99	---	1601	---	1862	---	1862
△	5152	2.007	---	1612	---	1860	---	1860
+	6152	1.958	---	1622	---	1854	---	1854
×	Conic 5	---	1.961	---	1618	---	1853	1853

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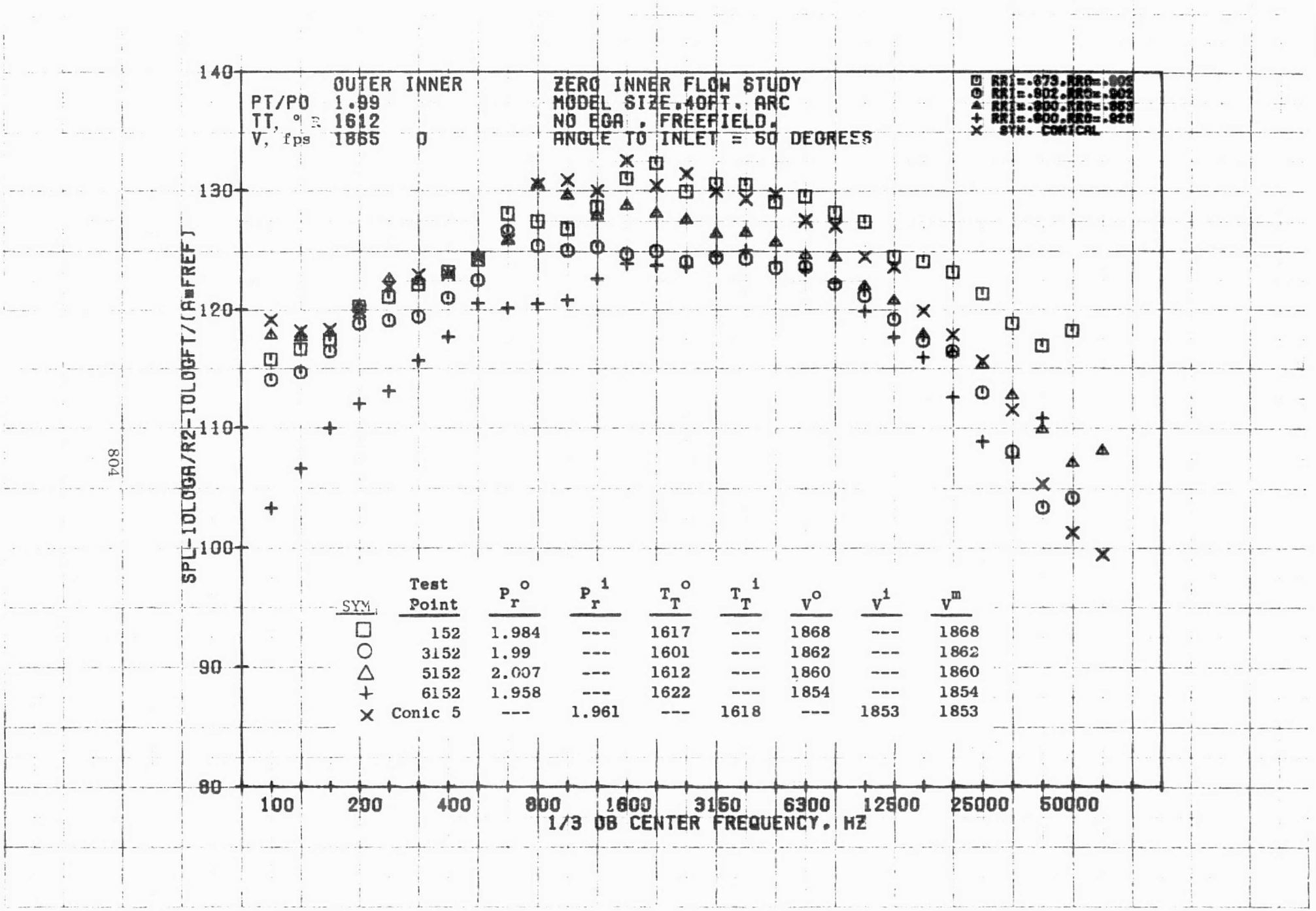
1X945-001

73KOLLSTEDT



SYM	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	152	1.984	---	1617	---	1868	---	1868
○	3152	1.99	---	1601	---	1862	---	1862
△	5152	2.007	---	1612	---	1860	---	1860
+	6152	1.958	---	1622	---	1854	---	1854
×	Conic 5	---	1.961	---	1618	---	1853	1853

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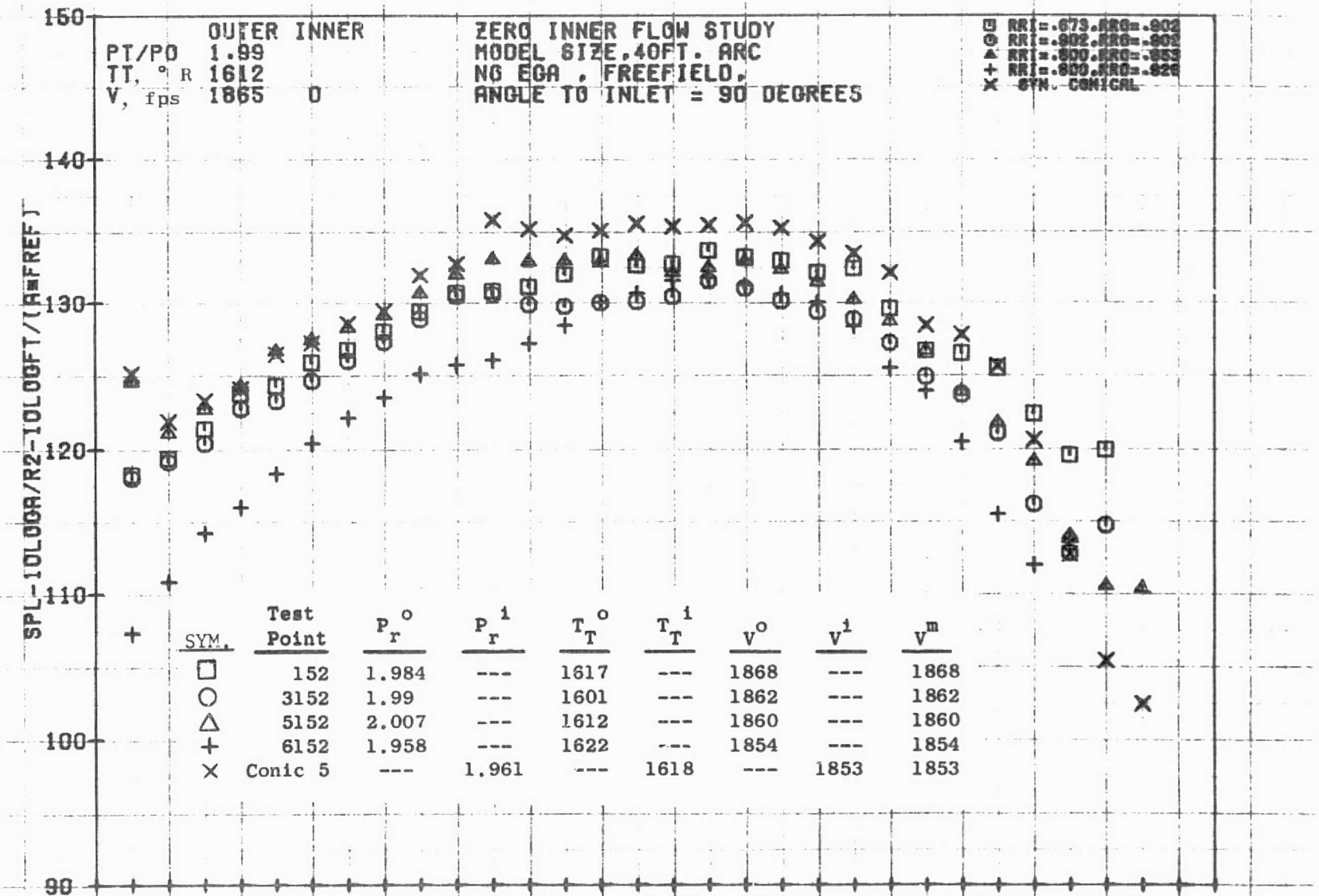
1X945-001

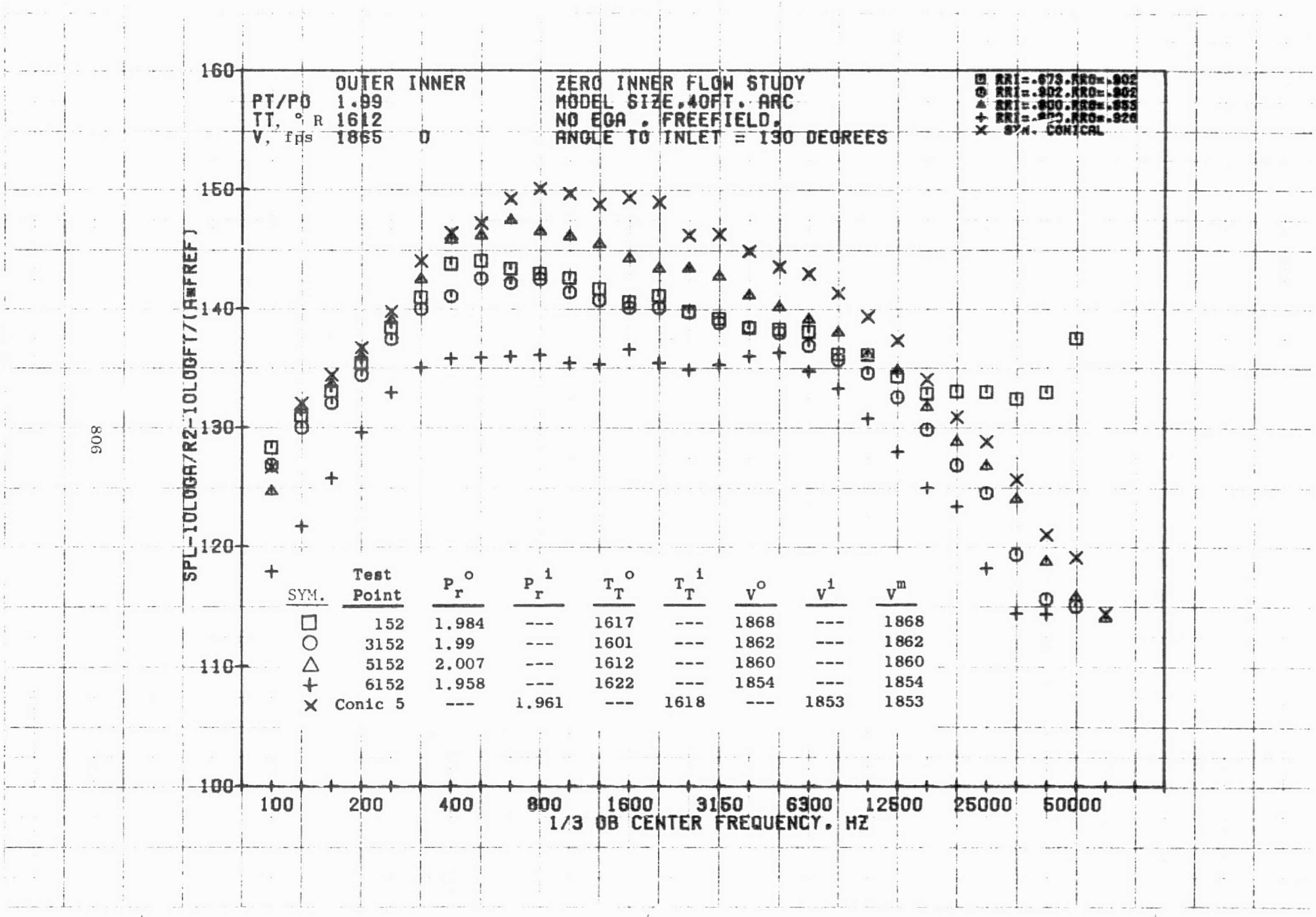
73KOLLSTEDT



805

10/25/76
1X945-001

73KOLLSTEDT



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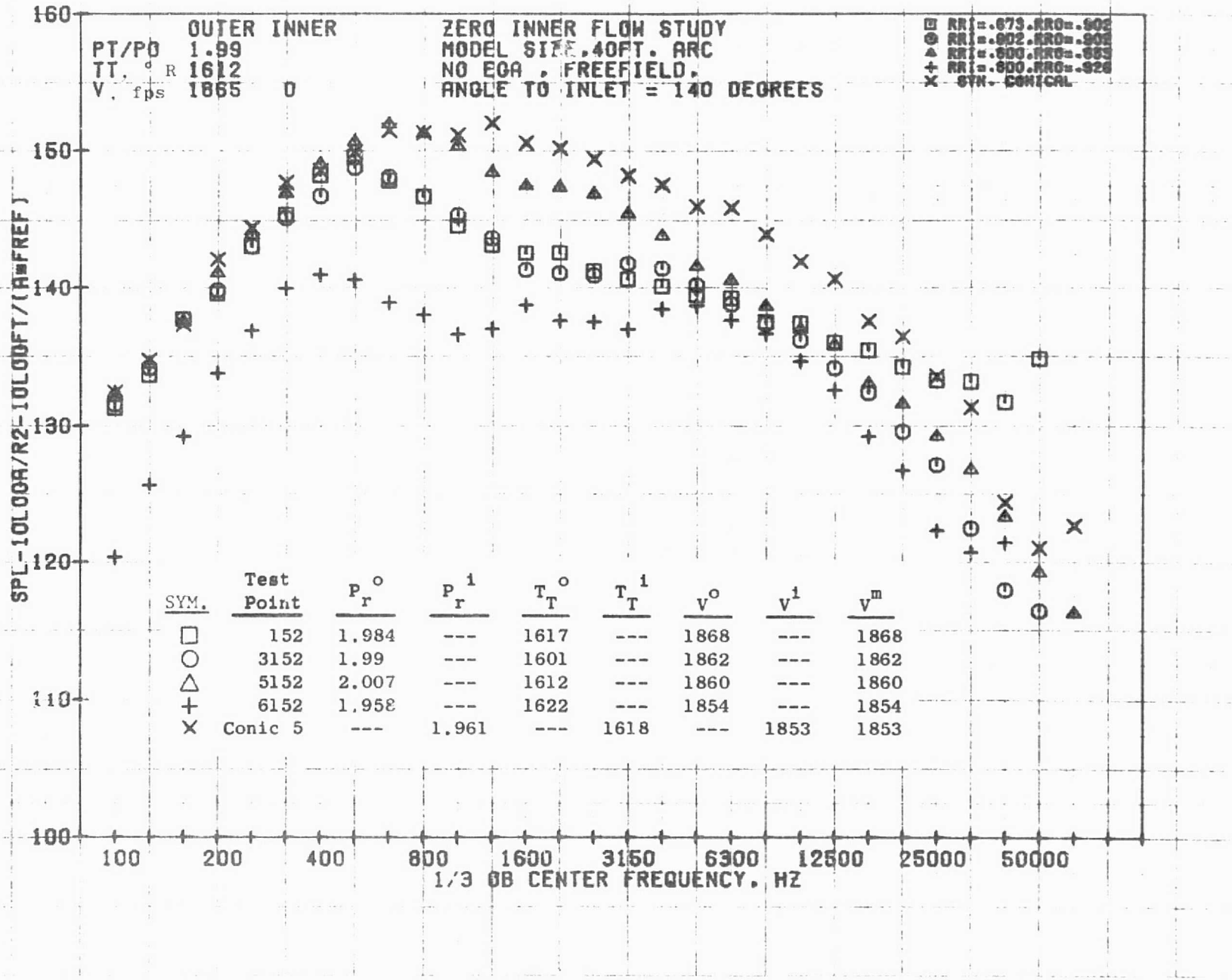
1X945-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	152	1.984	---	1617	---	1868	---	1868
○	3152	1.99	---	1601	---	1862	---	1862
△	5152	2.007	---	1612	---	1860	---	1860
+	6152	1.958	---	1622	---	1854	---	1854
×	Conic 5	---	1.961	---	1618	---	1853	1853

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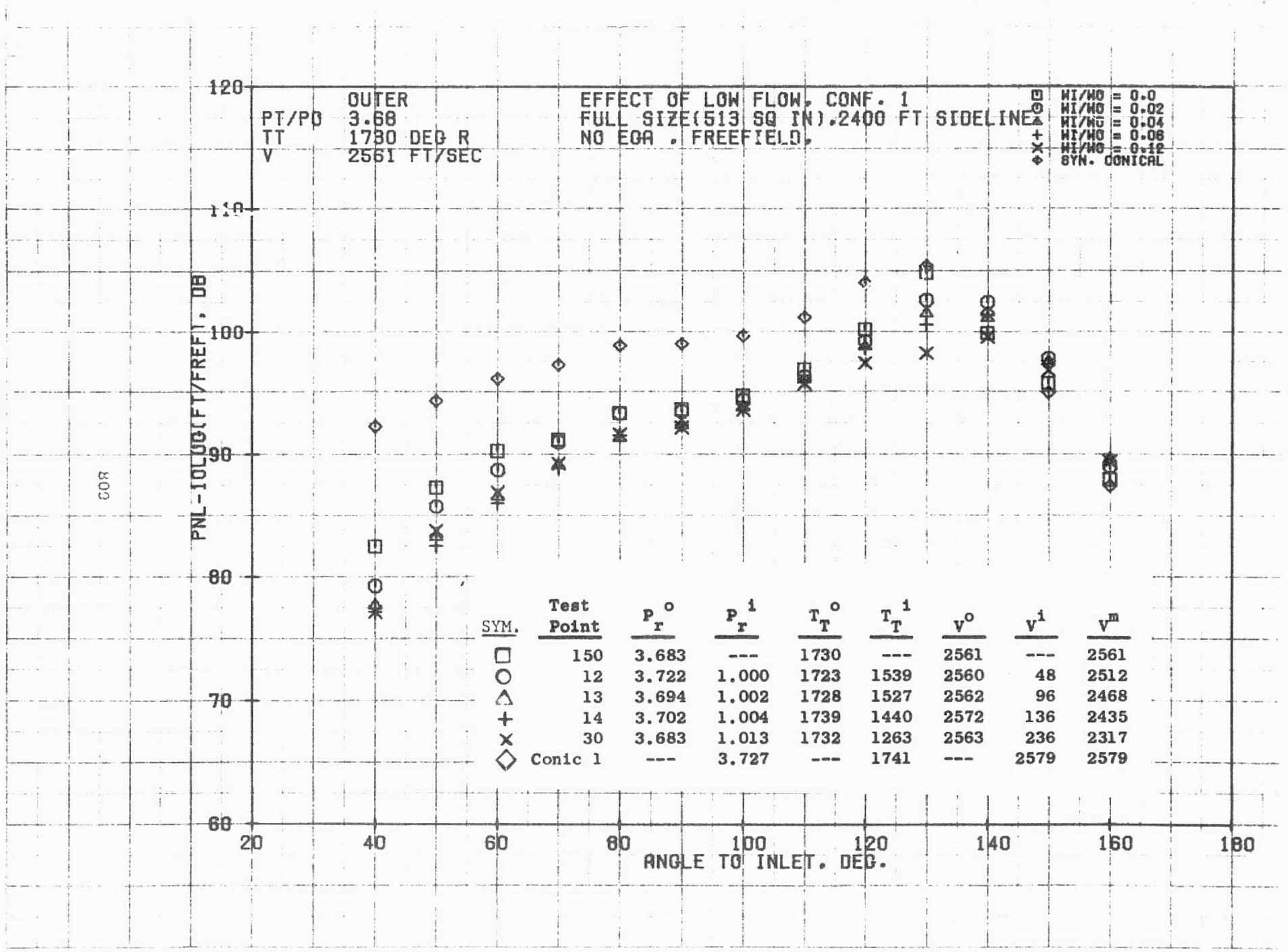
79KOLLSTEDT

7.3.2 Low Inner Flow Study

The effect of low inner flows was investigated for configurations 1 and 3. Configurations 1 and 3 both have a 0.902 outer radius ratio, but configuration 1 has a 0.673 inner radius ratio compared to a 0.902 inner radius ratio for configuration 3. Low flow testing was initially performed on configuration 1 at weight flow ratios (W^i/W^o) of 0.02, 0.04, and 0.06. It was found that there was no significant noise suppression relative to the zero inner flow case so higher inner flow rates were tested. Noise suppression was seen at higher flow rates so that for configuration 3 the tests were performed primarily at weight flow ratios of 0.06, 0.09, and 0.12.

The following graphs are based on a variation of W^i/W^o (sometimes expressed as W_8/W_{28}) whereas the Tables 6 and 7 in Volume I used W^i/W_T and W^o/W_T parameters.



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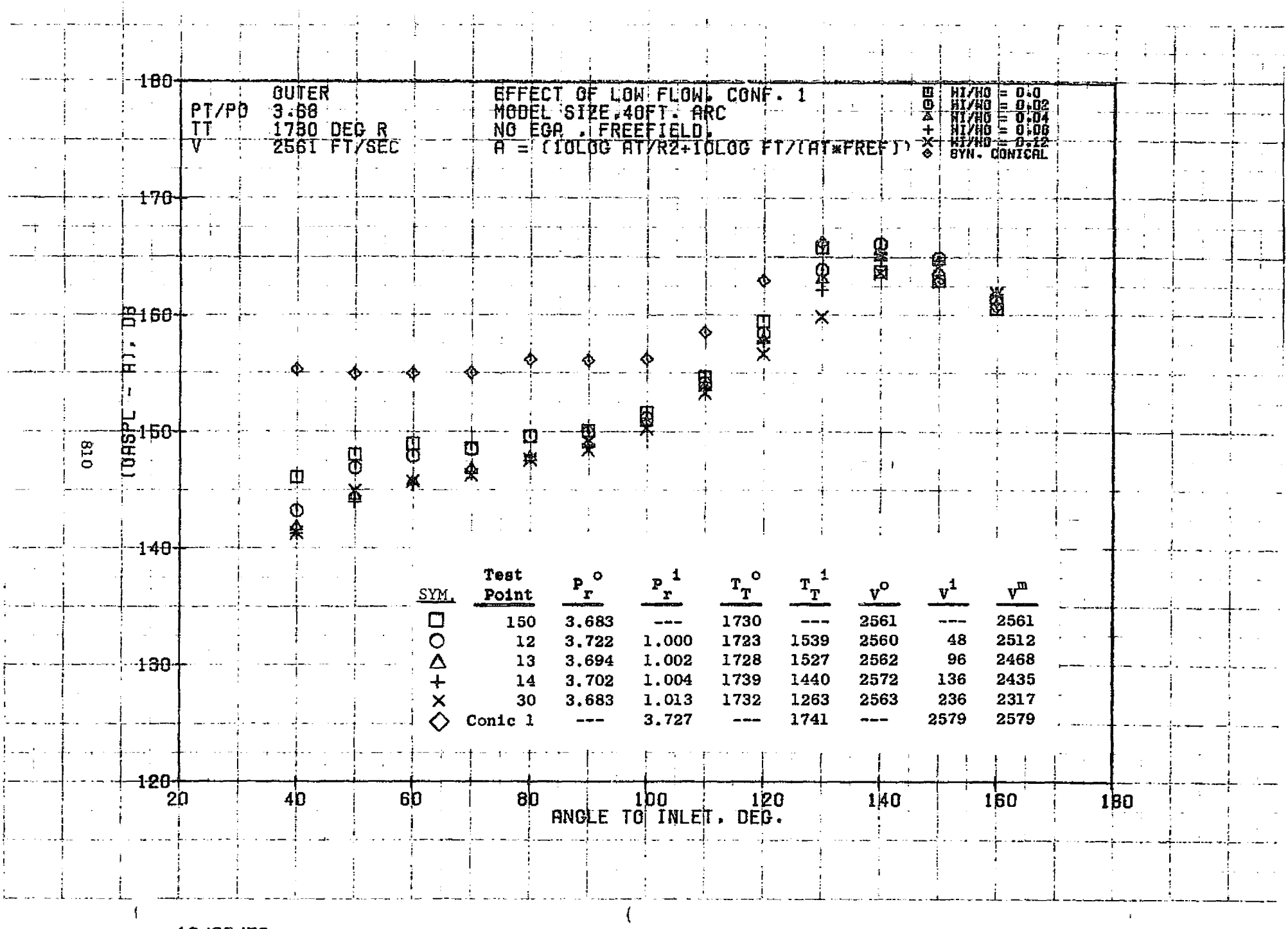
73KOLLSTEDT



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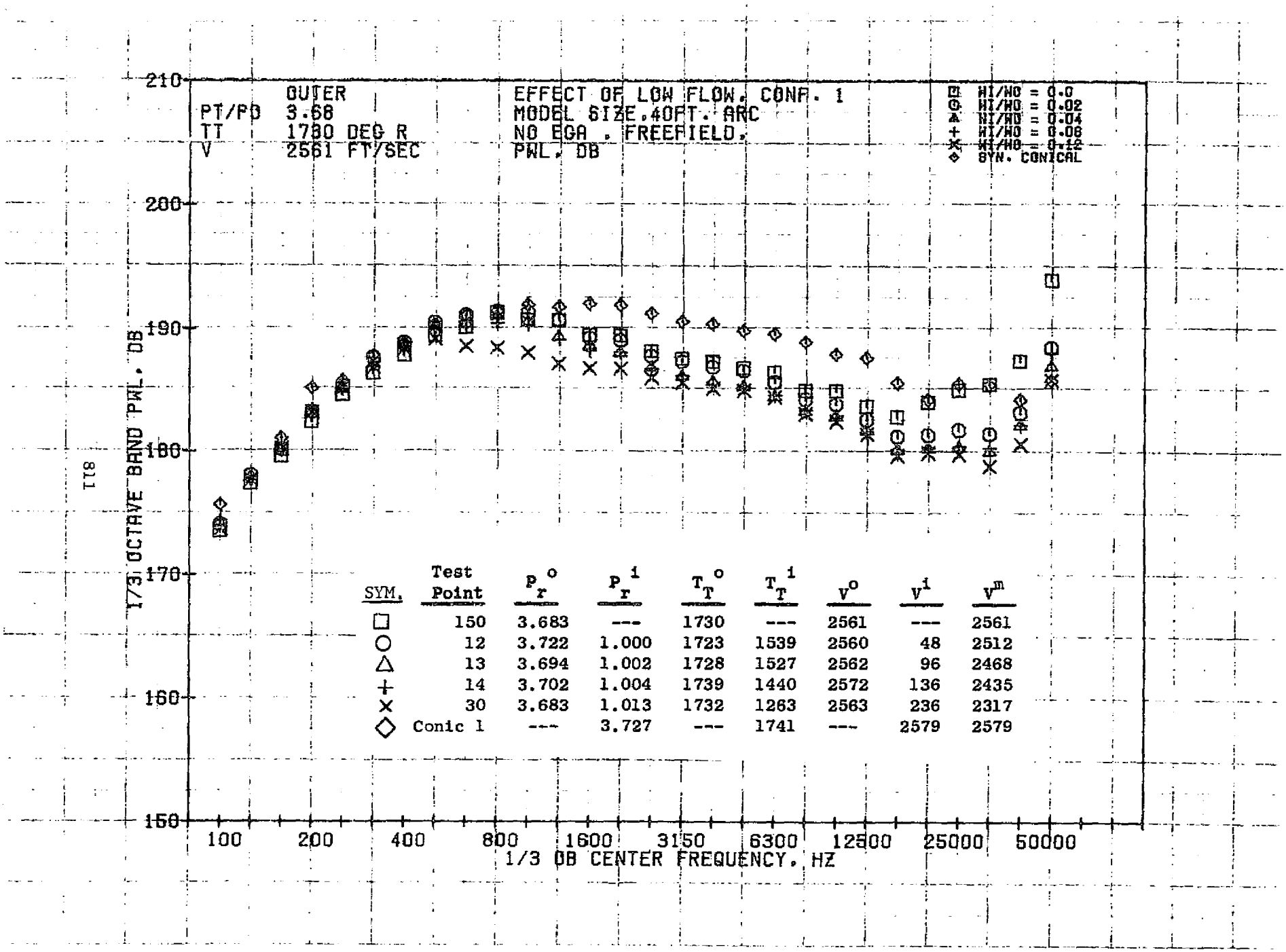
1X583-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	150	3.683	---	1730	---	2561	---	2561
○	12	3.722	1.000	1723	1539	2560	48	2512
△	13	3.694	1.002	1728	1527	2562	96	2468
+	14	3.702	1.004	1739	1440	2572	136	2435
×	30	3.683	1.013	1732	1263	2563	236	2317
◇	Conic 1	---	3.727	---	1741	---	2579	2579

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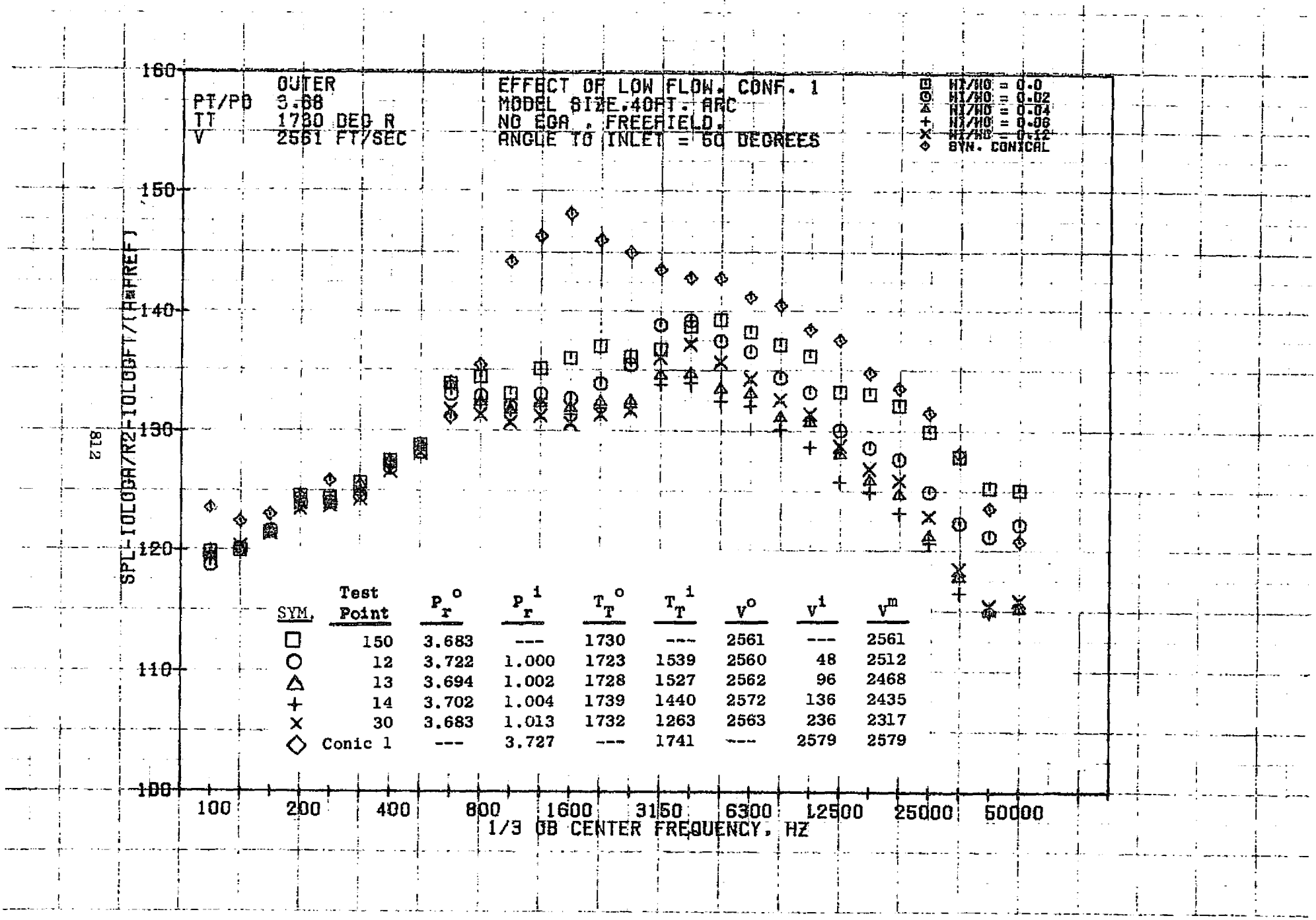
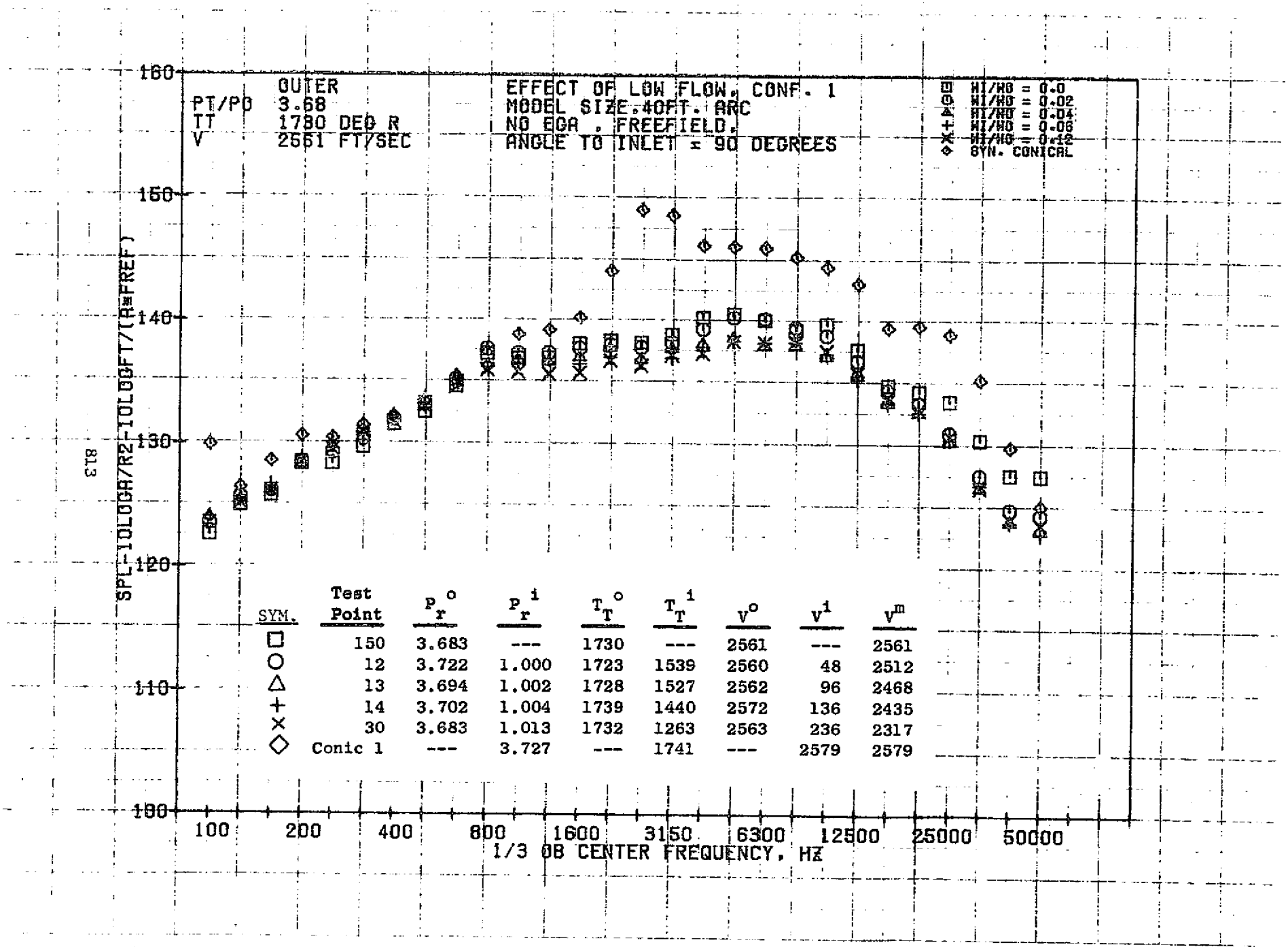
73KOLLSTEDT



10/06/76
1X583-001

73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	150	3.683	---	1730	---	2561	---	2561
○	12	3.722	1.000	1723	1539	2560	48	2512
△	13	3.694	1.002	1728	1527	2562	96	2468
+	14	3.702	1.004	1739	1440	2572	136	2435
×	30	3.683	1.013	1732	1263	2563	236	2317
◇	Conic 1	---	3.727	---	1741	---	2579	2579

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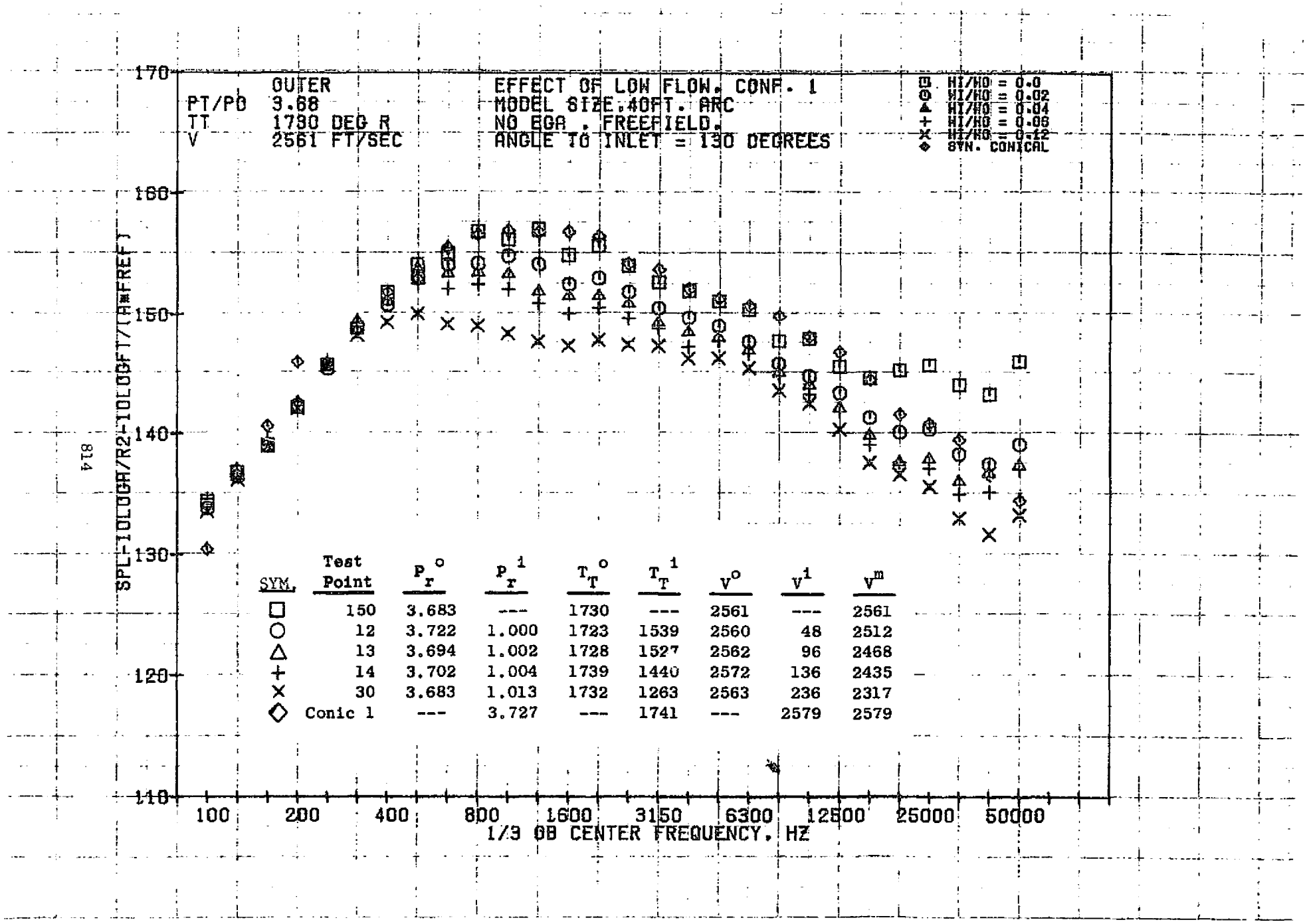
1X583-001

73KOLLSTEDT



814

10/05/76
1X583-001

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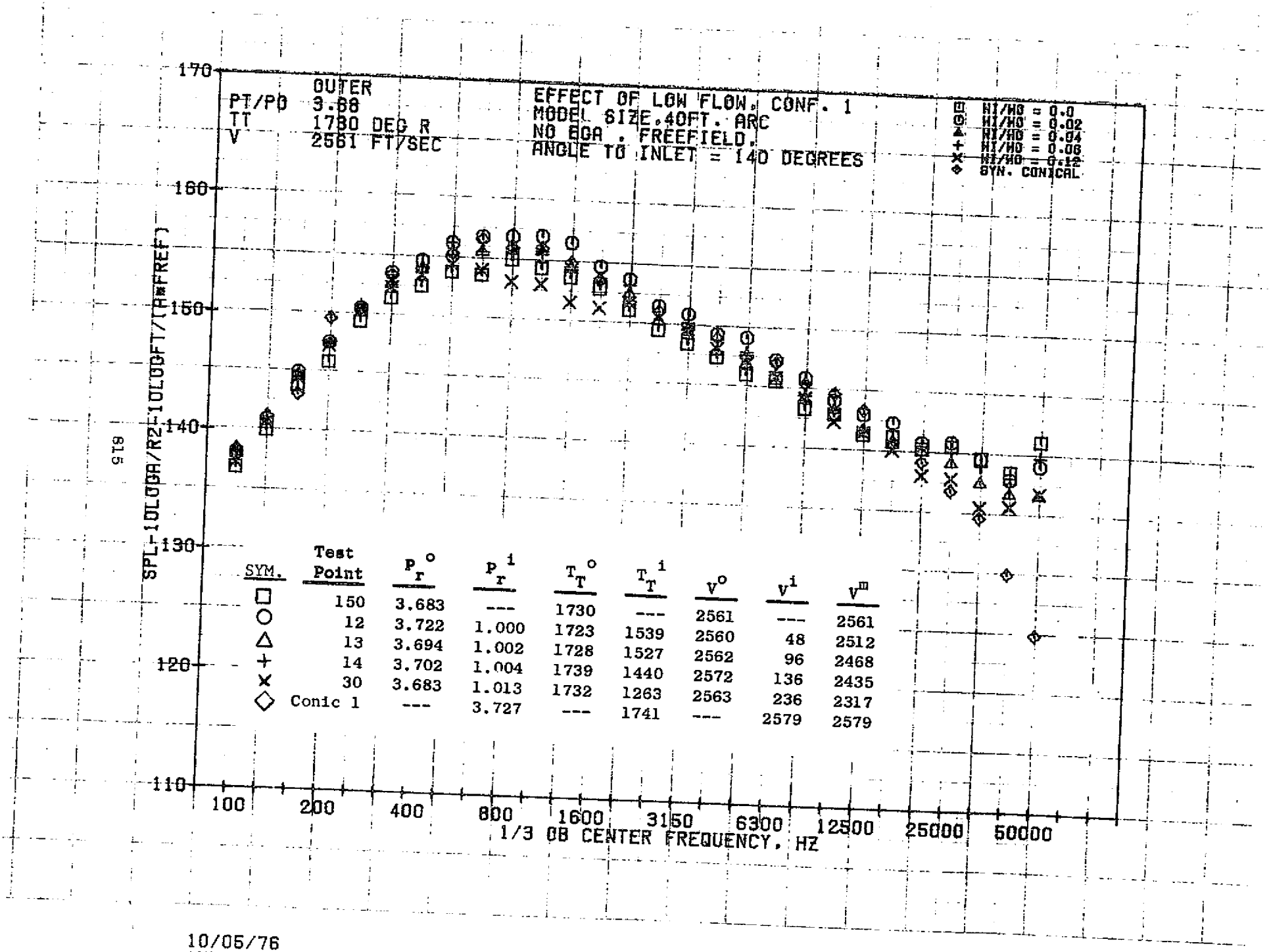

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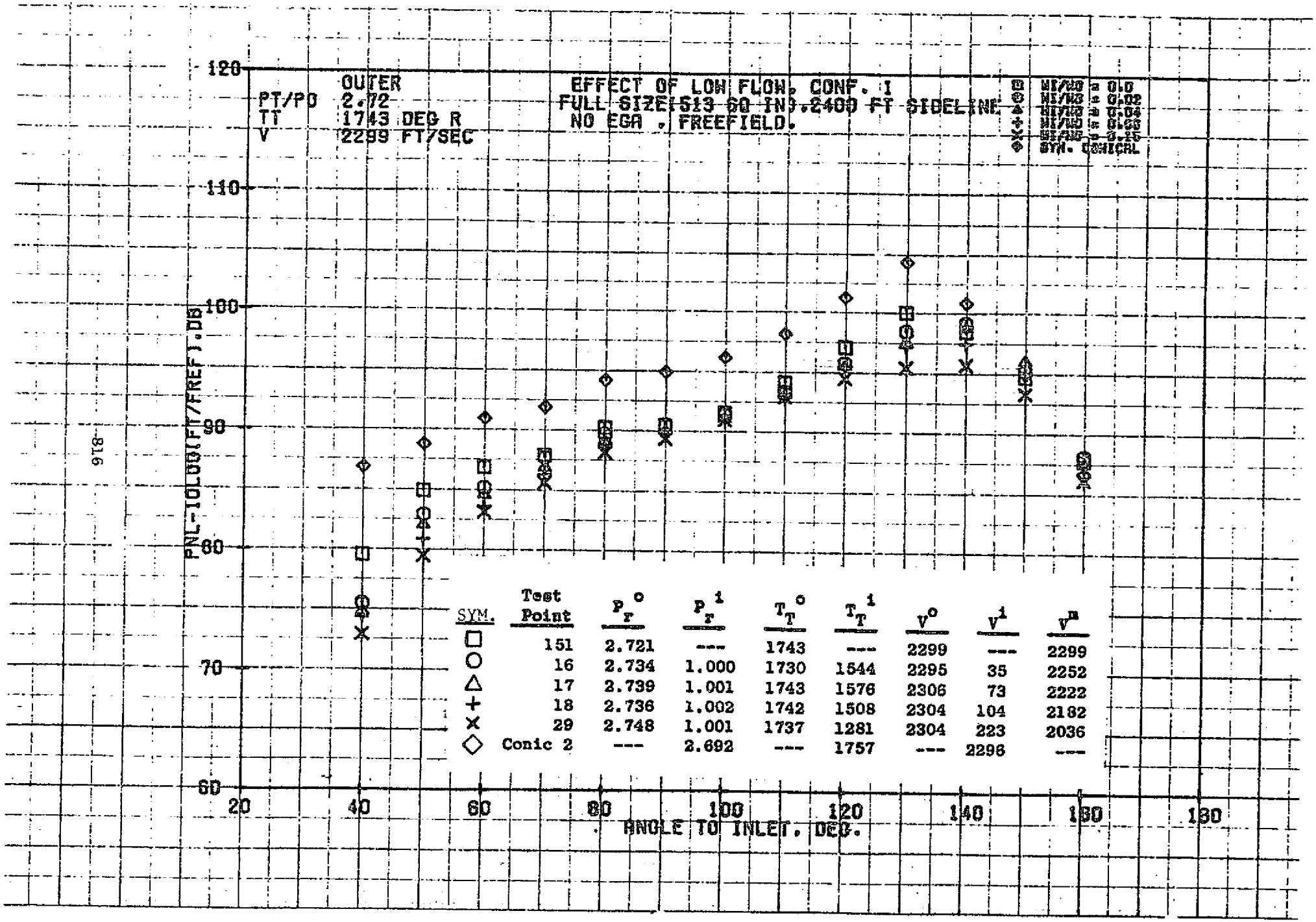
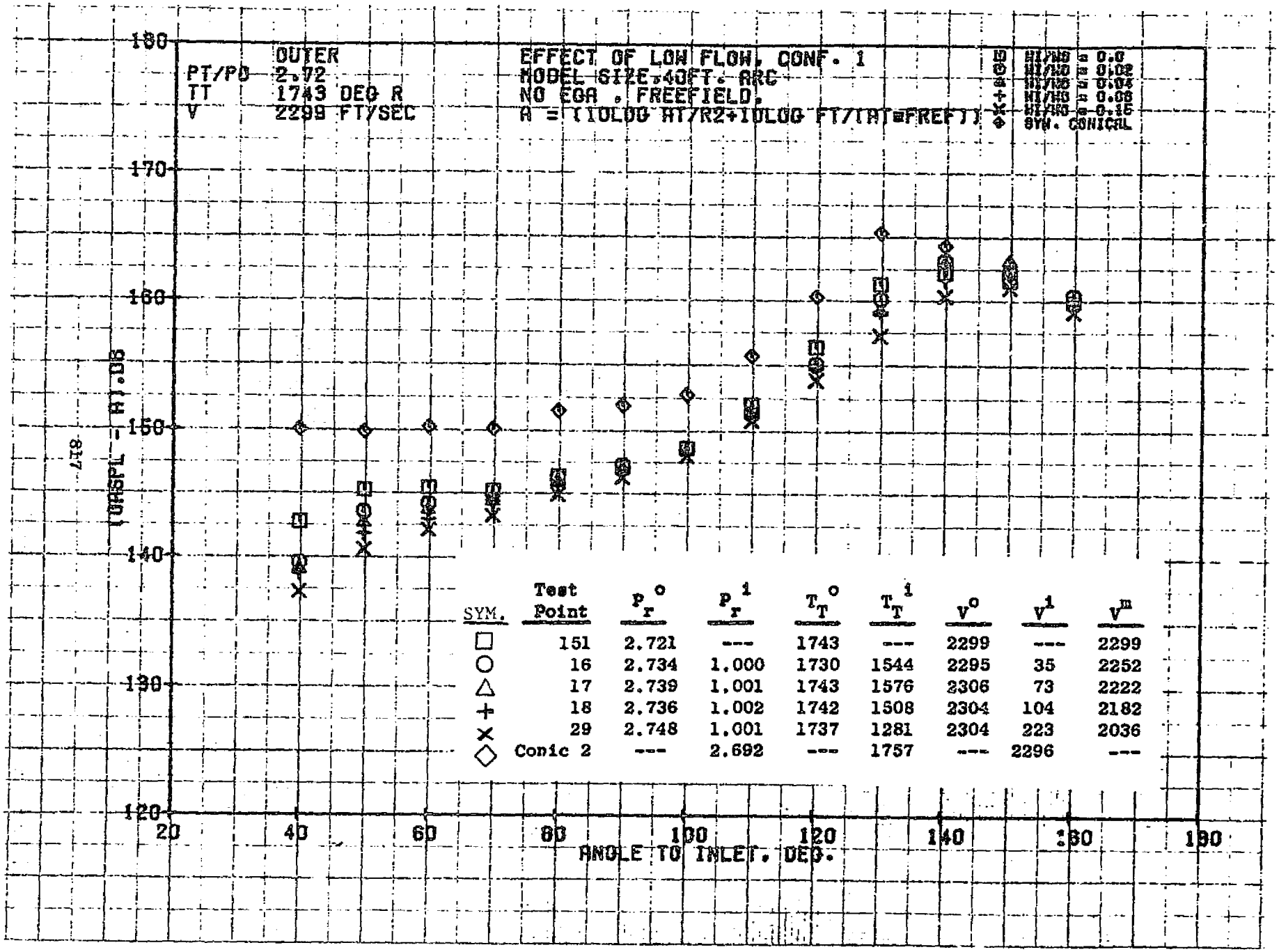
1X583-001

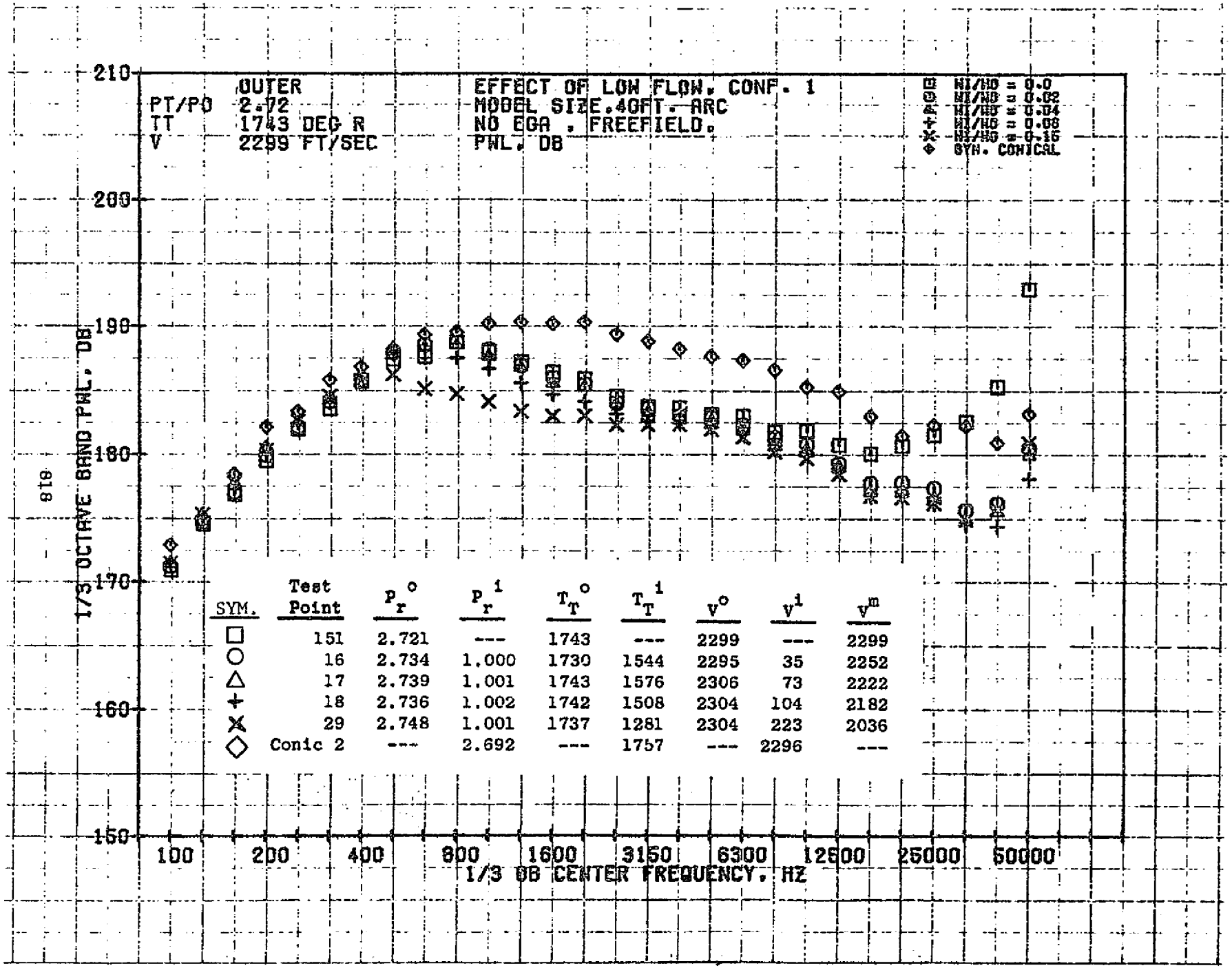
73KOLLSTFDT

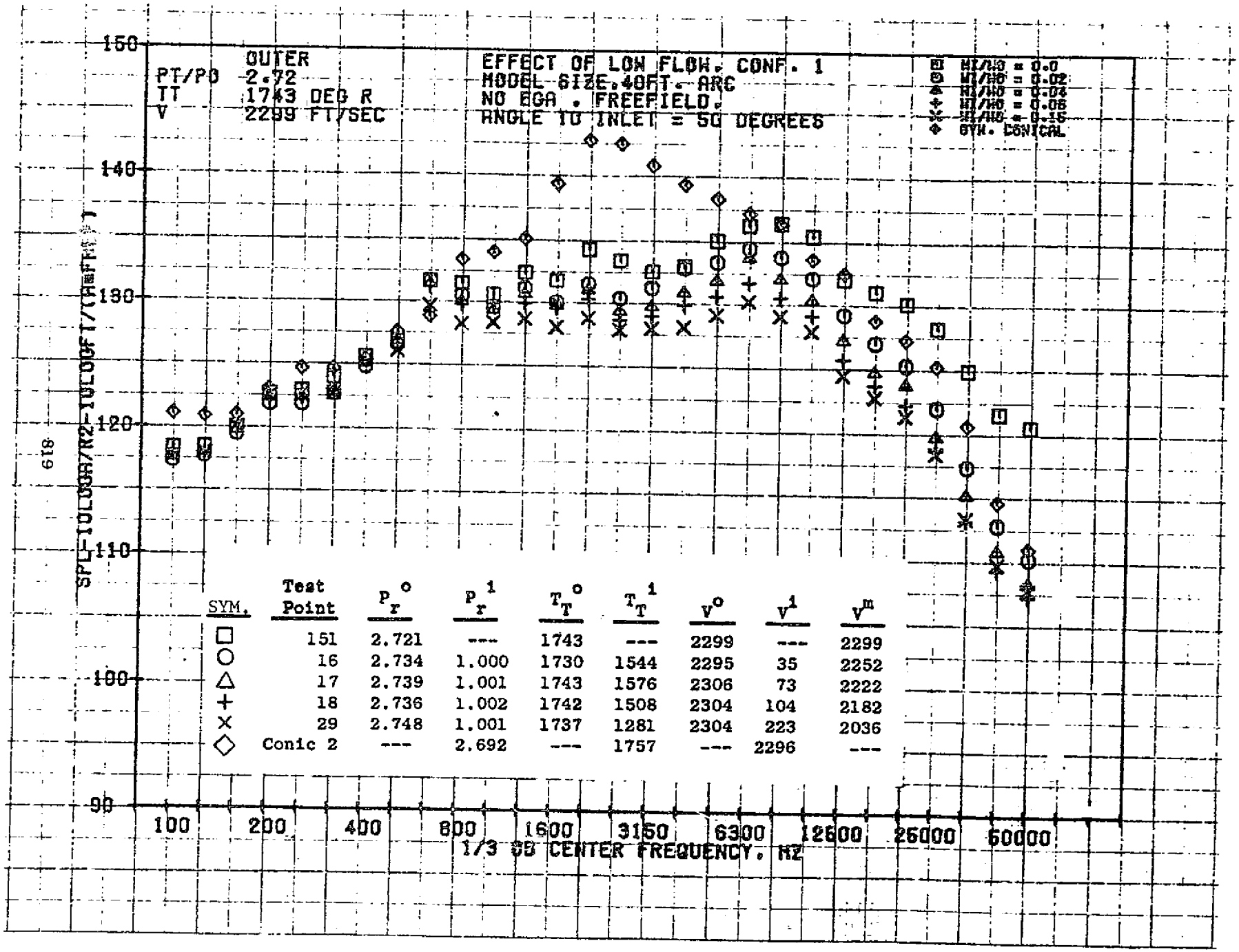


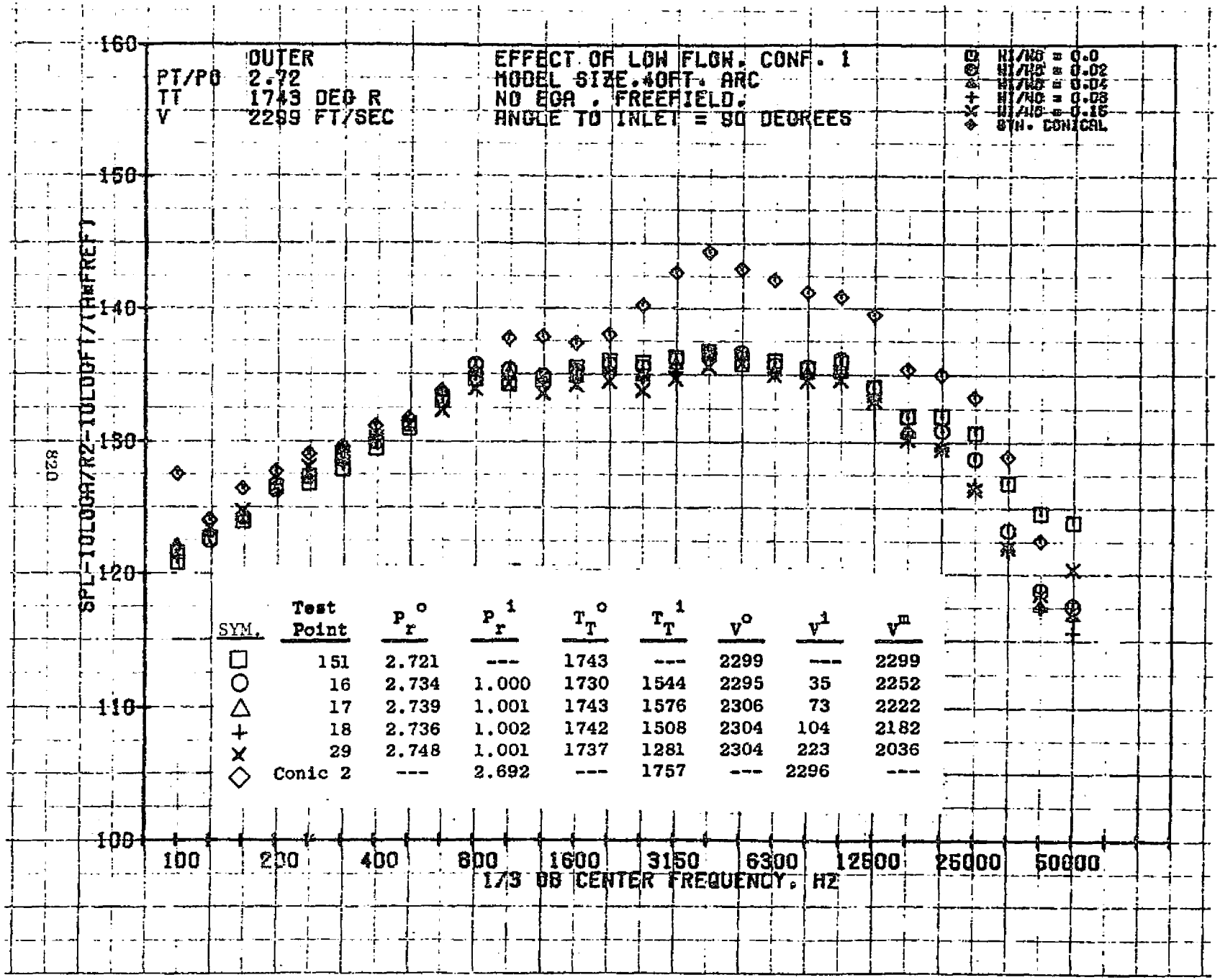
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^n
□	151	2.721	---	1743	---	2299	---	2299
○	16	2.734	1.000	1730	1544	2295	35	2252
△	17	2.739	1.001	1743	1576	2306	73	2222
+	18	2.736	1.002	1742	1508	2304	104	2182
×	29	2.748	1.001	1737	1281	2304	223	2036
◇	Conic 2	---	2.692	---	1757	---	2296	---

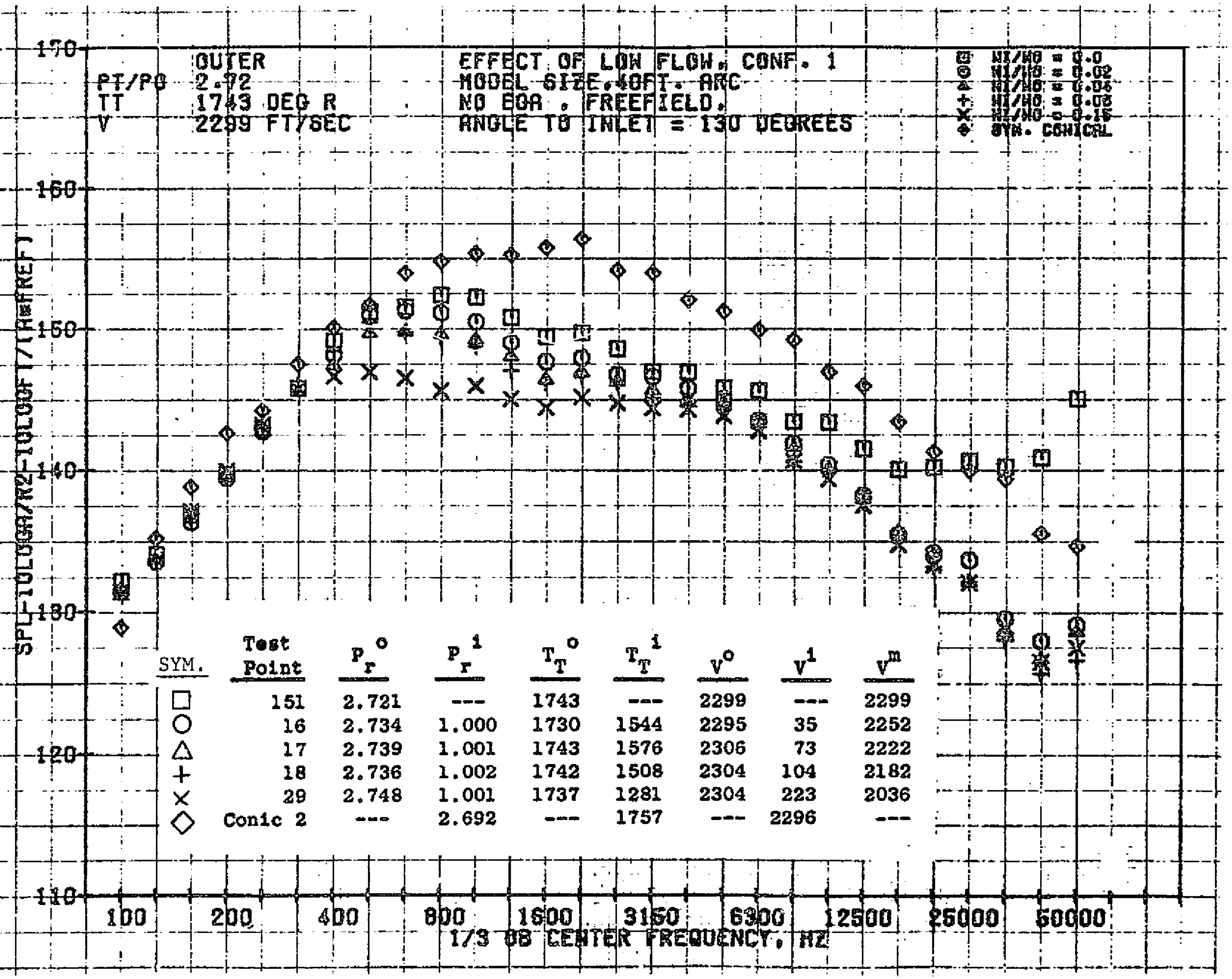


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	151	2.721	---	1743	---	2299	---	2299
○	16	2.734	1.000	1730	1544	2295	35	2252
△	17	2.739	1.001	1743	1576	2306	73	2222
+	18	2.736	1.002	1742	1508	2304	104	2182
×	29	2.748	1.001	1737	1281	2304	223	2036
◇	Conic 2	---	2.692	---	1757	---	2296	---

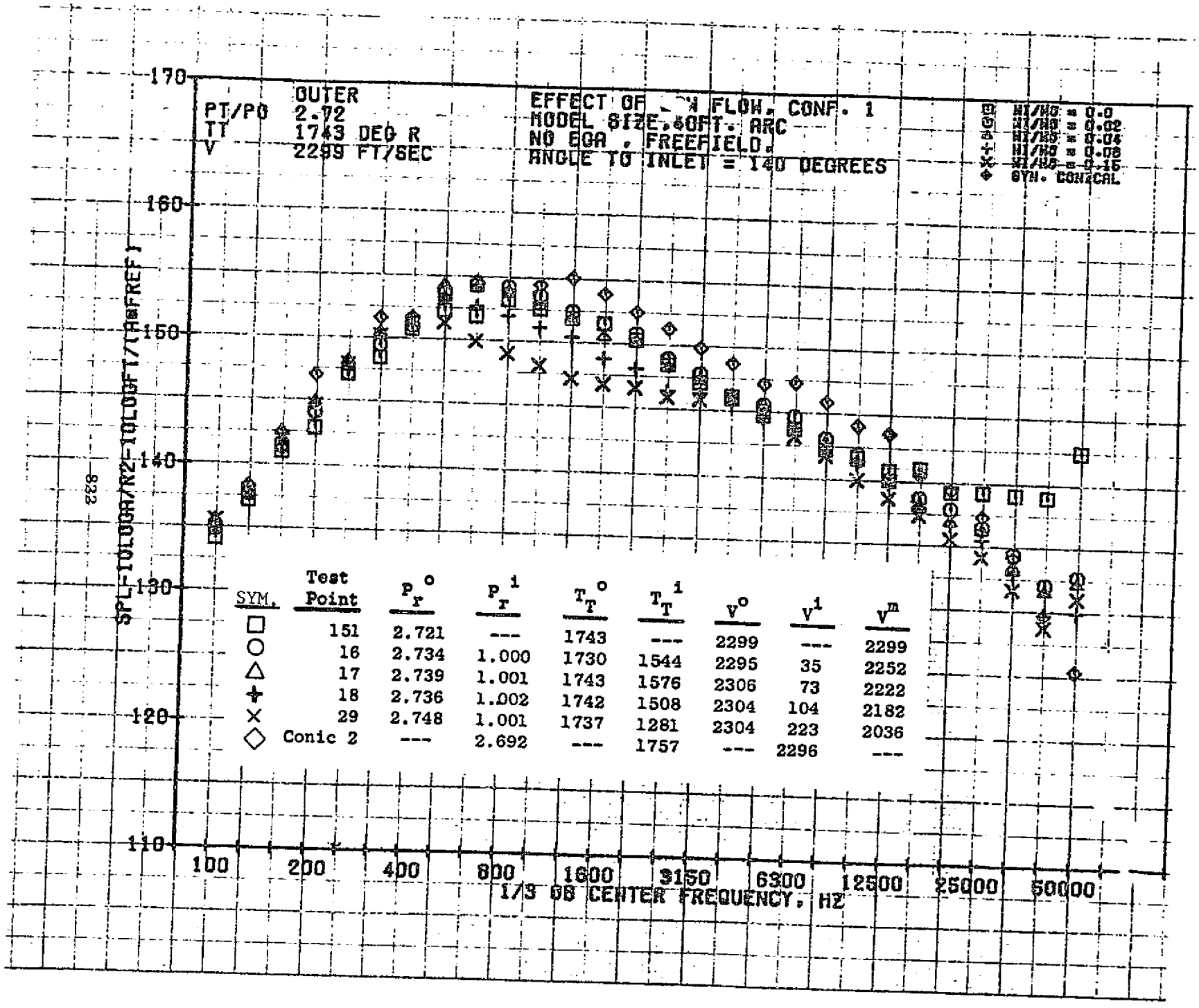

OUTER
PT/PO 2.72
TT 1743 DEG R
V 2299 FT/SEC
EFFECT OF LOW FLOW, CONF. 1
MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD.
PWL, DB
MI/MD = 0.0
MI/MD = 0.02
MI/MD = 0.04
MI/MD = 0.08
MI/MD = 0.16
SYM. CONICAL
1/3 OCTAVE BAND PWL, DB
210
200
190
180
170
160
150
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
16 2.734 1.000 1730 1544 2295 35 2252
17 2.739 1.001 1743 1576 2306 73 2222
18 2.736 1.002 1742 1508 2304 104 2182
29 2.748 1.001 1737 1281 2304 223 2036
Conic 2 --- 2.692 --- 1757 --- 2296 ---

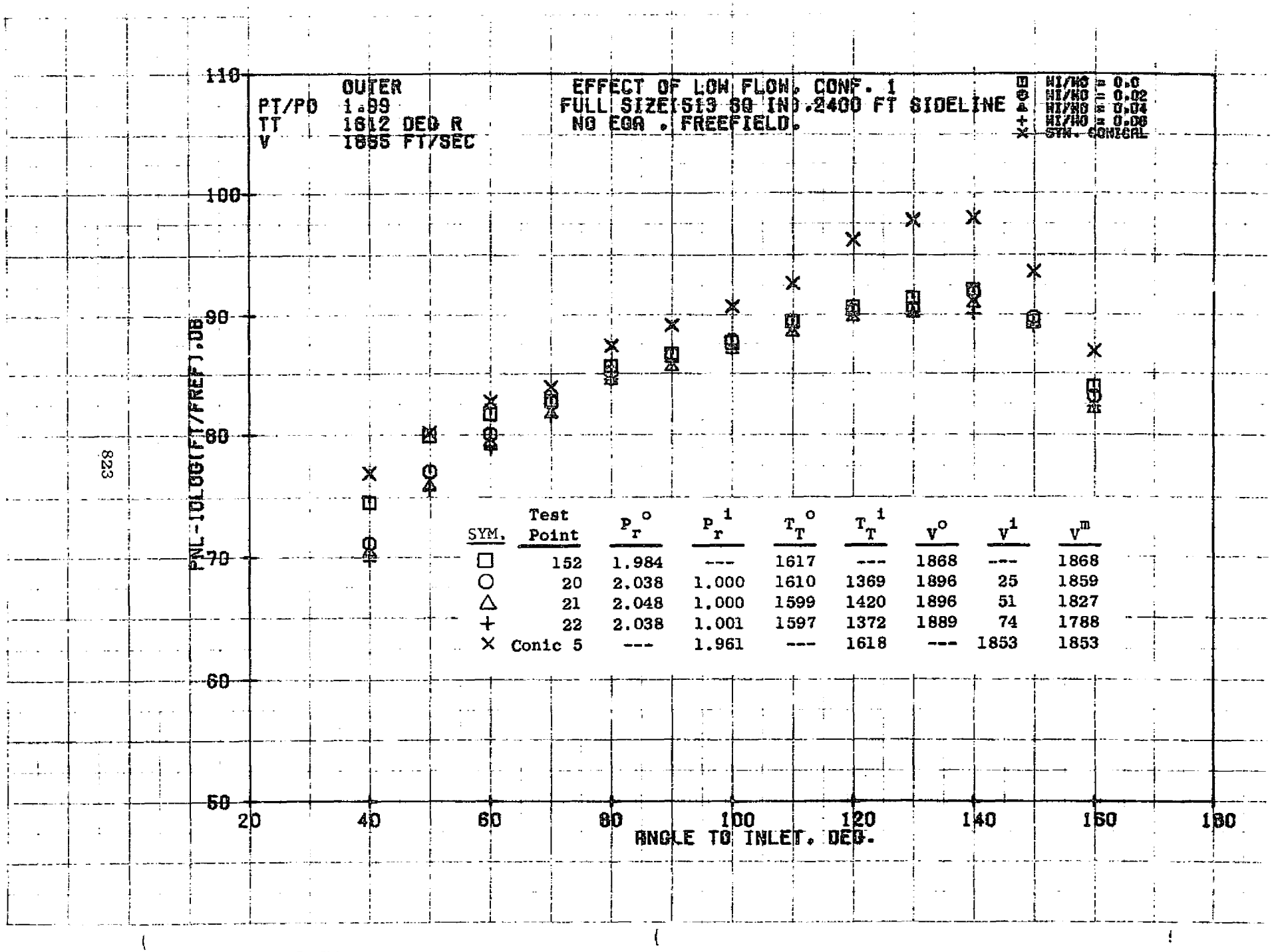

OUTER
PT/P0 2.72
TT 1743 DEG R
V 2299 FT/SEC
EFFECT OF LOW FLOW. CONF. 1
MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD.
ANGLE TO INLET = 50 DEGREES
H1/H0 = 0.0
H1/H0 = 0.02
H1/H0 = 0.04
H1/H0 = 0.08
H1/H0 = 0.15
SYM. CONICAL
SPL-10LOG(A/R2-10LOGFT/(REFFT))
150
140
130
120
110
100
90
100
200
400
800
1600
3150
6300
12500
25000
60000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
16 2.734 1.000 1730 1544 2295 35 2252
17 2.739 1.001 1743 1576 2306 73 2222
18 2.736 1.002 1742 1508 2304 104 2182
29 2.748 1.001 1737 1281 2304 223 2036
Conic 2 --- 2.692 --- 1757 --- 2296 ---


OUTER
PT/P0 2.72
TT 1743 DEG R
V 2299 FT/SEC
EFFECT OF LOW FLOW. CONF. 1
MODEL SIZE.40FT. ARC
NO EGA . FREEFIELD.
ANGLE TO INLET = 90 DEGREES
H1/H0 = 0.0
H1/H0 = 0.02
H1/H0 = 0.04
H1/H0 = 0.08
H1/H0 = 0.16
8TH. CONICAL
SPL-10LOG(R2-10LOGFT/(RMFREFT
160
150
140
130
120
110
100
820
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
151 2.721 --- 1743 --- 2299 --- 2299
16 2.734 1.000 1730 1544 2295 35 2252
17 2.739 1.001 1743 1576 2306 73 2222
18 2.736 1.002 1742 1508 2304 104 2182
29 2.748 1.001 1737 1281 2304 223 2036
Conic 2 --- 2.692 --- 1757 --- 2296 ---



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	151	2.721	---	1743	---	2299	---	2299
○	16	2.734	1.000	1730	1544	2295	35	2252
△	17	2.739	1.001	1743	1576	2306	73	2222
+	18	2.736	1.002	1742	1508	2304	104	2182
×	29	2.748	1.001	1737	1281	2304	223	2036
◇	Conic 2	---	2.692	---	1757	---	2296	---

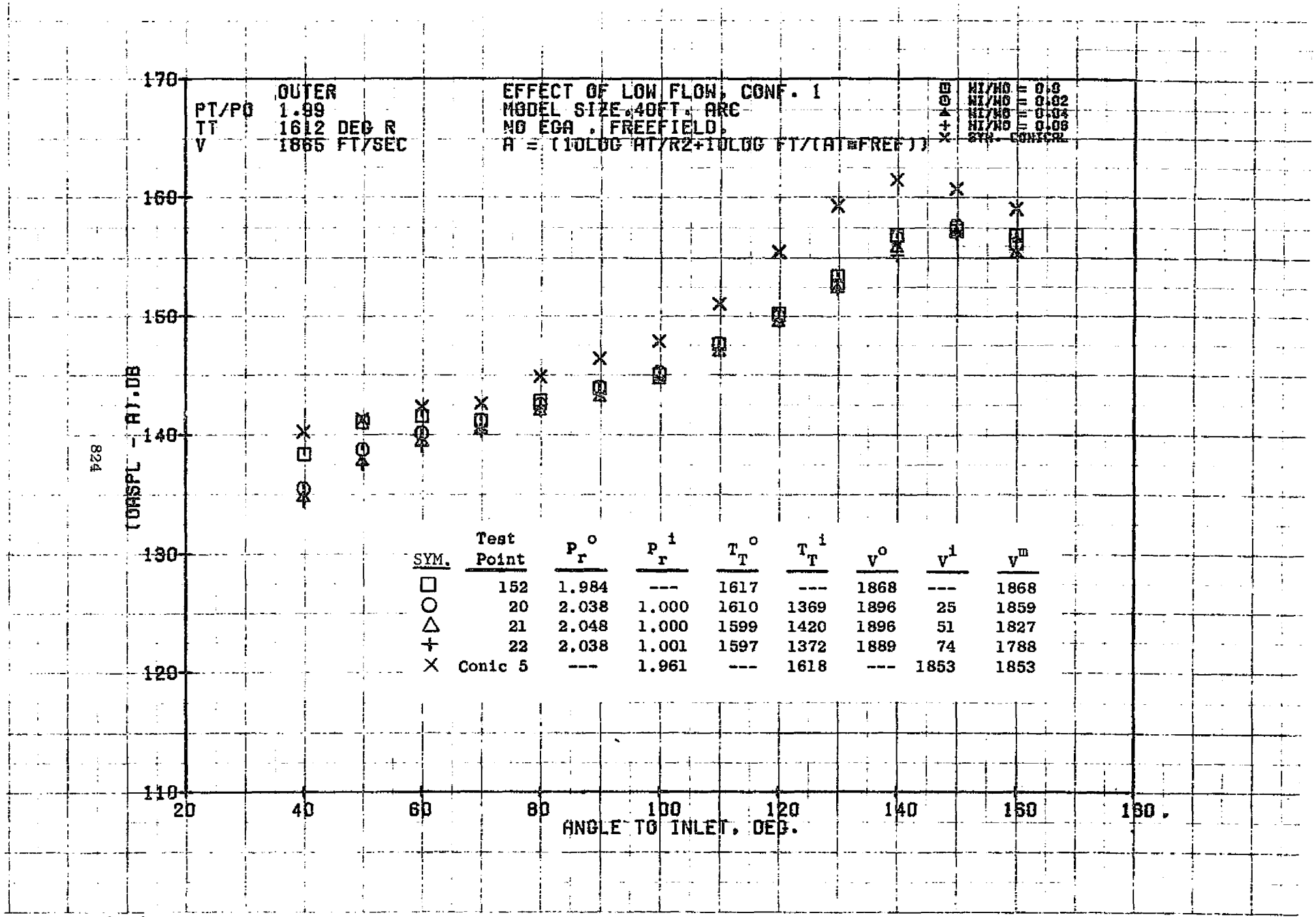

OUTER
PT/P0 2.72
TT 1743 DEG R
V 2299 FT/SEC
EFFECT OF [illegible] FLOW, CONF. 1
MODEL SIZE, 60FT. ARC
NO EGA , FREEFIELD.
ANGLE TO INLET = 140 DEGREES
HI/HG = 0.0
HI/HS = 0.02
HI/HS = 0.04
HI/HS = 0.08
HI/HS = 0.16
SYM. CONICAL
SPL-10LOG(R2-10LOGFT/(RSFREF)
170
160
150
140
130
120
110
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM.
Test Point
P_r^o
P_r^i
T_T^o
T_T^i
V^o
V^i
V^m
151 2.721 --- 1743 --- 2299 --- 2299
16 2.734 1.000 1730 1544 2295 35 2252
17 2.739 1.001 1743 1576 2306 73 2222
18 2.736 1.002 1742 1508 2304 104 2182
29 2.748 1.001 1737 1281 2304 223 2036
Conic 2 --- 2.692 --- 1757 --- 2296 ---



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	152	1.984	---	1617	---	1868	---	1868
○	20	2.038	1.000	1610	1369	1896	25	1859
△	21	2.048	1.000	1599	1420	1896	51	1827
+	22	2.038	1.001	1597	1372	1889	74	1788
×	Conic 5	---	1.961	---	1618	---	1853	1853

10/25/76
1X556-001

73KBLLSTEOT



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1X334-001

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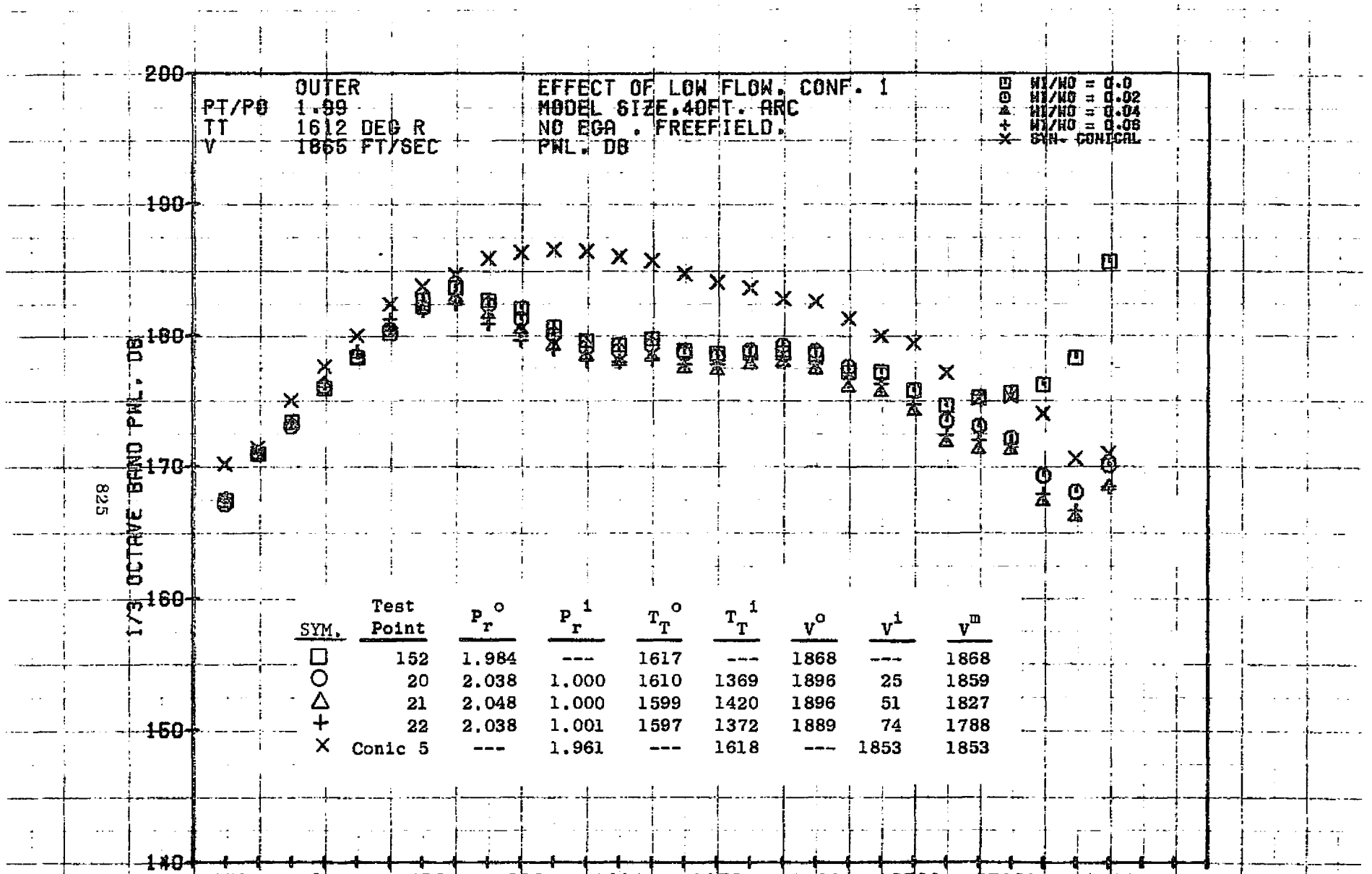

SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	152	1.984	---	1617	---	1868	---	1868
○	20	2.038	1.000	1610	1369	1896	25	1859
△	21	2.048	1.000	1599	1420	1896	51	1827
+	22	2.038	1.001	1597	1372	1889	74	1788
×	Conic 5	---	1.961	---	1618	---	1853	1853

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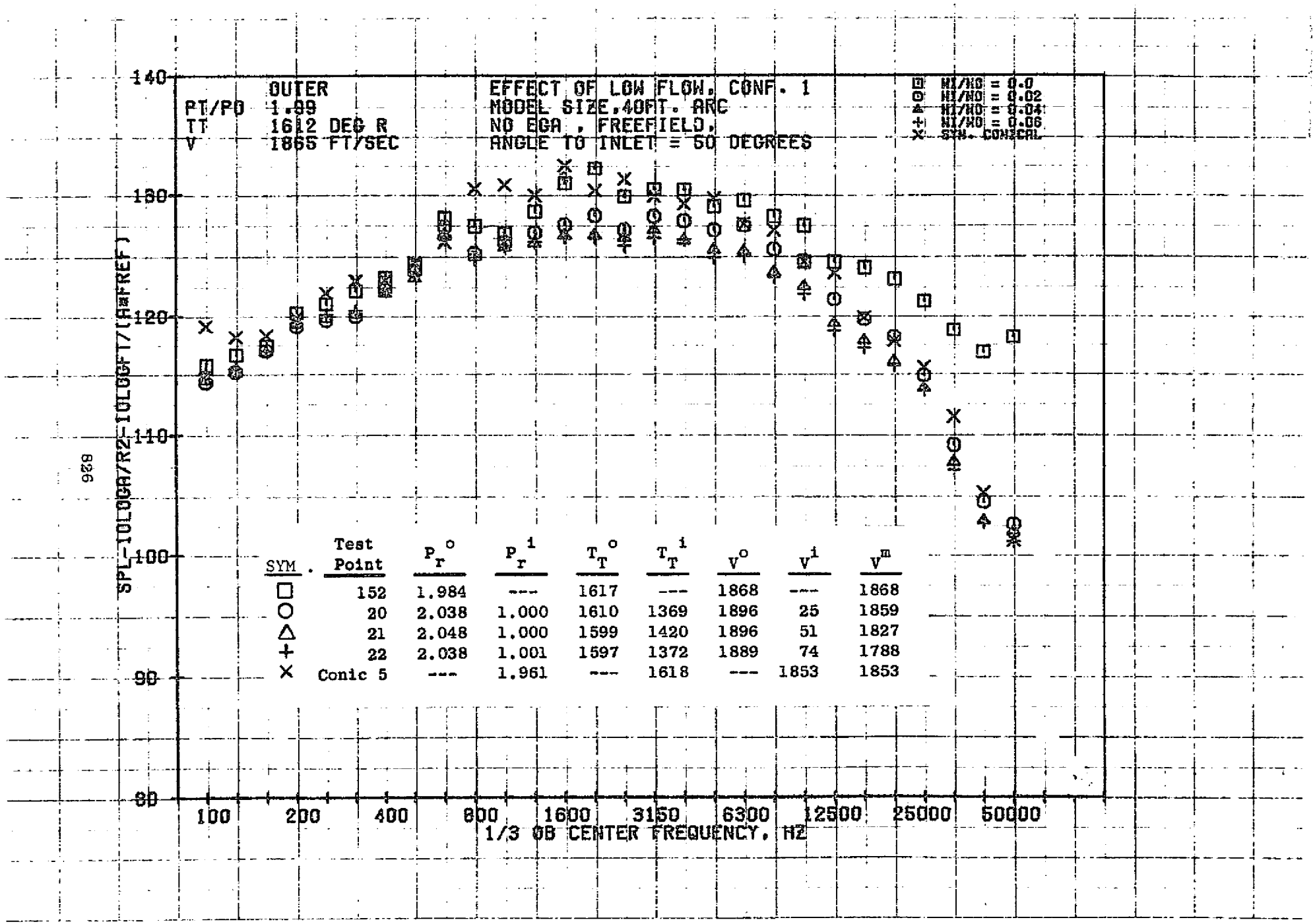
1X334-001

73KOLLSTEDT



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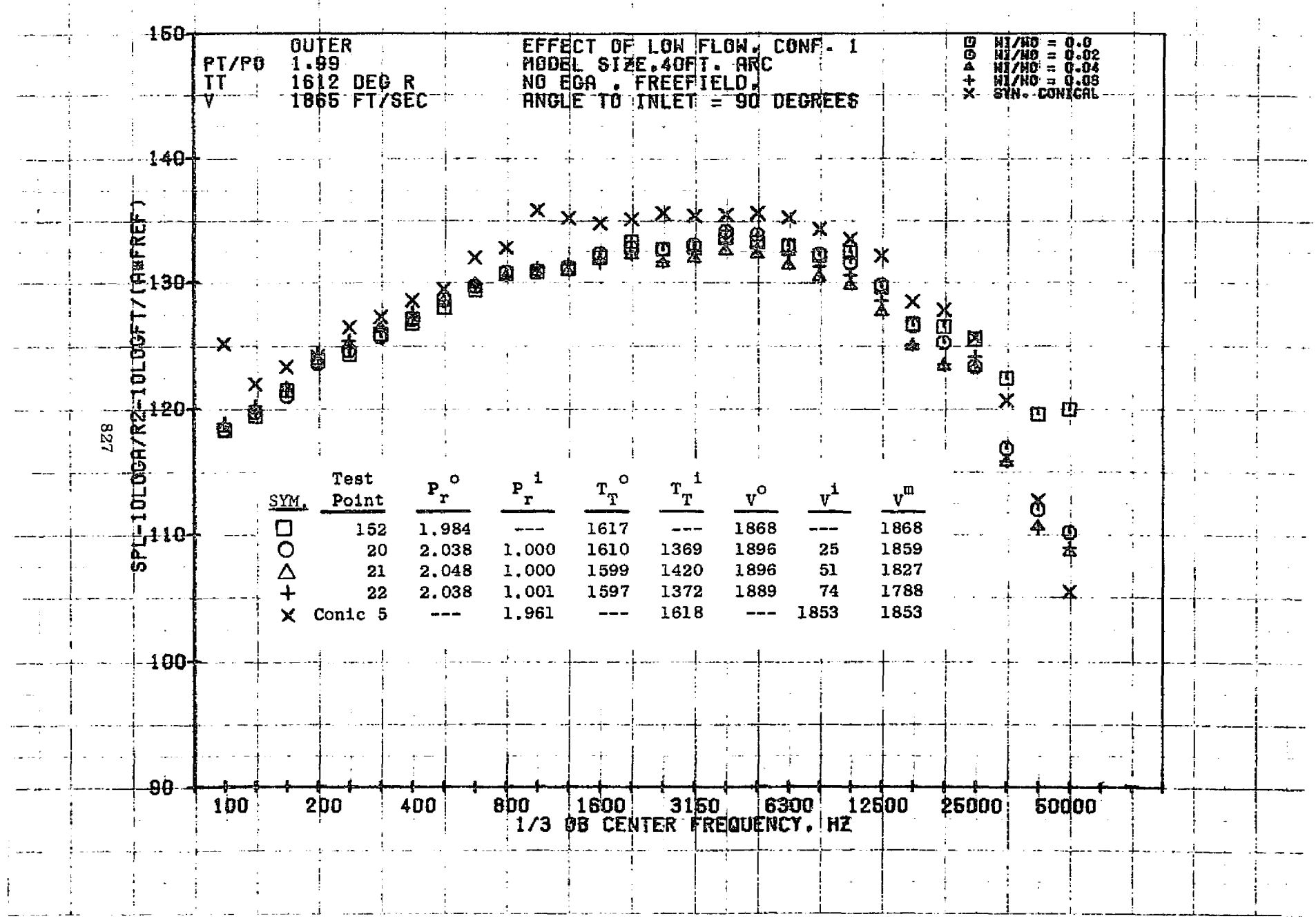
73KOLLSTEDT



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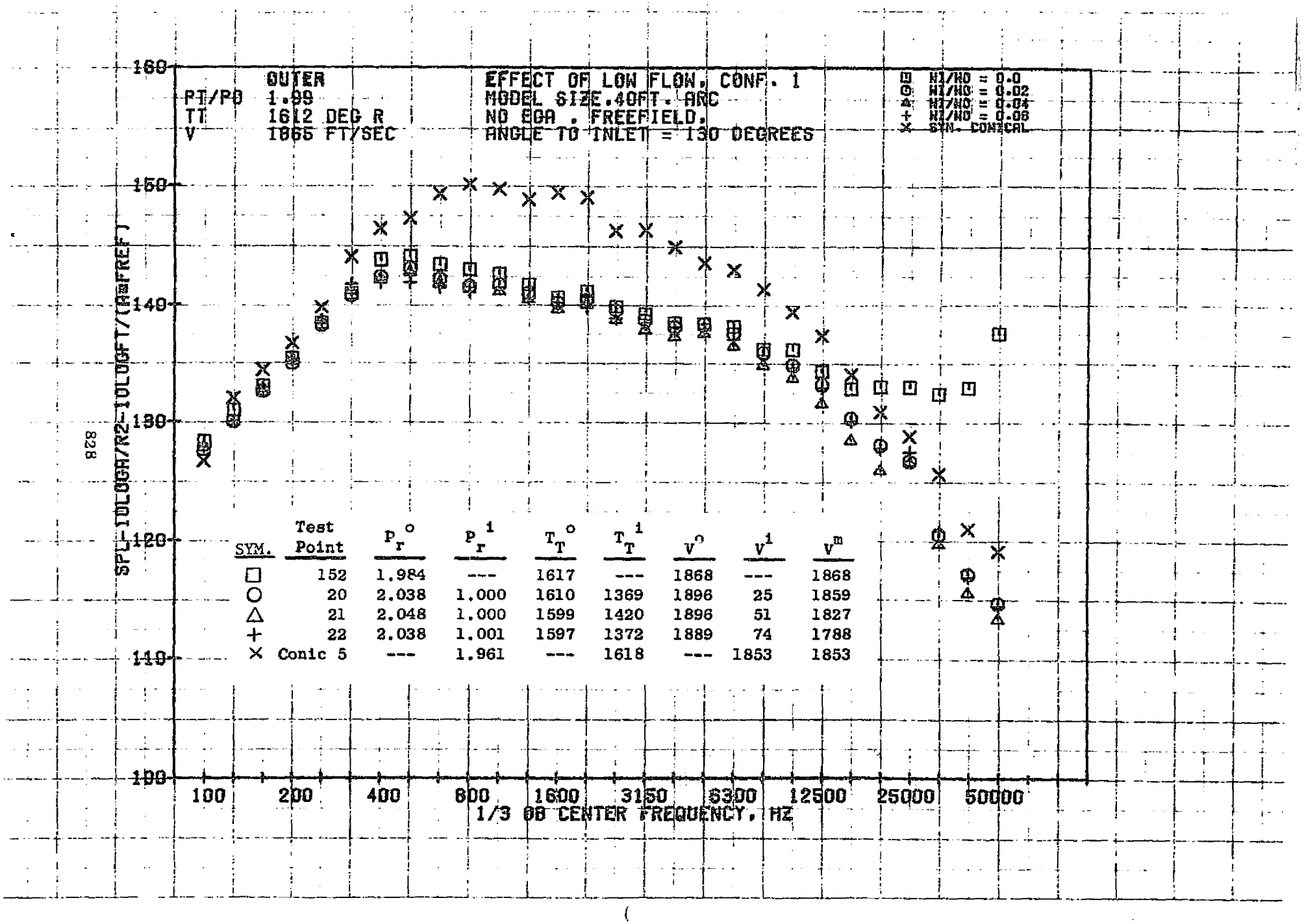
73KOLLSTEDT



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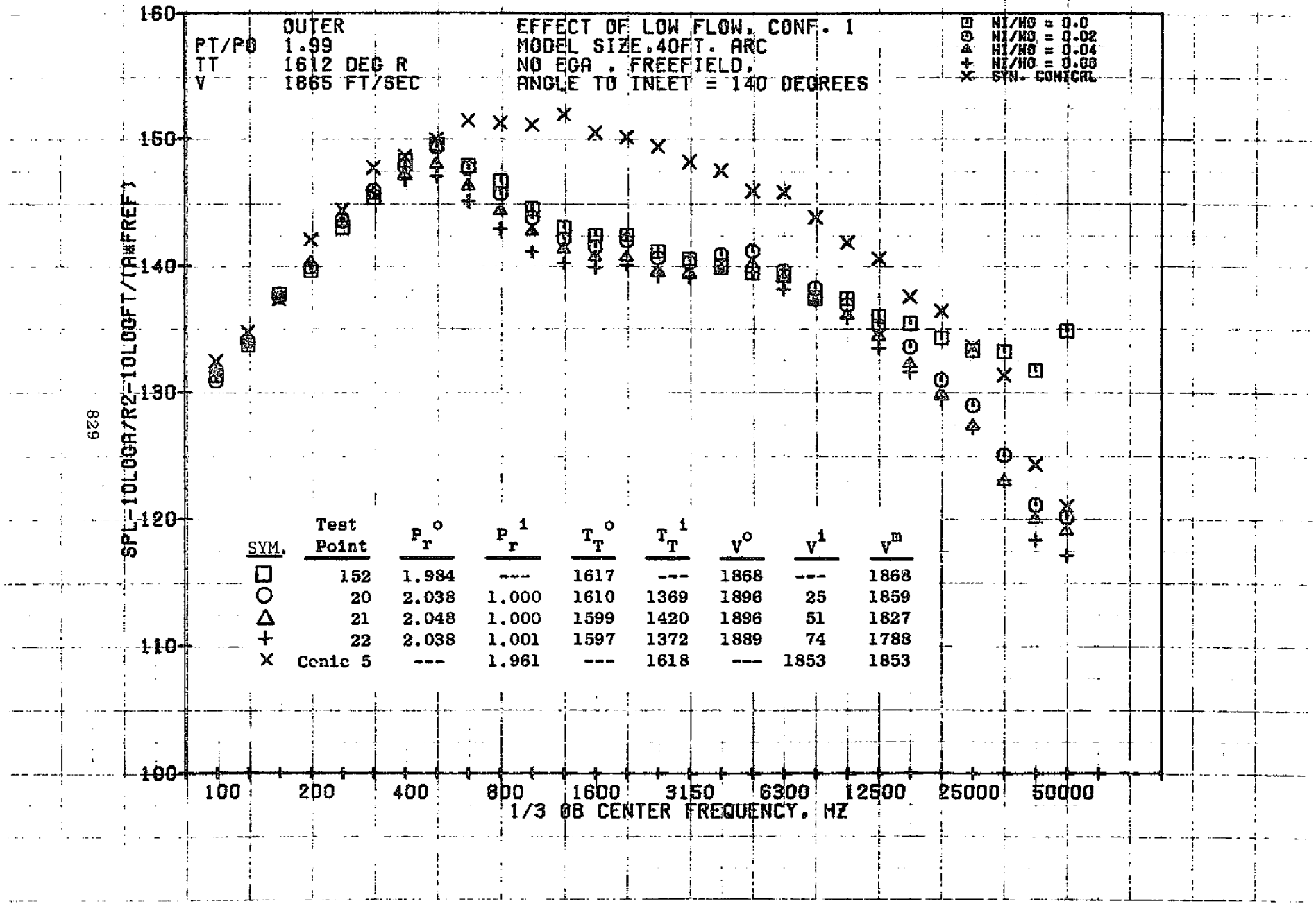

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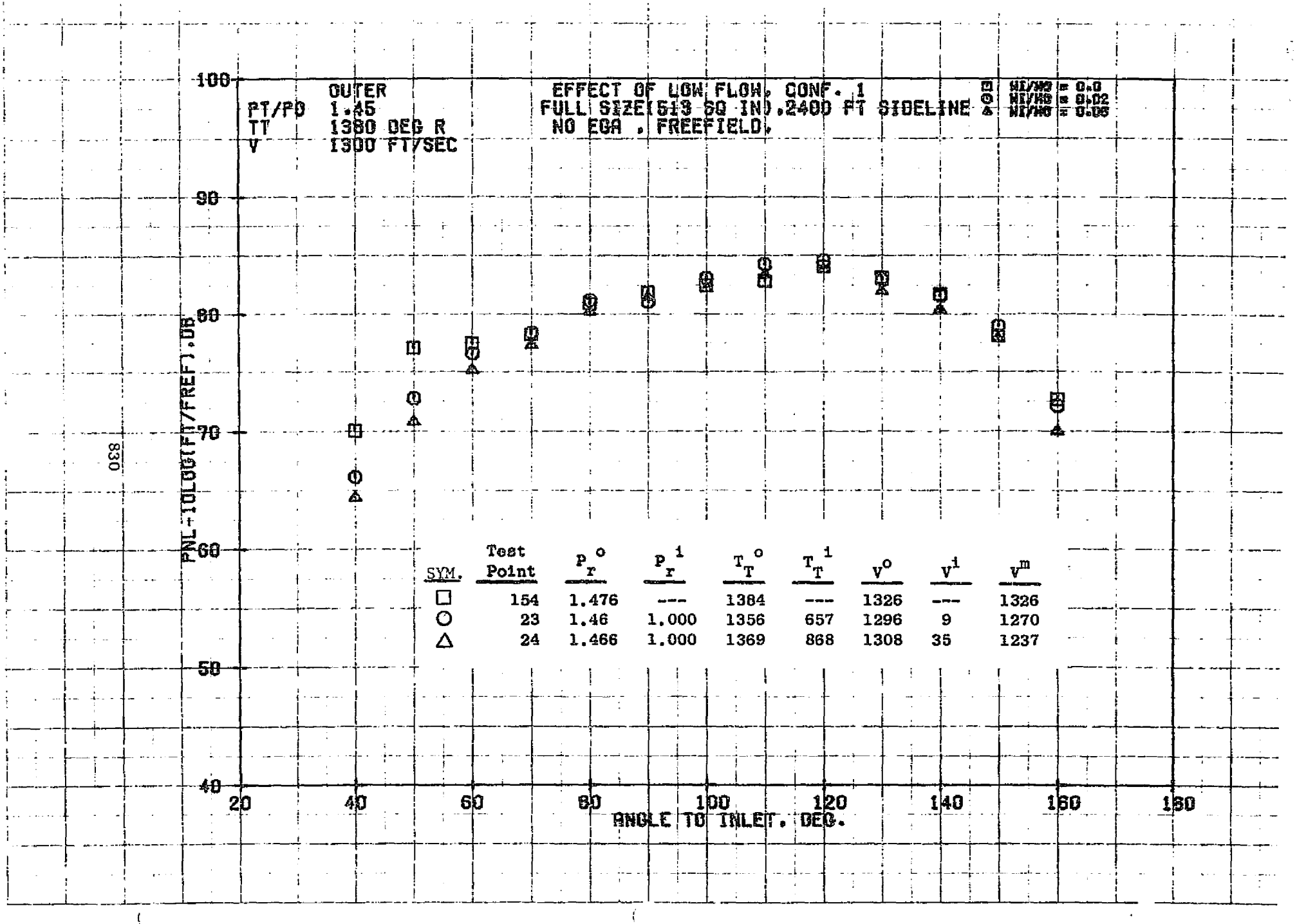
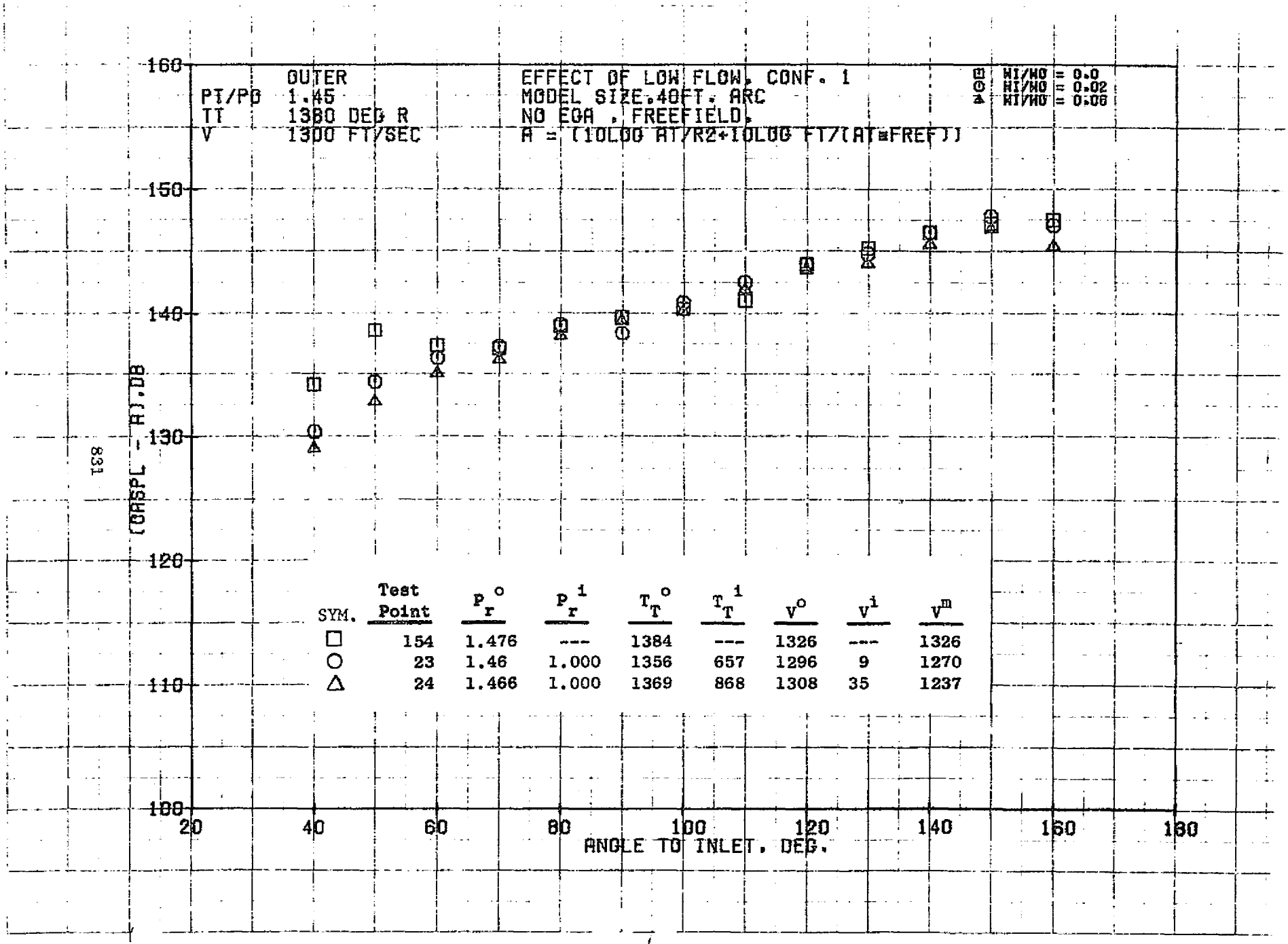
1X334-001

73KOLLSTEDT



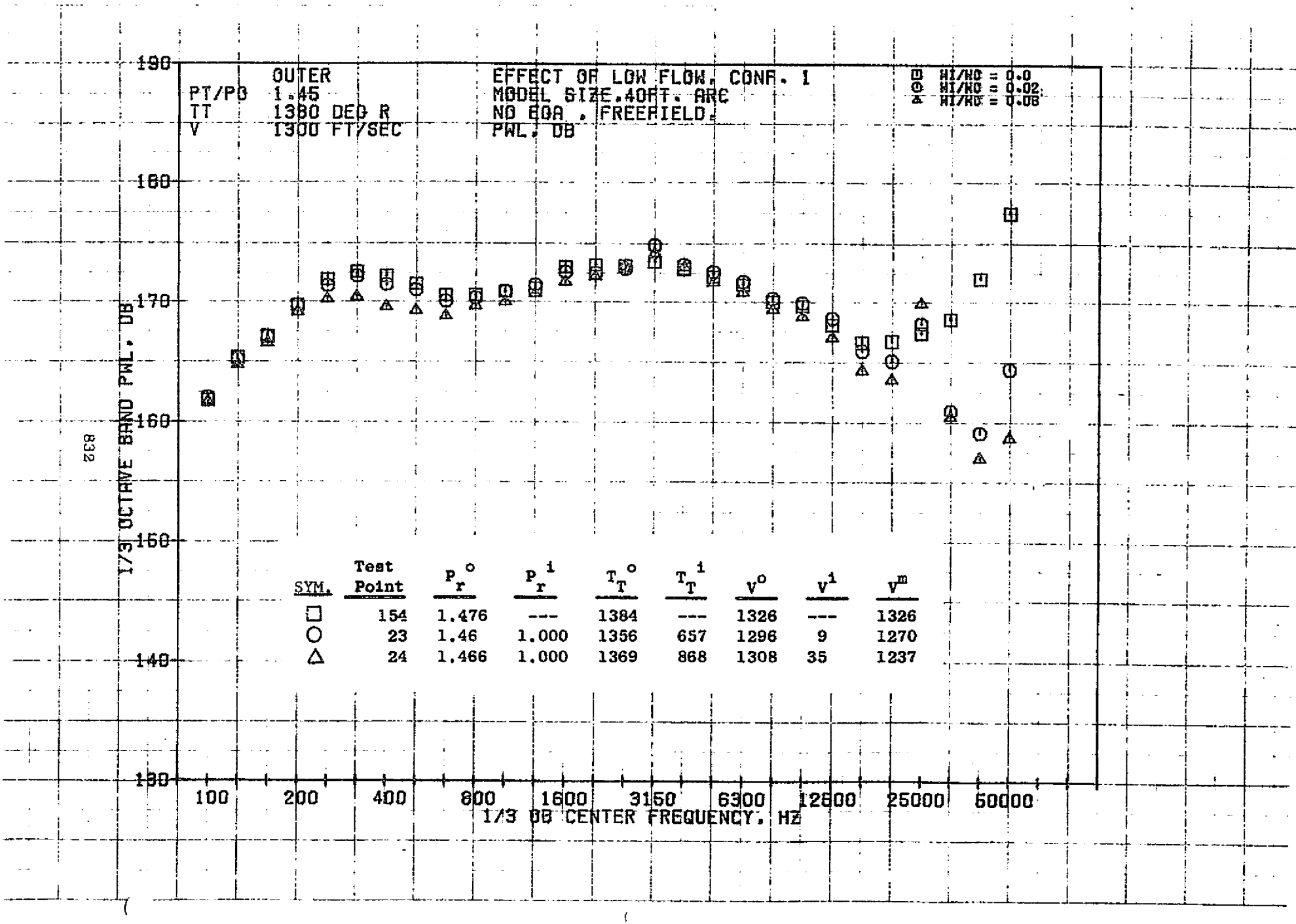
10/25/76
1X556-001

73KOLLSTEDT



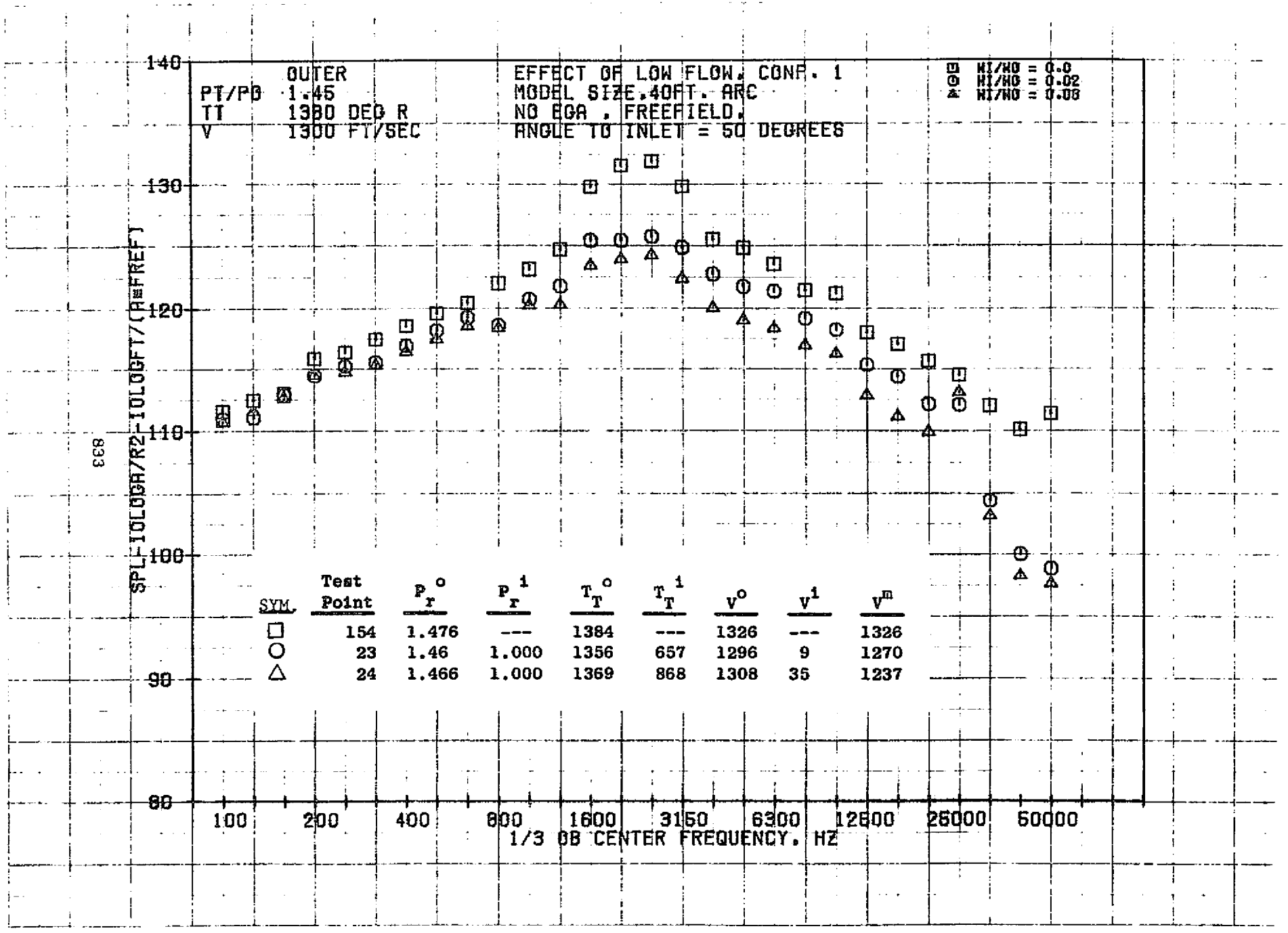
10/08/76
1X746-001

73KOLLSTEDT



10/08/76
1X746-001

73KOLLSTEDT



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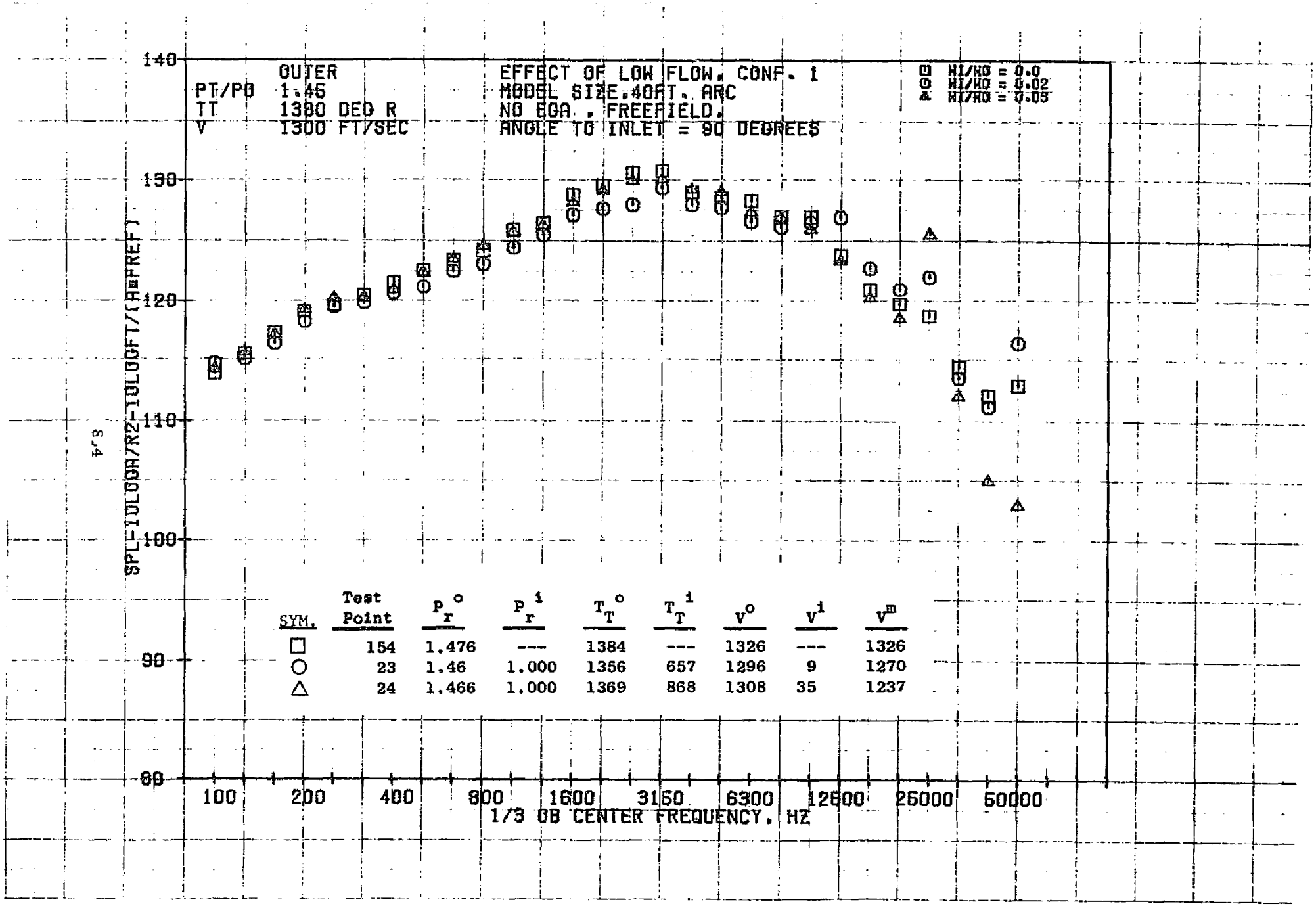
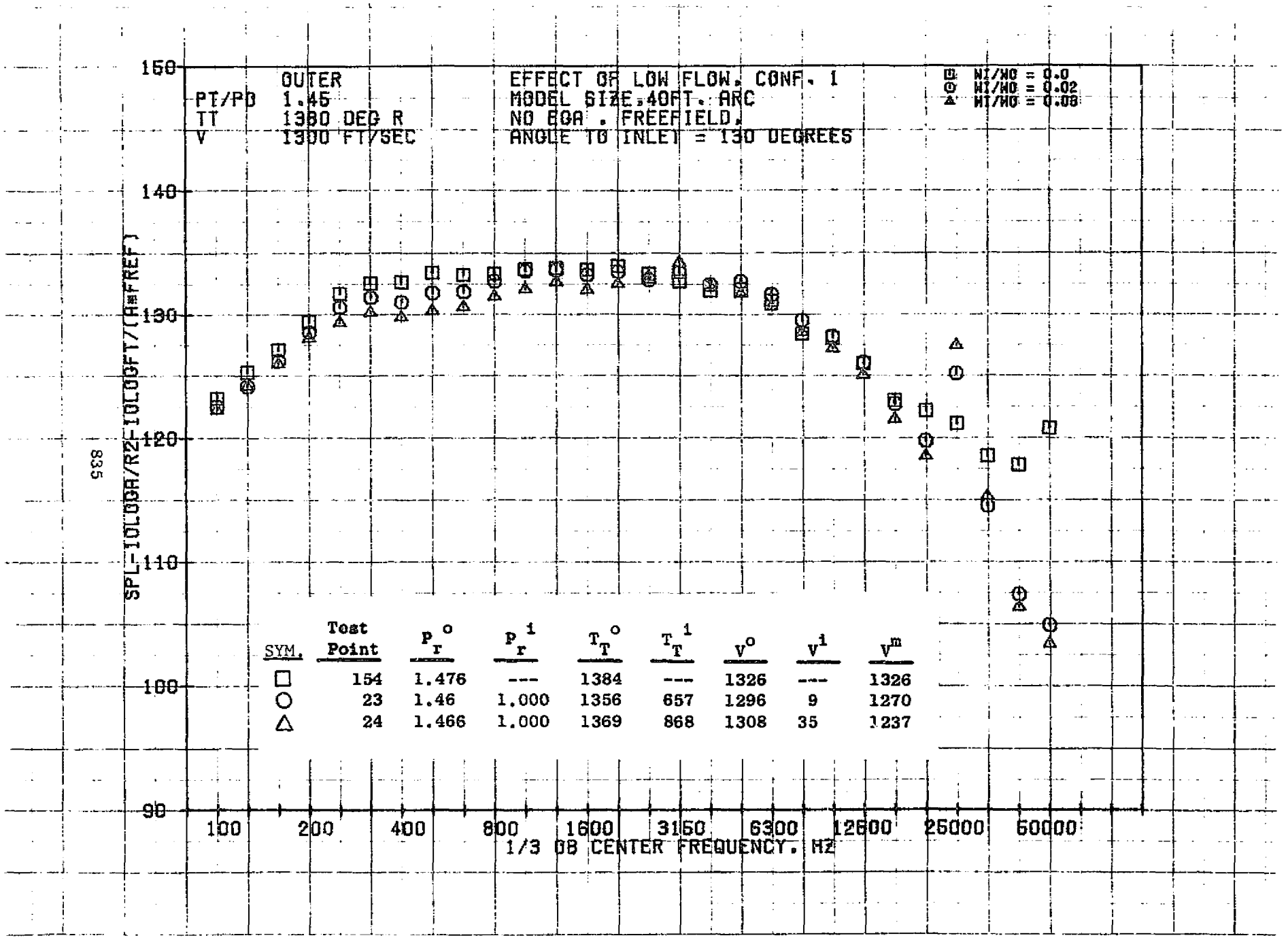
10/08/76
1X746-001

73KOLLSTEDT



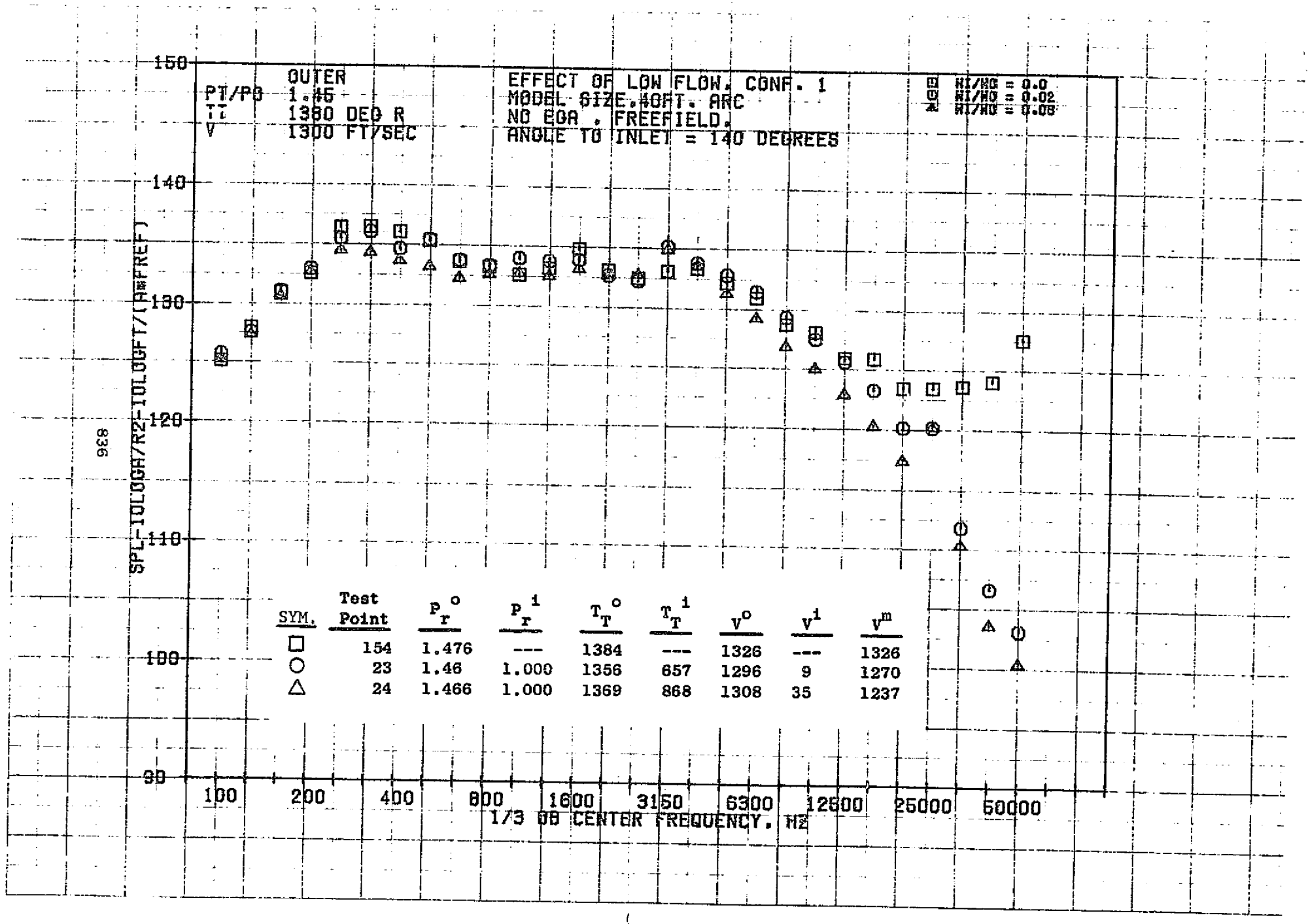
10/08/76
1X746-001

73KOLLSTEDT



10/08/76
1X746-001

73KOLLSTEDT



10/08/76
1X746-001

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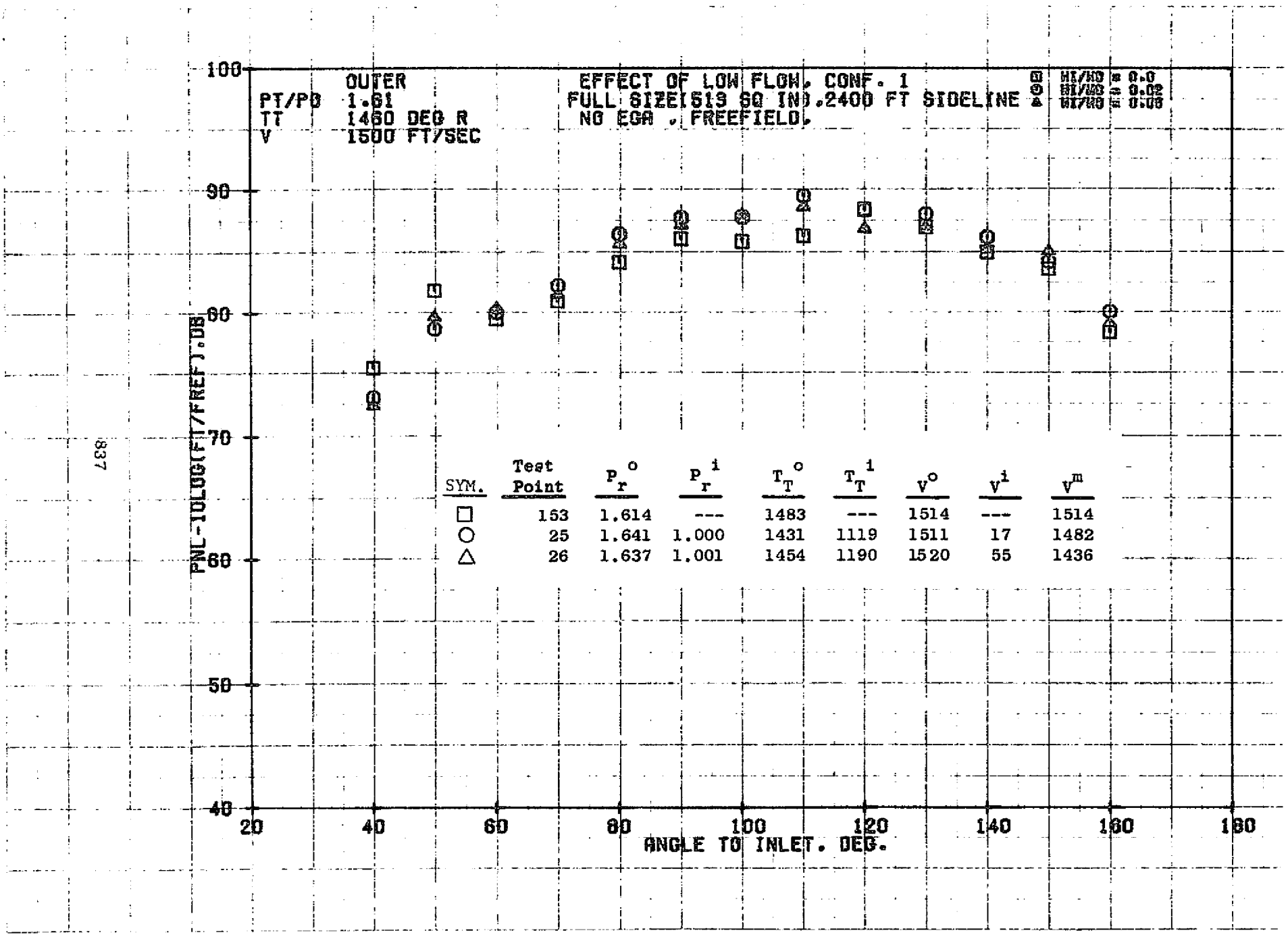

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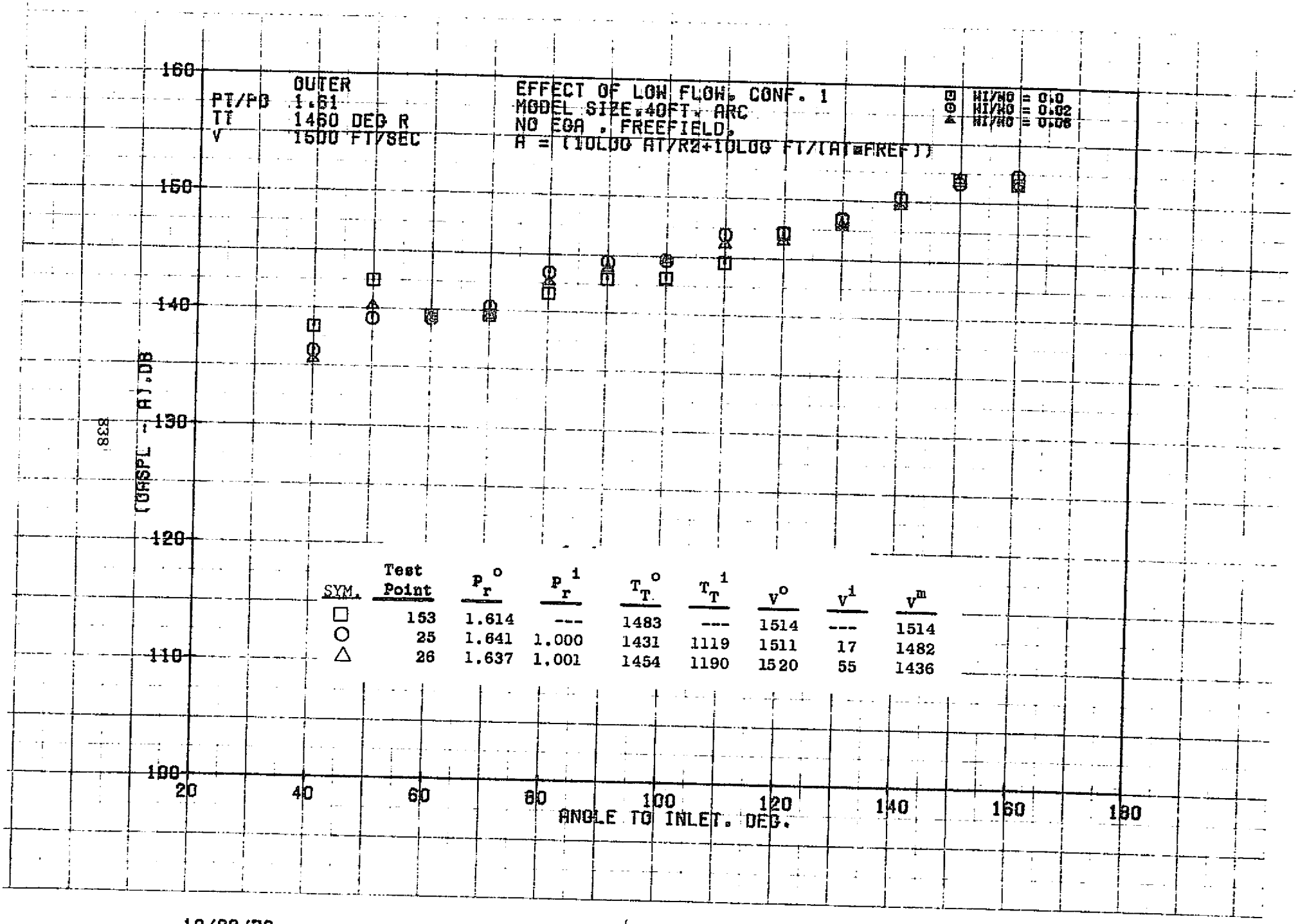
10/25/76
1X556-001

73KOLLSTEDT



10/08/76
1X746-001

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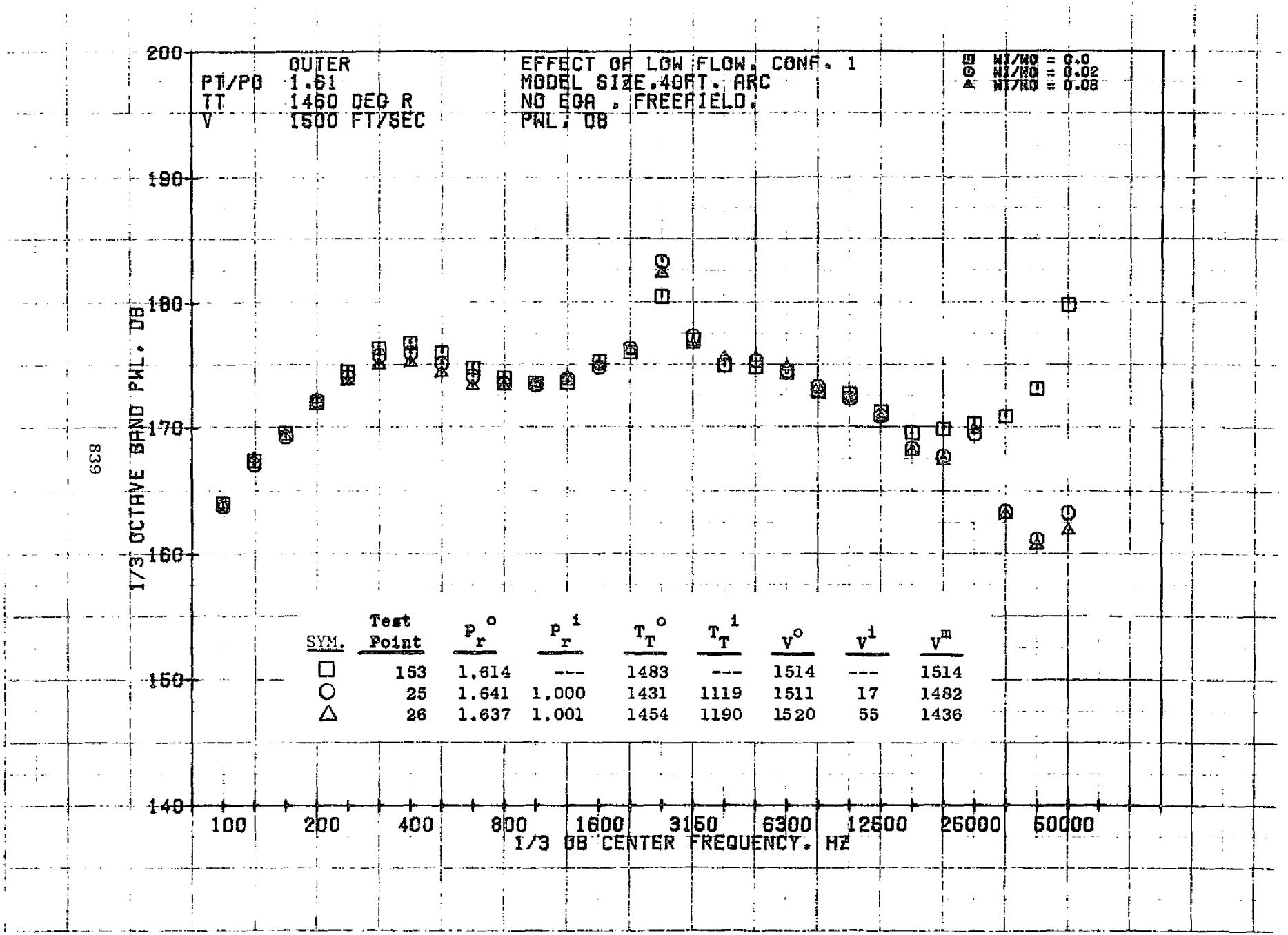

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10/08/76
1X746-001

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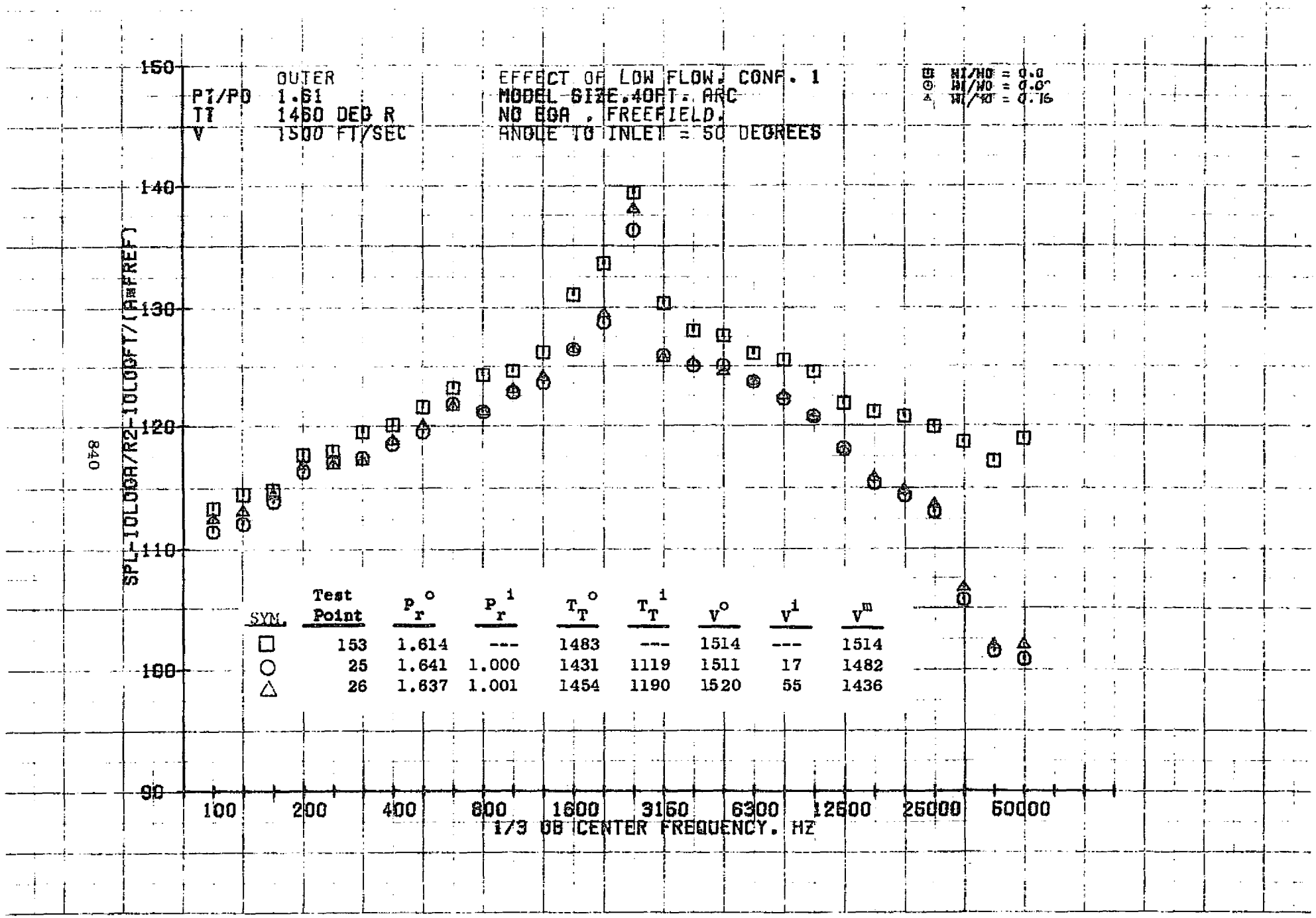
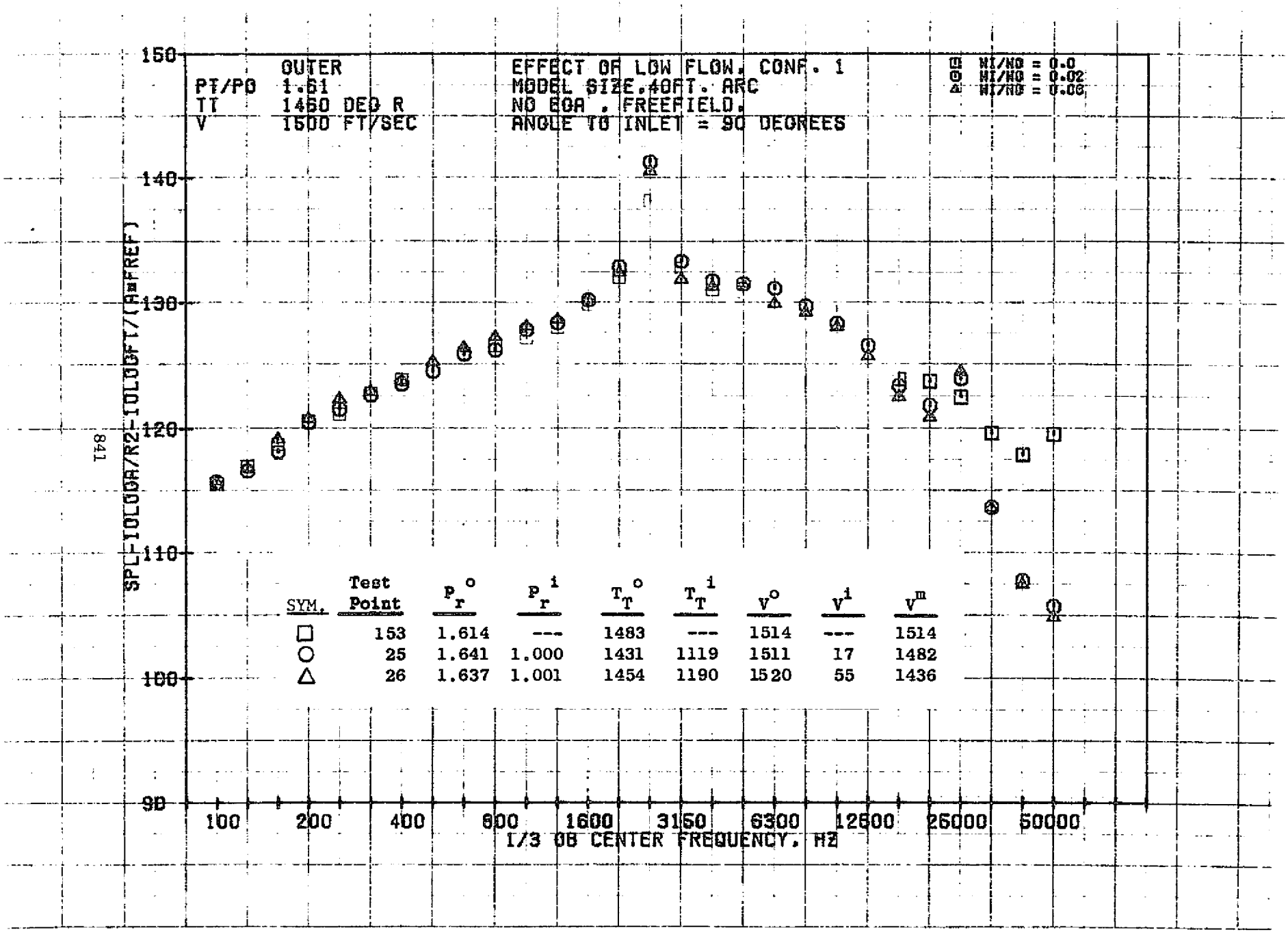

OUTER
PT/PO 1.61
TT 1460 DEG R
V 1500 FT/SEC
EFFECT OF LOW FLOW, CONF. 1
MODEL SIZE.40FT. ARC
NO EGA , FREEFIELD.
ANGLE TO INLET = 50 DEGREES
HI/HO = 0.0
HI/HO = 0.0^
HI/HO = 0.16
SPL-10LOGA/R2-10LOGFT/(A=AREF)
150
140
130
120
110
100
90
840
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM.
Test Point
P_r^o
P_r^i
T_T^o
T_T^i
V^o
V^i
V^m
153 1.614 --- 1483 --- 1514 --- 1514
25 1.641 1.000 1431 1119 1511 17 1482
26 1.637 1.001 1454 1190 1520 55 1436

LLSTEDT



10/08/76
1X746-001

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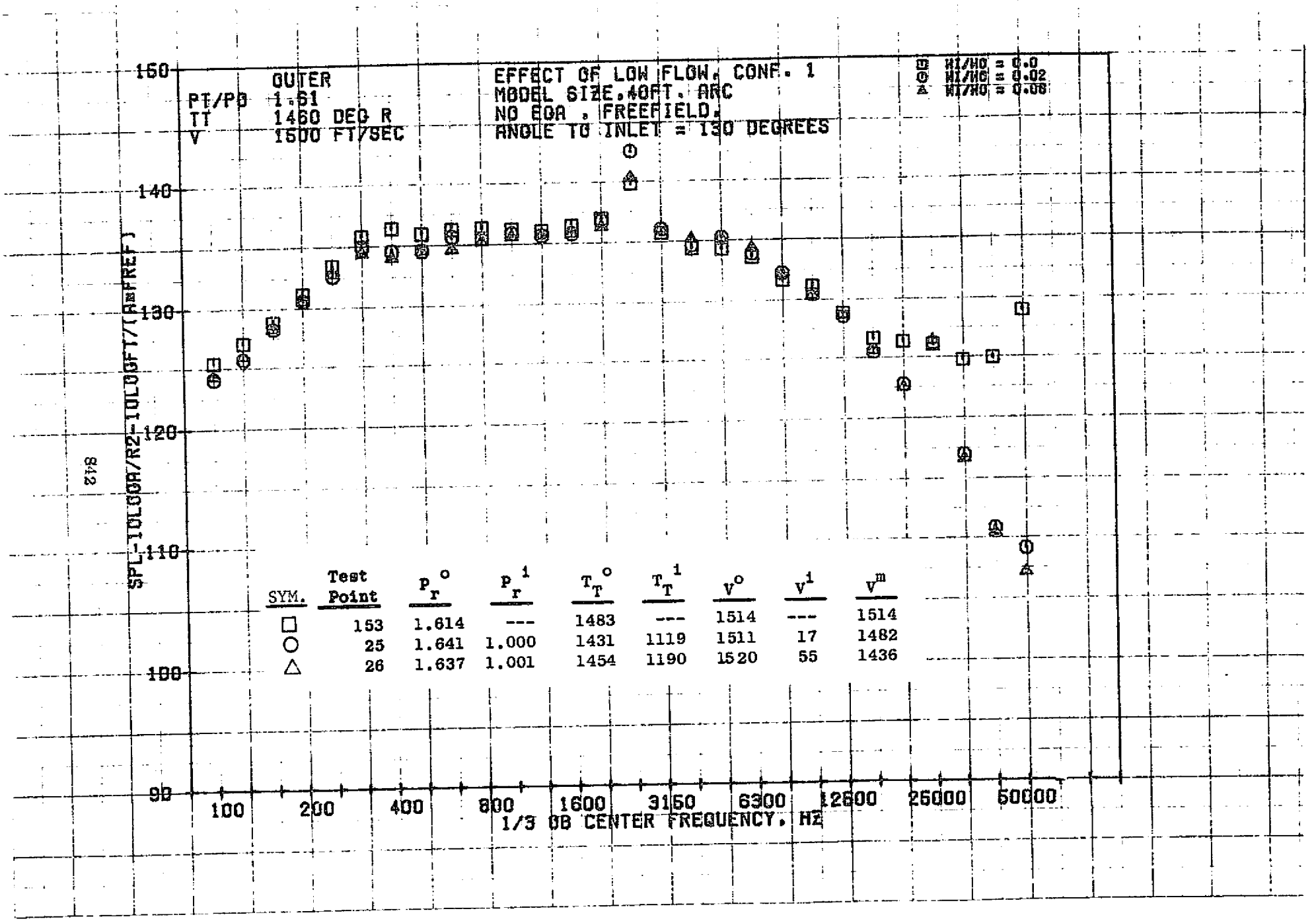
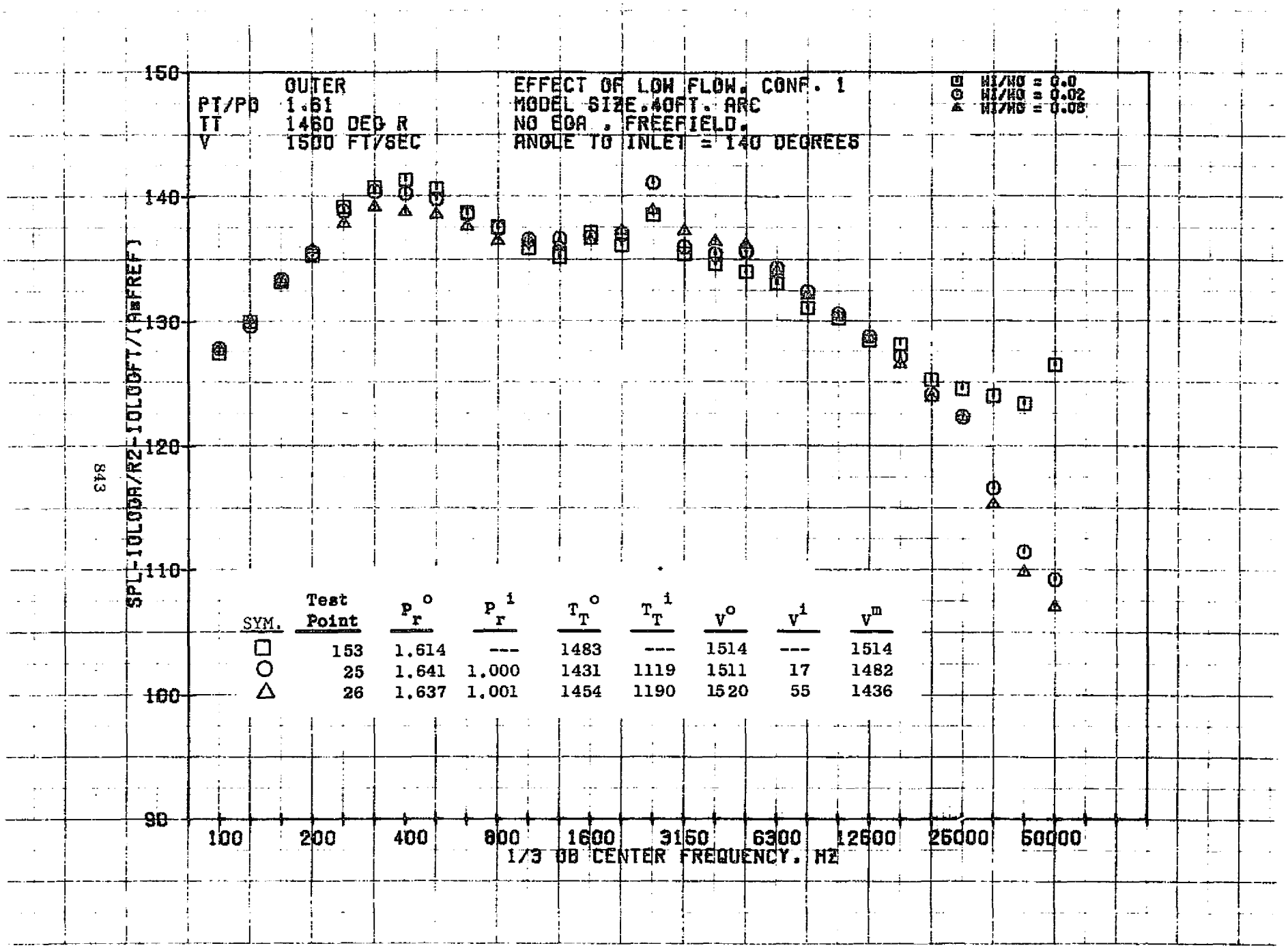


10/08/76
1X746-001

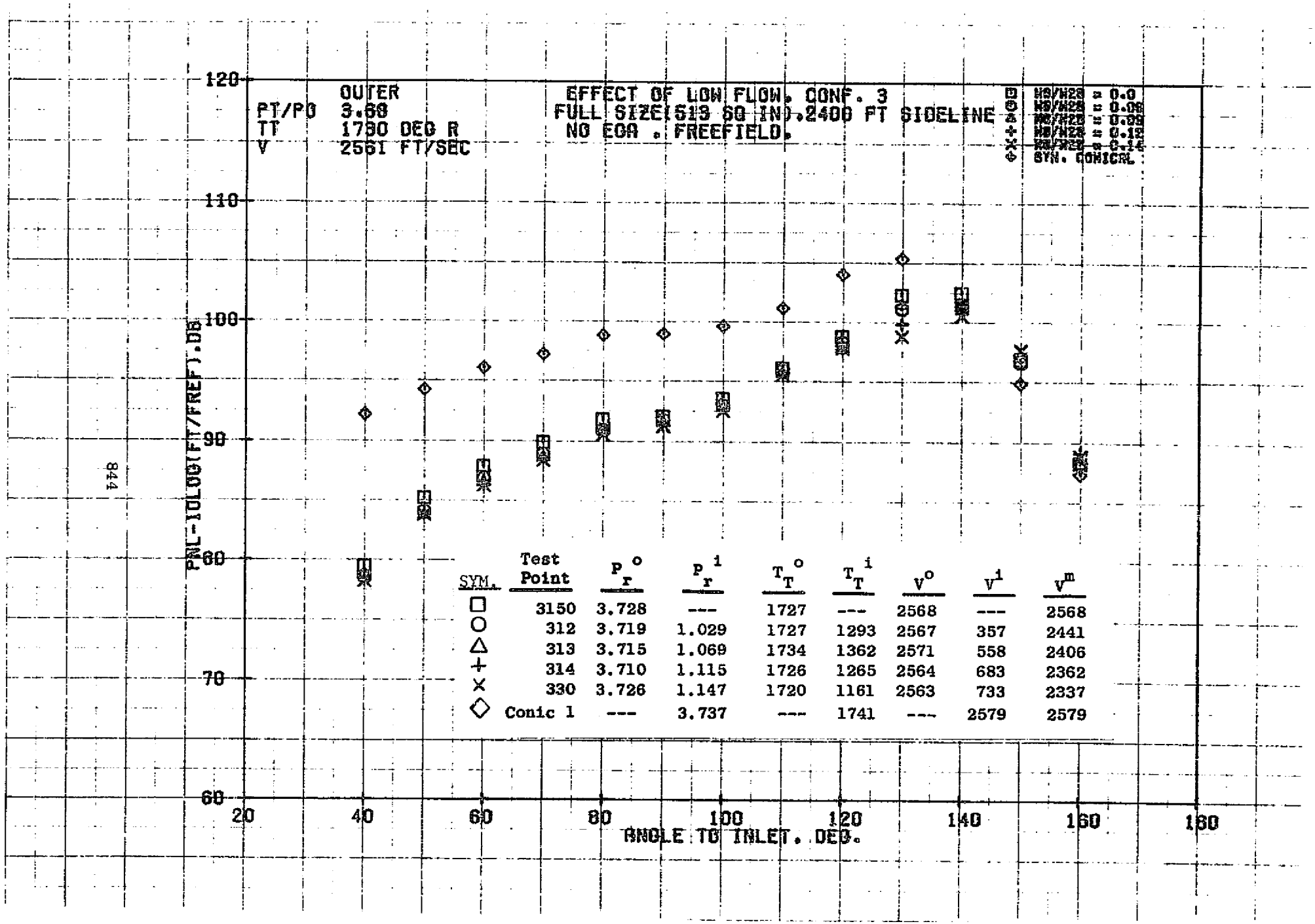
73KOLLSTEDT



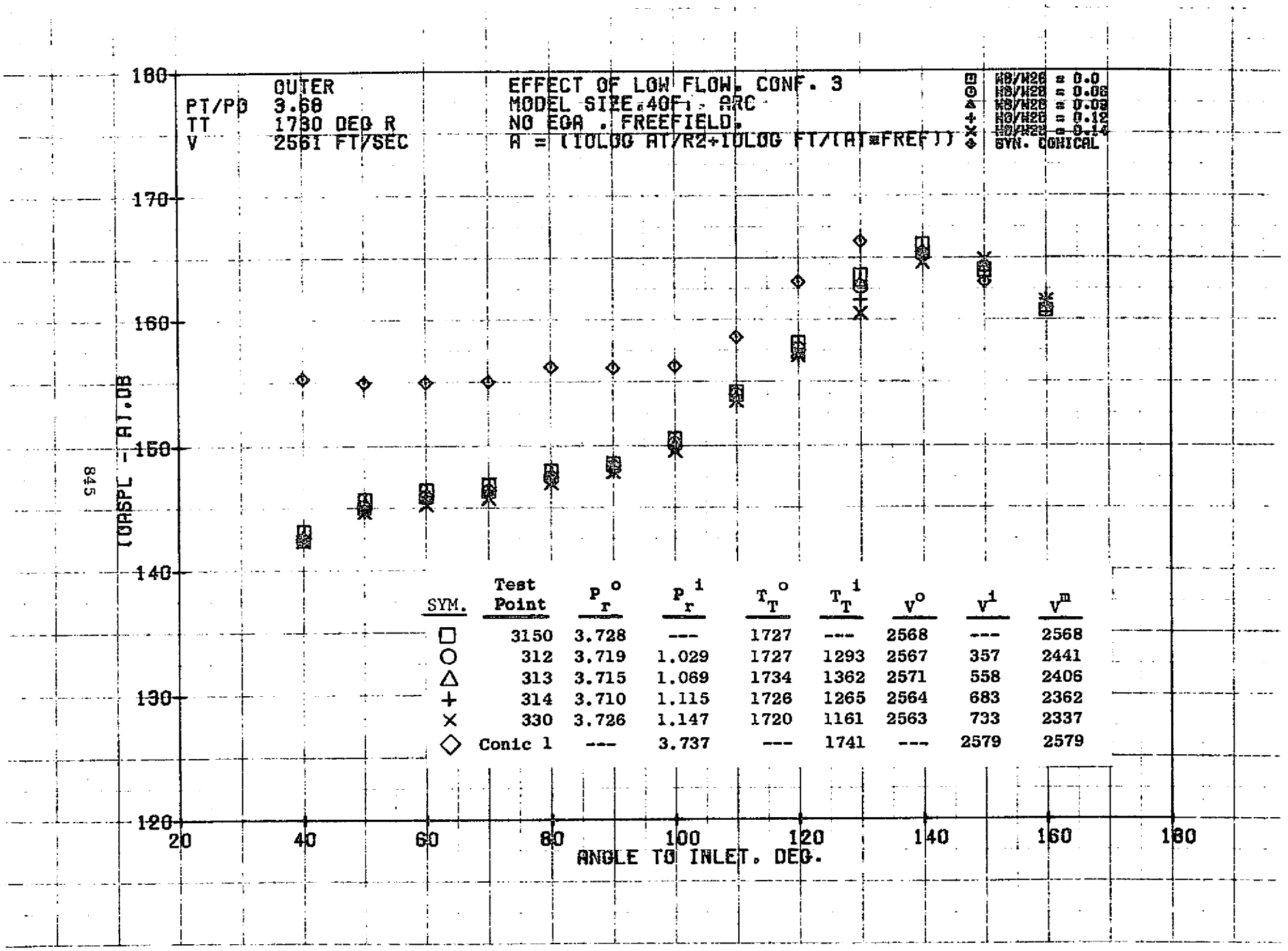
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	153	1.614	---	1483	---	1514	---	1514
○	25	1.641	1.000	1431	1119	1511	17	1482
△	26	1.637	1.001	1454	1190	1520	55	1436

10/08/76
1X746-001

73KOLLSTEDT



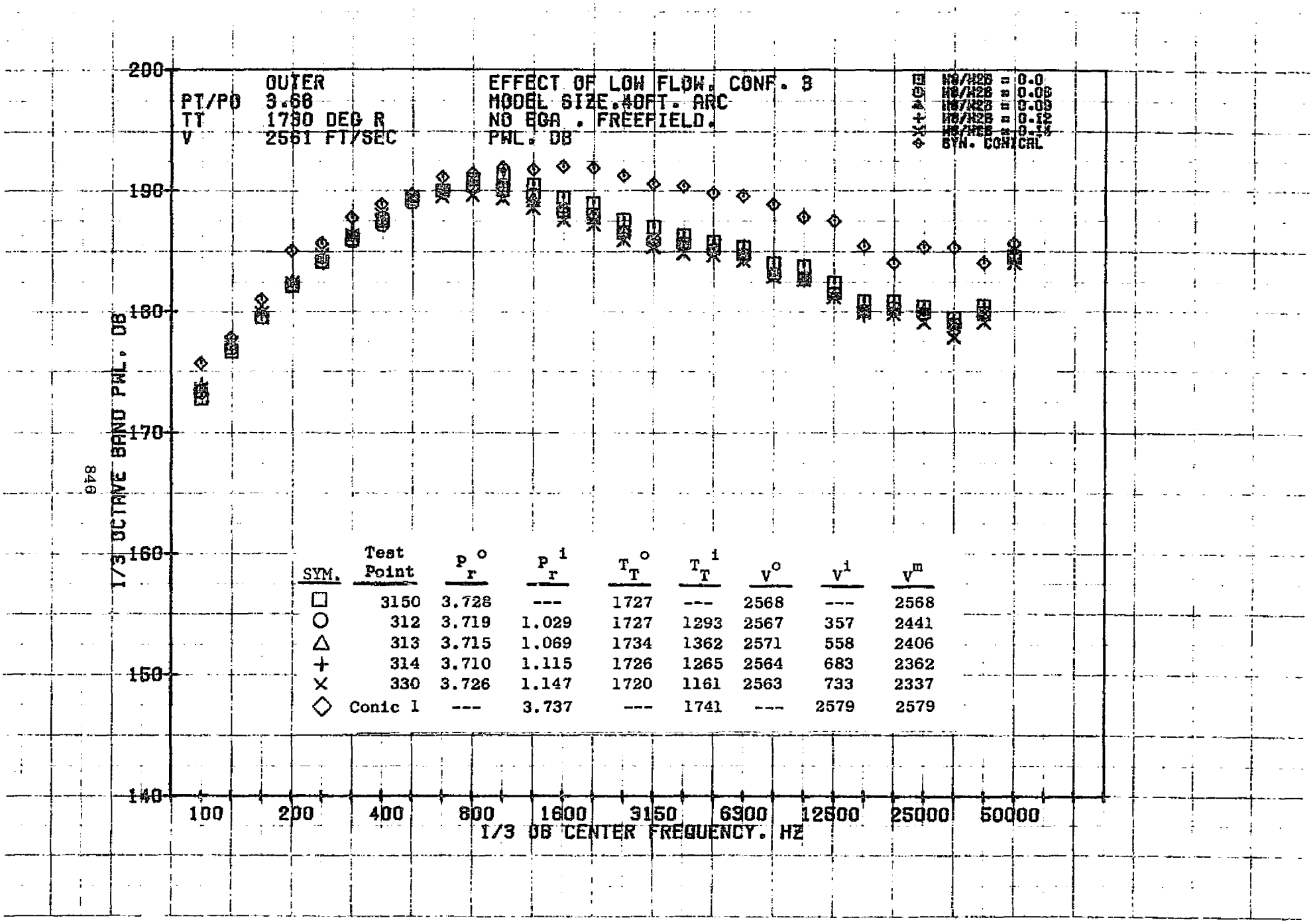
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3150	3.728	---	1727	---	2568	---	2568
○	312	3.719	1.029	1727	1293	2567	357	2441
△	313	3.715	1.069	1734	1362	2571	558	2406
+	314	3.710	1.115	1726	1265	2564	683	2362
×	330	3.726	1.147	1720	1161	2563	733	2337
◇	Conic 1	---	3.737	---	1741	---	2579	2579



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3150	3.728	---	1727	---	2568	---	2568
○	312	3.719	1.029	1727	1293	2567	357	2441
△	313	3.715	1.069	1734	1362	2571	558	2406
+	314	3.710	1.115	1726	1265	2564	683	2362
×	330	3.726	1.147	1720	1161	2563	733	2337
◇	Conic 1	---	3.737	---	1741	---	2579	2579

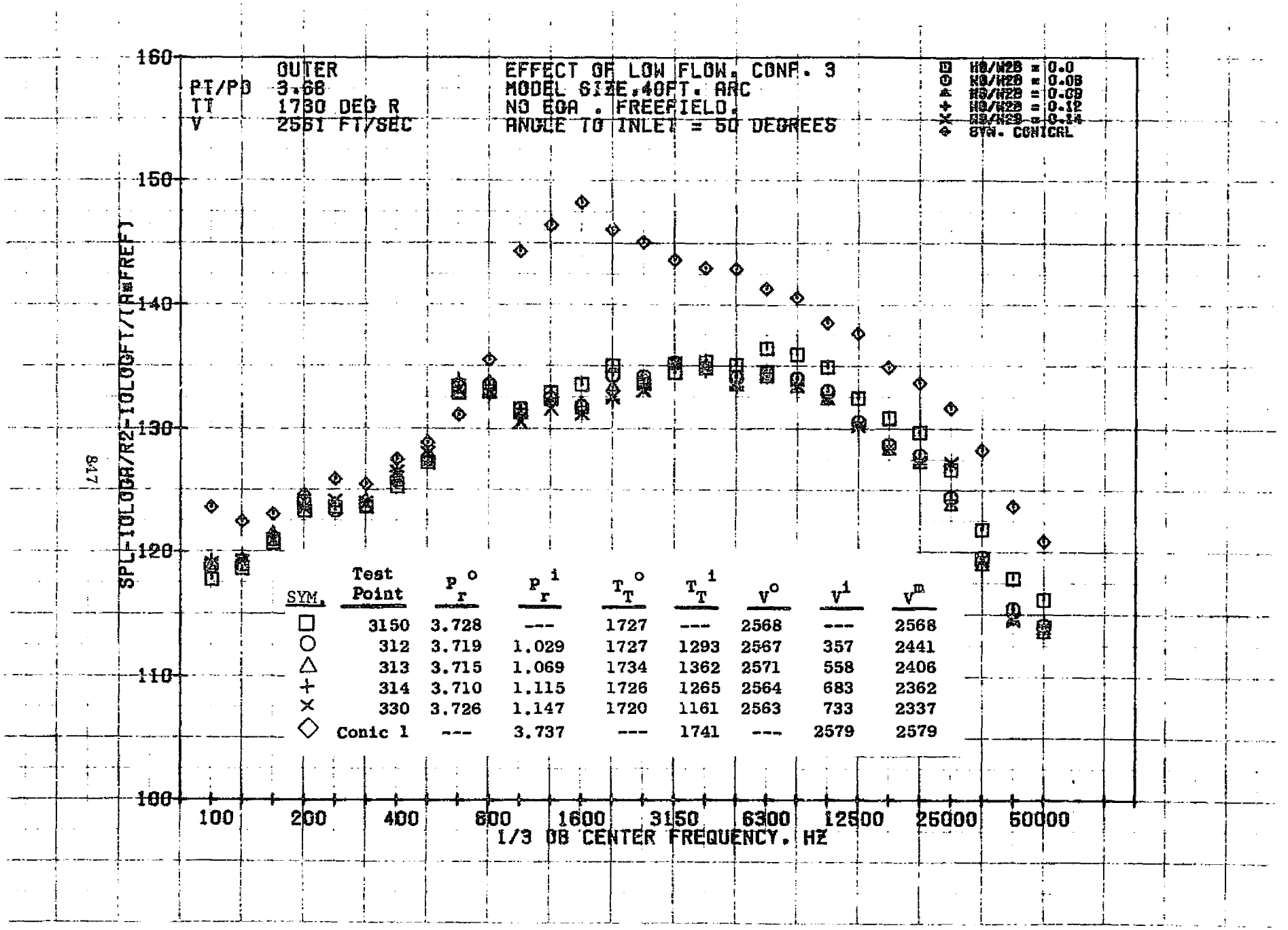
10/11/76
1X207-001

73KOLLSTEDT



10/11/76
1X207-001

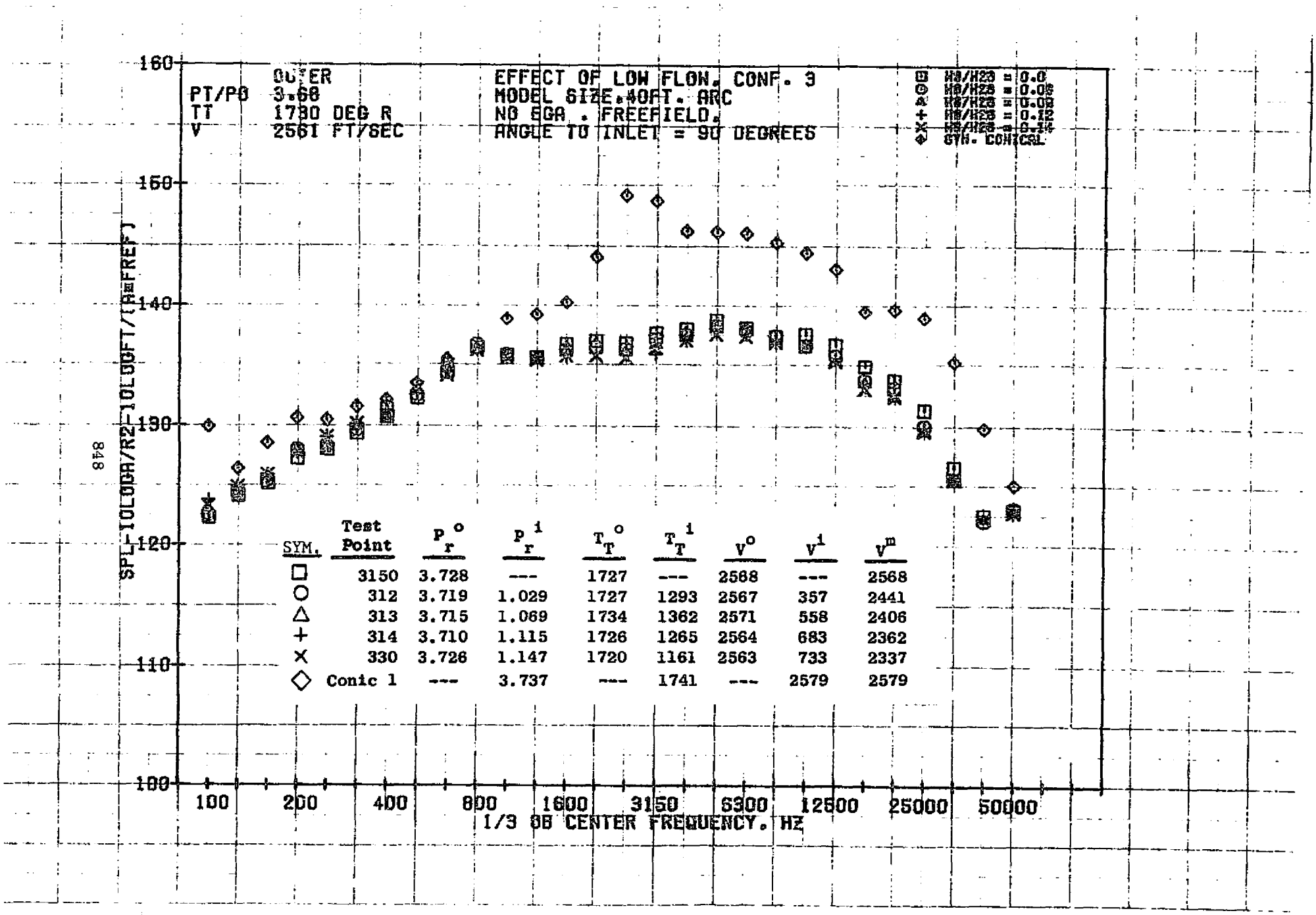
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3150	3.728	---	1727	---	2568	---	2568
○	312	3.719	1.029	1727	1293	2567	357	2441
△	313	3.715	1.069	1734	1362	2571	558	2406
+	314	3.710	1.115	1726	1265	2564	683	2362
×	330	3.726	1.147	1720	1161	2563	733	2337
◇	Conic 1	---	3.737	---	1741	---	2579	2579

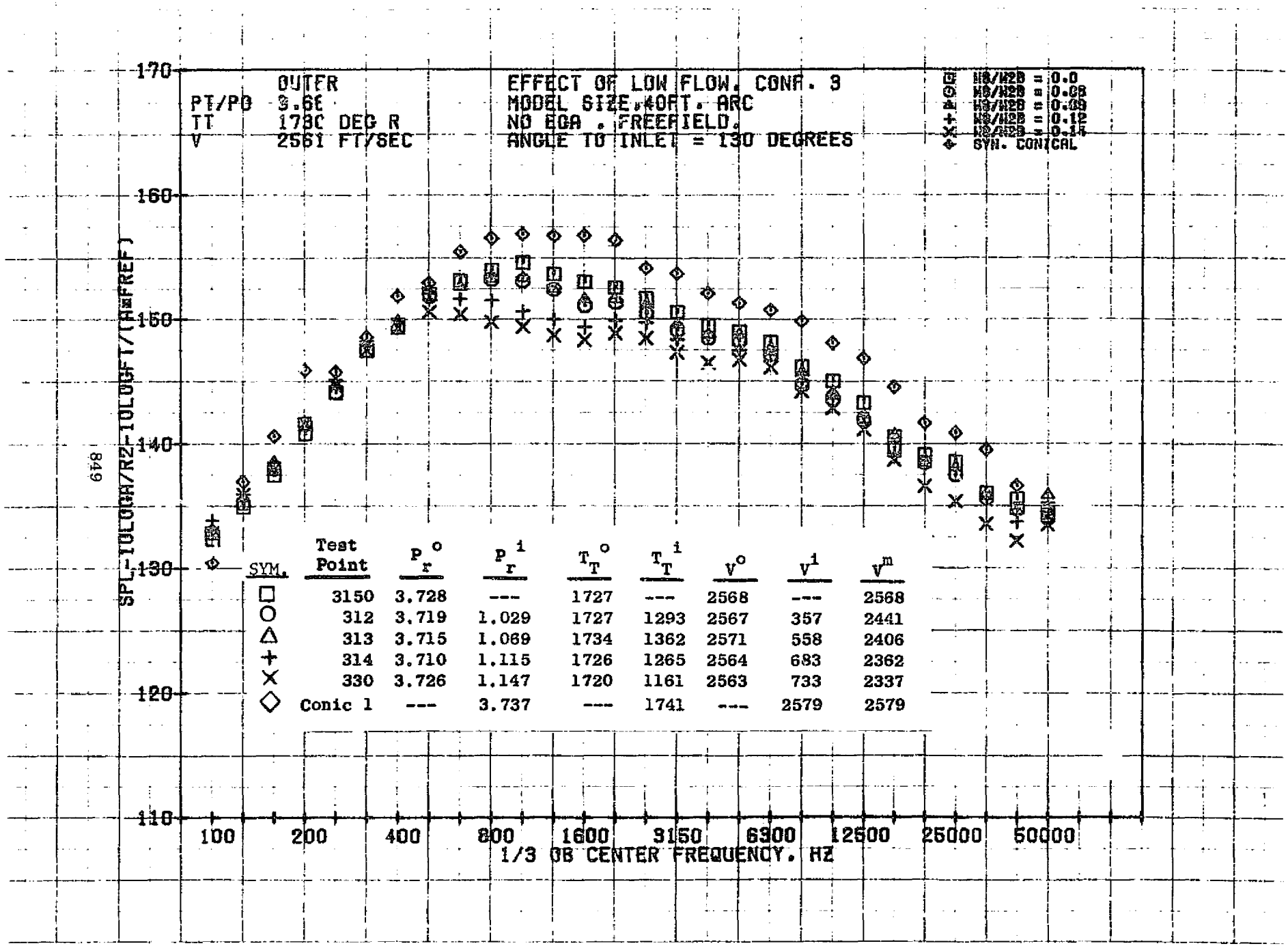
10/11/76
1X207-001

73KOLLSTEDT



10/11/76
1X207-001

73KOLLSTEDT



10/11/76
1X207-001

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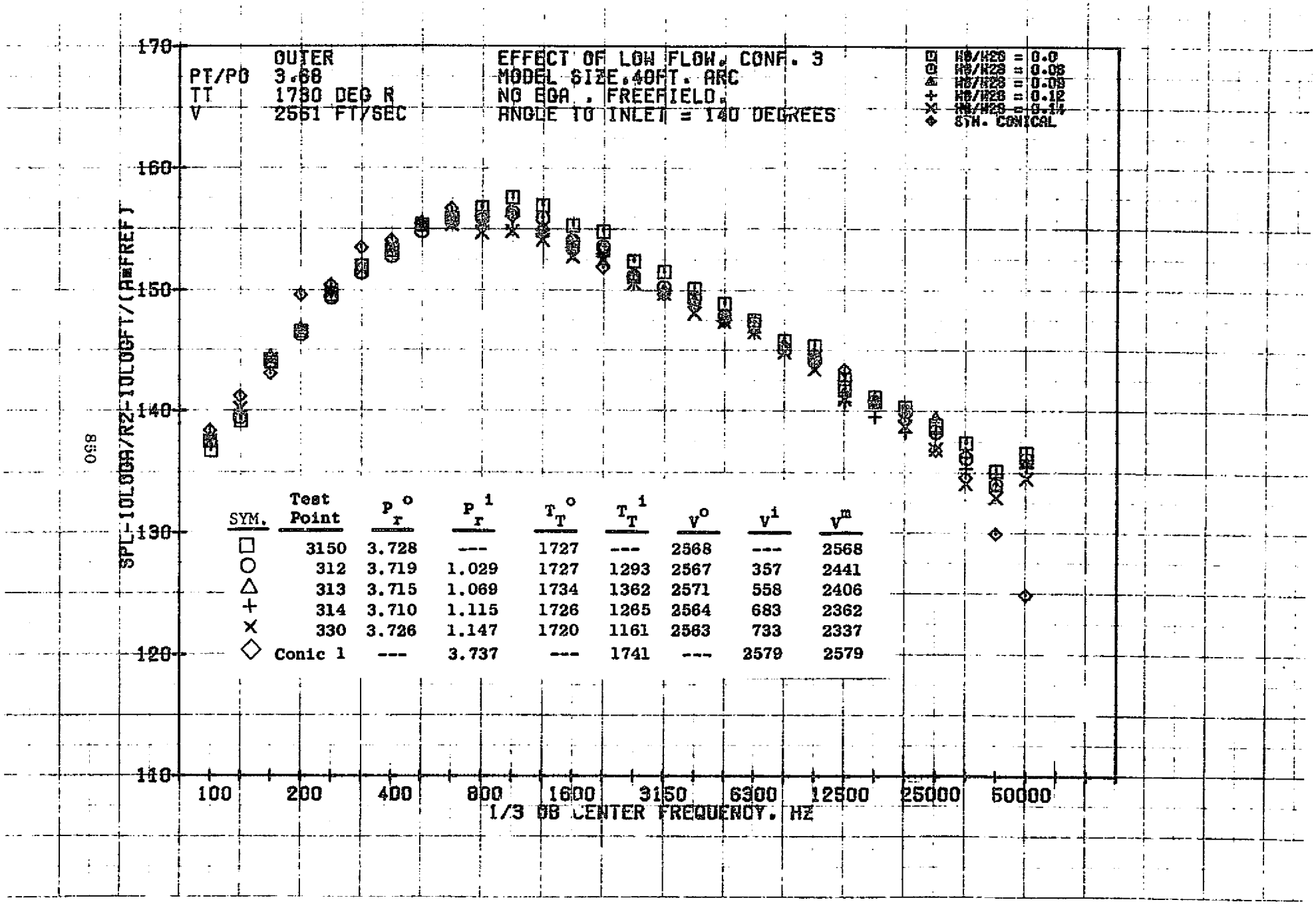
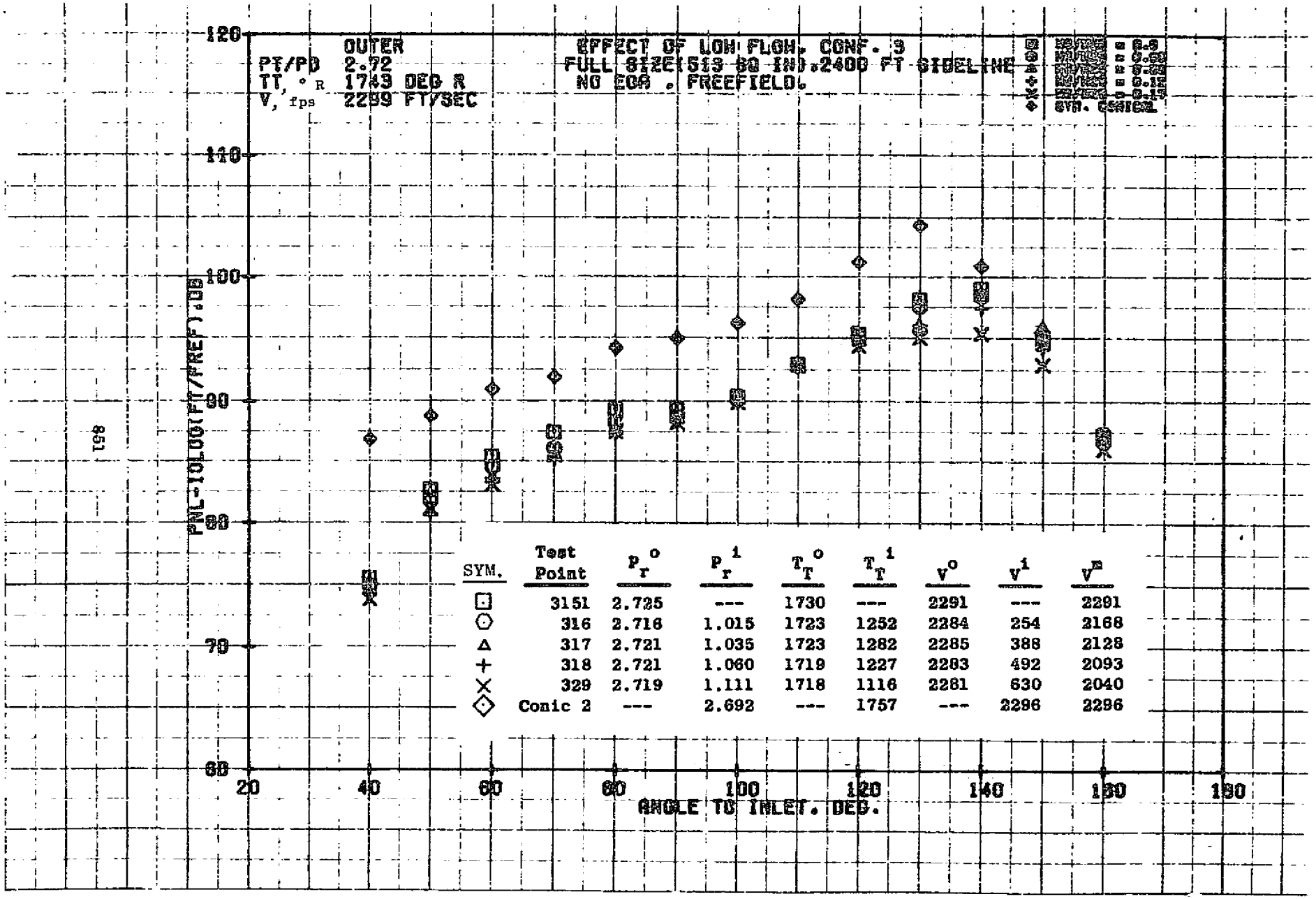
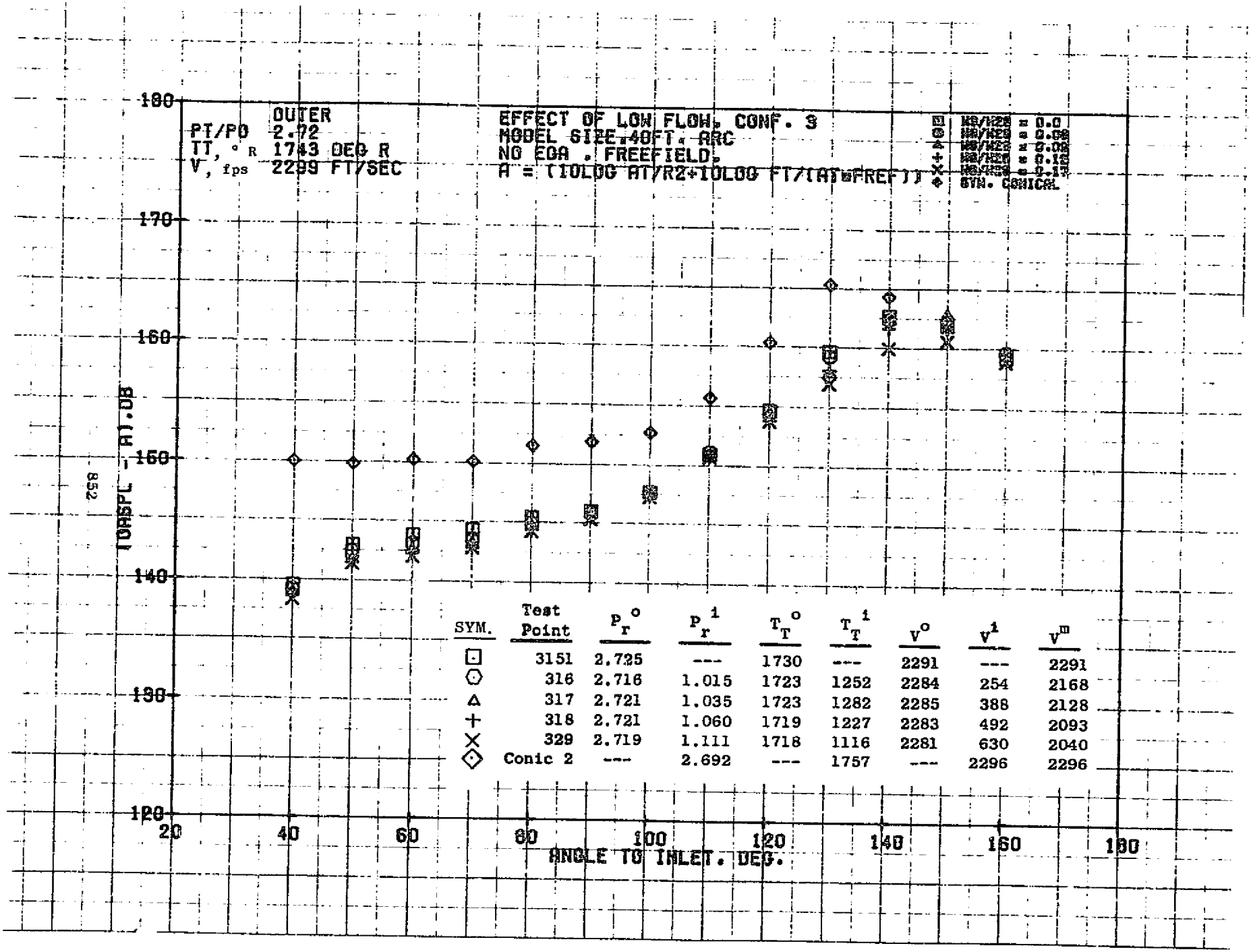


10/11/76
1X207-001

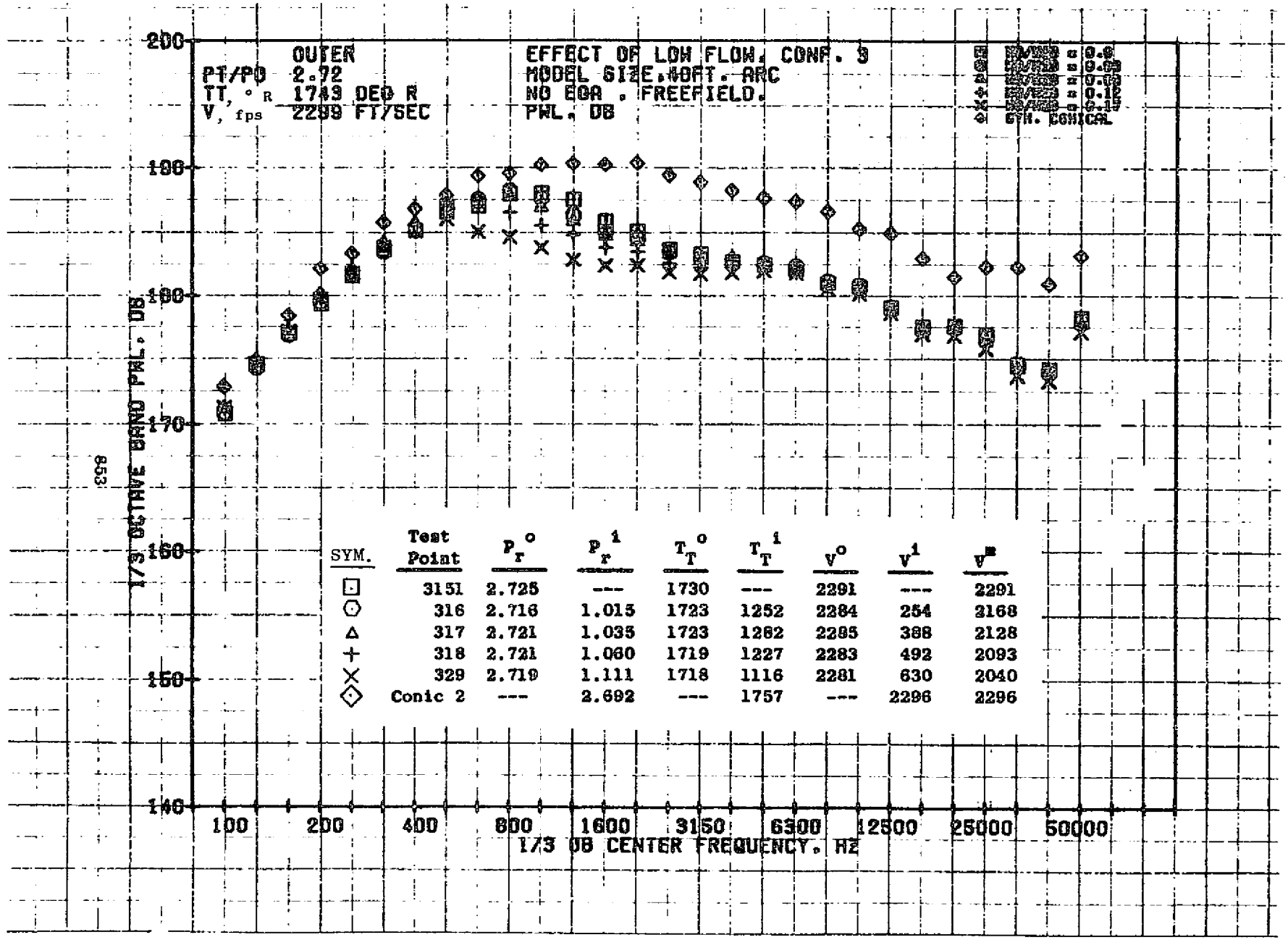
73KGLLSTEDT

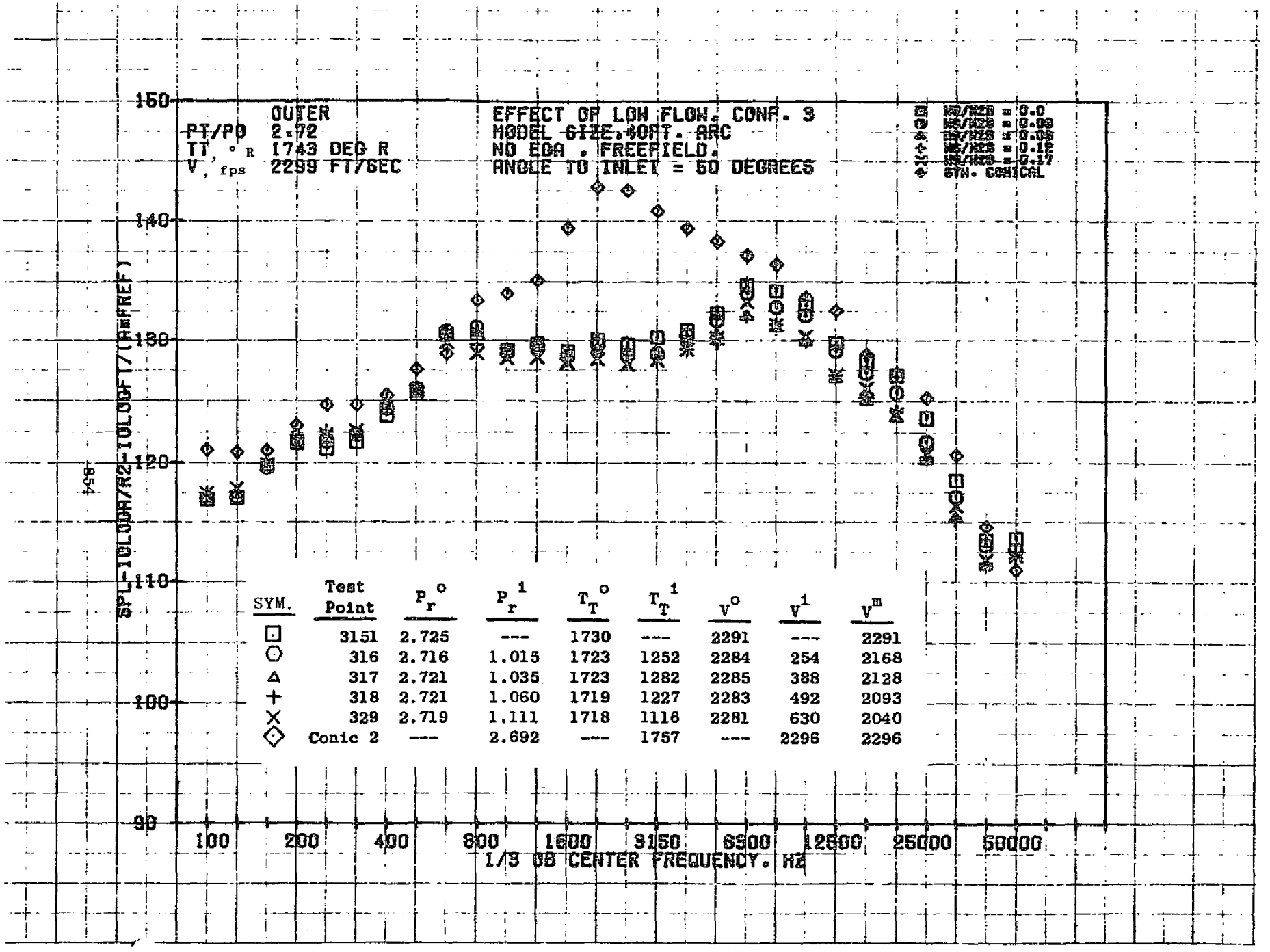


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
⊡	3151	2.725	---	1730	---	2291	---	2291
⊙	316	2.716	1.015	1723	1252	2284	254	2168
△	317	2.721	1.035	1723	1282	2285	388	2128
+	318	2.721	1.060	1719	1227	2283	492	2093
×	329	2.719	1.111	1718	1116	2281	630	2040
◇	Conic 2	---	2.692	---	1757	---	2296	2296

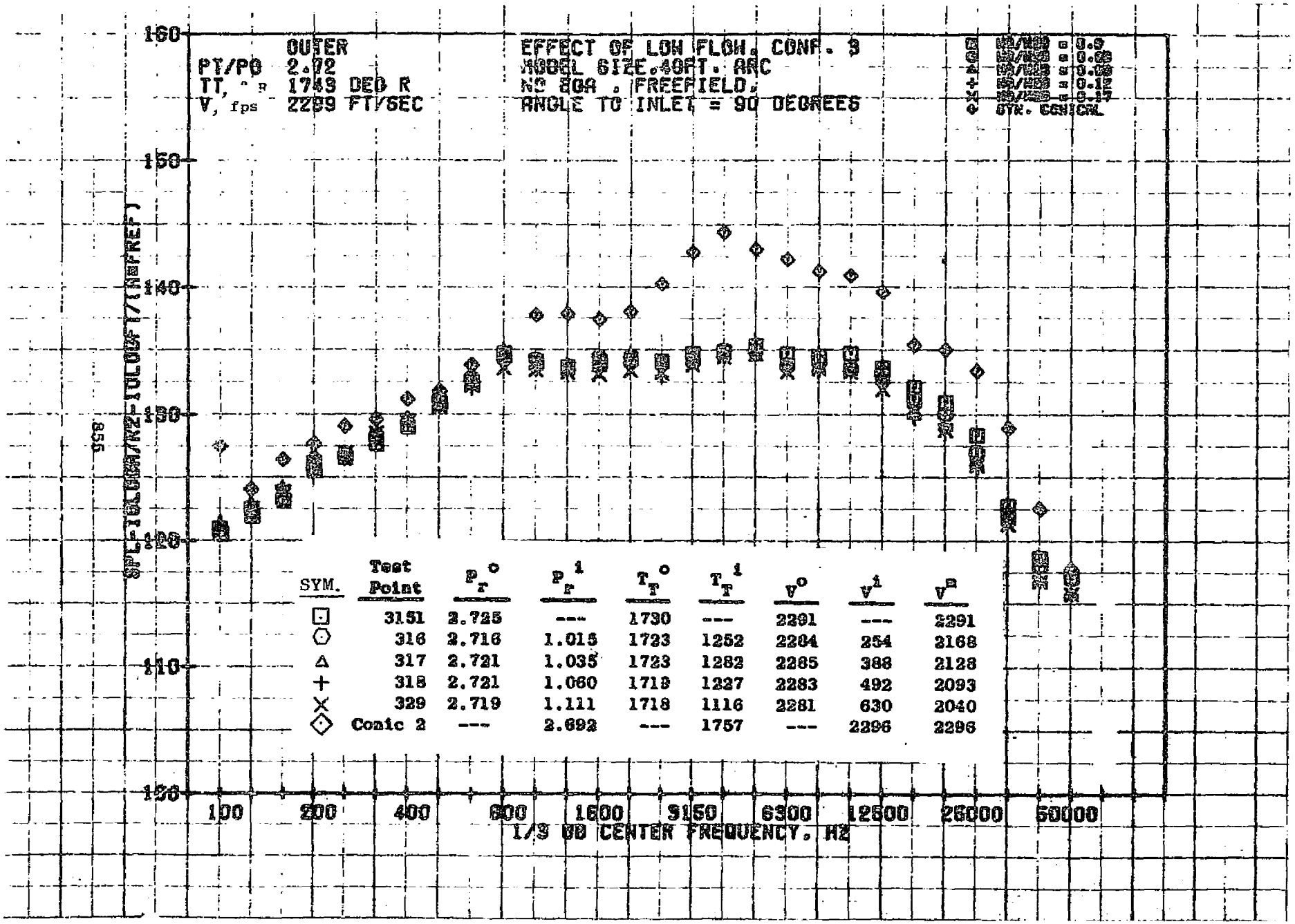


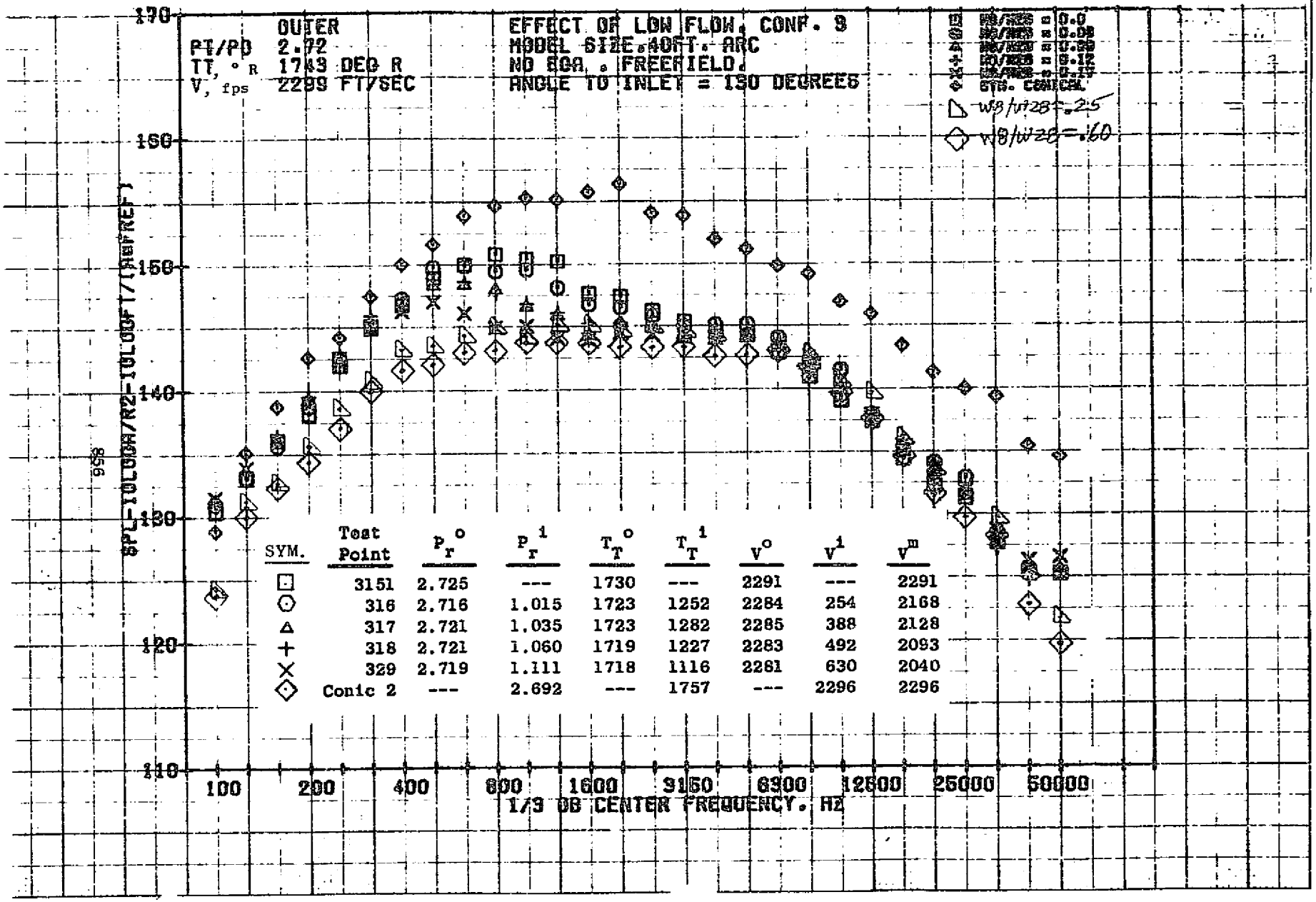
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3151	2.725	---	1730	---	2291	---	2291
○	316	2.716	1.015	1723	1252	2284	254	2168
△	317	2.721	1.035	1723	1282	2285	388	2128
+	318	2.721	1.060	1719	1227	2283	492	2093
×	329	2.719	1.111	1718	1116	2281	630	2040
◇	Conic 2	---	2.692	---	1757	---	2296	2296


OUTER
PT/PO 2.72
TT, °R 1743 DEG R
V, fps 2299 FT/SEC
EFFECT OF LOW FLOW, CONF. 3
MODEL SIZE, 40FT. ARC
NO EGR . FREEFIELD.
PWL, DB
6TH. CONICAL
200
190
180
170
160
150
140
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SPL, PWL BAND 1/3 OCTAVE BAND, DB
853
SYM.
Test Point
P_r^o
P_r^i
T_T^o
T_T^i
V^o
V^i
V^m
3151 2.725 --- 1730 --- 2291 --- 2291
316 2.716 1.015 1723 1252 2284 254 2168
317 2.721 1.035 1723 1262 2285 388 2128
318 2.721 1.060 1719 1227 2283 492 2093
329 2.719 1.111 1718 1116 2281 630 2040
Conic 2 --- 2.692 --- 1757 --- 2296 2296

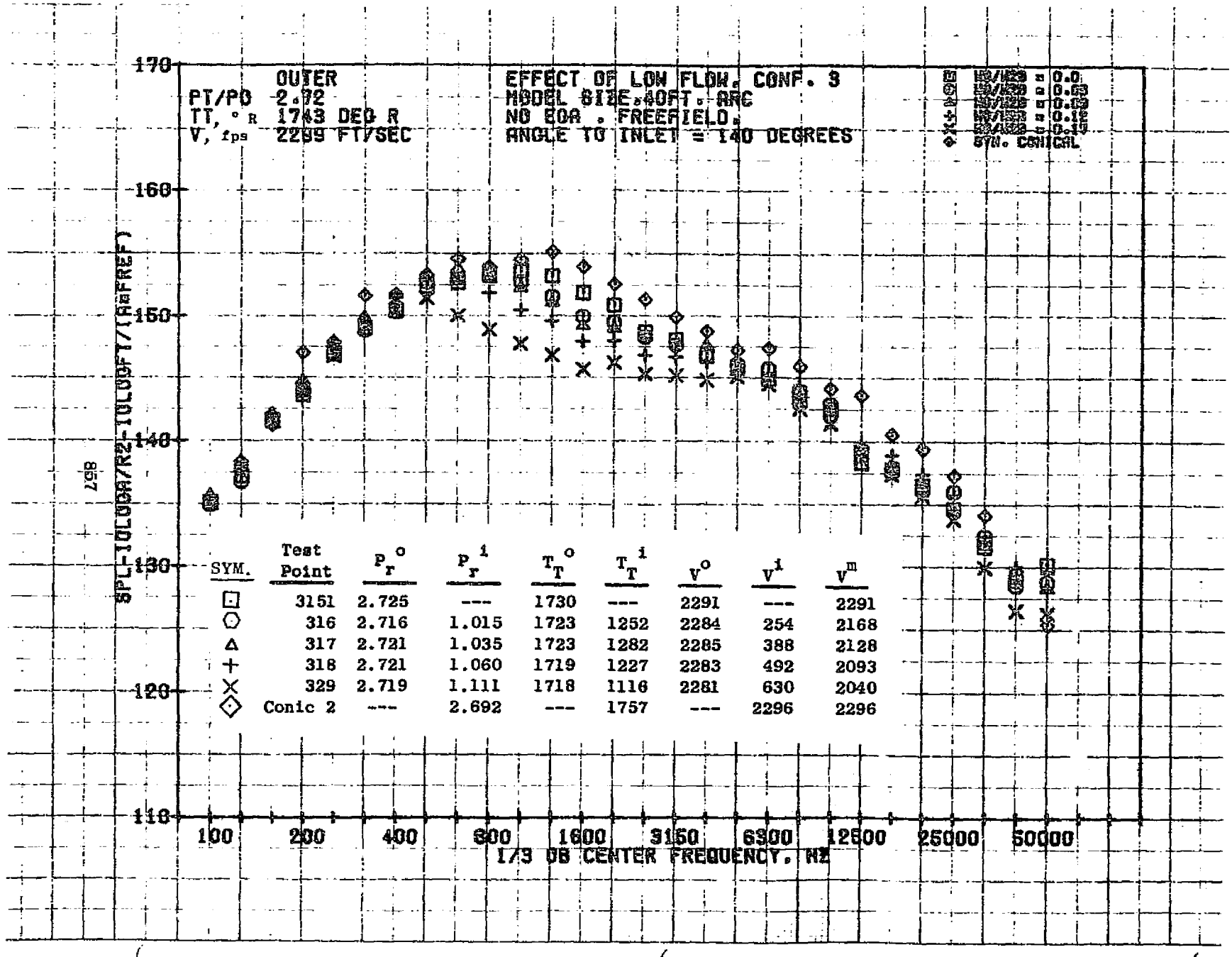


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3151	2.725	---	1730	---	2291	---	2291
○	316	2.716	1.015	1723	1252	2284	254	2168
△	317	2.721	1.035	1723	1282	2285	388	2128
+	318	2.721	1.060	1719	1227	2283	492	2093
×	329	2.719	1.111	1718	1116	2281	630	2040
◇	Conic 2	---	2.692	---	1757	---	2296	2296


OUTER
PT/PO 2.72
TT, °R 1749 DEG R
V, fps 2289 FT/SEC
EFFECT OF LOW FLOW, CONF. 3
MODEL SIZE,40FT. ARC
NO BOR . FREEFIELD.
ANGLE TO INLET = 90 DEGREES
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^n
3151 2.725 --- 1730 --- 2291 --- 2291
316 2.716 1.015 1723 1252 2284 254 2168
317 2.721 1.035 1723 1282 2285 388 2128
318 2.721 1.060 1719 1227 2283 492 2093
329 2.719 1.111 1718 1116 2281 630 2040
Conic 2 --- 2.692 --- 1757 --- 2296 2296
160
150
140
130
120
110
100
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
855



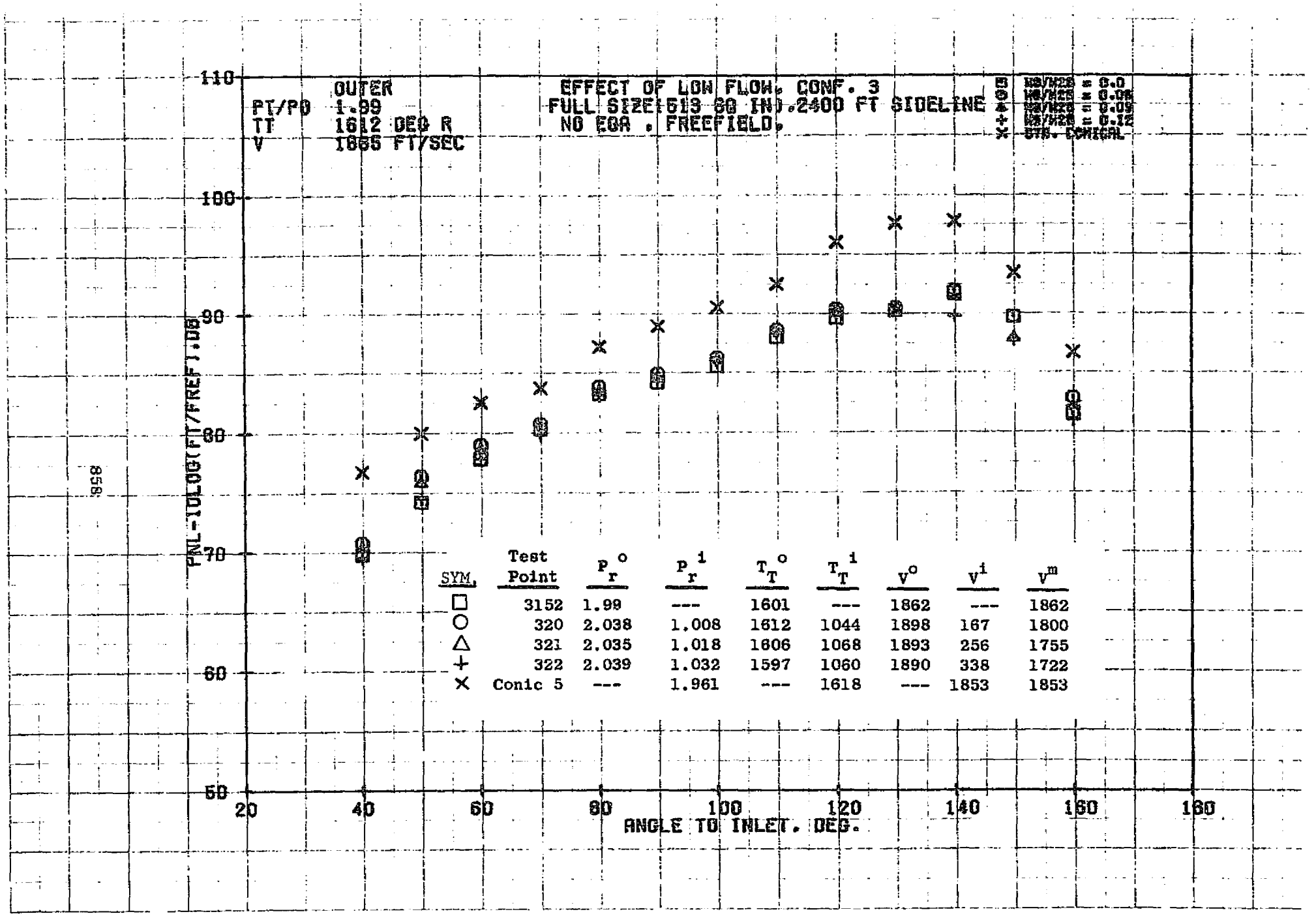
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3151	2.725	---	1730	---	2291	---	2291
○	316	2.716	1.015	1723	1252	2284	254	2168
△	317	2.721	1.035	1723	1282	2285	388	2128
+	318	2.721	1.060	1719	1227	2283	492	2093
×	329	2.719	1.111	1718	1116	2281	630	2040
◇	Conic 2	---	2.692	---	1757	---	2296	2296



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3151	2.725	---	1730	---	2291	---	2291
○	316	2.716	1.015	1723	1252	2284	254	2168
△	317	2.721	1.035	1723	1282	2285	388	2128
+	318	2.721	1.060	1719	1227	2283	492	2093
×	329	2.719	1.111	1718	1116	2281	630	2040
◇	Conic 2	---	2.692	---	1757	---	2296	2296

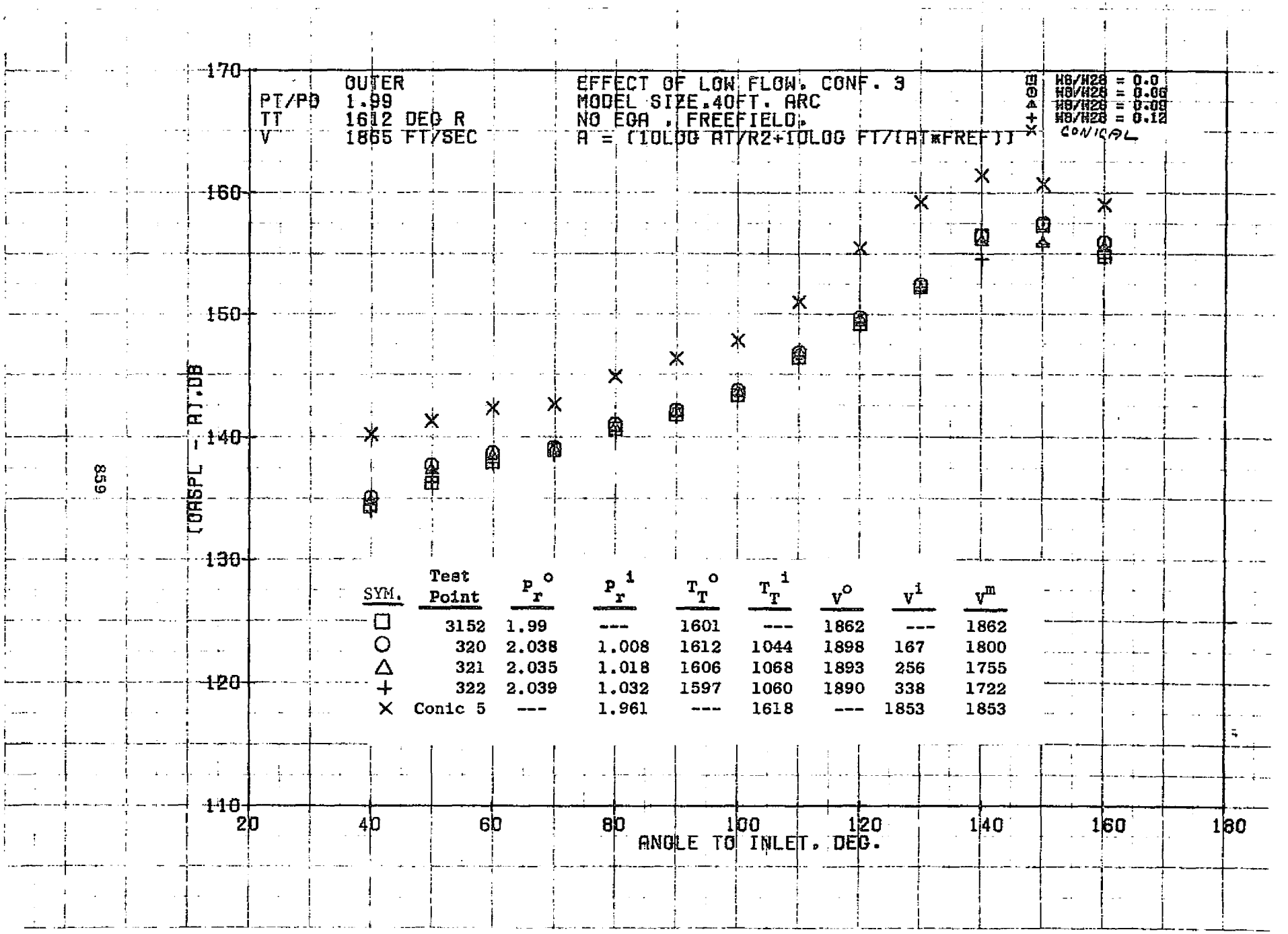
10/11/76
1X207-001

73KOLLSTEDT



10/25/76
1X558-001

73KOLLSTEDT

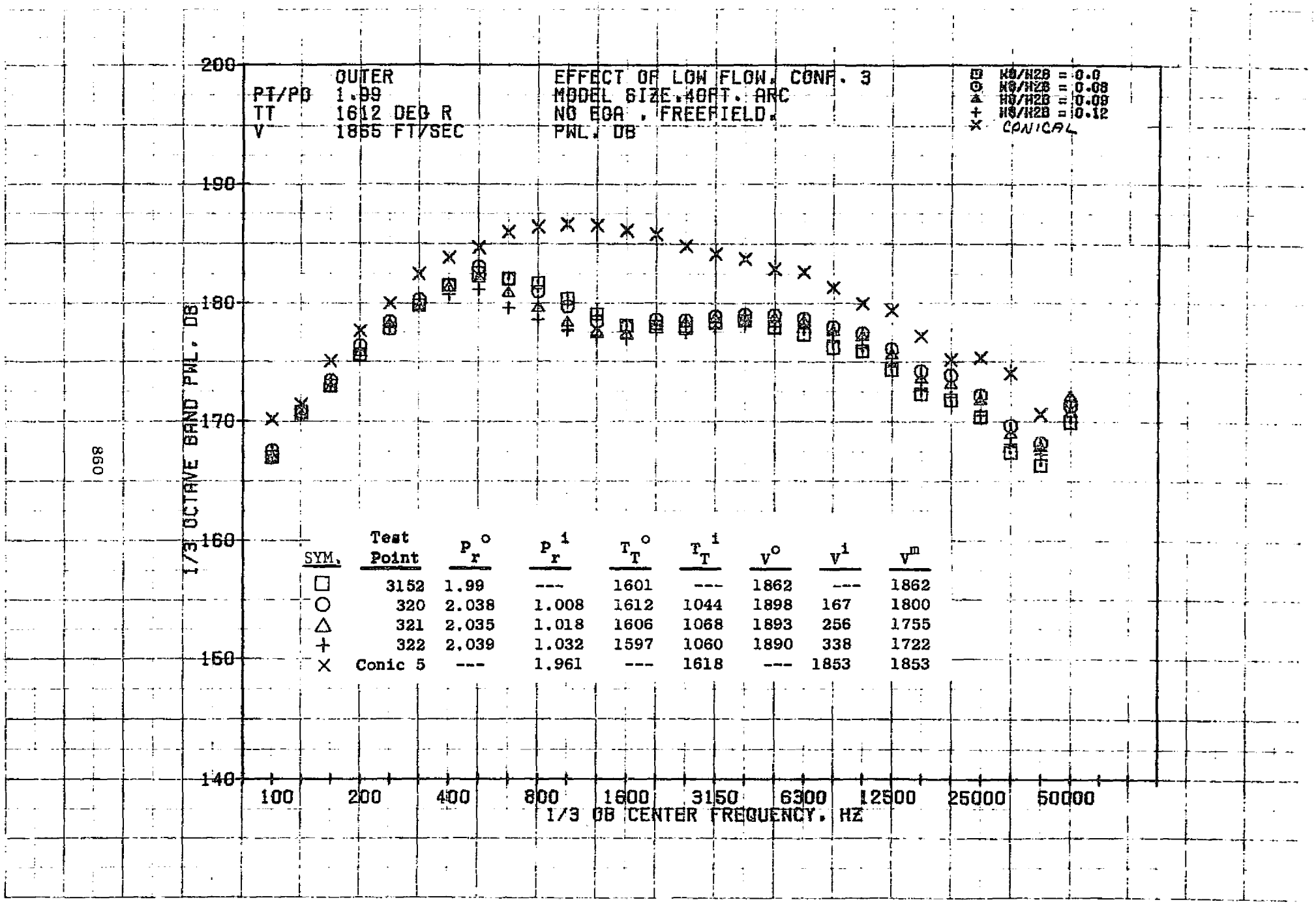


SYM.	Test Point	p_r^o	p_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3152	1.99	---	1601	---	1862	---	1862
○	320	2.038	1.008	1612	1044	1898	167	1800
△	321	2.035	1.018	1606	1068	1893	256	1755
+	322	2.039	1.032	1597	1060	1890	338	1722
×	Conic 5	---	1.961	---	1618	---	1853	1853

858

10/12/76
1X525-001

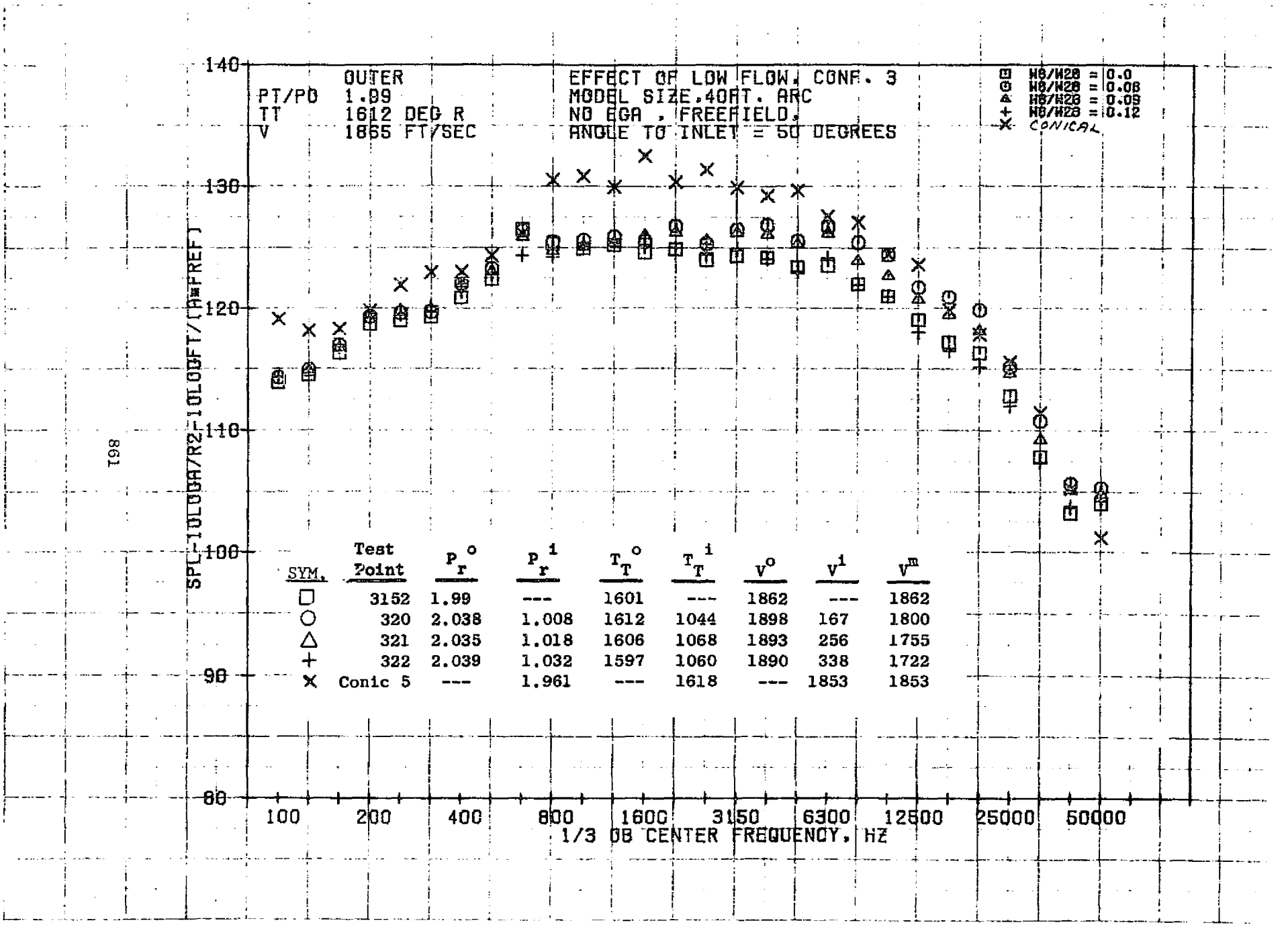
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3152	1.99	---	1601	---	1862	---	1862
○	320	2.038	1.008	1612	1044	1898	167	1800
△	321	2.035	1.018	1606	1068	1893	256	1755
+	322	2.039	1.032	1597	1060	1890	338	1722
×	Conic 5	---	1.961	---	1618	---	1853	1853

10/12/76
1X525-001

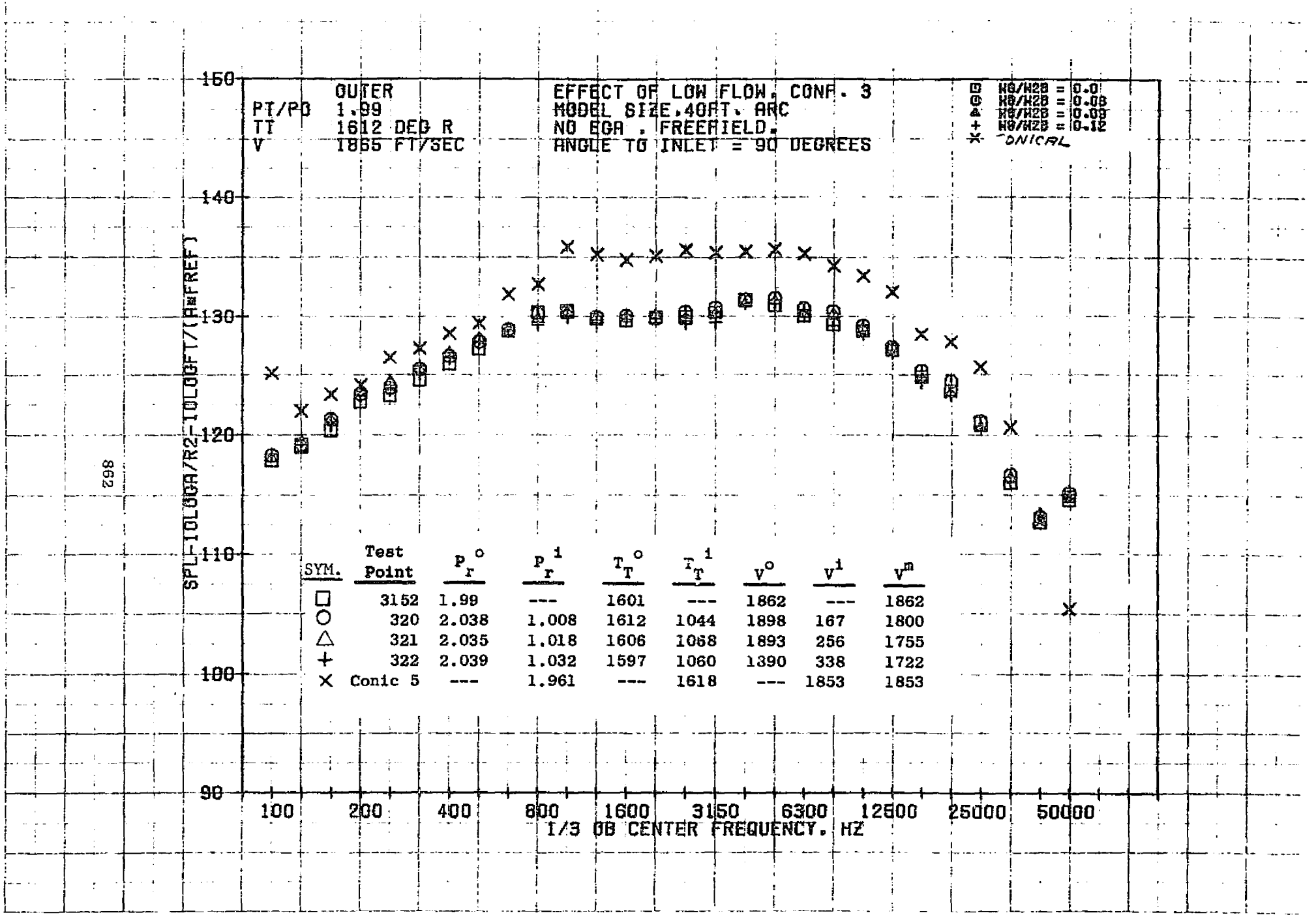
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3152	1.99	---	1601	---	1862	---	1862
○	320	2.038	1.008	1612	1044	1898	167	1800
△	321	2.035	1.018	1606	1068	1893	256	1755
+	322	2.039	1.032	1597	1060	1890	338	1722
×	Conic 5	---	1.961	---	1618	---	1853	1853

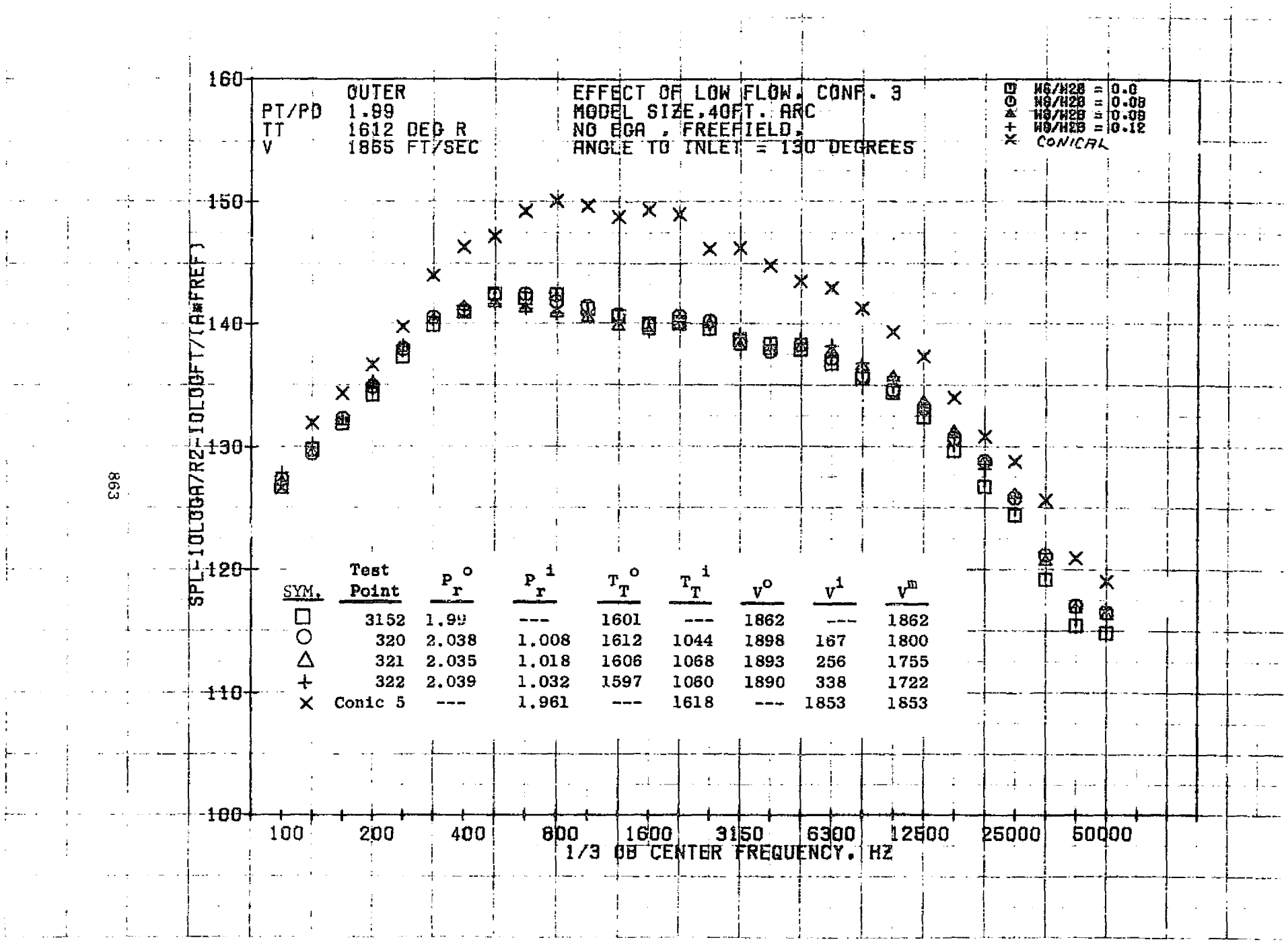
10/12/76
1X525-001

73KOLLSTEDT



10/12/76
1X525-001

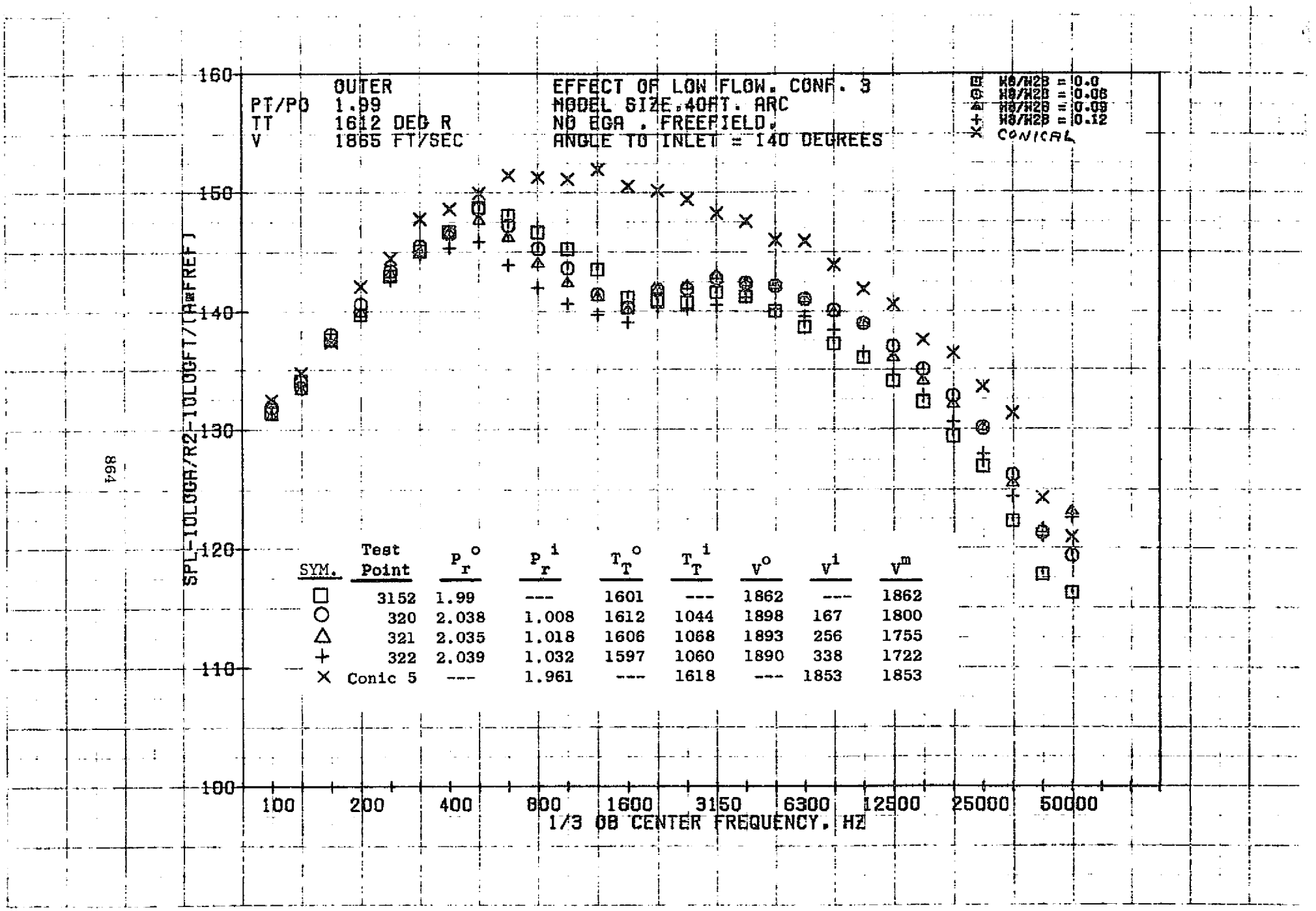
73KOLLSTEDT



863

10/12/76
1X525-001

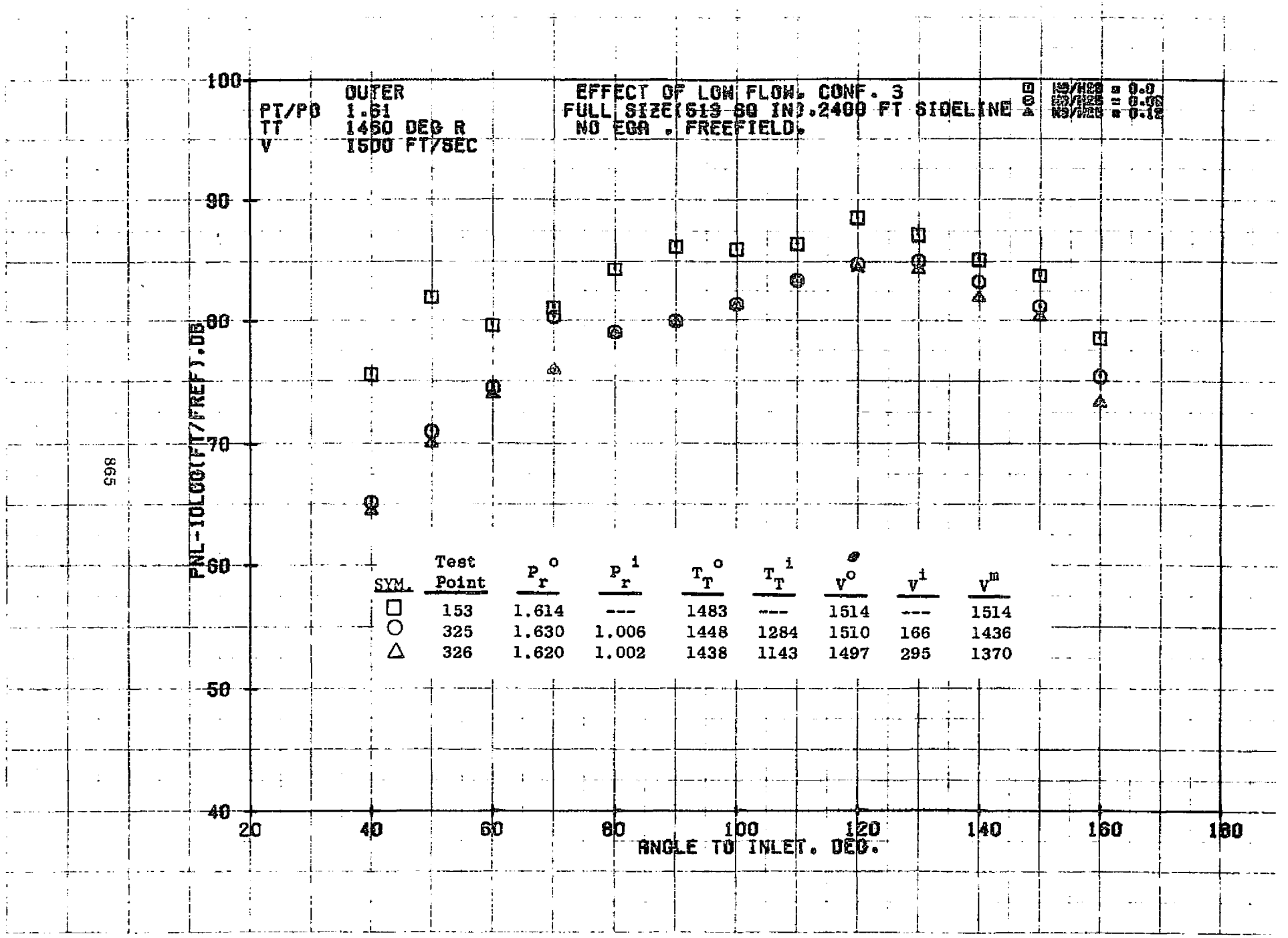
73KOLLSTEDT



864

10/12/76
1X625-001

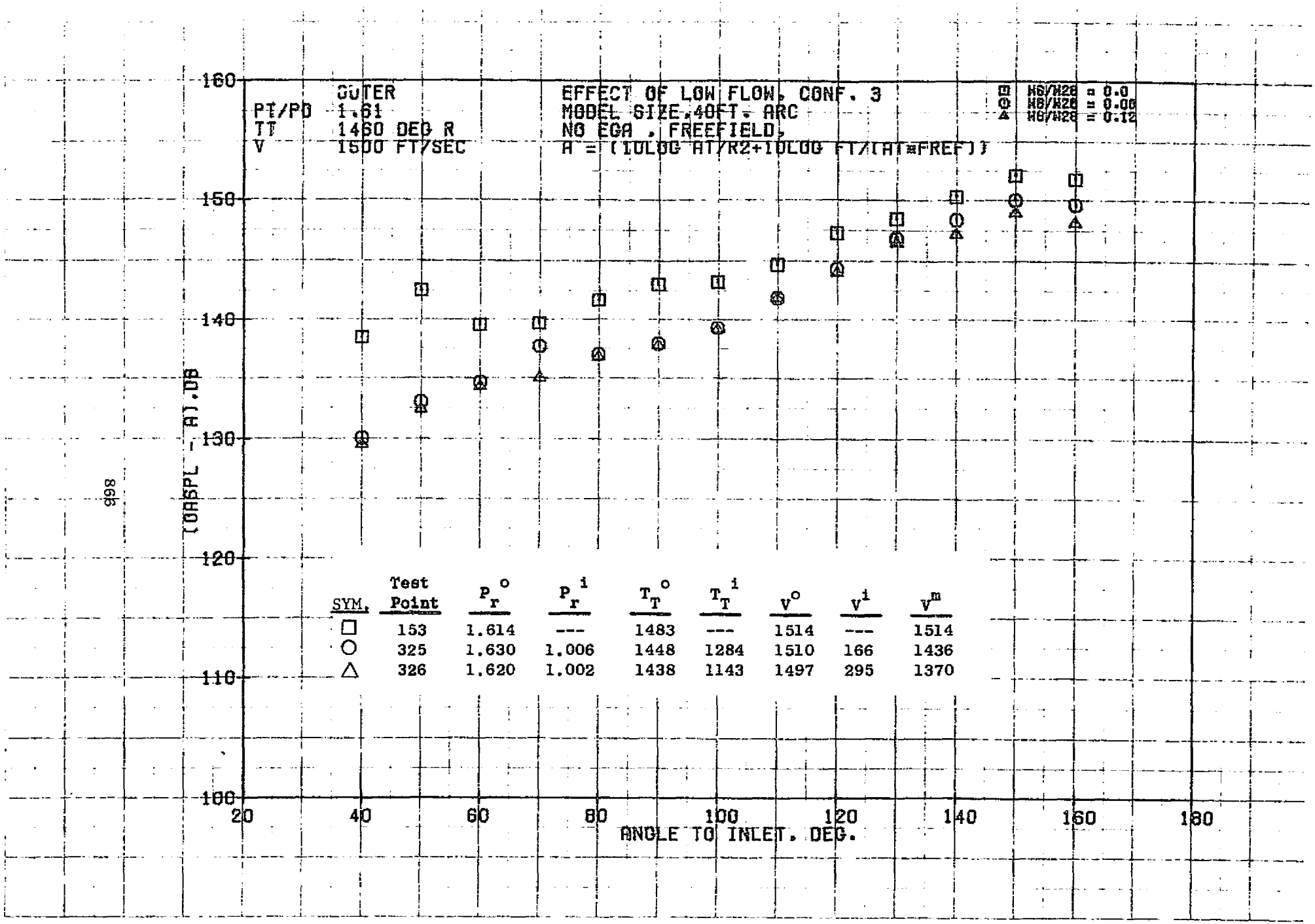
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	153	1.614	---	1483	---	1514	---	1514
○	325	1.630	1.006	1448	1284	1510	166	1436
△	326	1.620	1.002	1438	1143	1497	295	1370

10/25/76
1X658-001

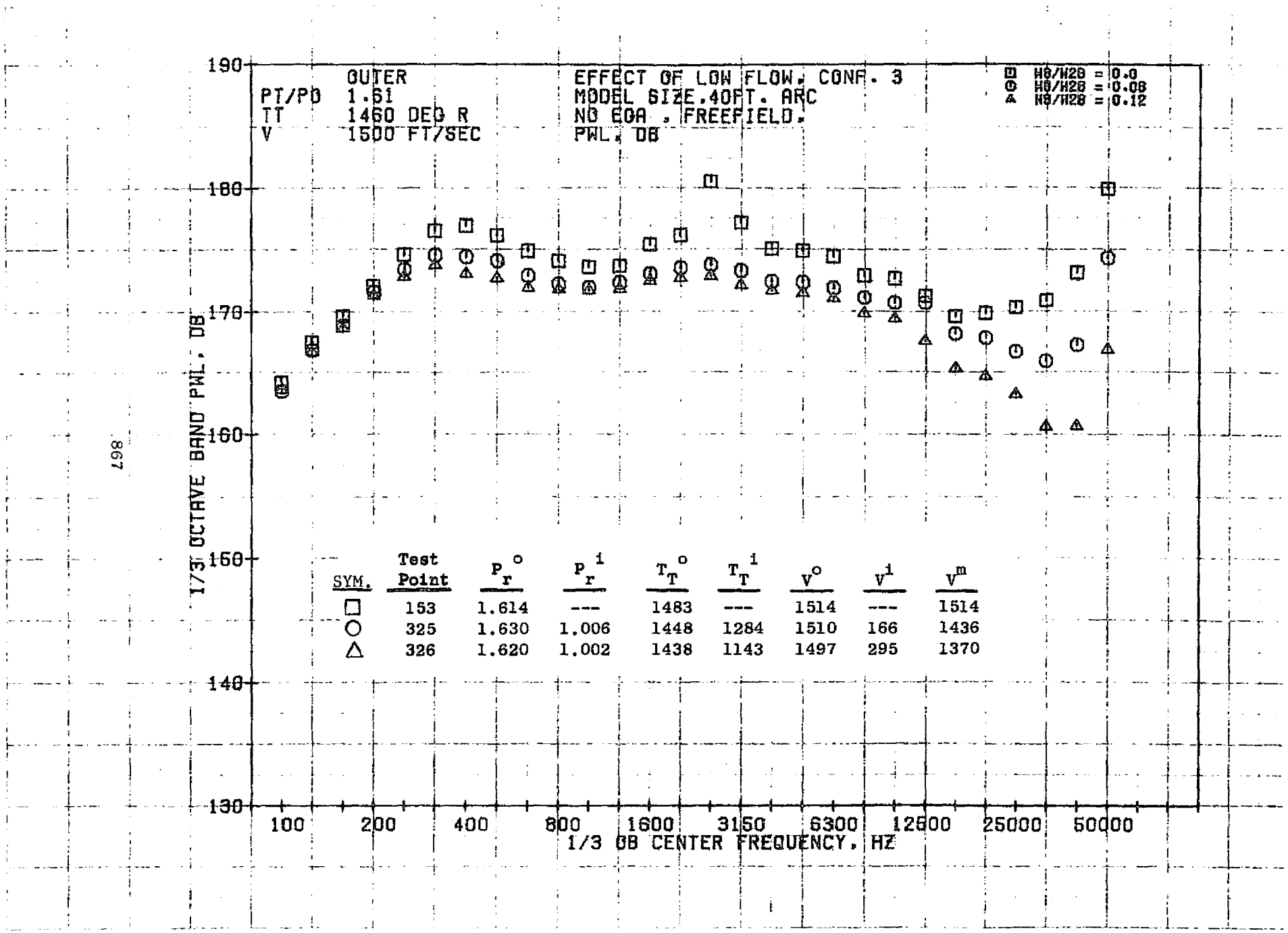
73KOLLSTEDT



898

10/12/76
1X525-001

73KOLLSTEDT



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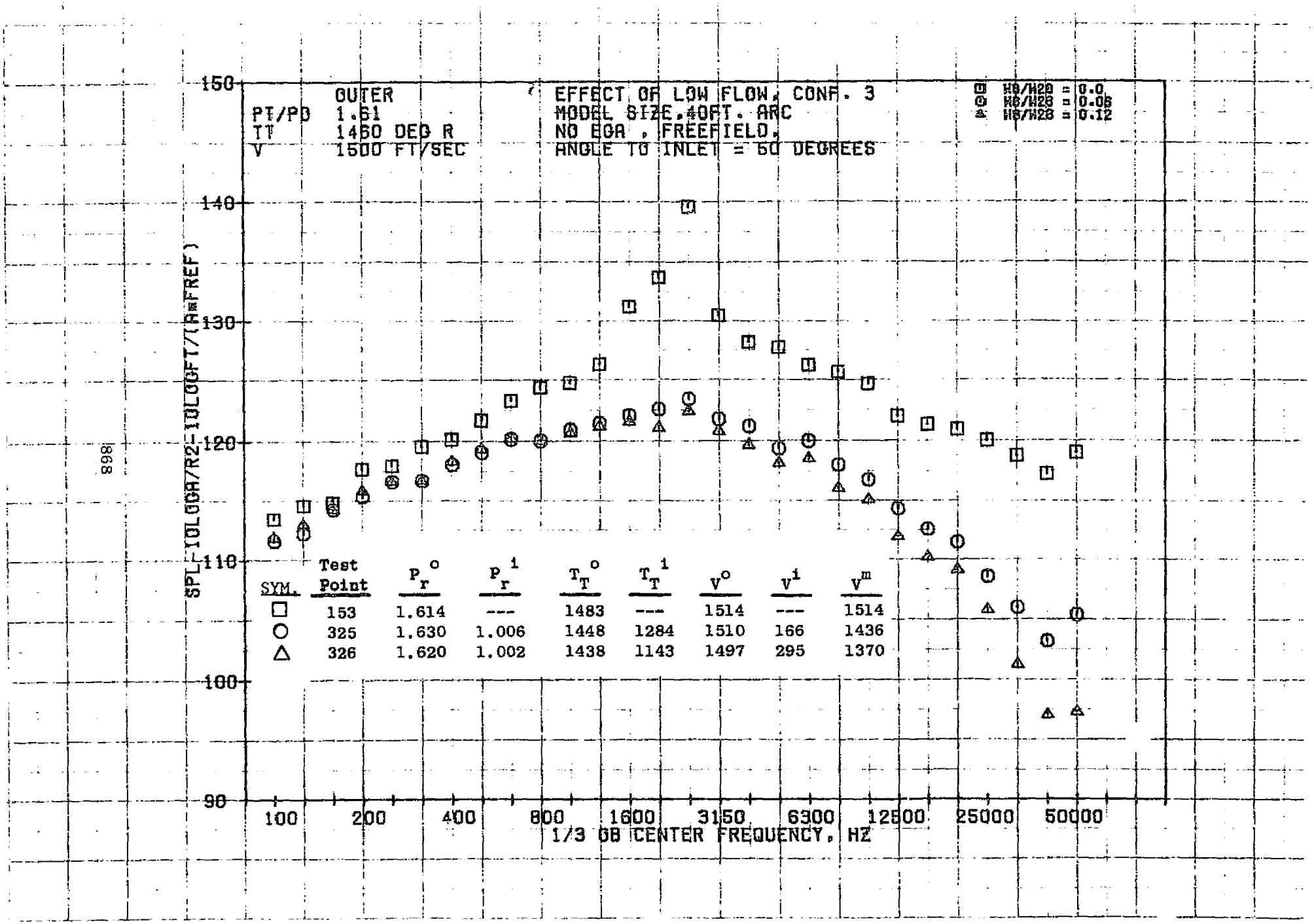
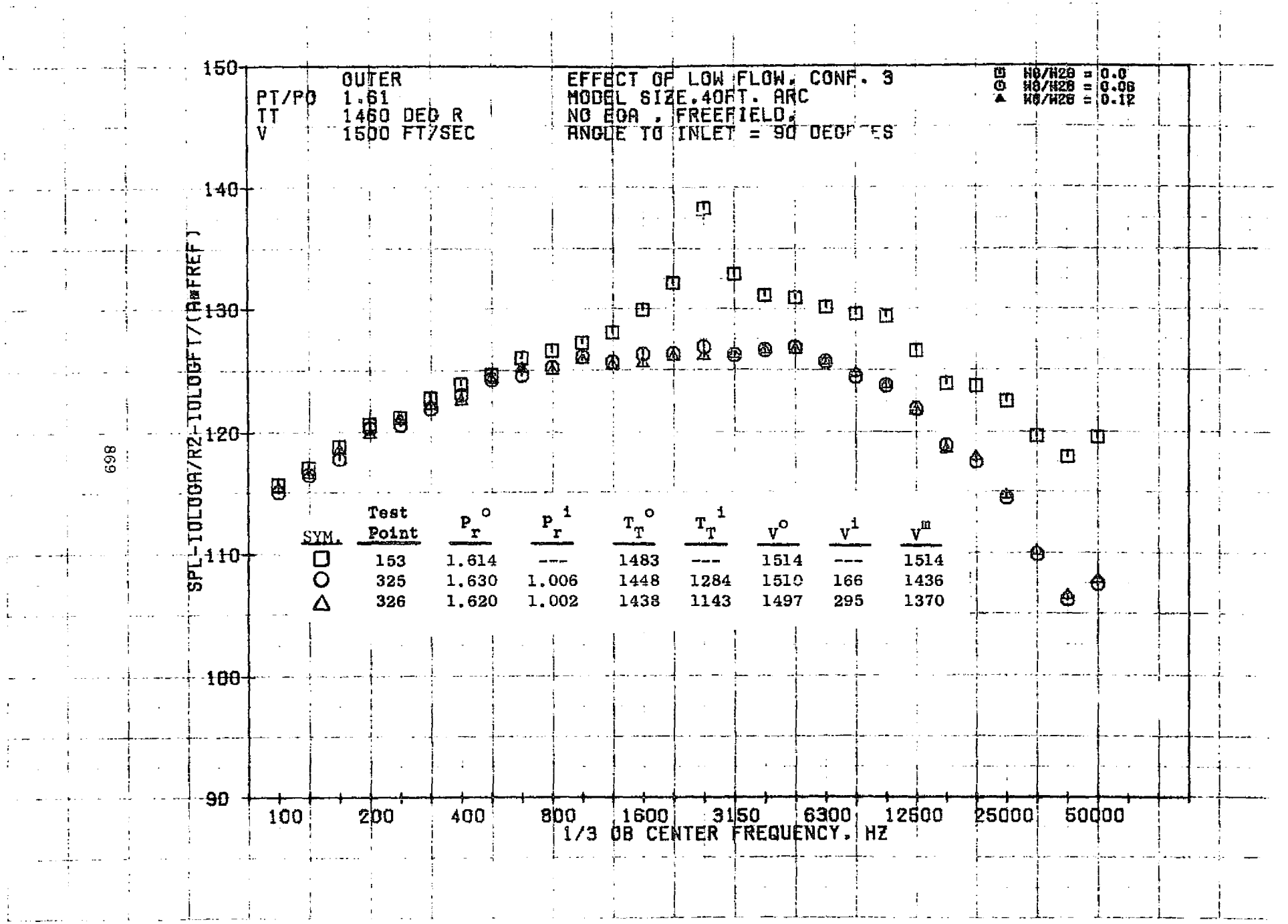
10/12/76
1X525-001

73KOLLSTEDT



10/12/76
1X525-001

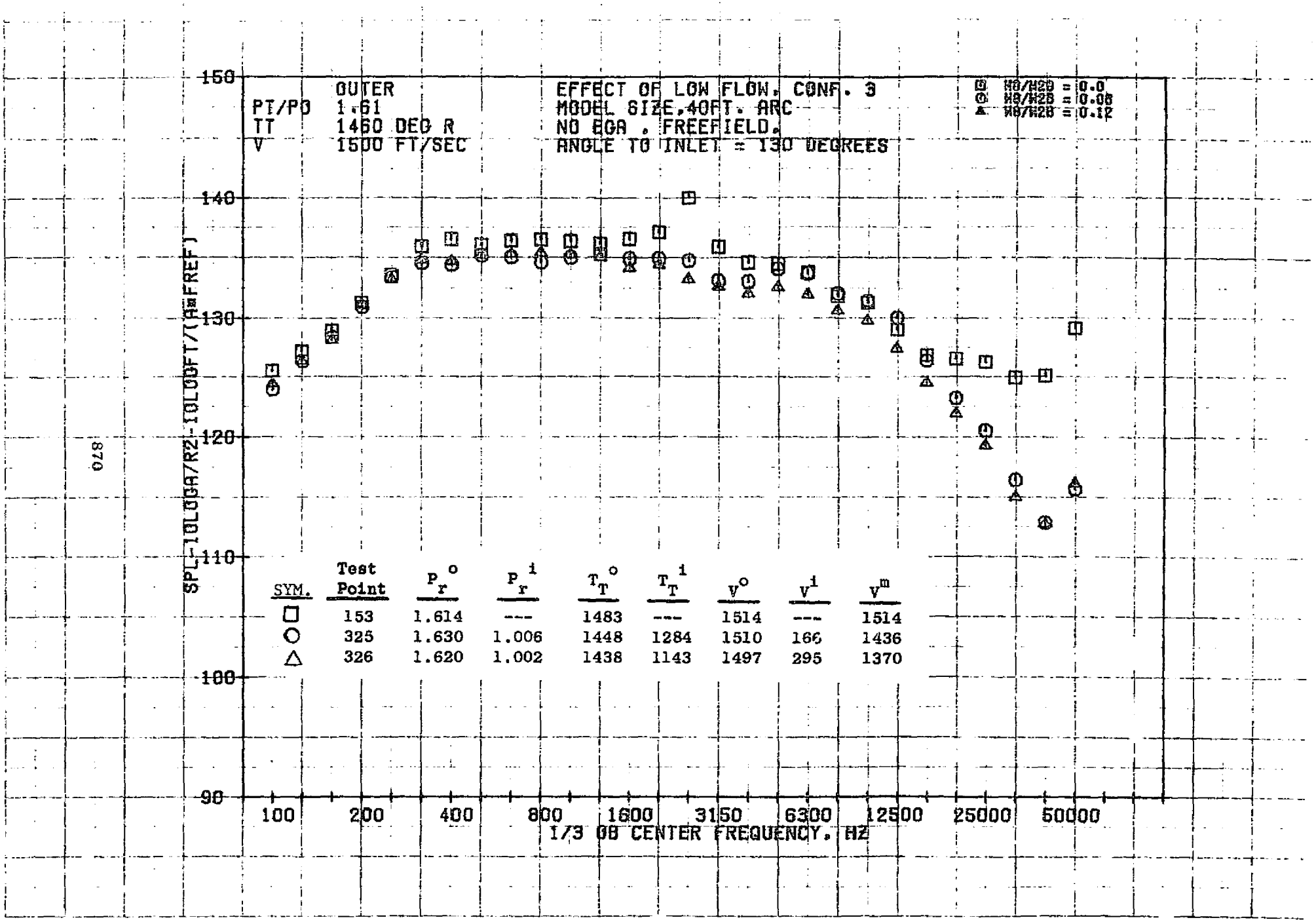
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	153	1.614	---	1483	---	1514	---	1514
○	325	1.630	1.006	1448	1284	1510	166	1436
△	326	1.620	1.002	1438	1143	1497	295	1370

10/12/76
1X525-001

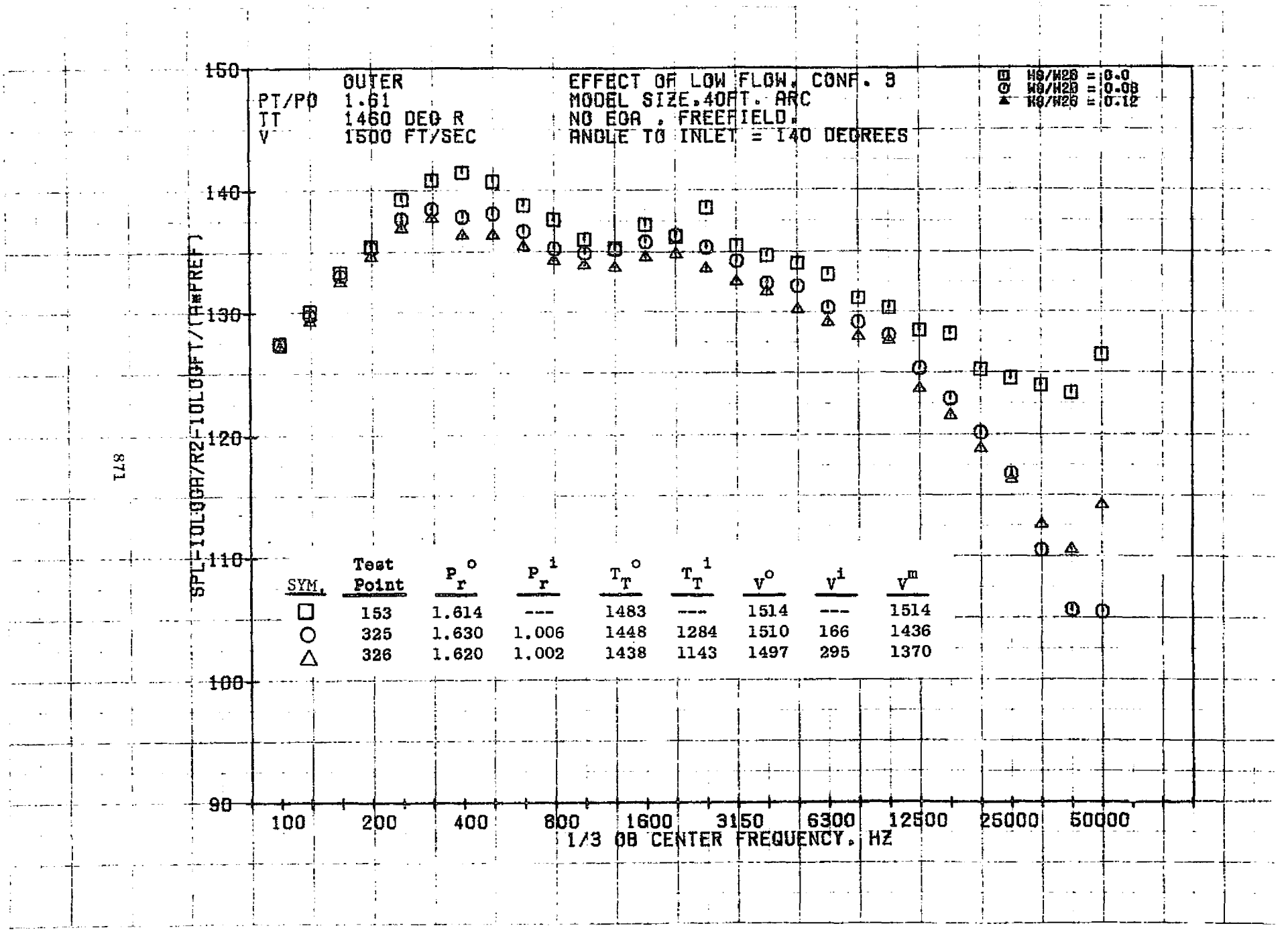
73KOLLSTEDT



870

10/12/76
1X525-001

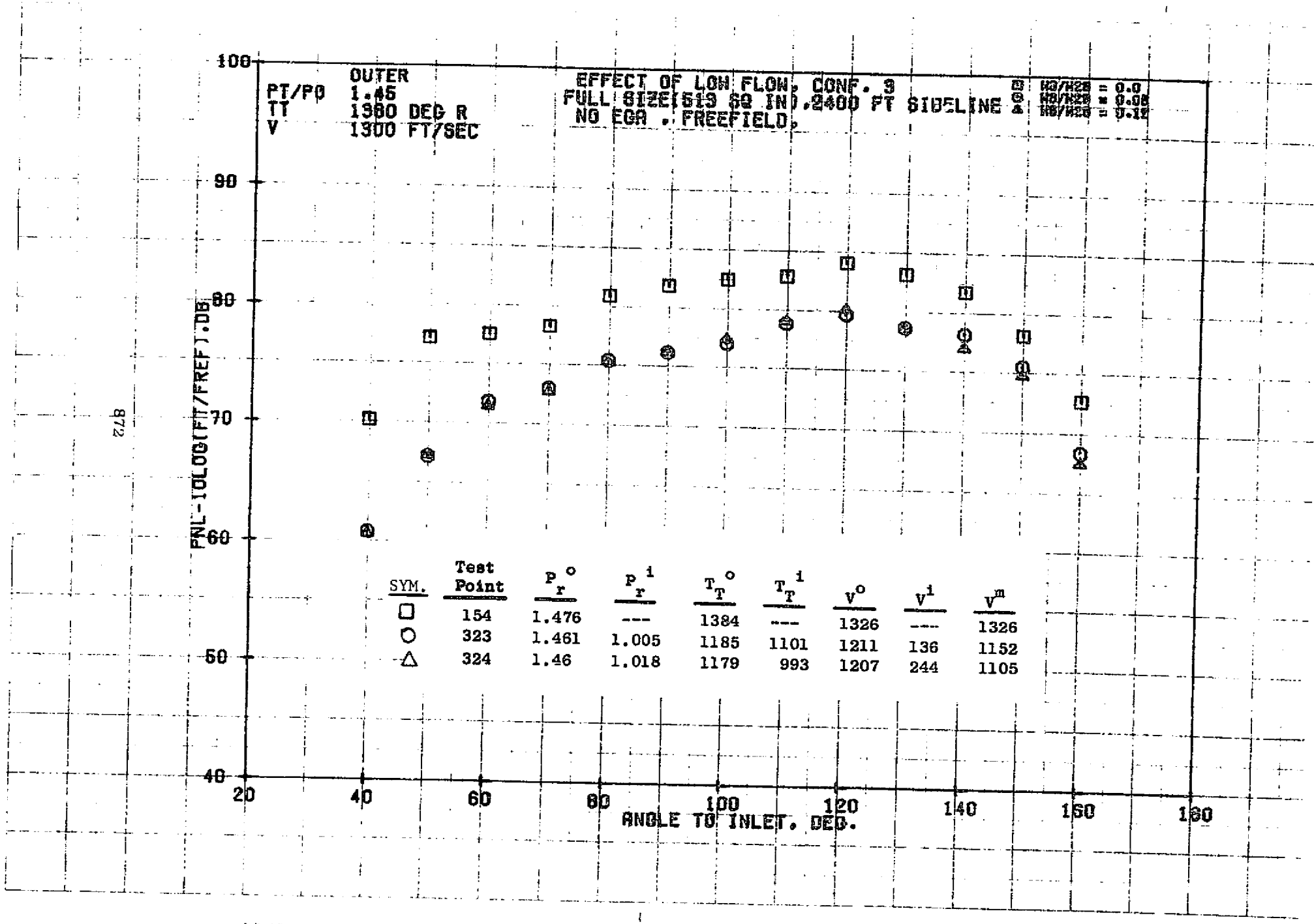
73KOLLSTEDT



871

10/12/76
1X525-001

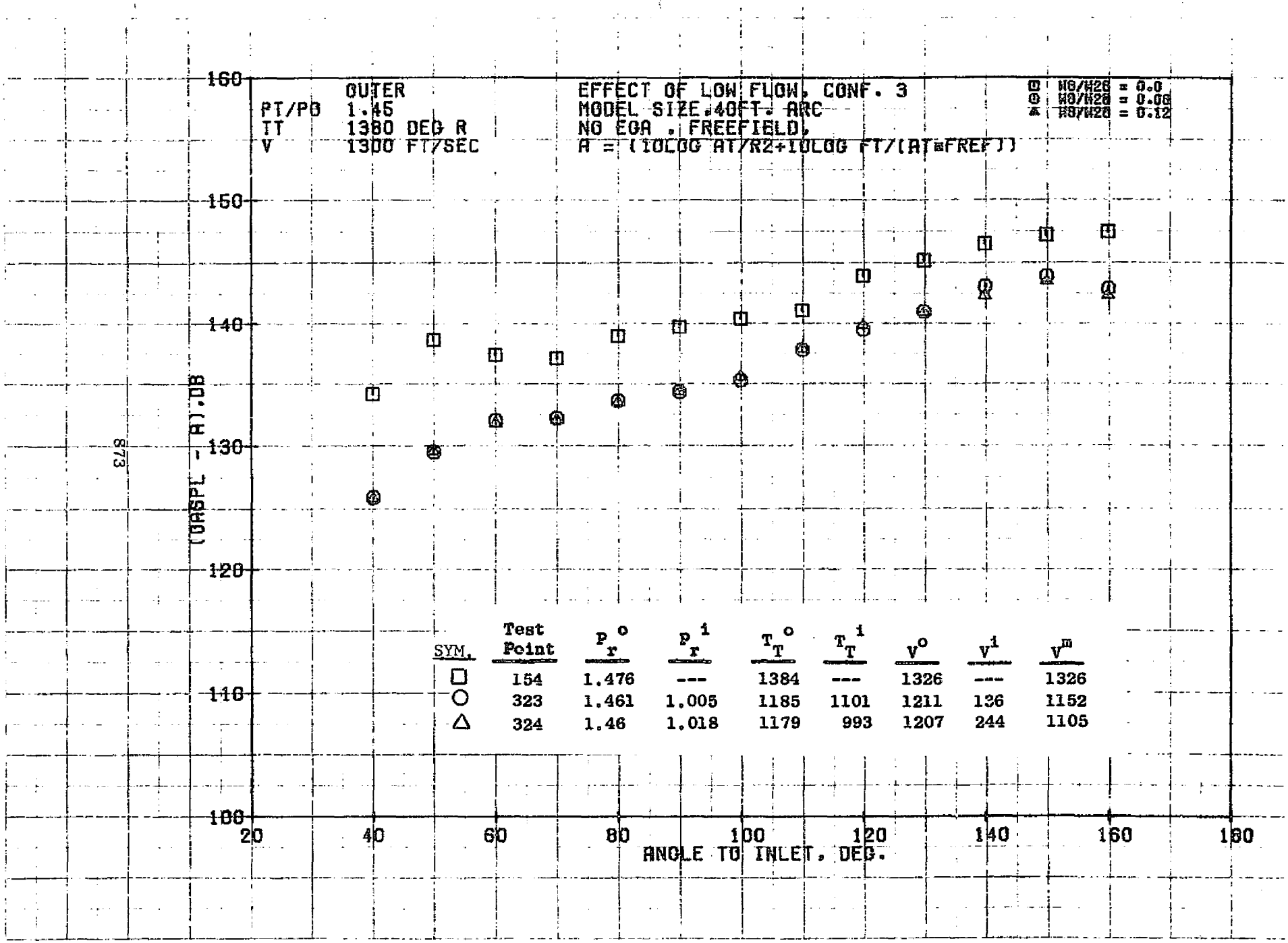
73KOLLSTEOT



872

10/25/76
1X556-001

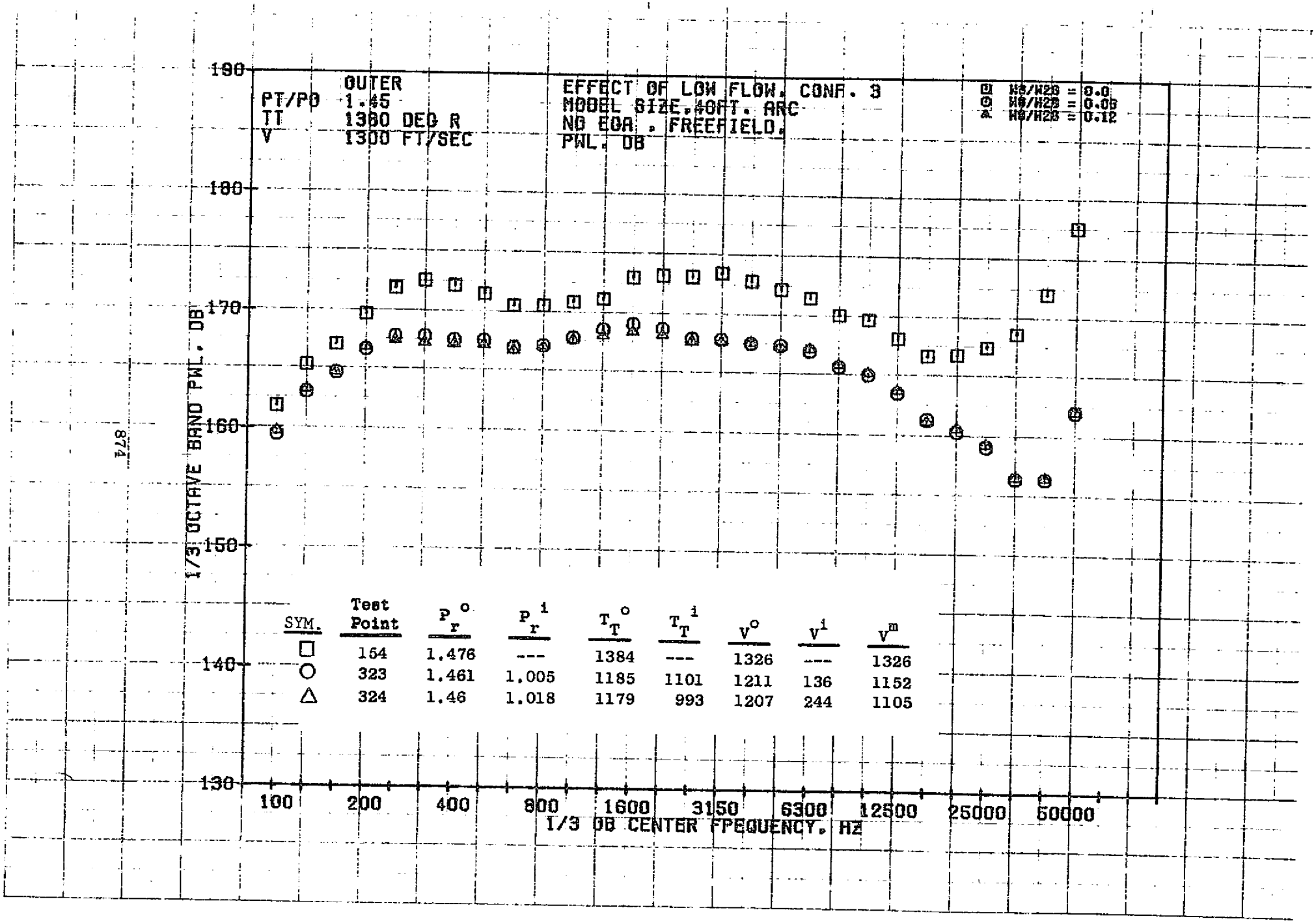
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	154	1.476	---	1384	---	1326	---	1326
○	323	1.461	1.005	1185	1101	1211	136	1152
△	324	1.46	1.018	1179	993	1207	244	1105

10/12/76
1X525-001

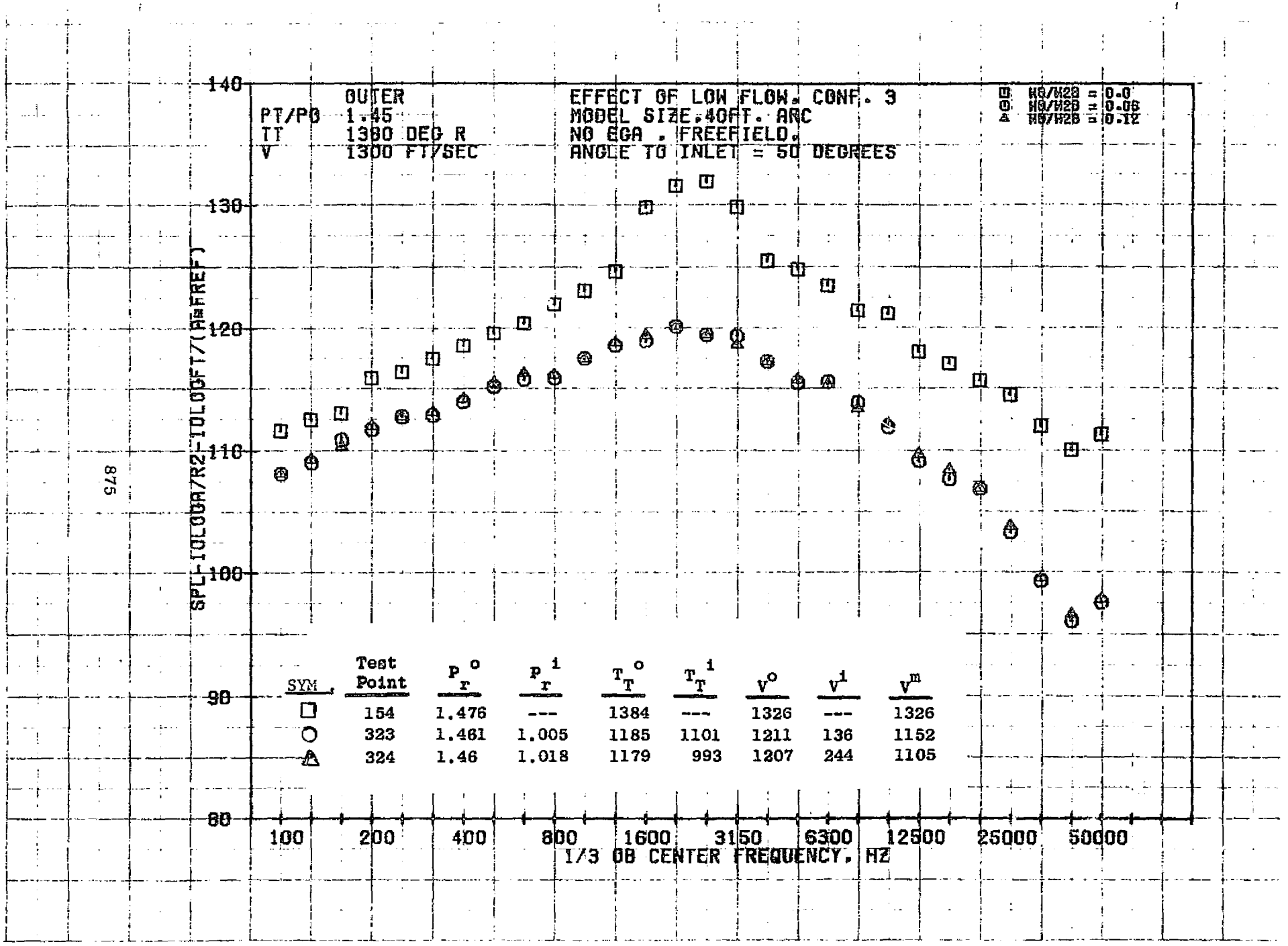
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	154	1.476	---	1384	---	1326	---	1326
○	323	1.461	1.005	1185	1101	1211	136	1152
△	324	1.46	1.018	1179	993	1207	244	1105

10/12/76
1X525-001

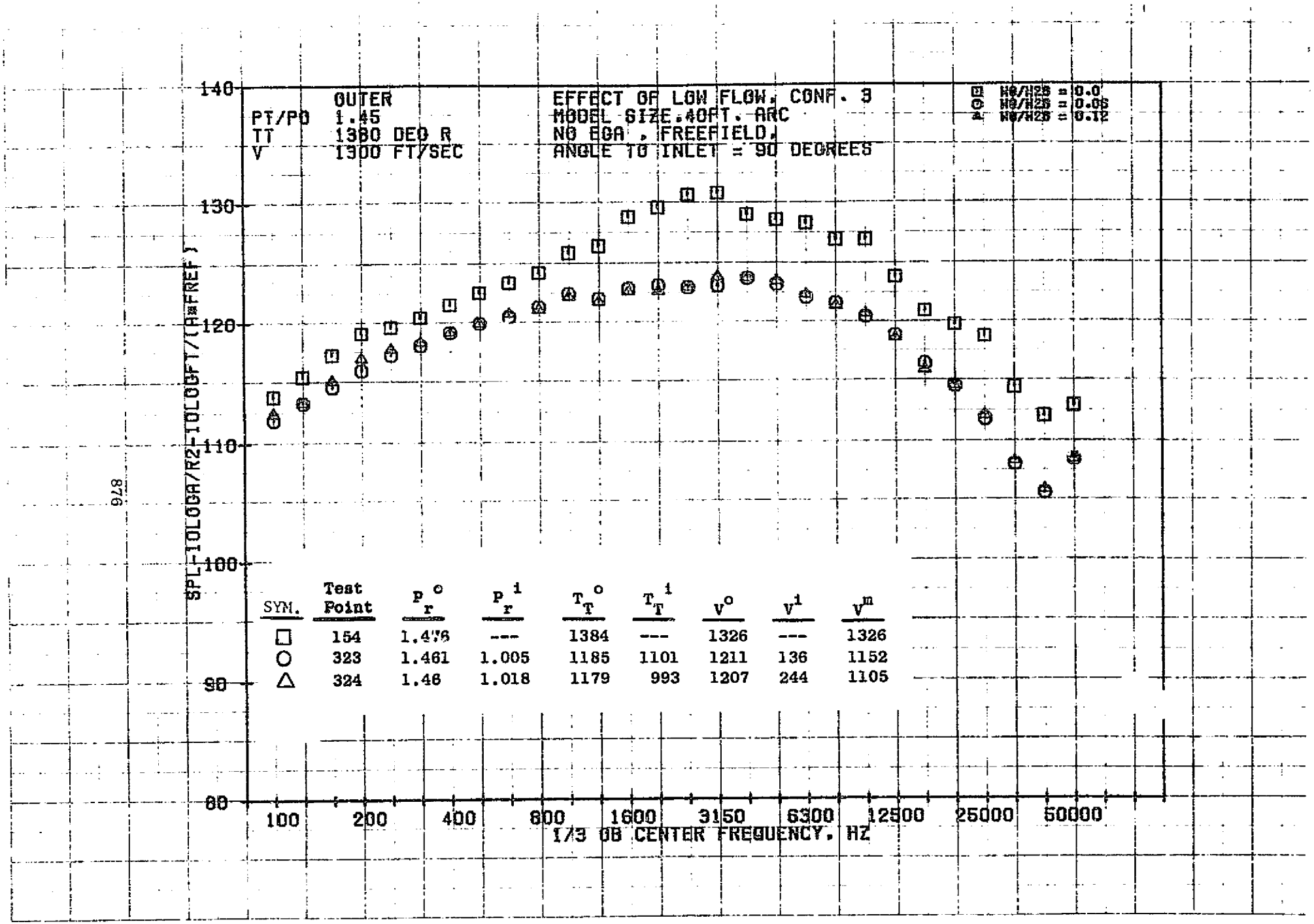
73KOLLSTEDT



SYM	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	154	1.476	---	1384	---	1326	---	1326
○	323	1.461	1.005	1185	1101	1211	136	1152
△	324	1.46	1.018	1179	993	1207	244	1105

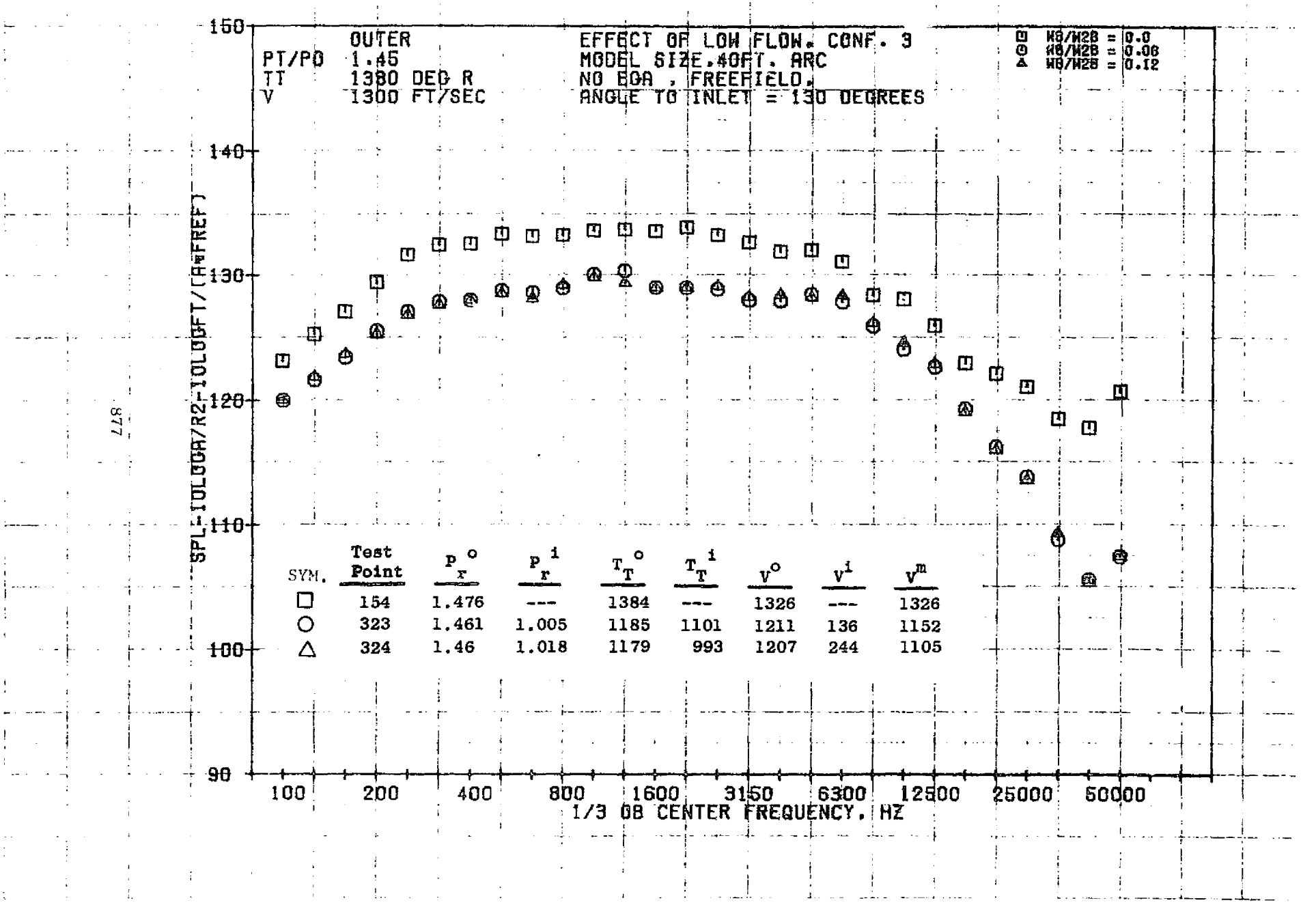
10/12/76
1X525-001

73KOLLSTEDT



10/12/76
1X525-001

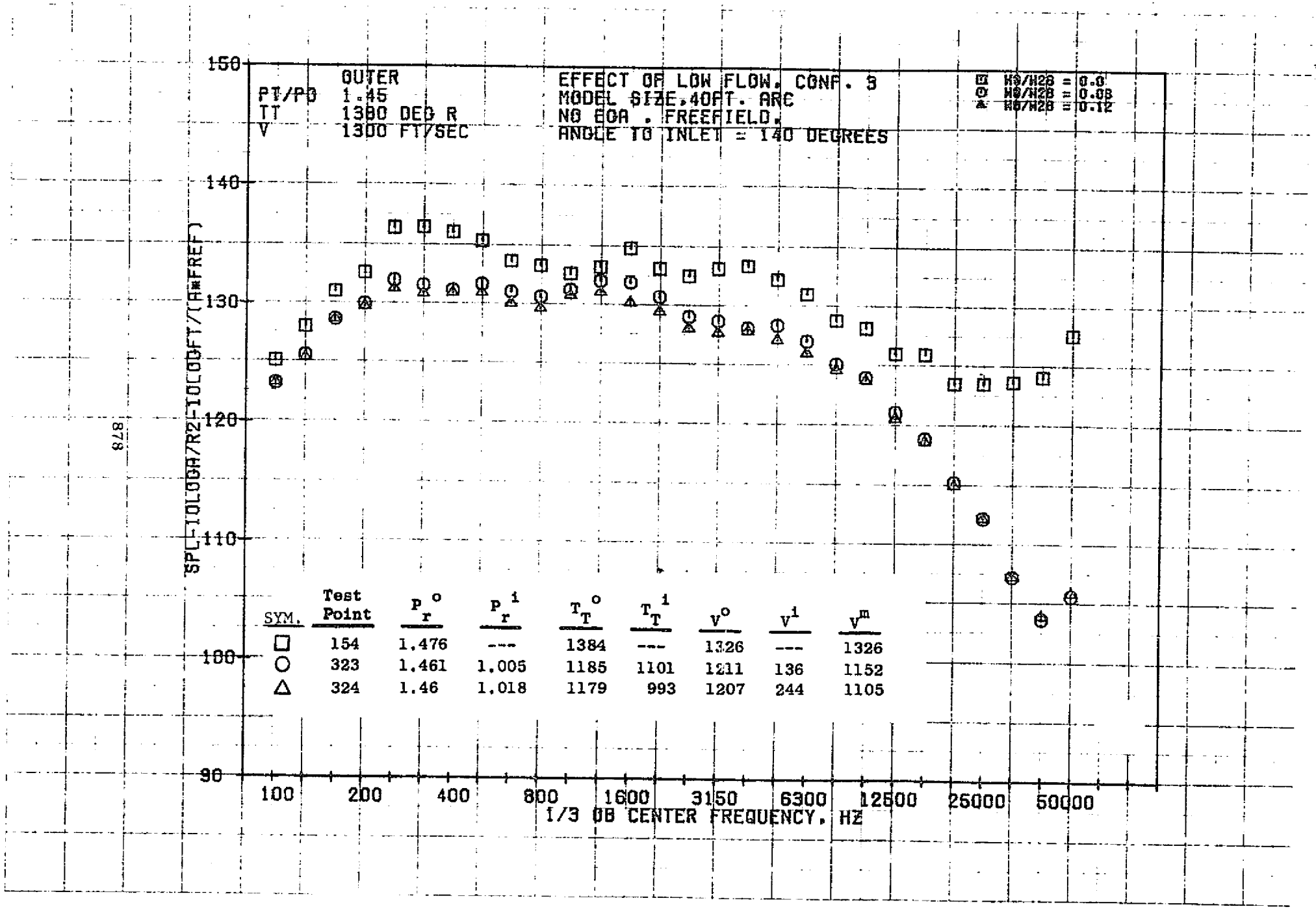
73KOLLSTEDT



877

10/12/76
1X525-001

73KOLLSTEDT



10/12/76
1X525-001

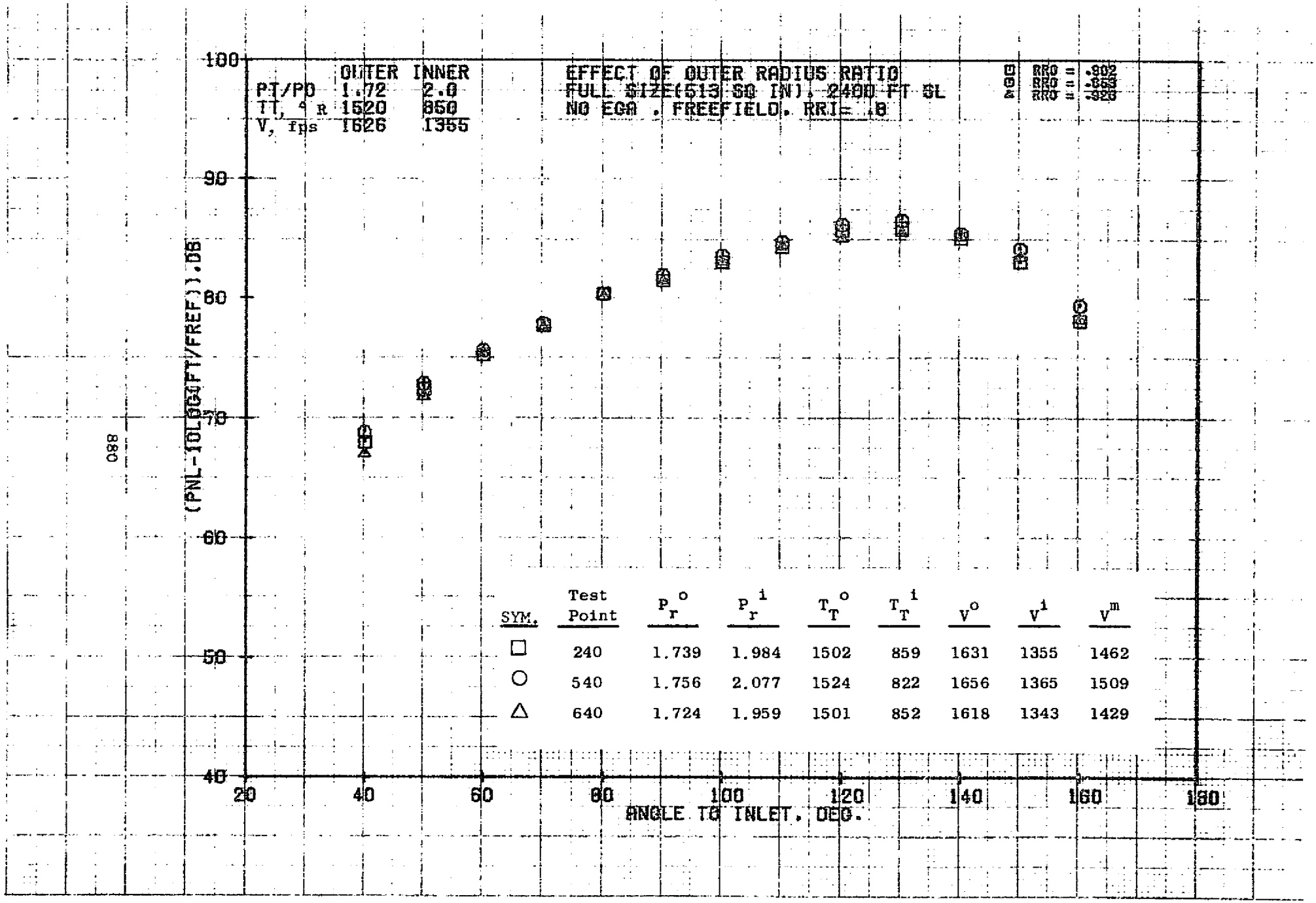
73KOLLSTEDT

7.4 COMPARISONS OF DATA FOR IVP NOZZLES WITH HIGH AMOUNTS OF INNER FLOW

The purpose of this test series was to examine the noise suppression characteristics of coannular nozzle configurations with high inner flows. Data presentations are described in the following sections.

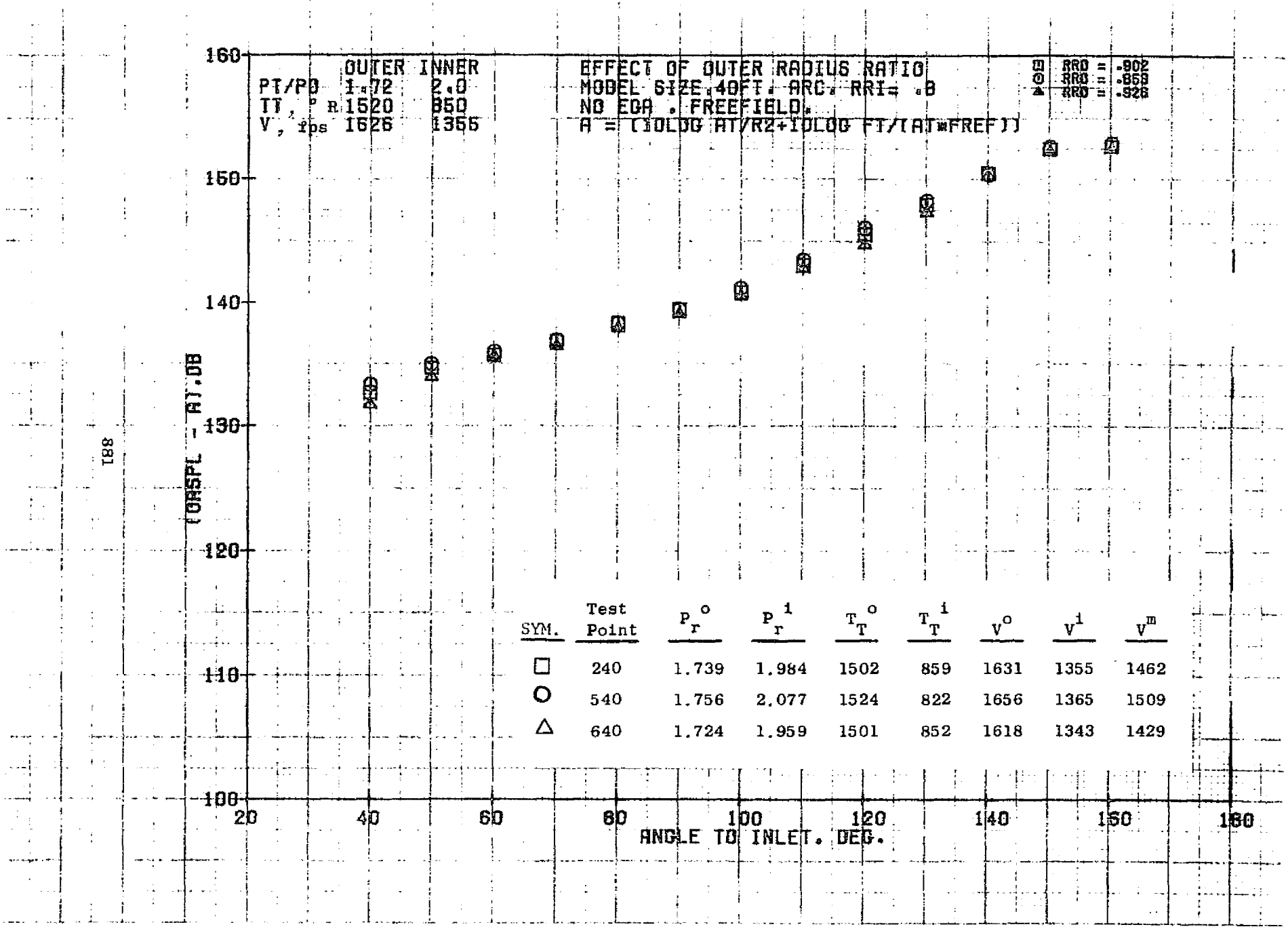
7.4.1 Effect of Outer Radius Ratio

In this section, the test results from Configurations 2, 5, and 6 are compared. All three configurations have the same inner radius ratio (0.8) and plug geometry, but the outer radius ratio varies from 0.853 to 0.926.



10/27/76
1X009-001

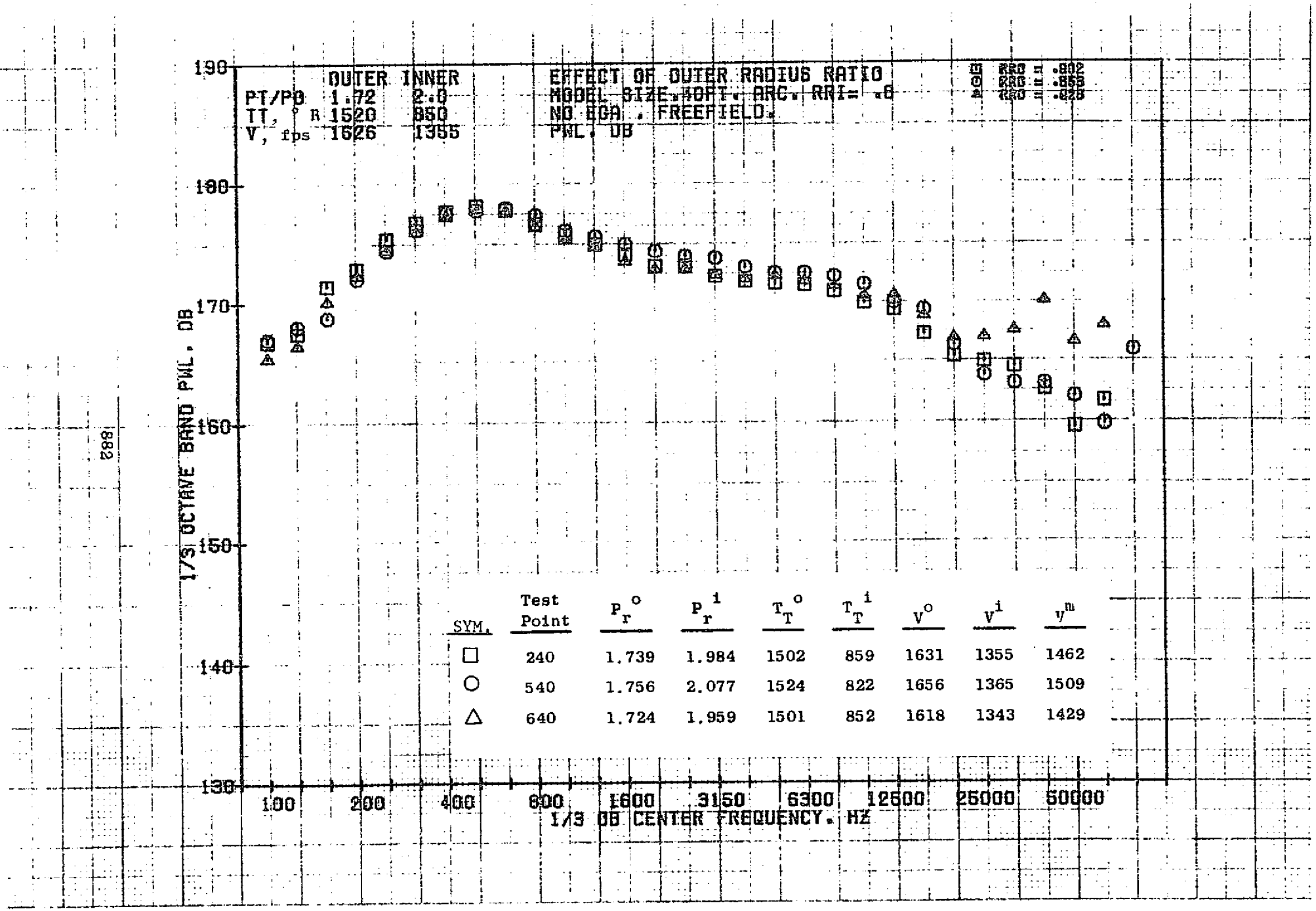
73KOLLSTEDT



881

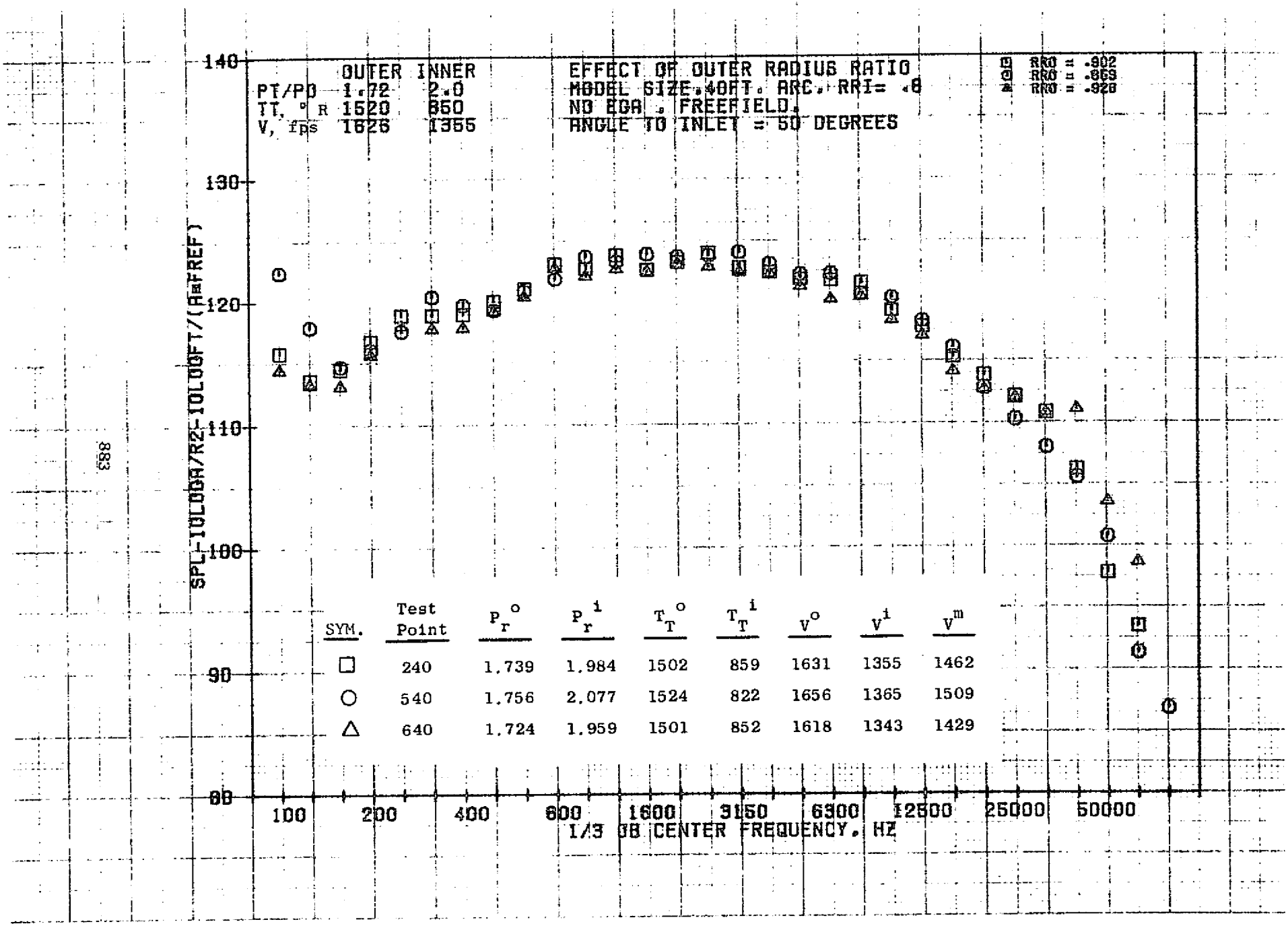
10/27/76
LX824-001

73KOLLSTEDT



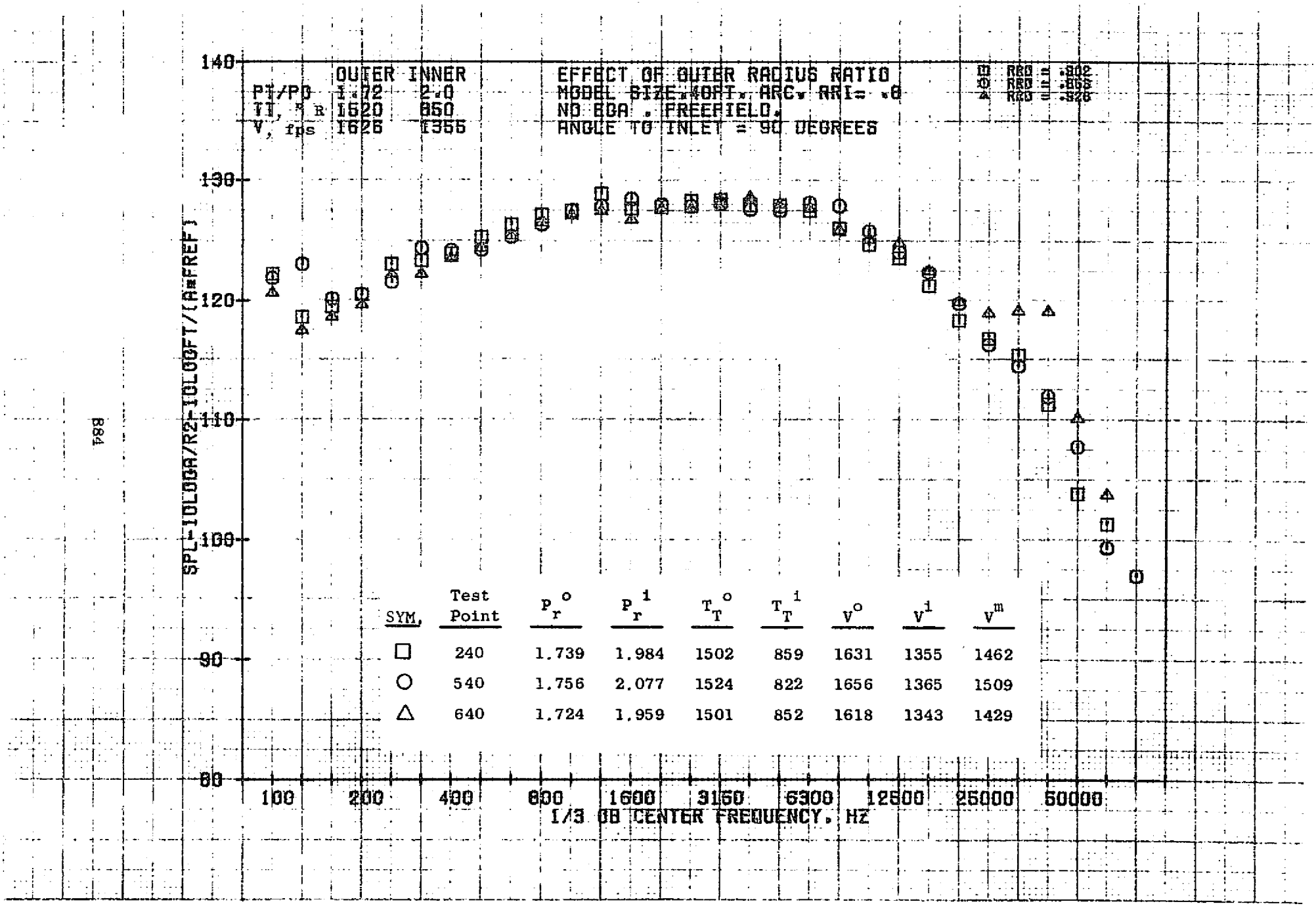
10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1X824-001

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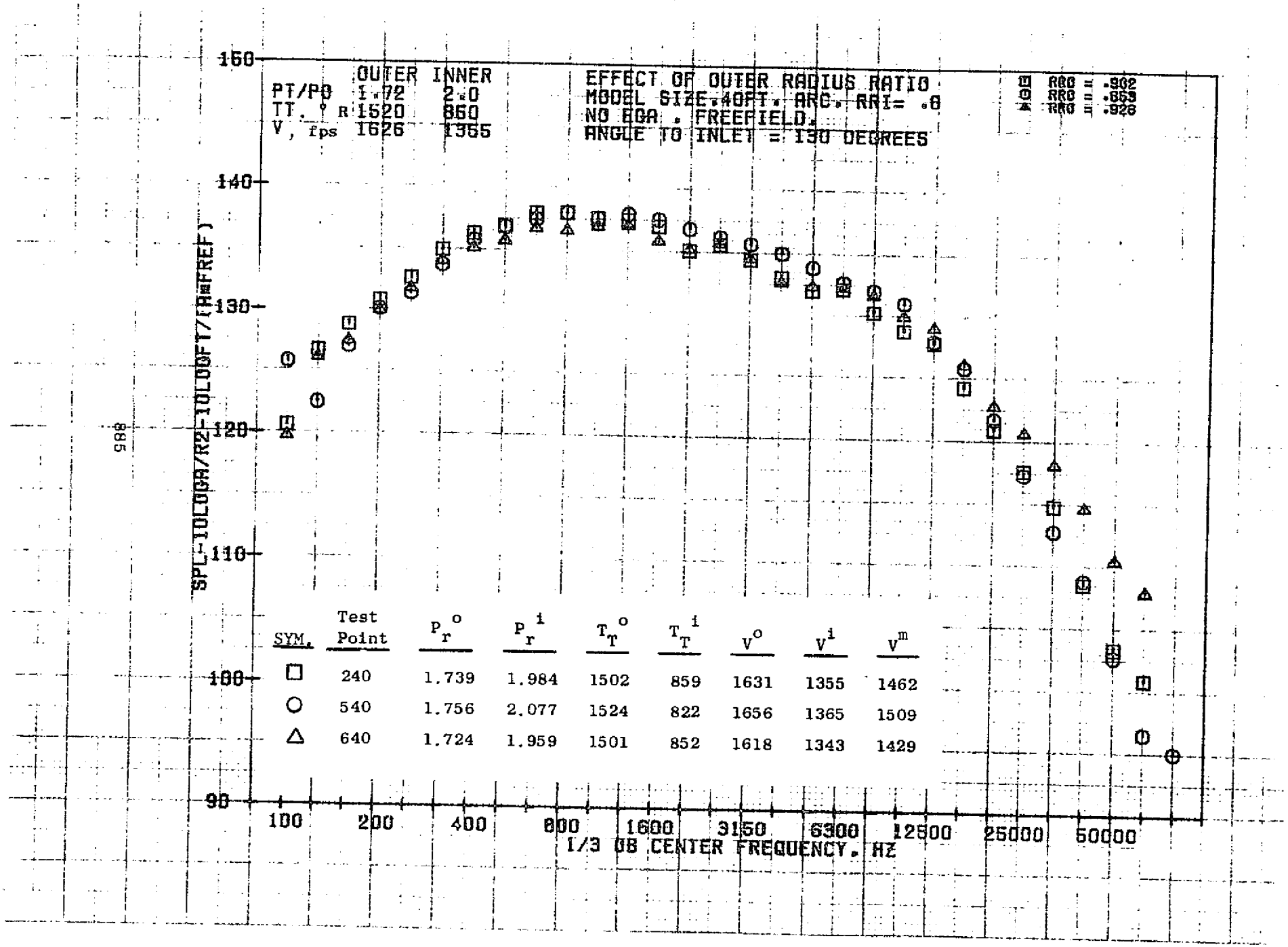
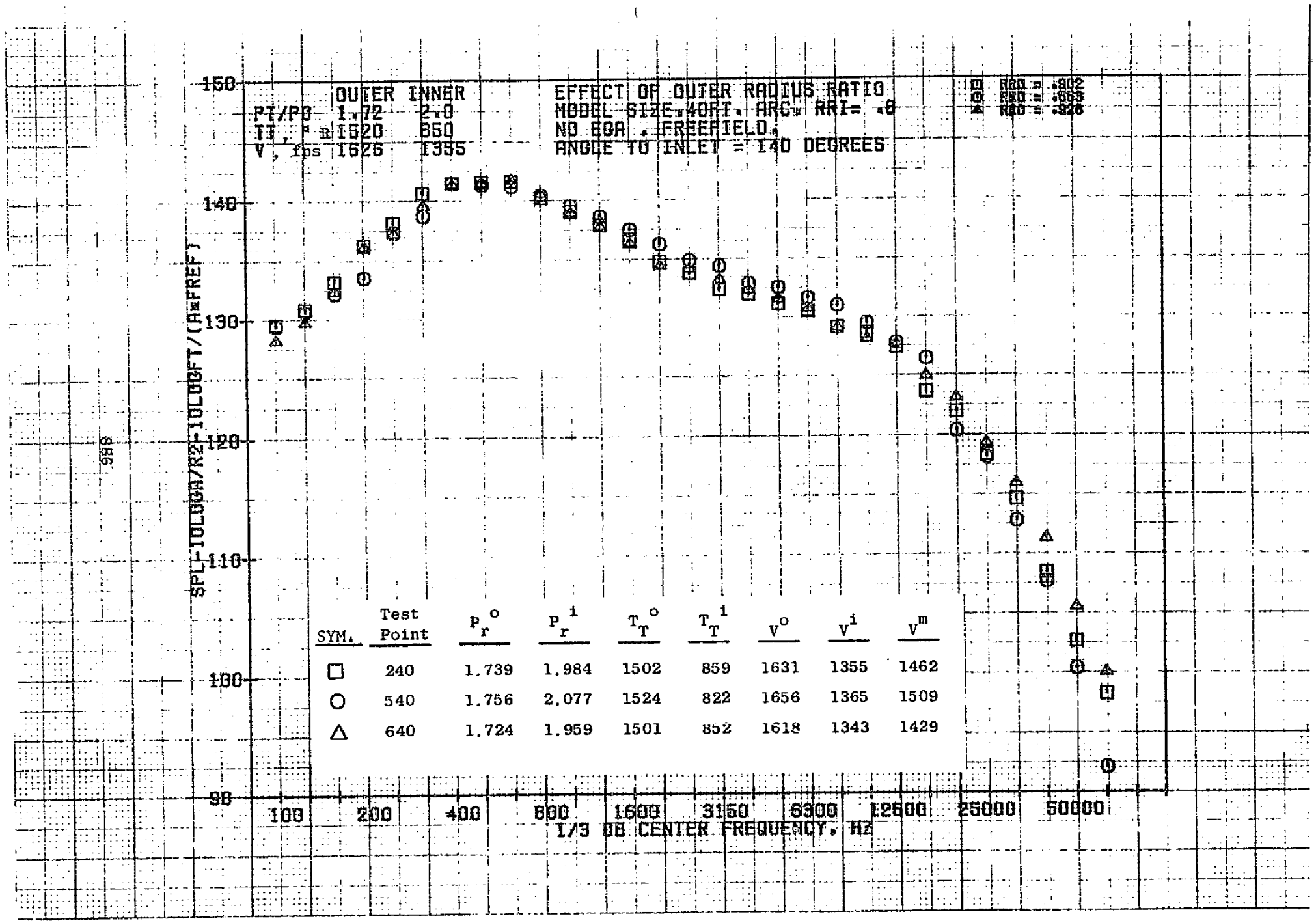
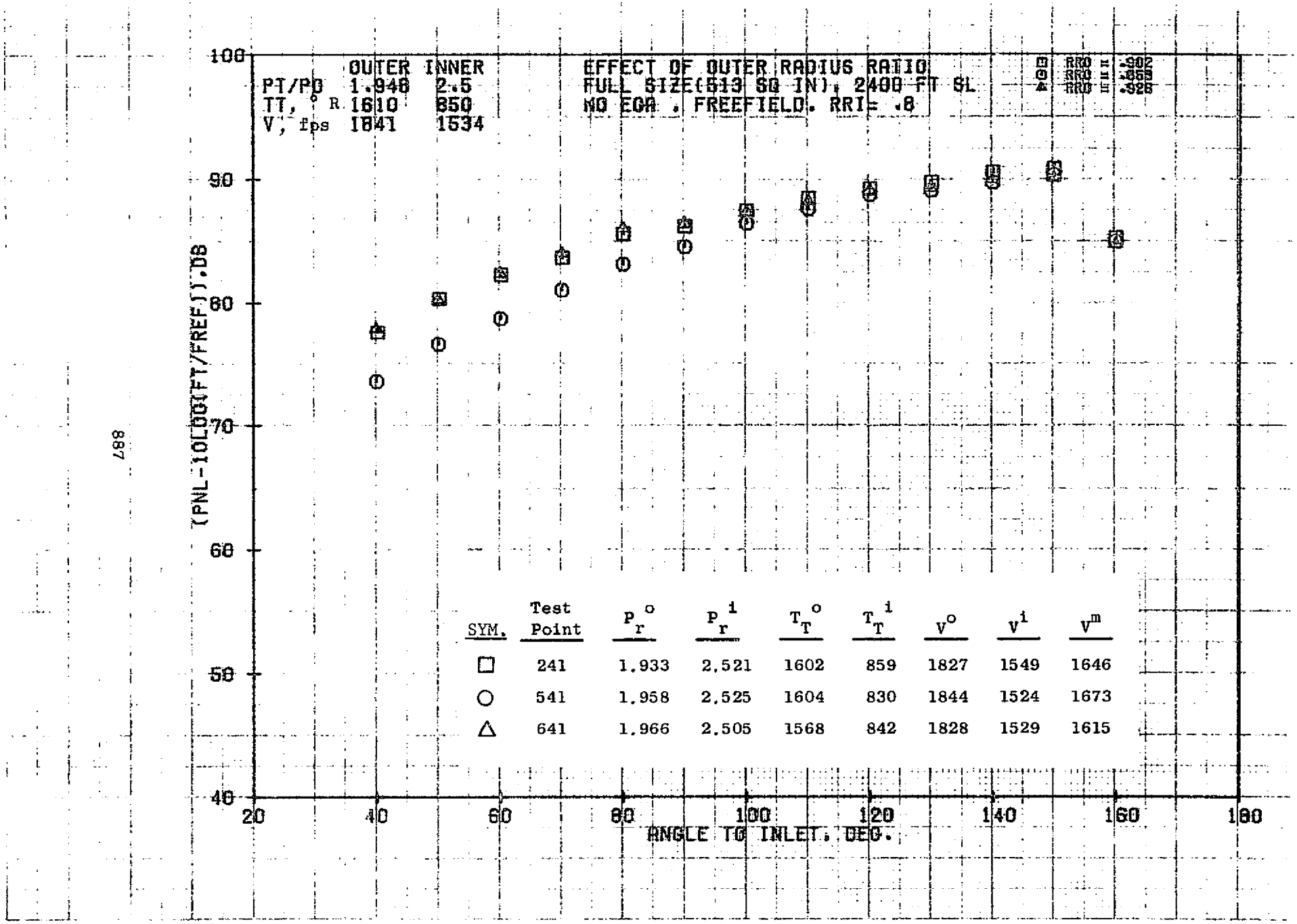


10/27/76
fX824-001



10/27/76
1X824-001

73KOLLSTEDT

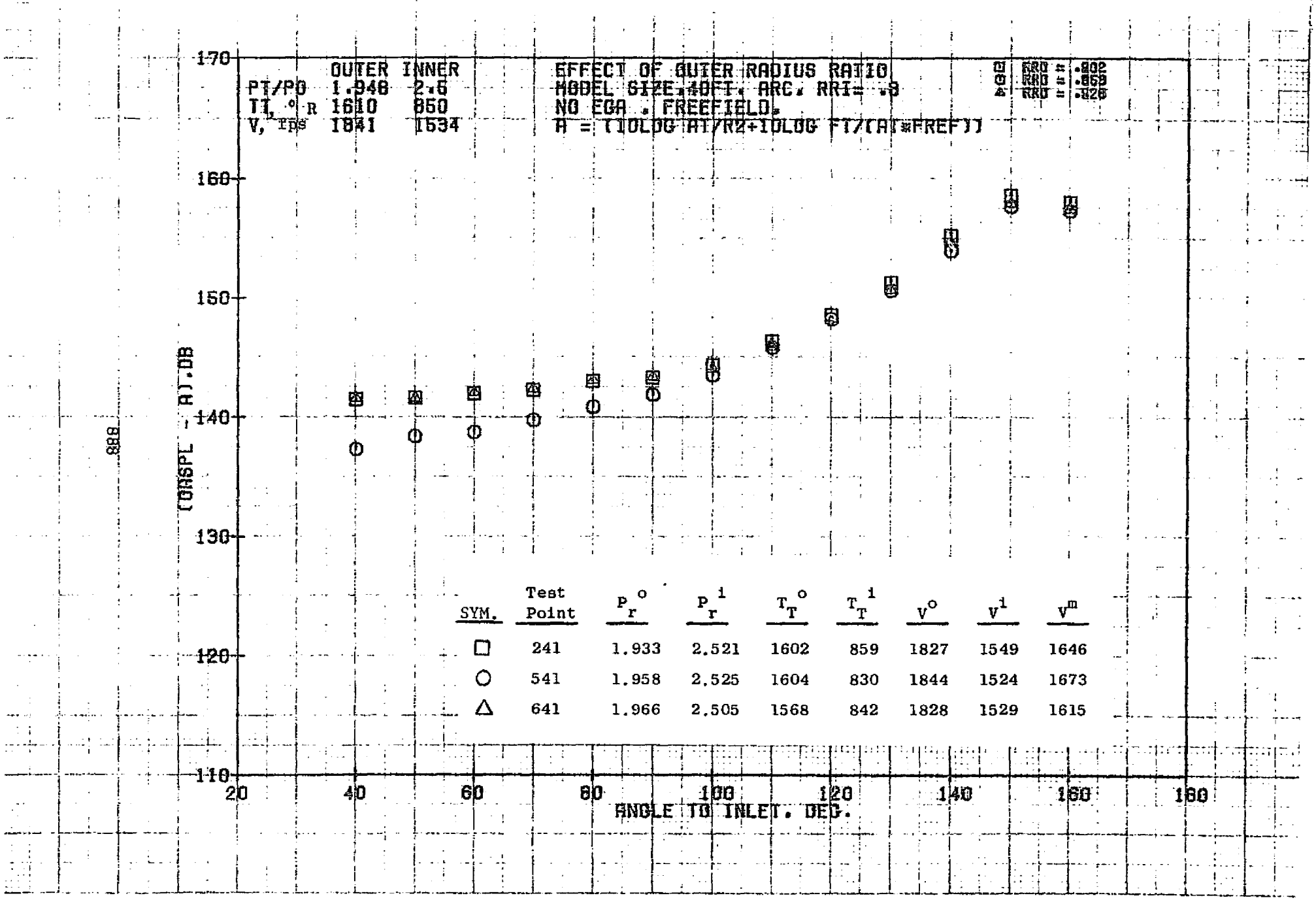


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	241	1.933	2.521	1602	859	1827	1549	1646
○	541	1.958	2.525	1604	830	1844	1524	1673
△	641	1.966	2.505	1568	842	1828	1529	1615

887

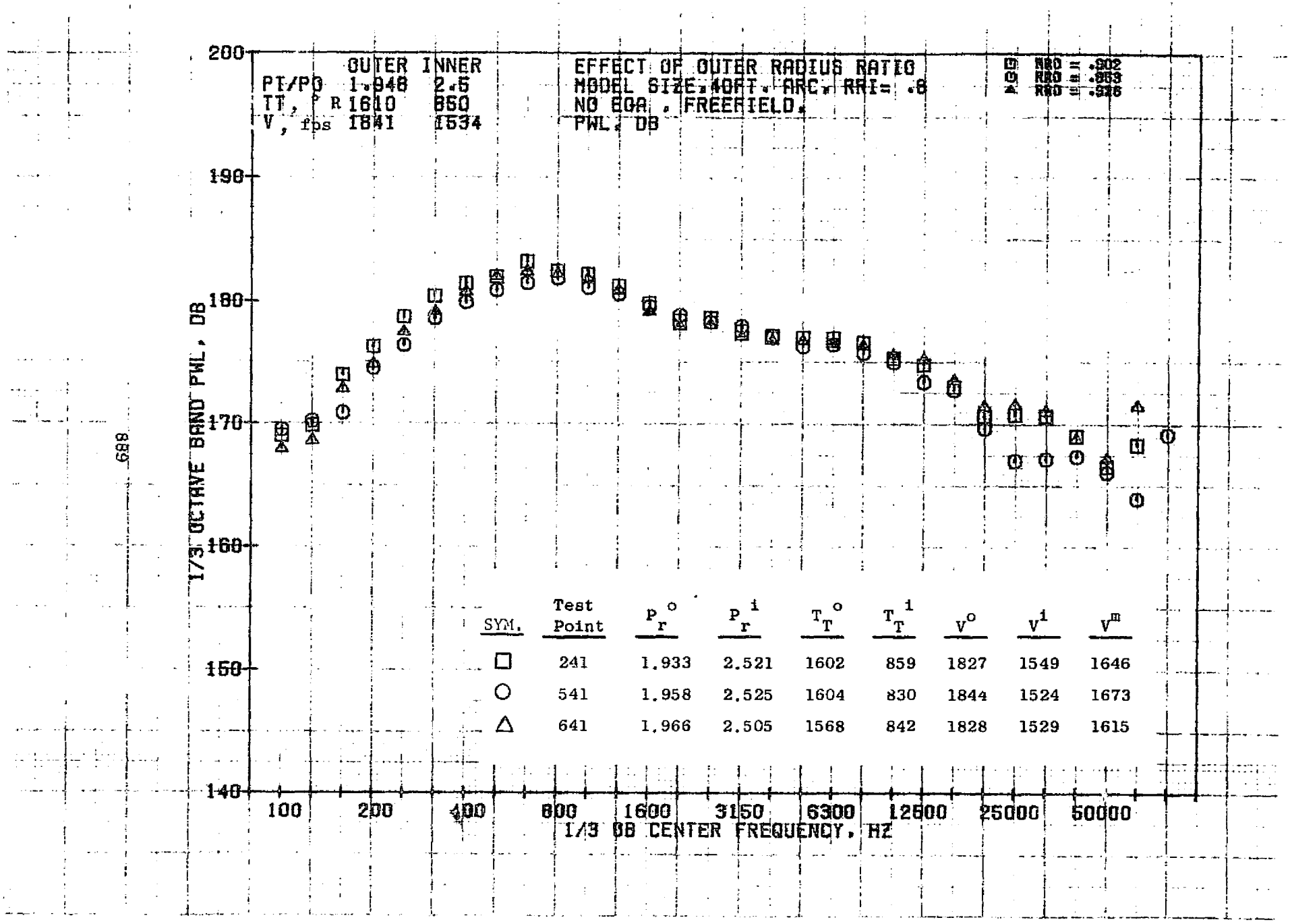
10/27/76
1X008-001

73K01 STFDT



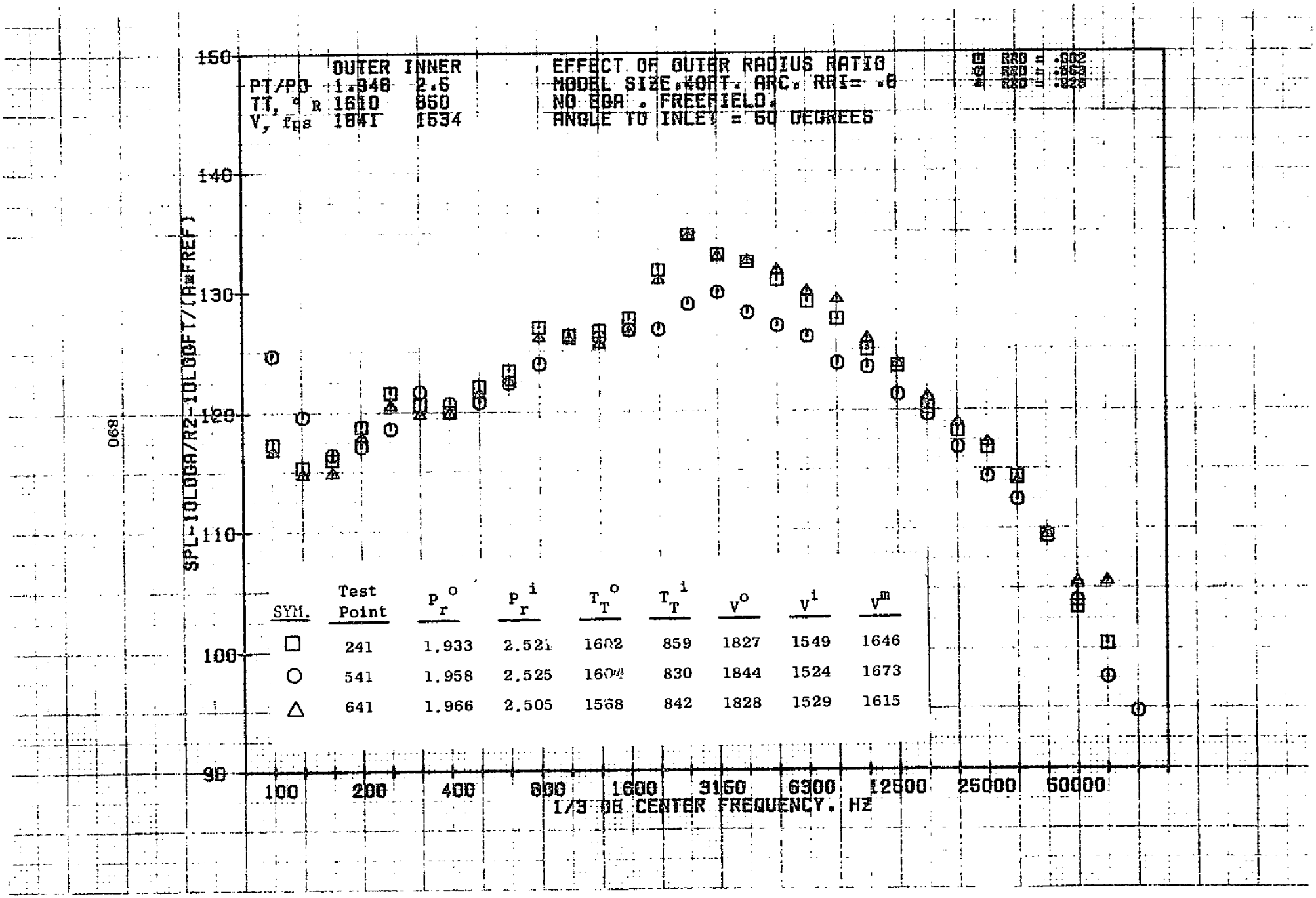
10/27/76
1X824-001

73KOLLSTFDT



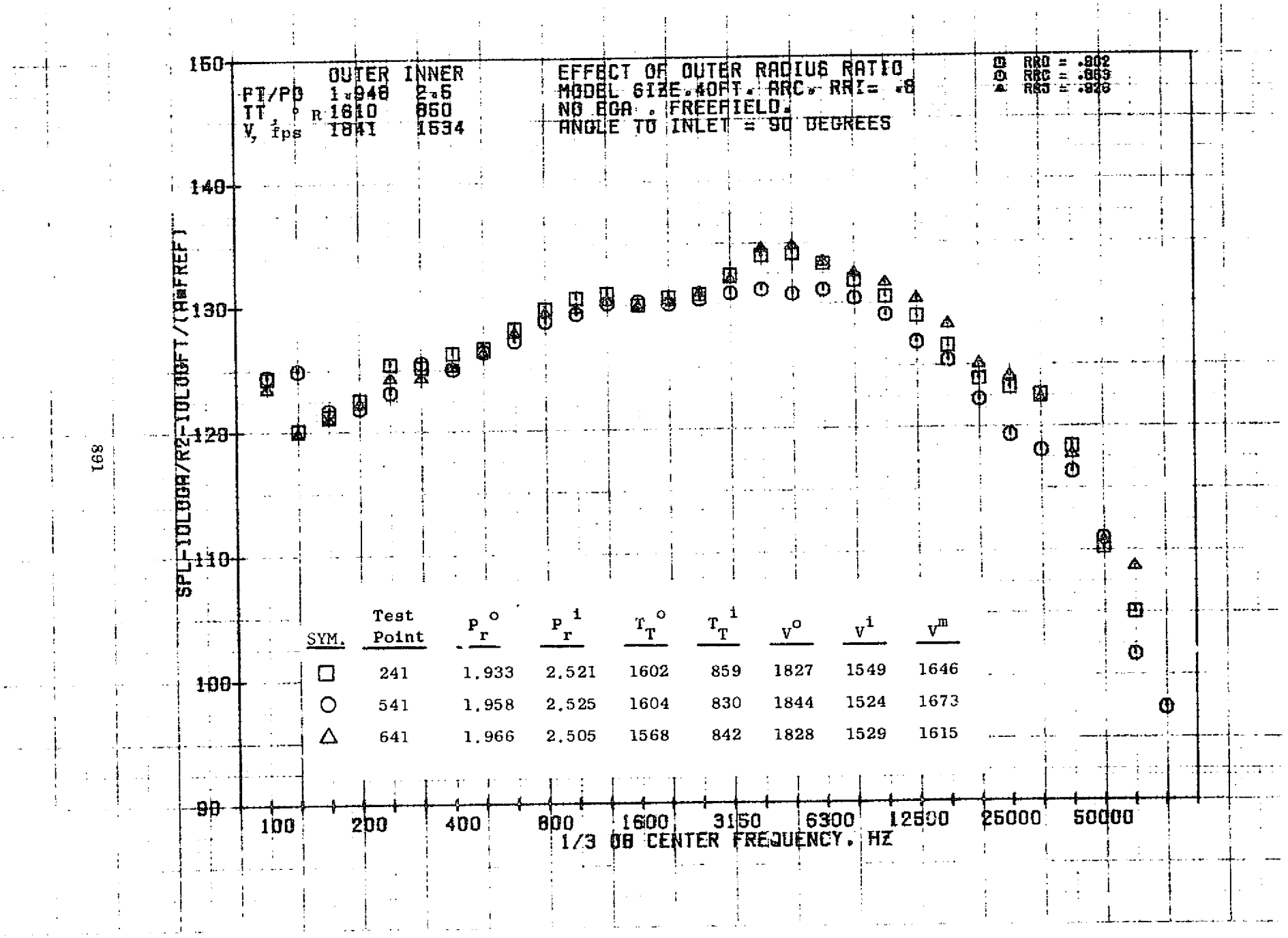
10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1X824-001

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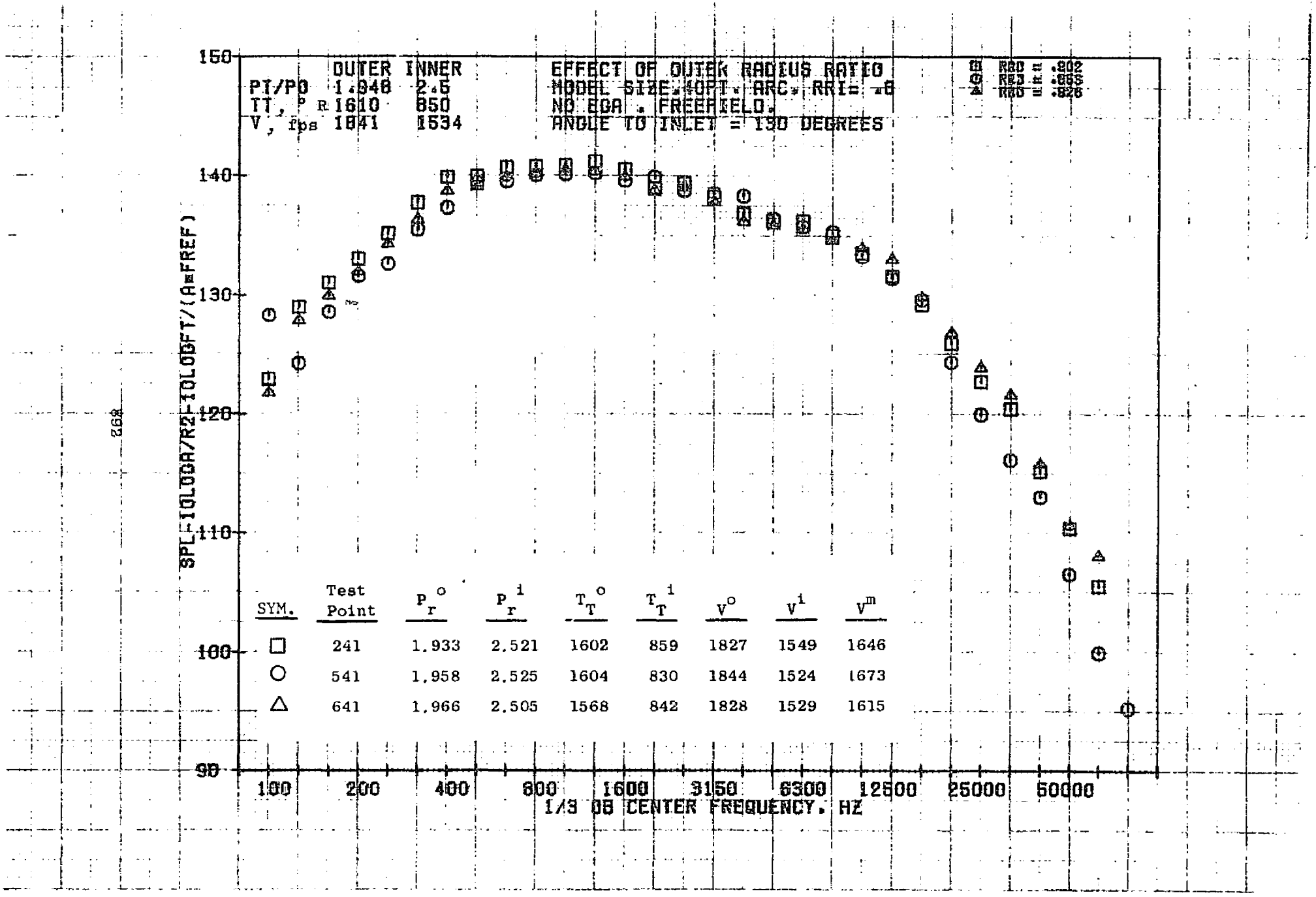

10/27/76
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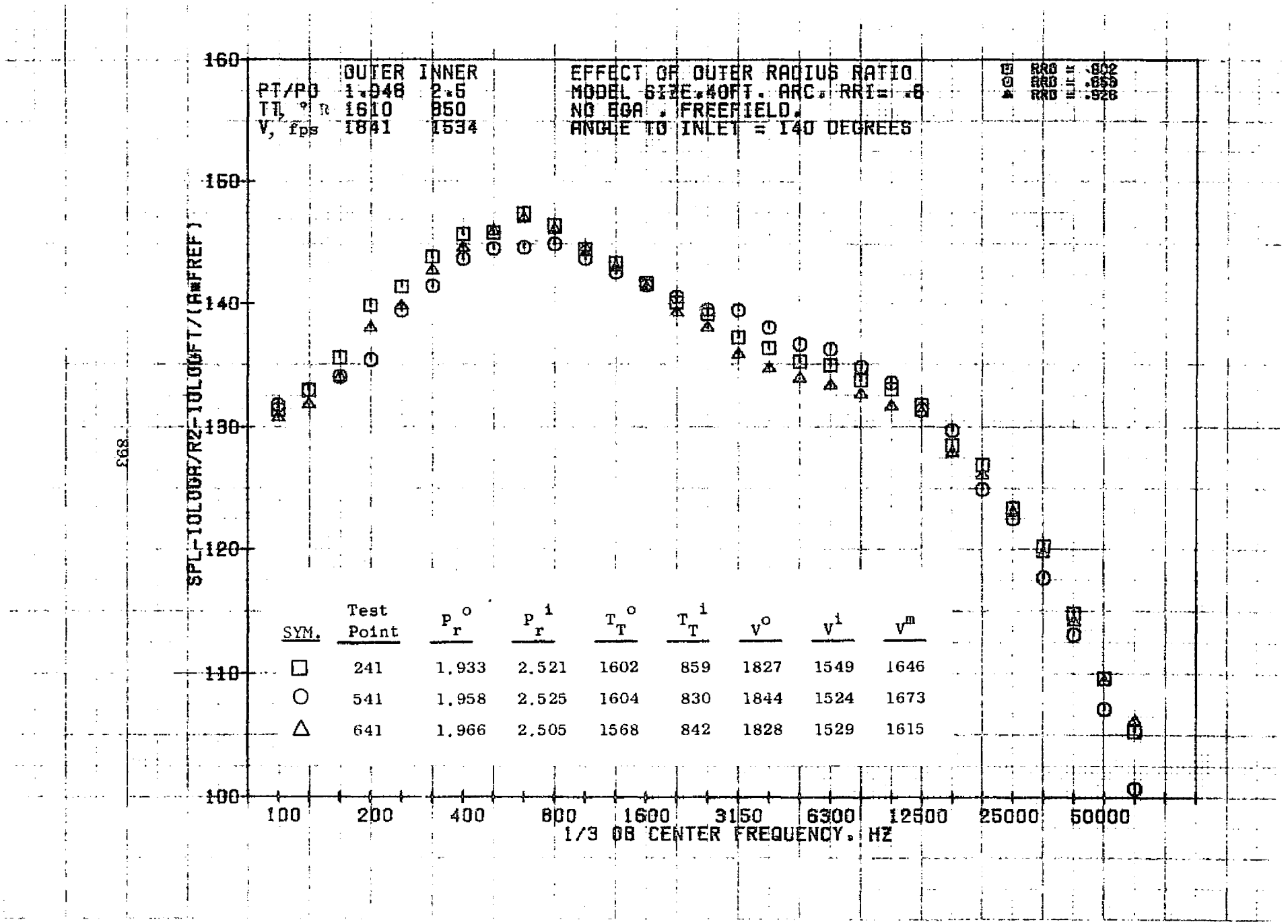
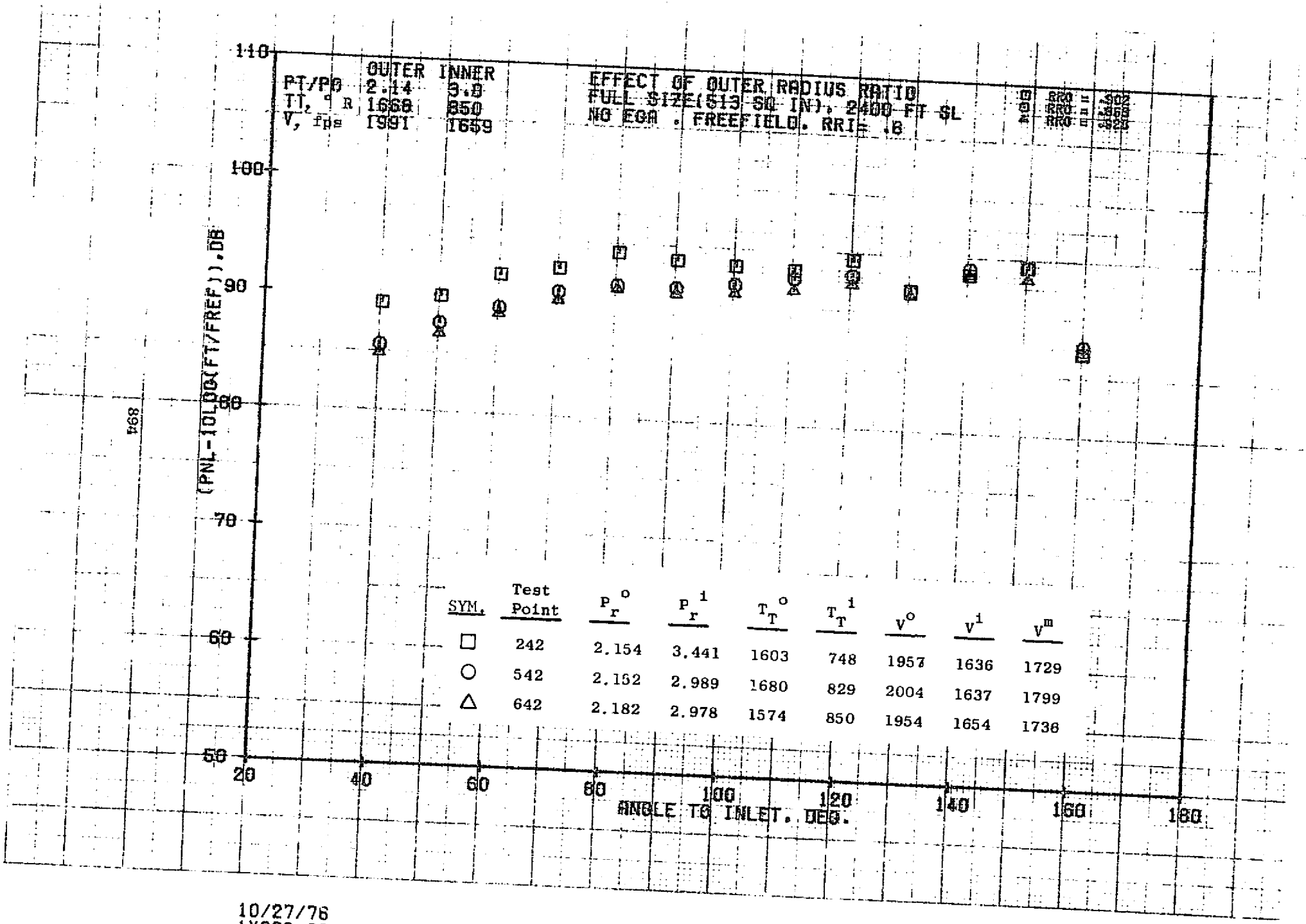
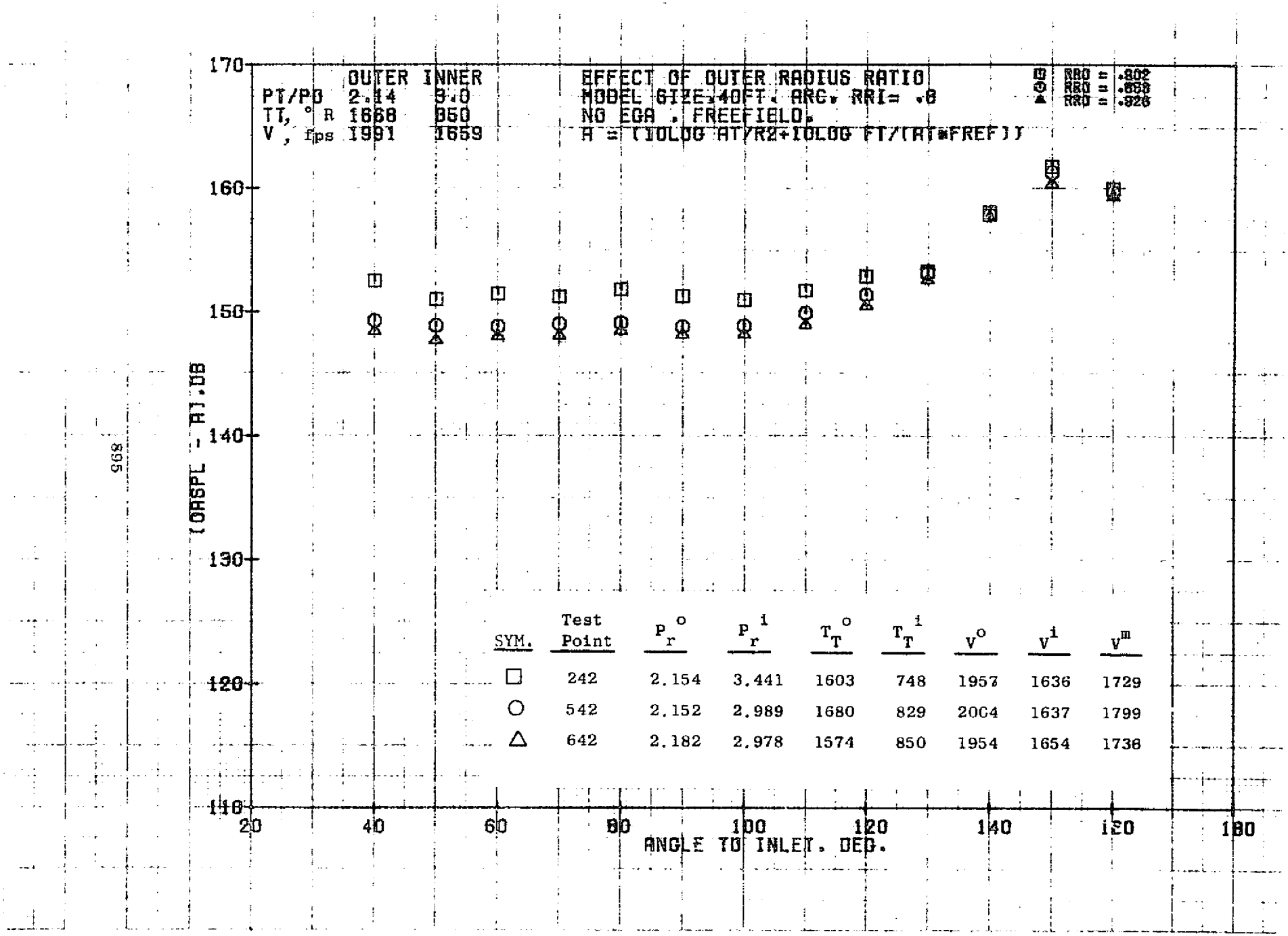


10/27/76
1X824-001

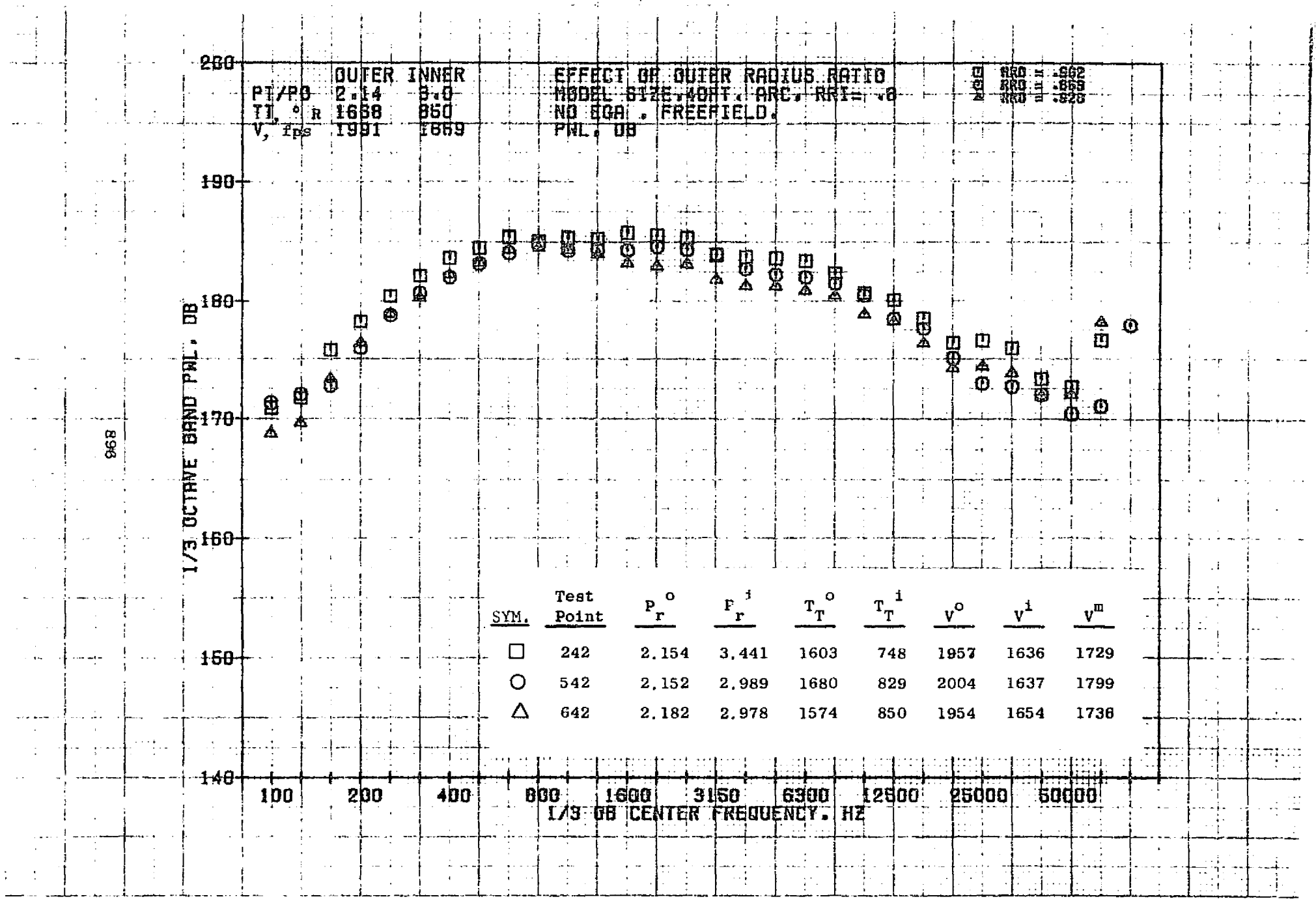
73KOLI STEOT


EFFECT OF OUTER RADIUS RATIO
FULL SIZE(513 SQ IN), 2400 FT SL
NO EGR , FREEFIELD, RRI= .8
RRO = .902
RRO = .868
RRO = .928
OUTER INNER
PT/P0 2.14 3.8
TT, °R 1668 850
V, fps 1991 1659
(PNL-10LOG(FT/FREF)),DB
110
100
90
80
70
60
50
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SYM. Test Point Pr^o Pr^i TT^o TT^i V^o V^i V^m
□ 242 2.154 3.441 1603 748 1957 1636 1729
○ 542 2.152 2.989 1680 829 2004 1637 1799
△ 642 2.182 2.978 1574 850 1954 1654 1736
894
10/27/76
1X008-001



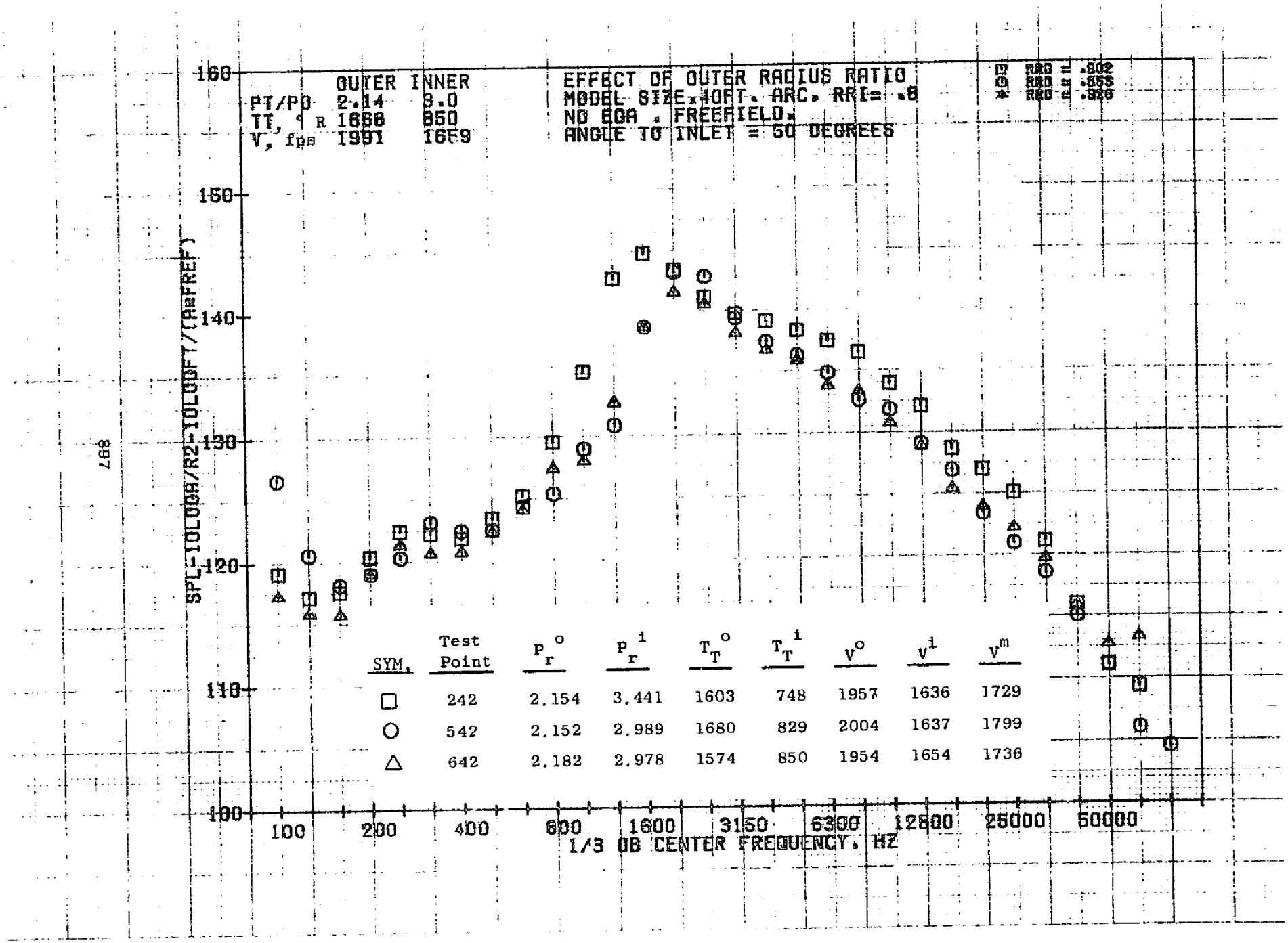
10/27/76
1X824-001

73KOLLSTEDT



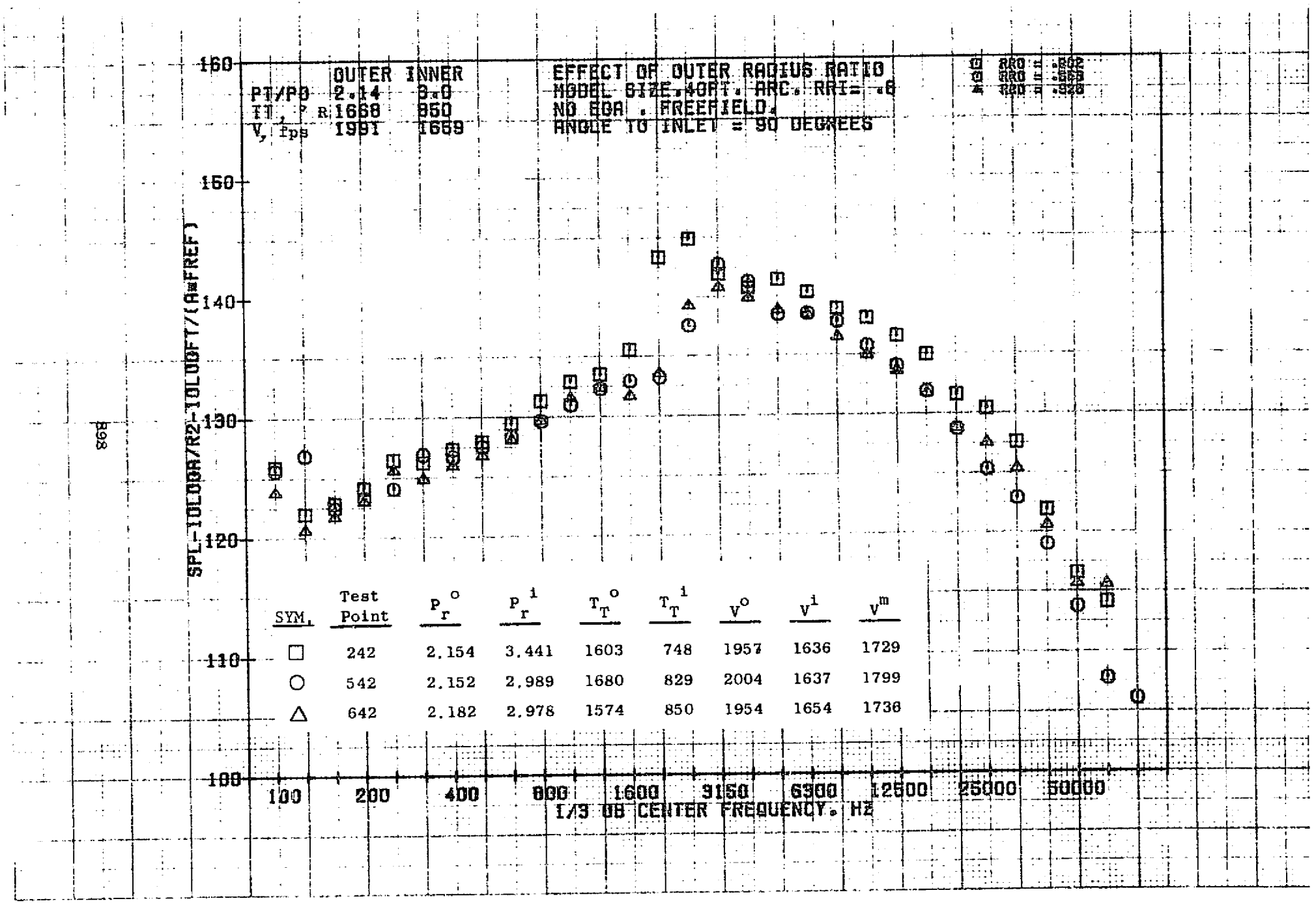
10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1XA24-001

73KOLLSTEDT



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1X824-001

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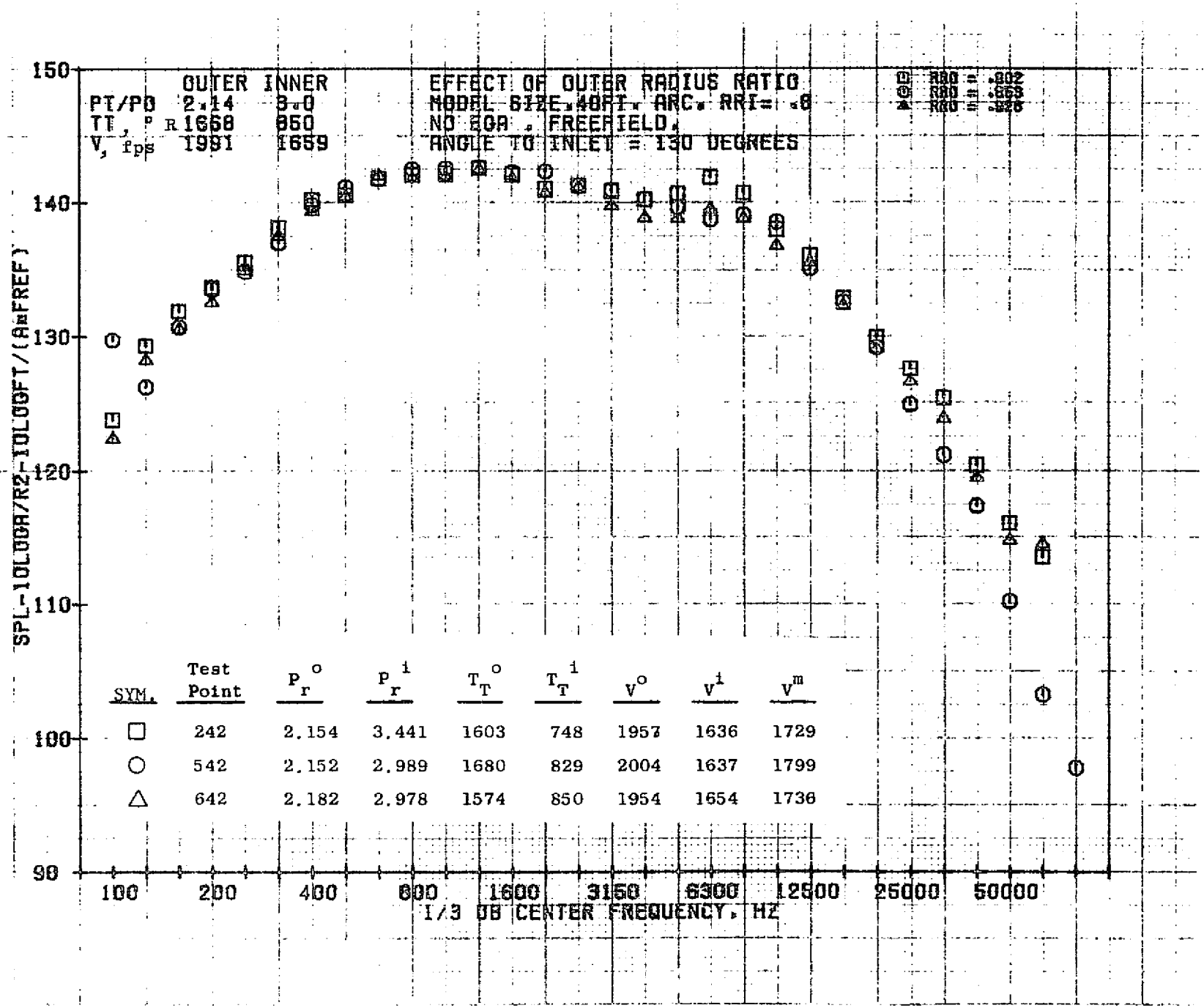

668

10/27/76
1X824 001

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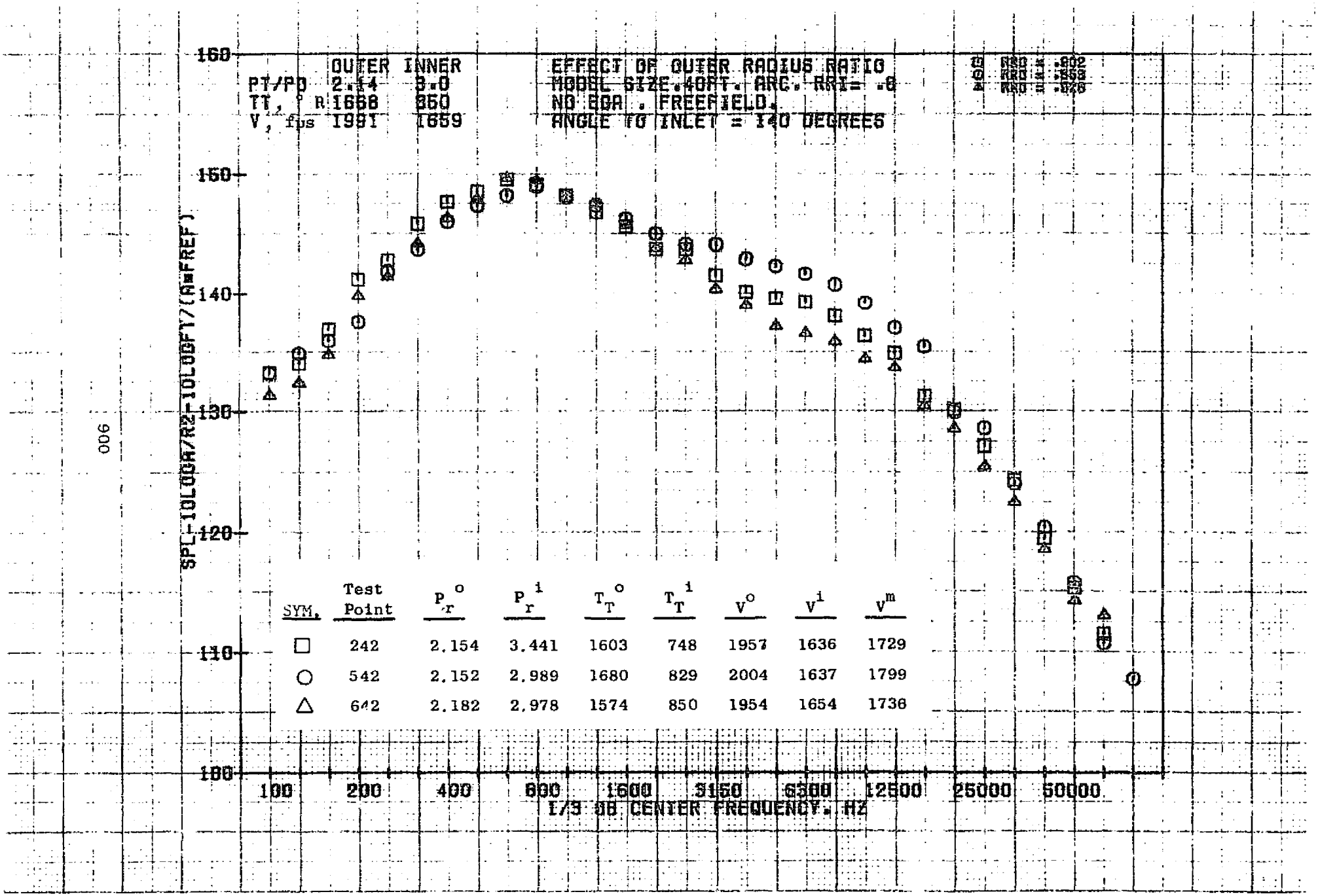

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1X824-001

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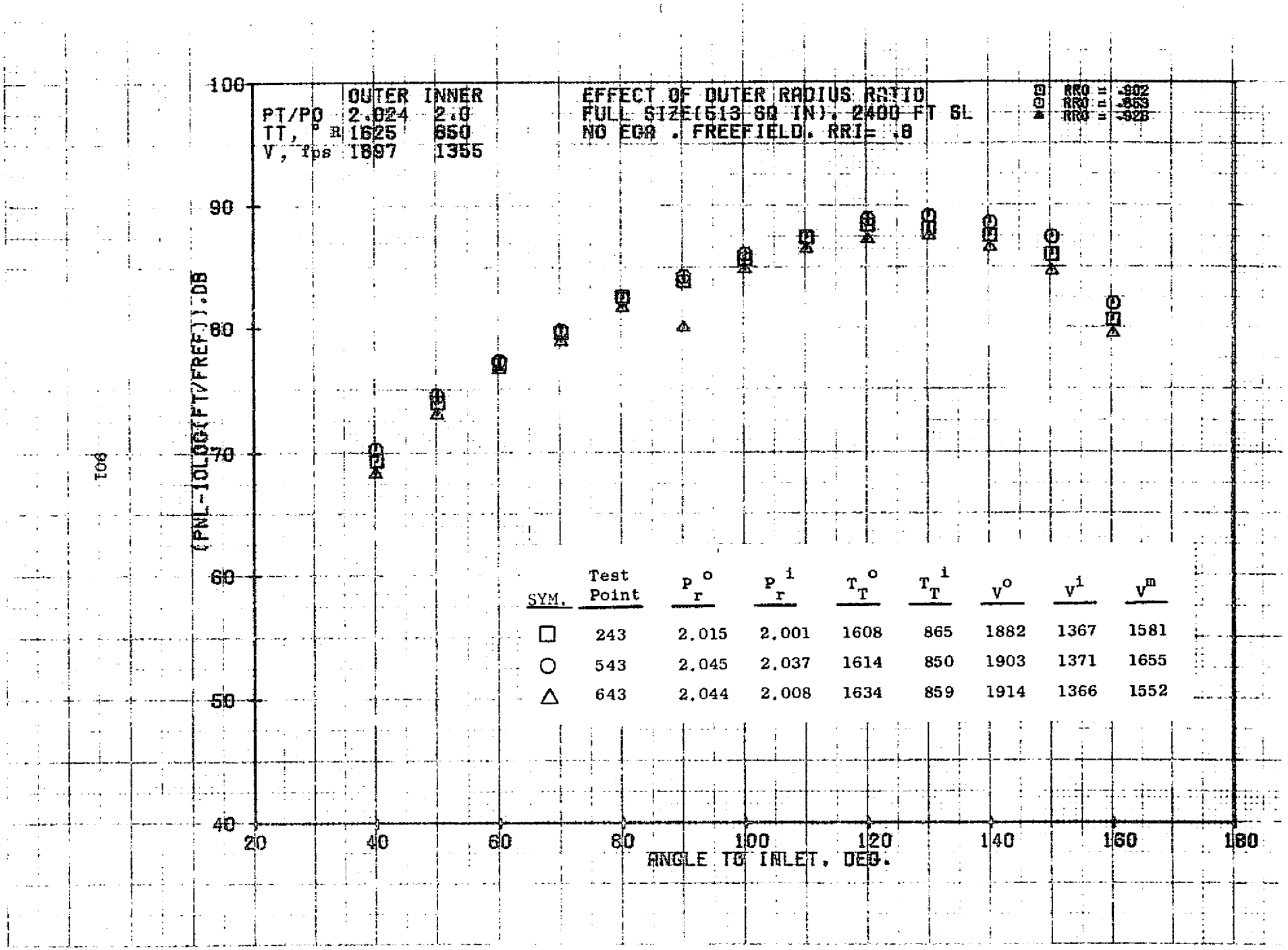

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1X008-001

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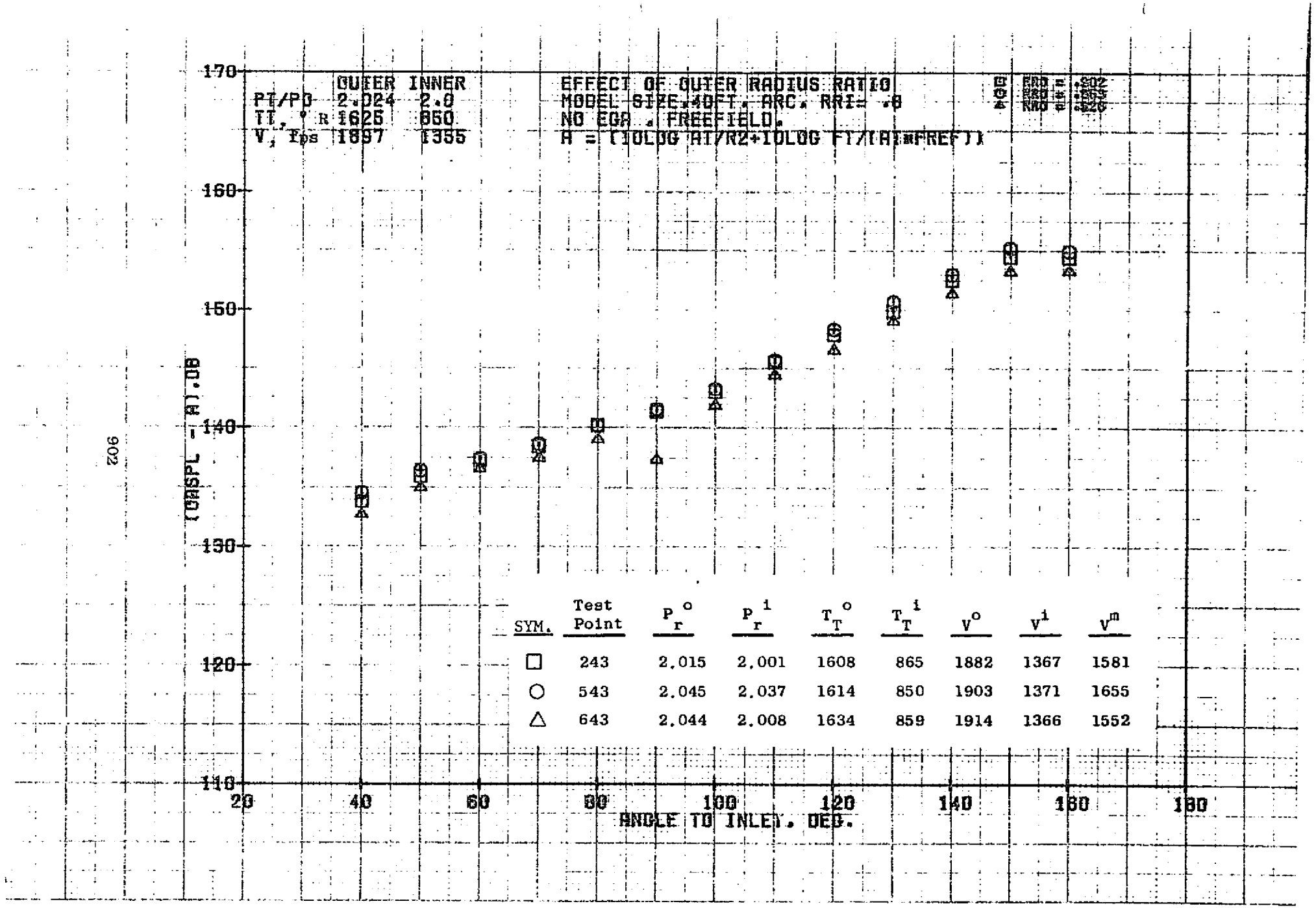

10/27/76
1X824-001

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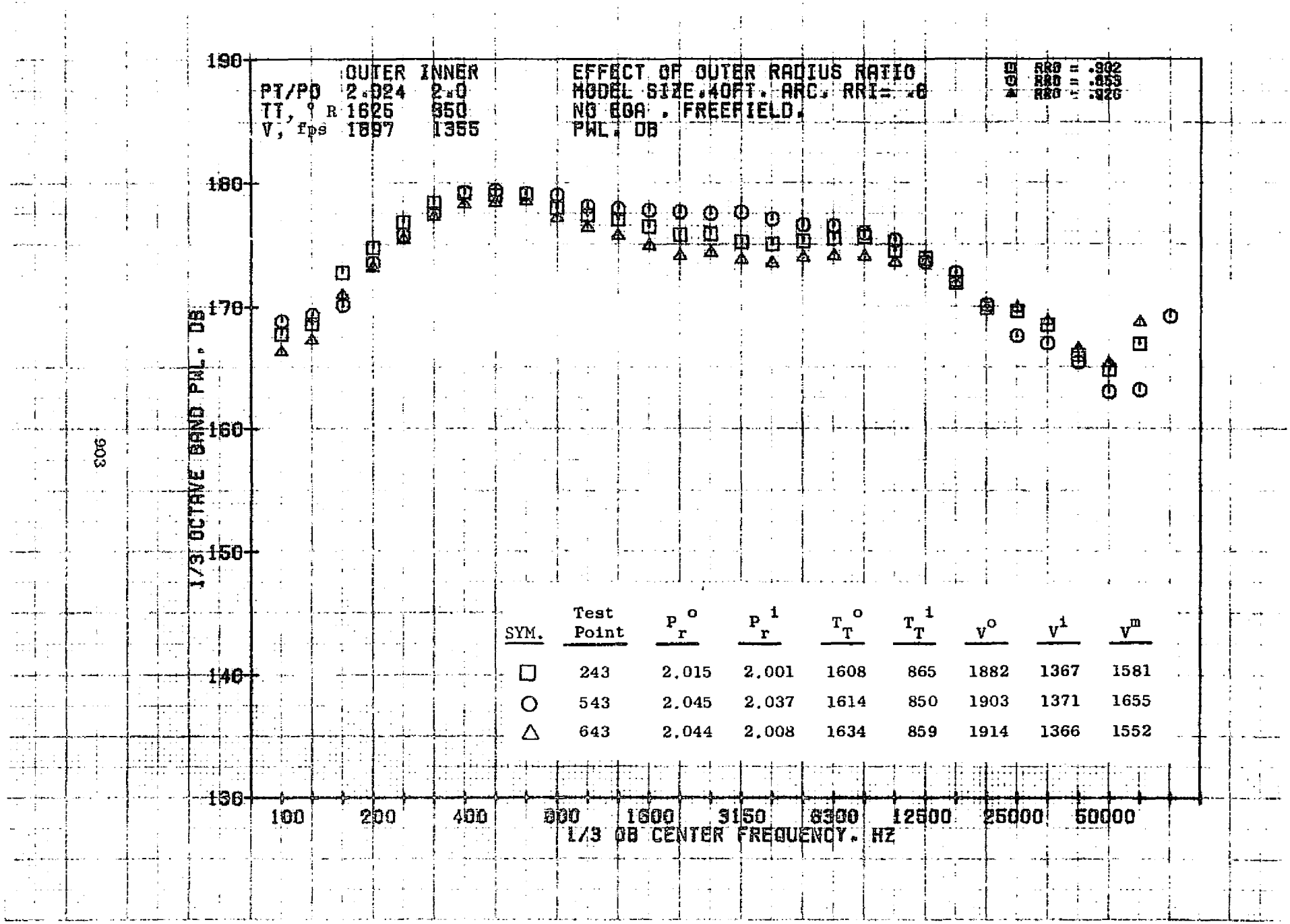

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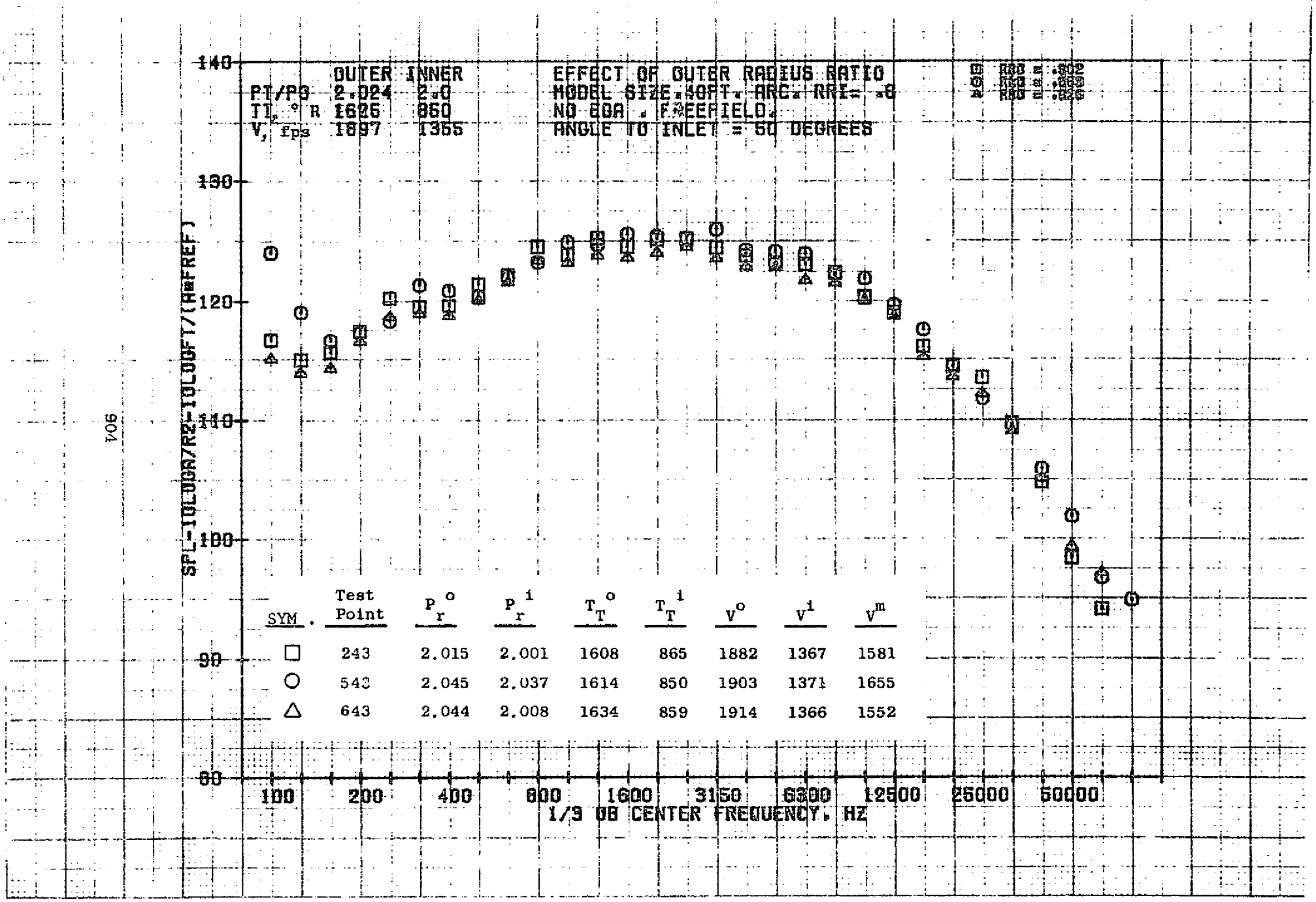

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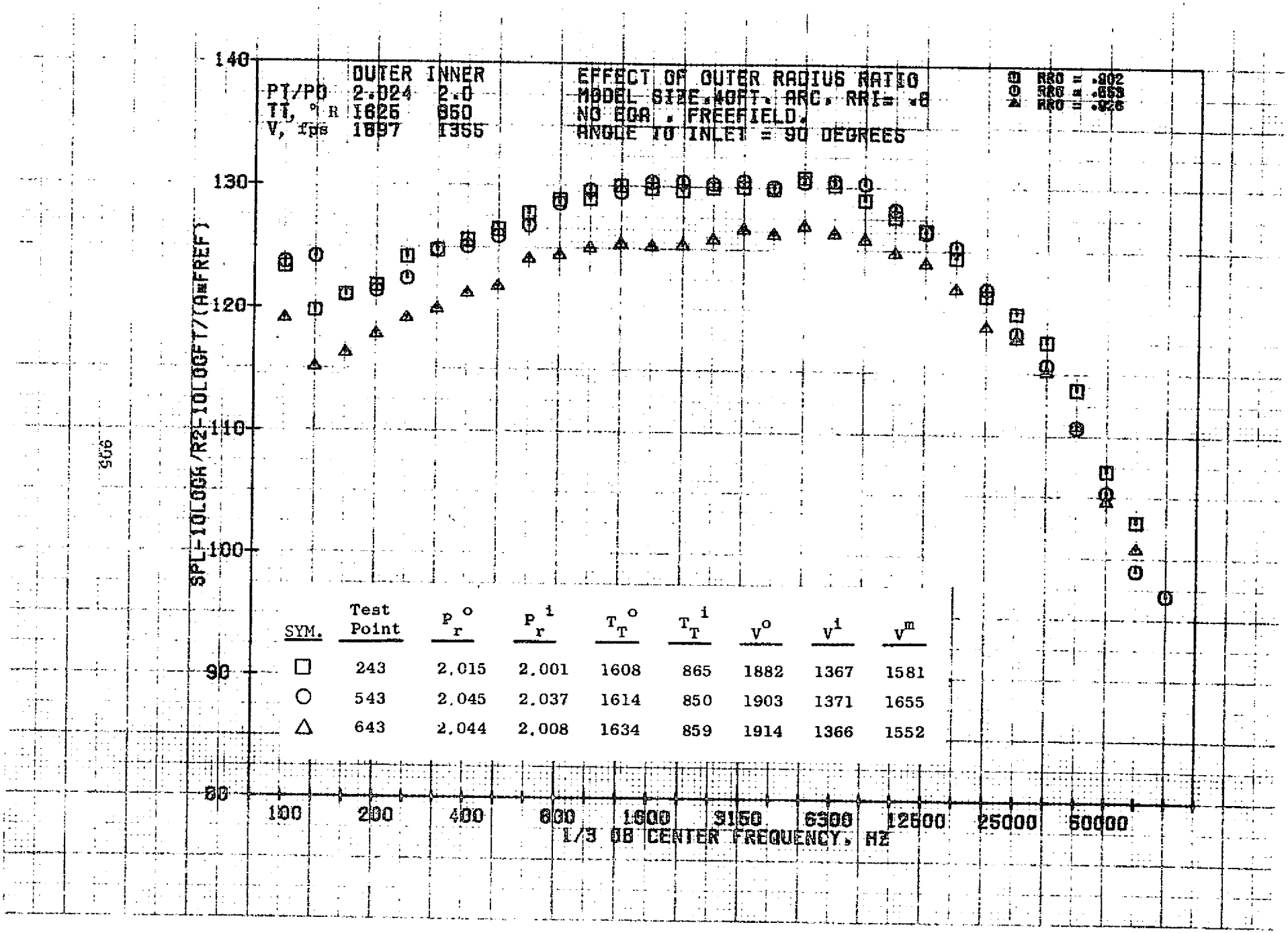

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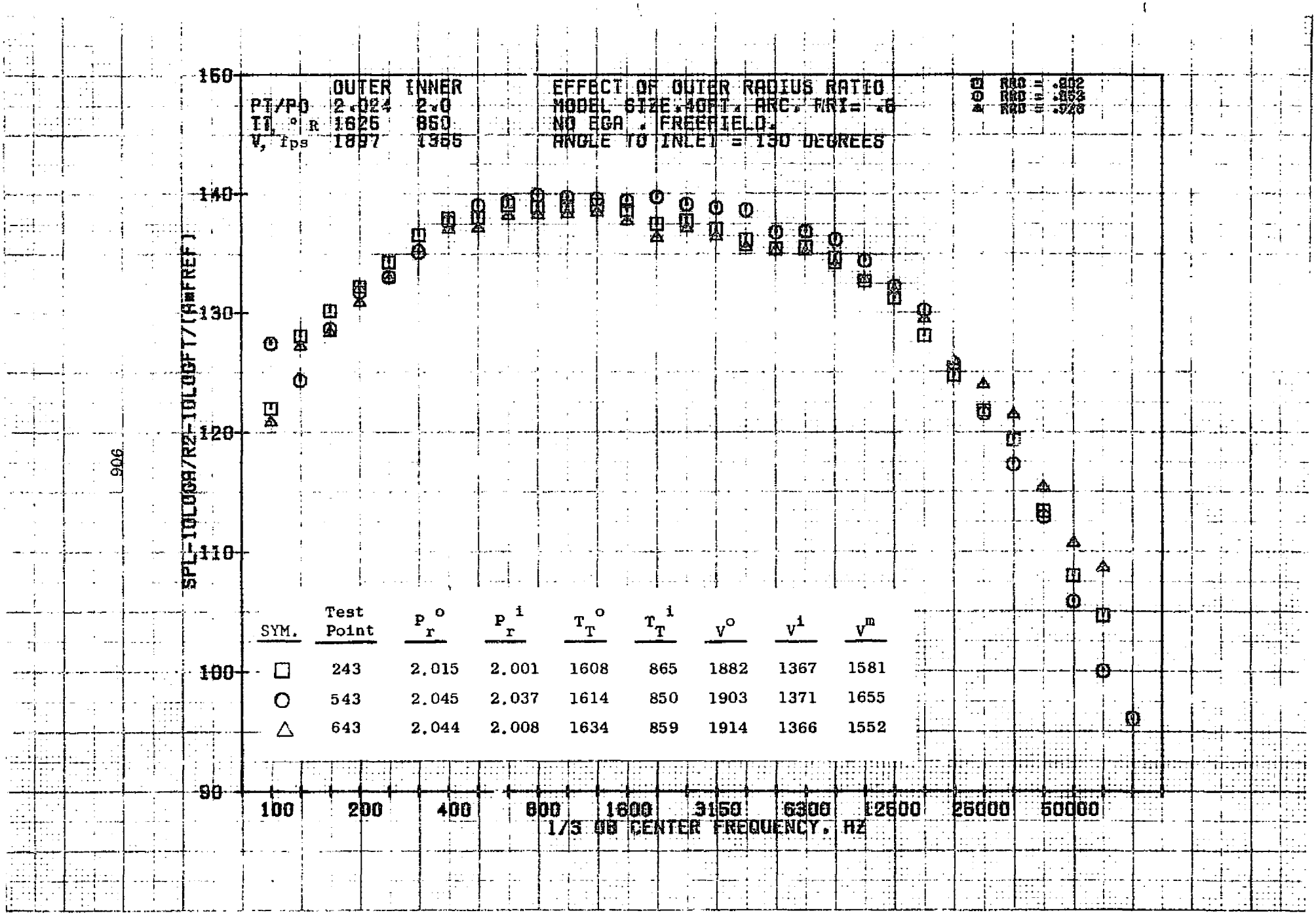

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1X824-001

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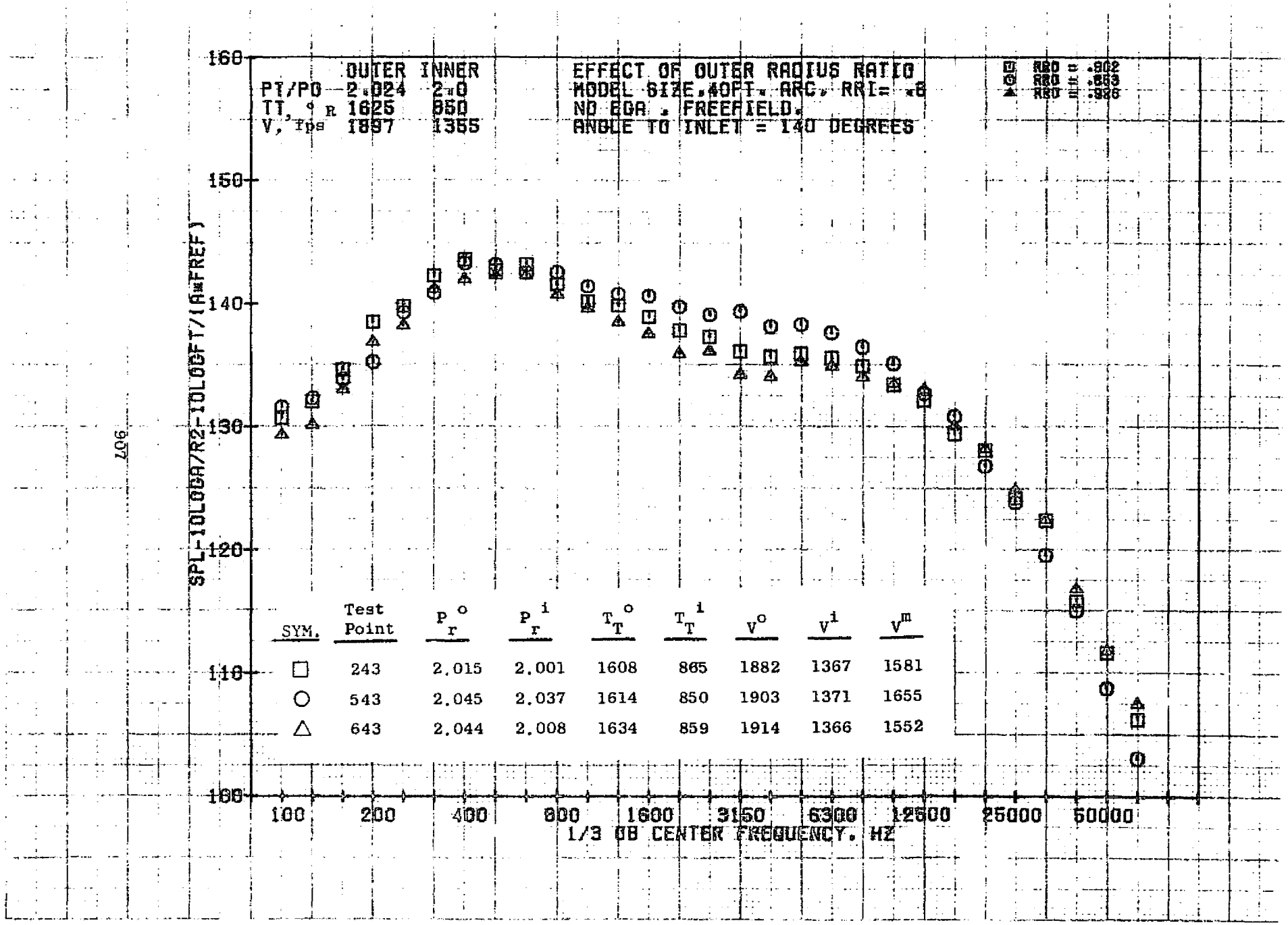

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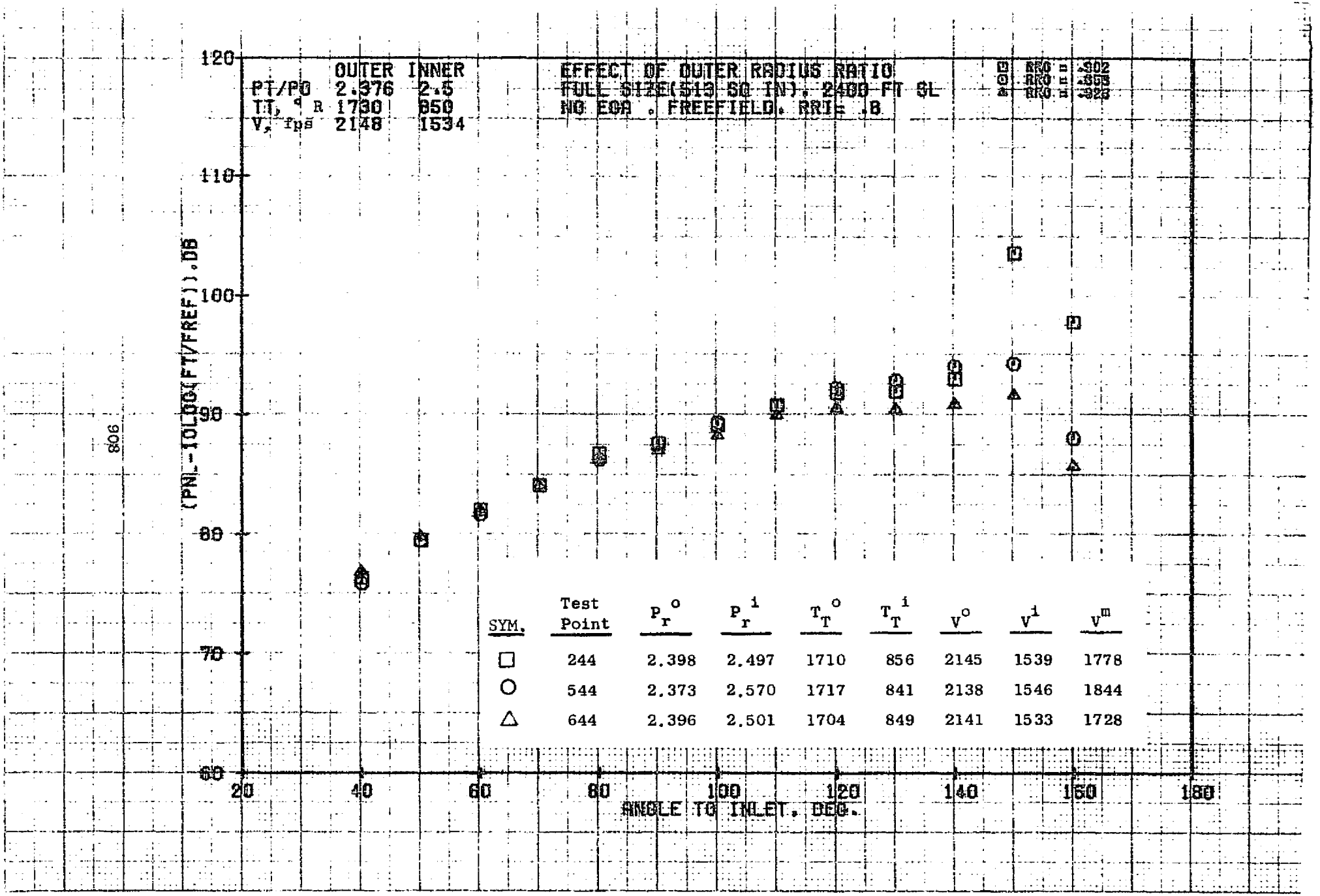

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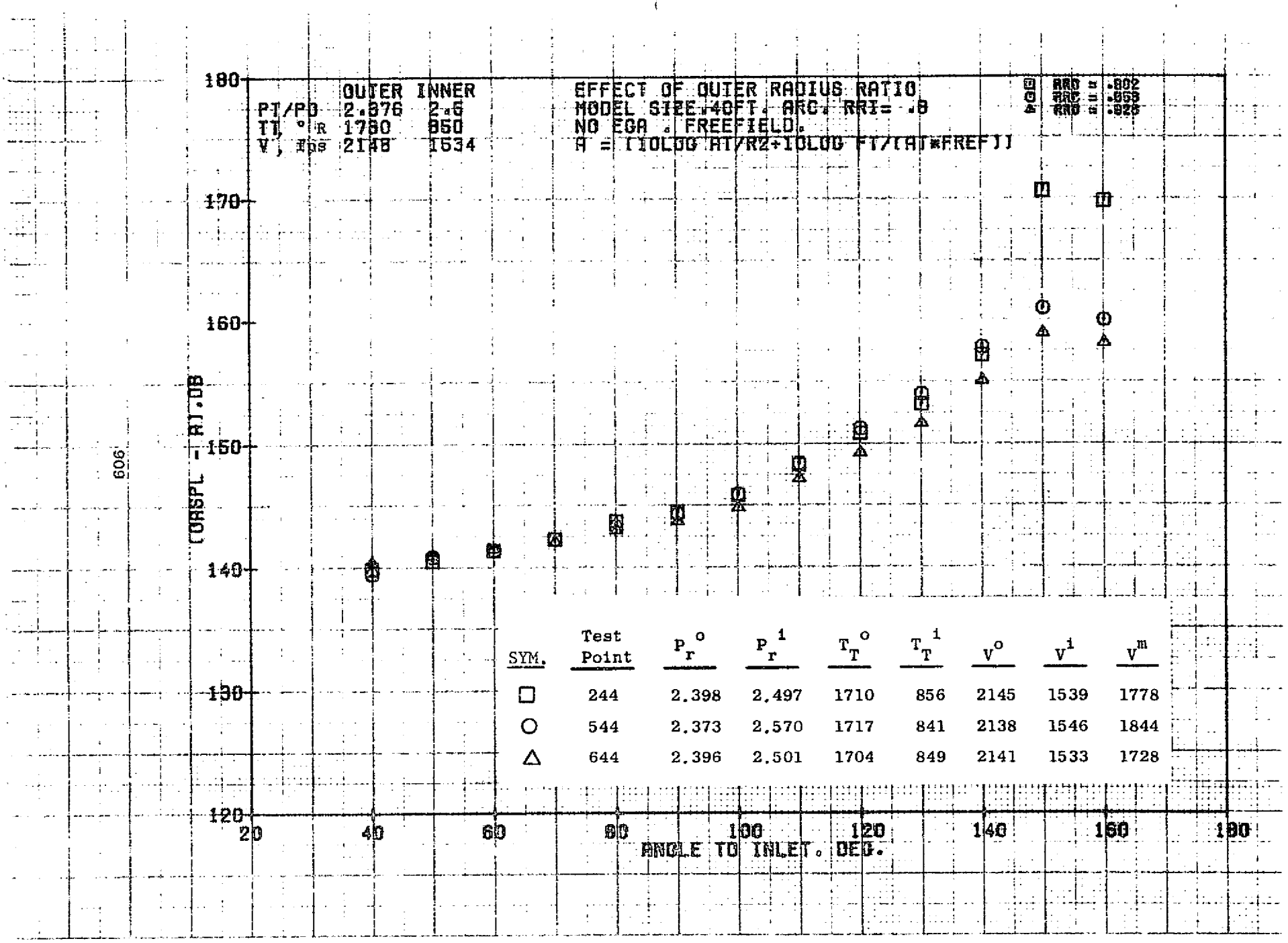

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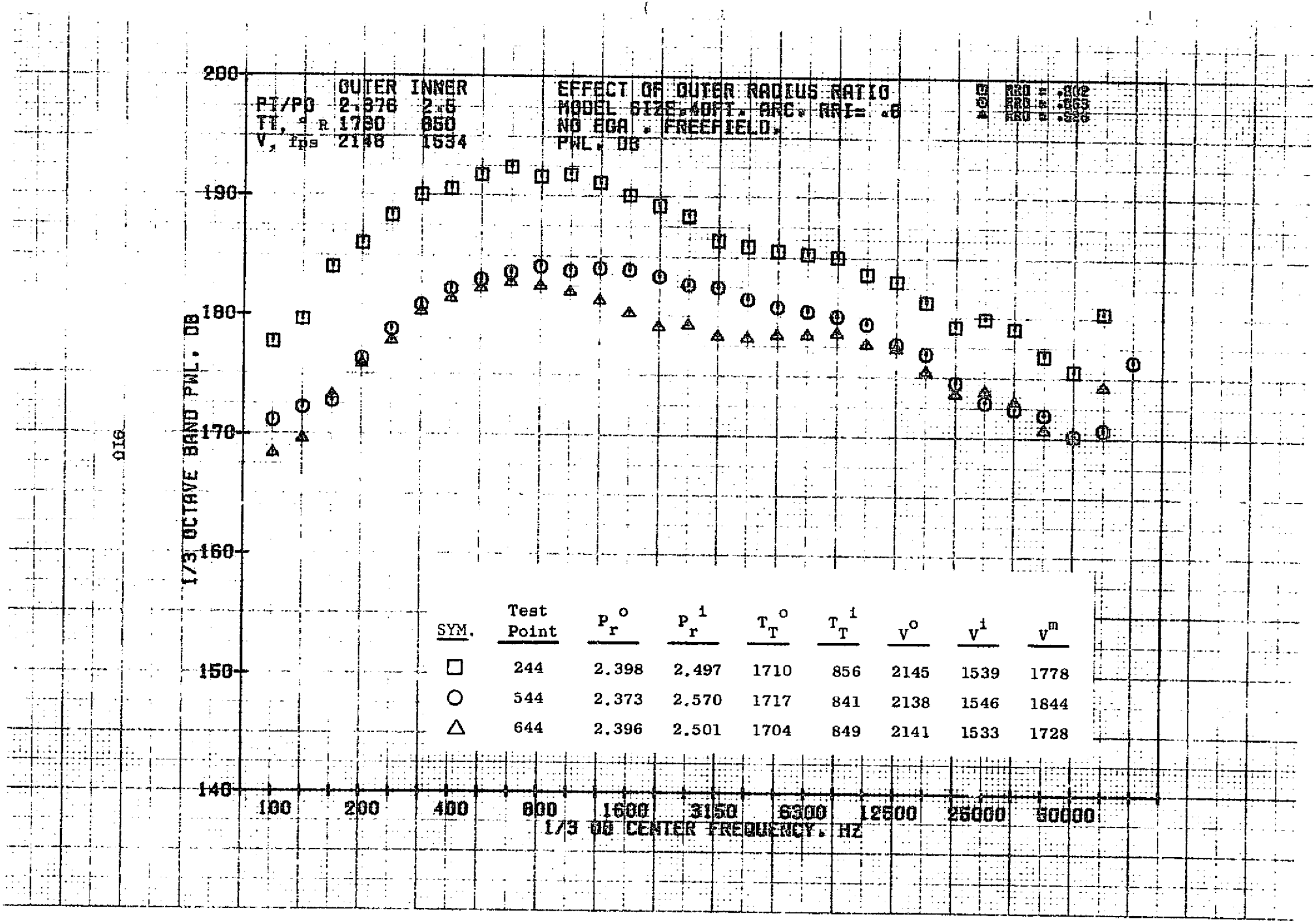

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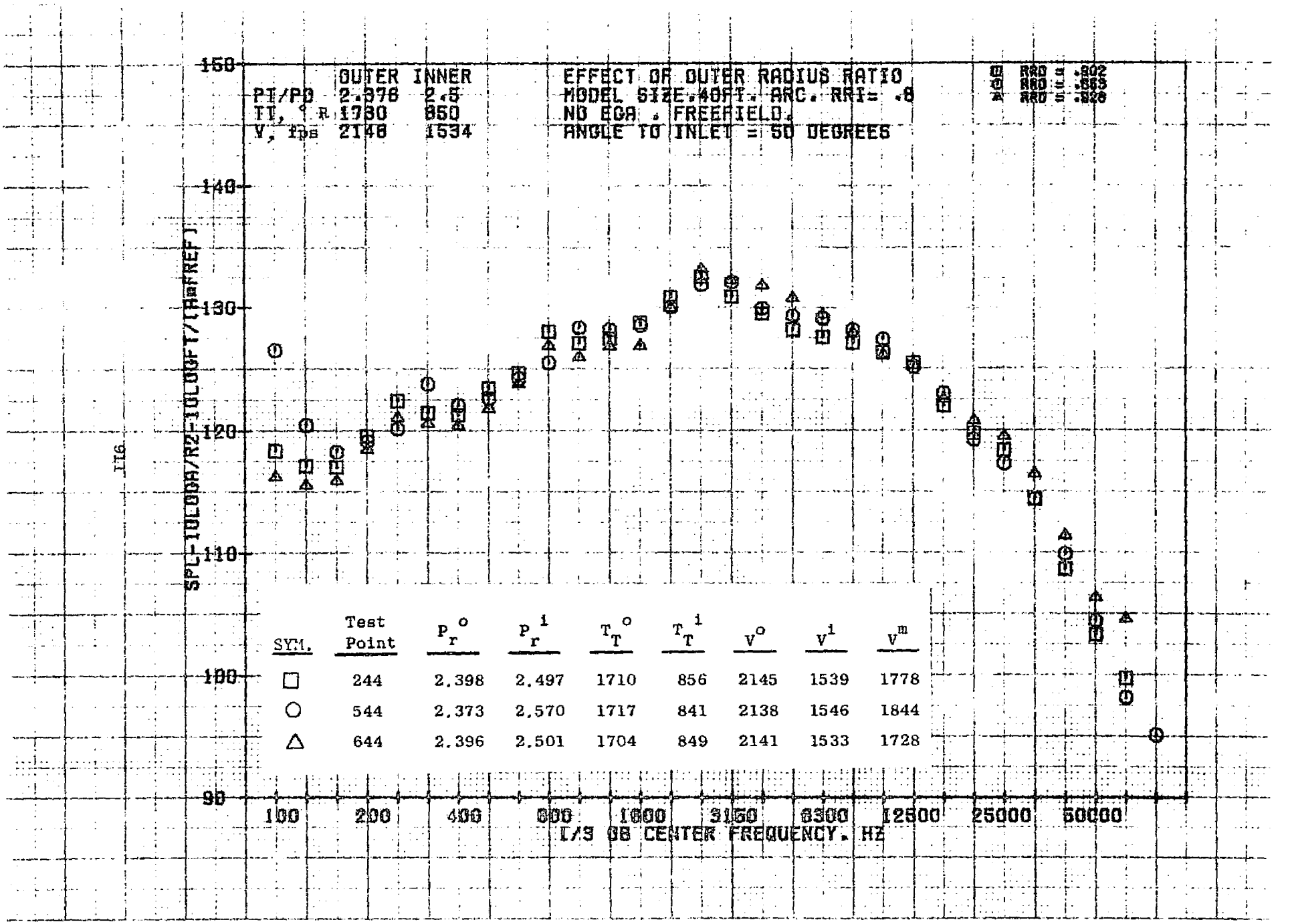
10/27/76
1X824-001

73KOLLSTEDT



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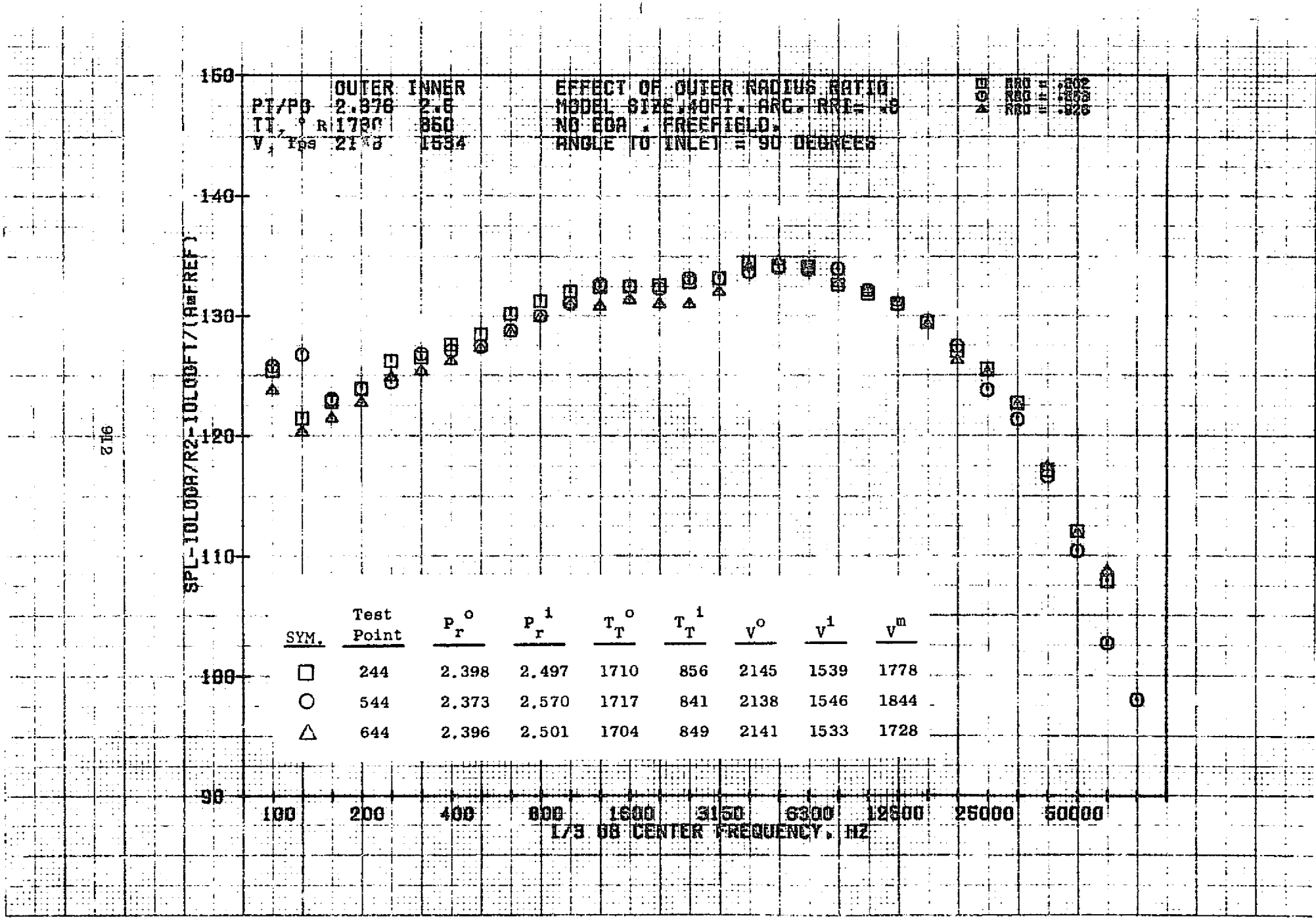

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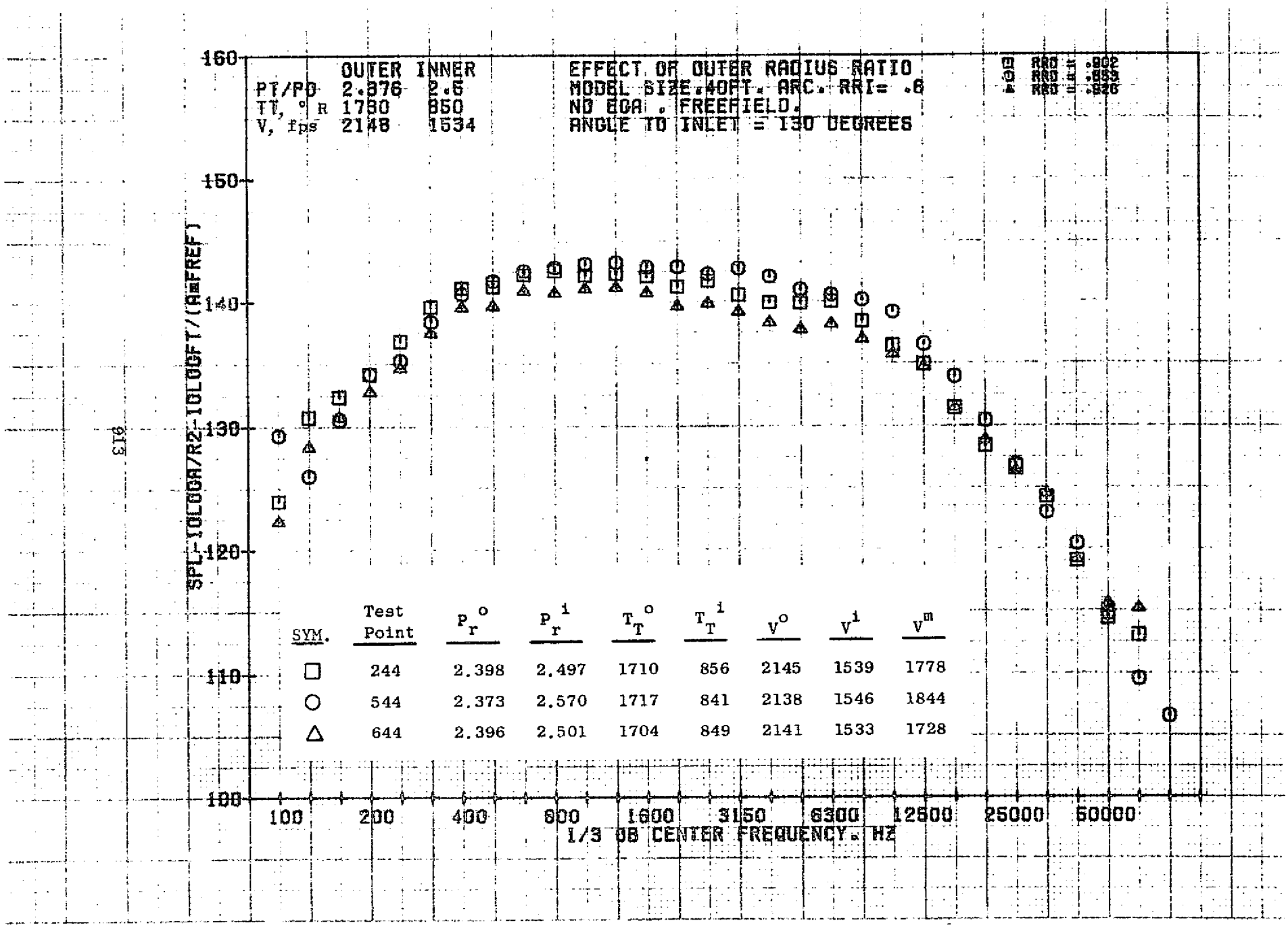

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1X824-001

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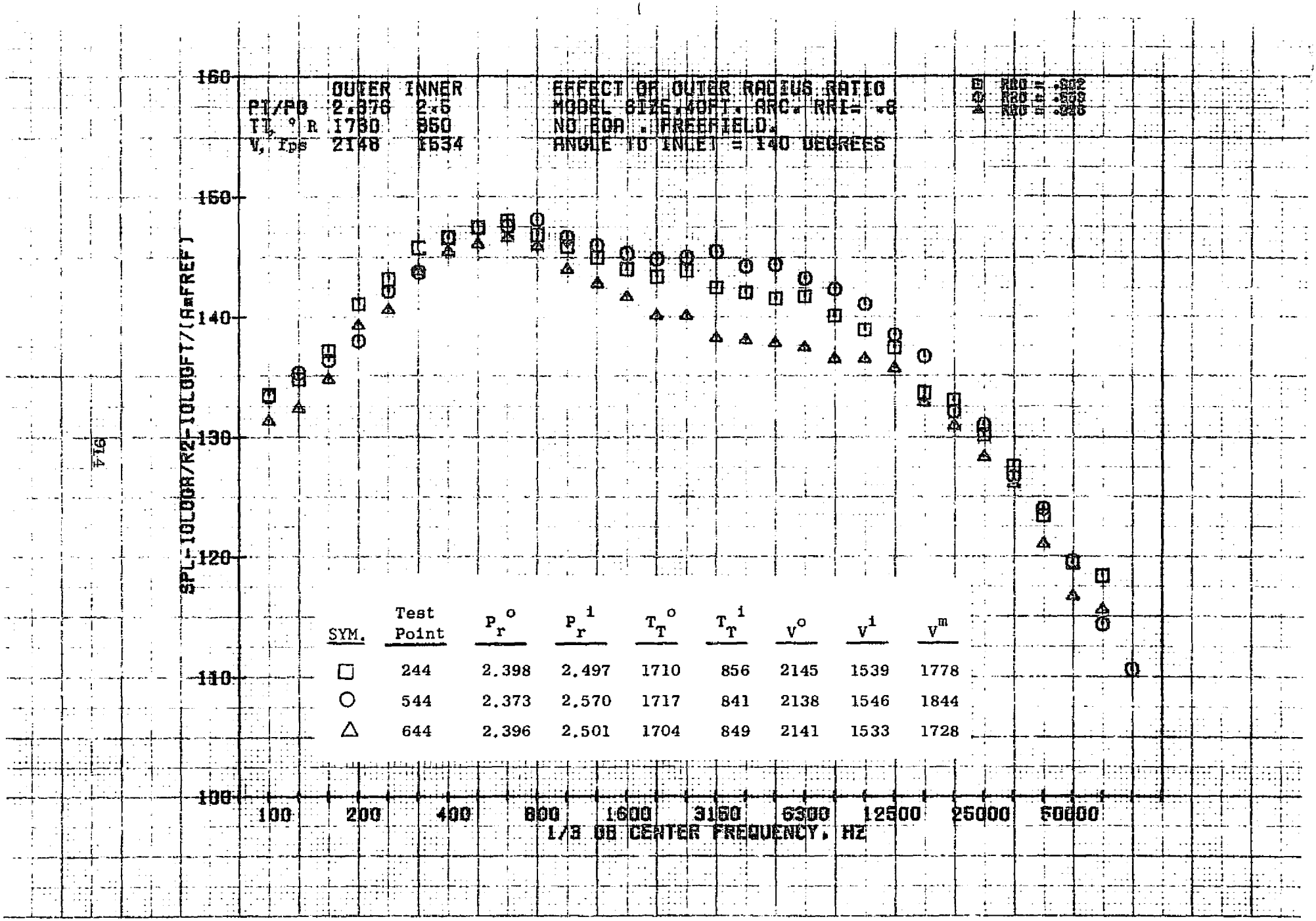
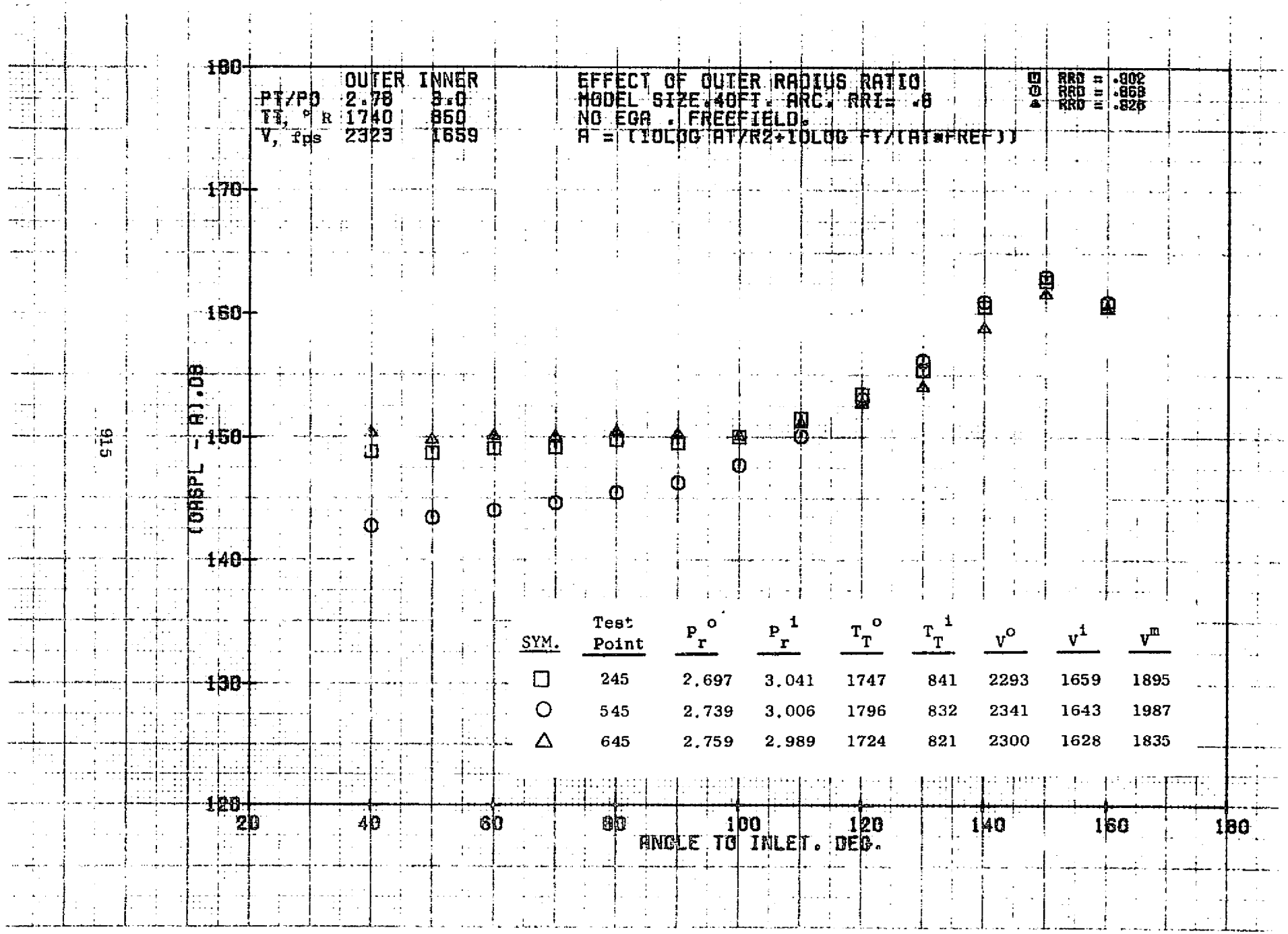


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	244	2.398	2.497	1710	856	2145	1539	1778
○	544	2.373	2.570	1717	841	2138	1546	1844
△	644	2.396	2.501	1704	849	2141	1533	1728

10/27/76
1X824-001

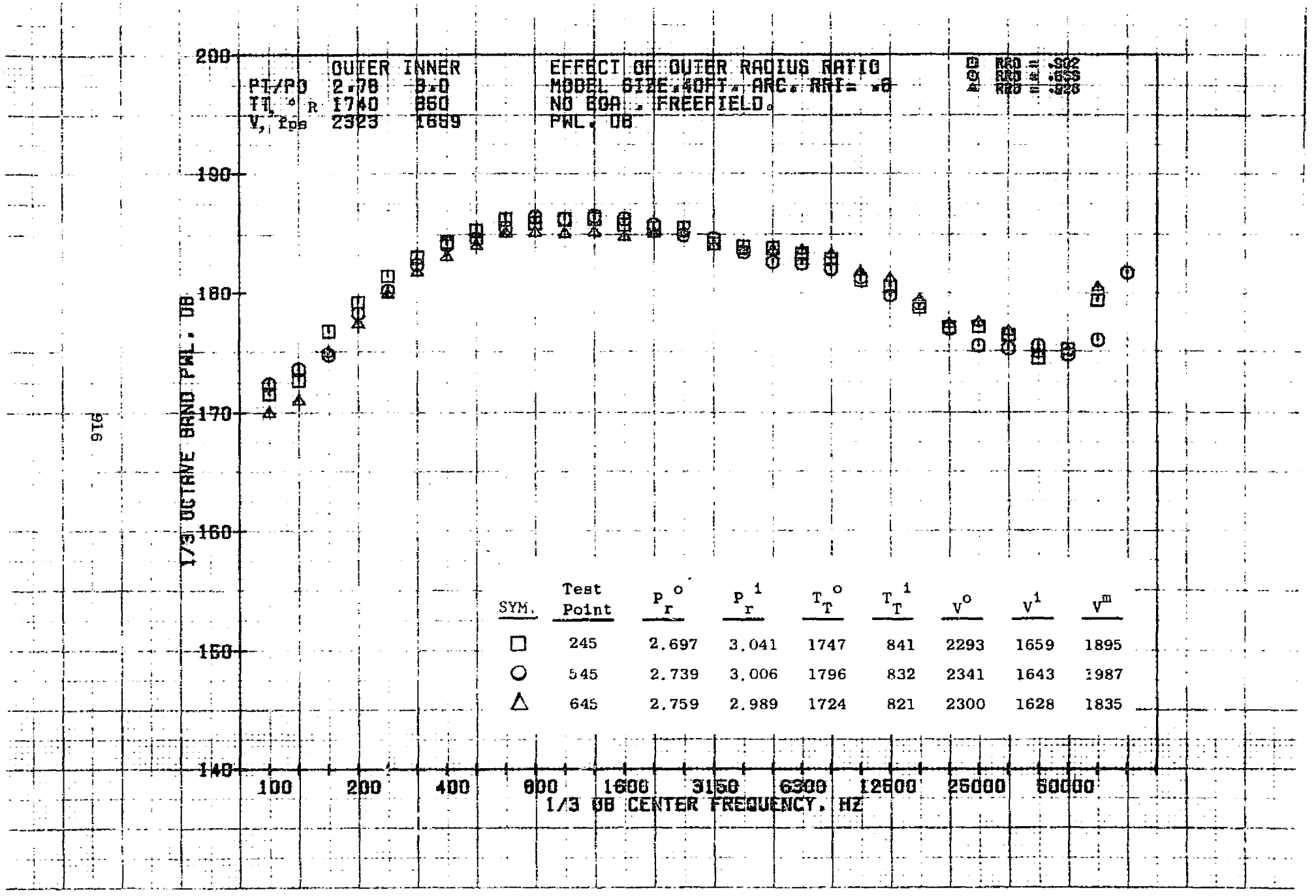
73KOLLSTEDT



915

10/27/76
1X824-001

73KOLLSTEDT



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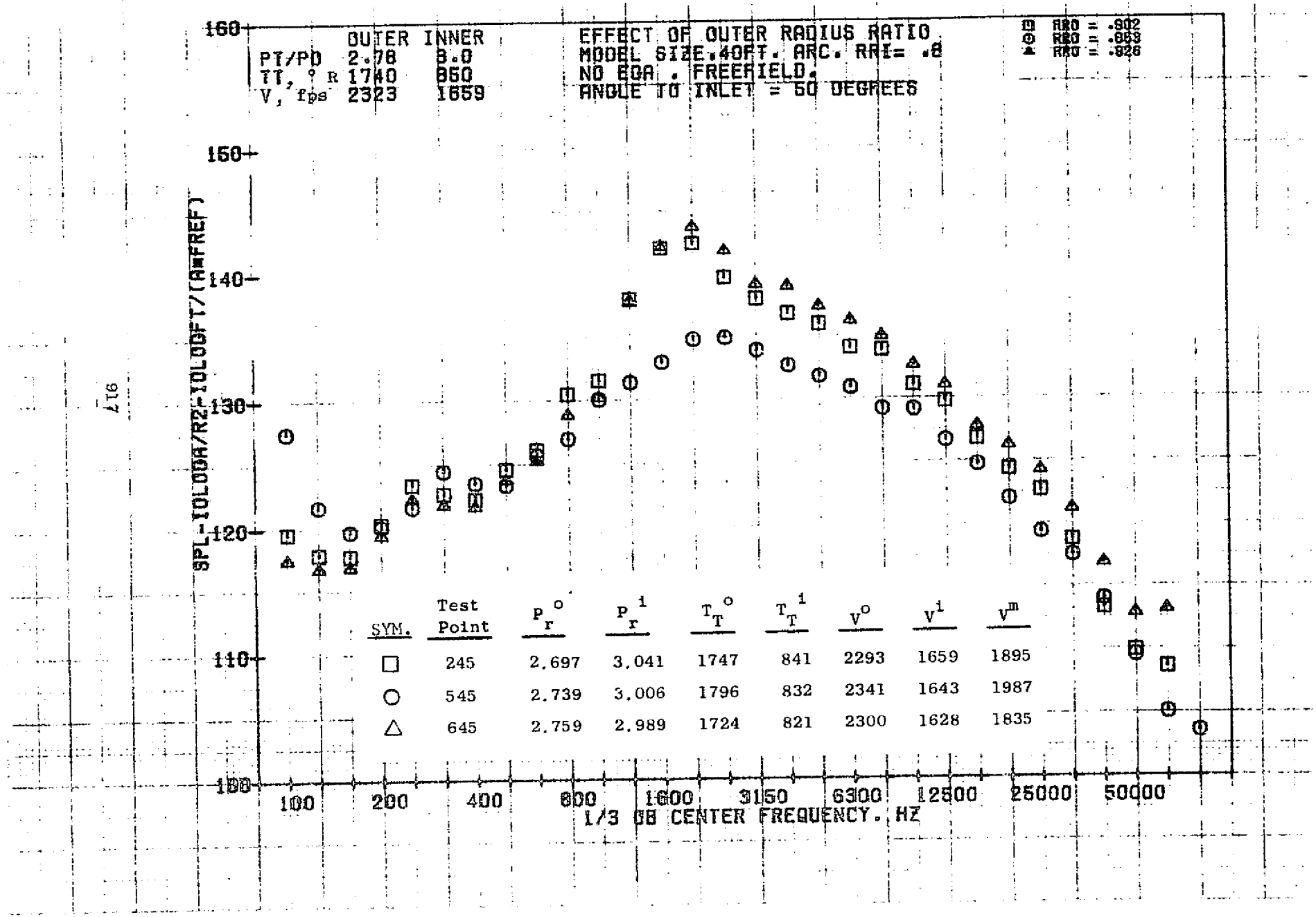
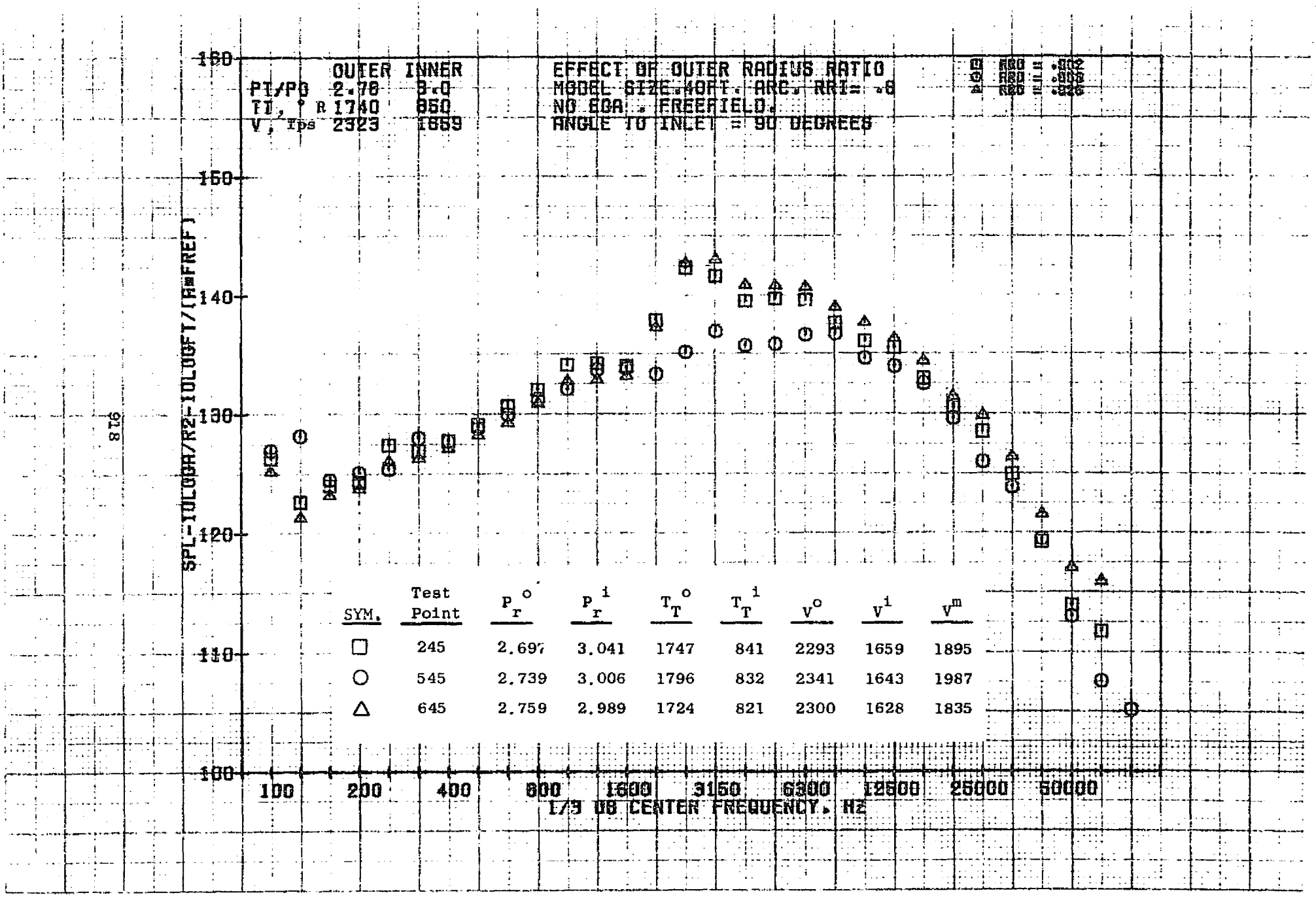
10/27/76
1X824-001

73K3LLSTEDT

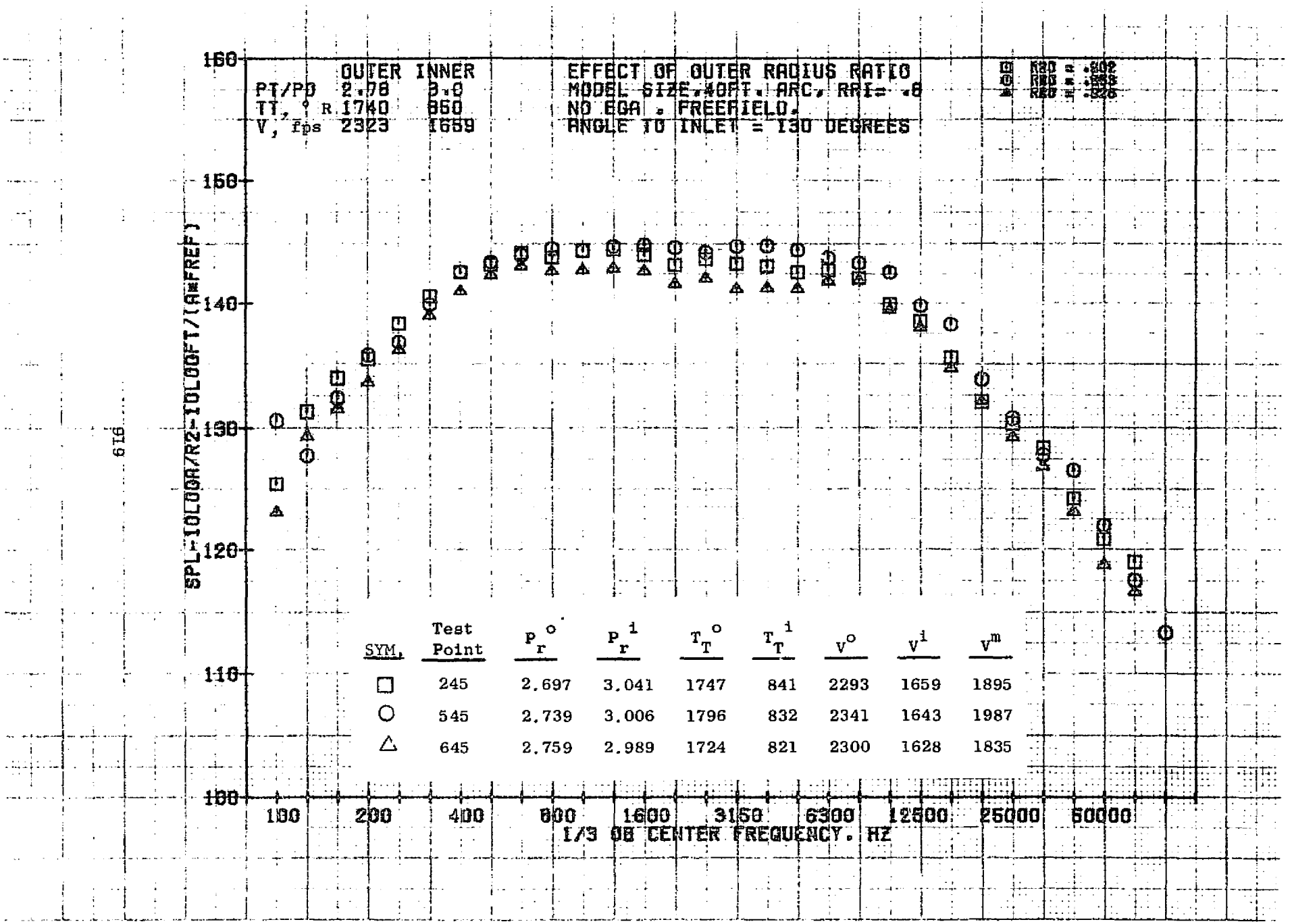

EFFECT OF OUTER RADIUS RATIO
MODEL SIZE.40FT. ARC. RRI= .8
NO EGA . FREEFIELD.
ANGLE TO INLET = 50 DEGREES
OUTER INNER
PT/PD 2.78 3.0
TT, ° R 1740 860
V, fps 2323 1659
RRO = .902
RRO = .883
RRO = .926
SPL-10LOGA/R2-10LOGFT/(A=FREF)
160
150
140
130
120
110
100
100 200 400 800 1600 3150 6300 12500 25000 50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
245 2.697 3.041 1747 841 2293 1659 1895
545 2.739 3.006 1796 832 2341 1643 1987
645 2.759 2.989 1724 821 2300 1628 1835

10/27/76



10/27/76
1X824-001

73KOLLSTEOT



10/27/76
1X824-001

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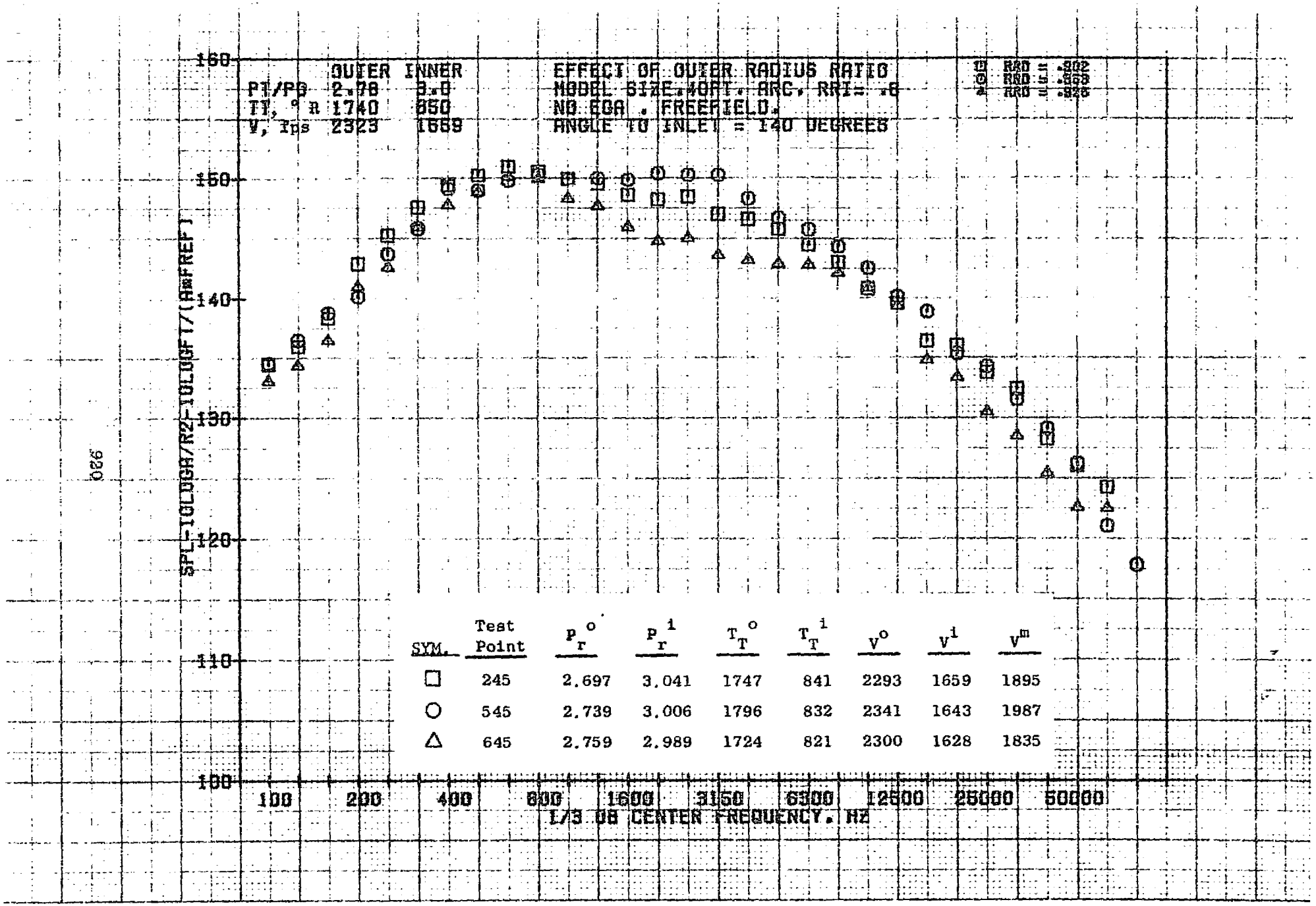
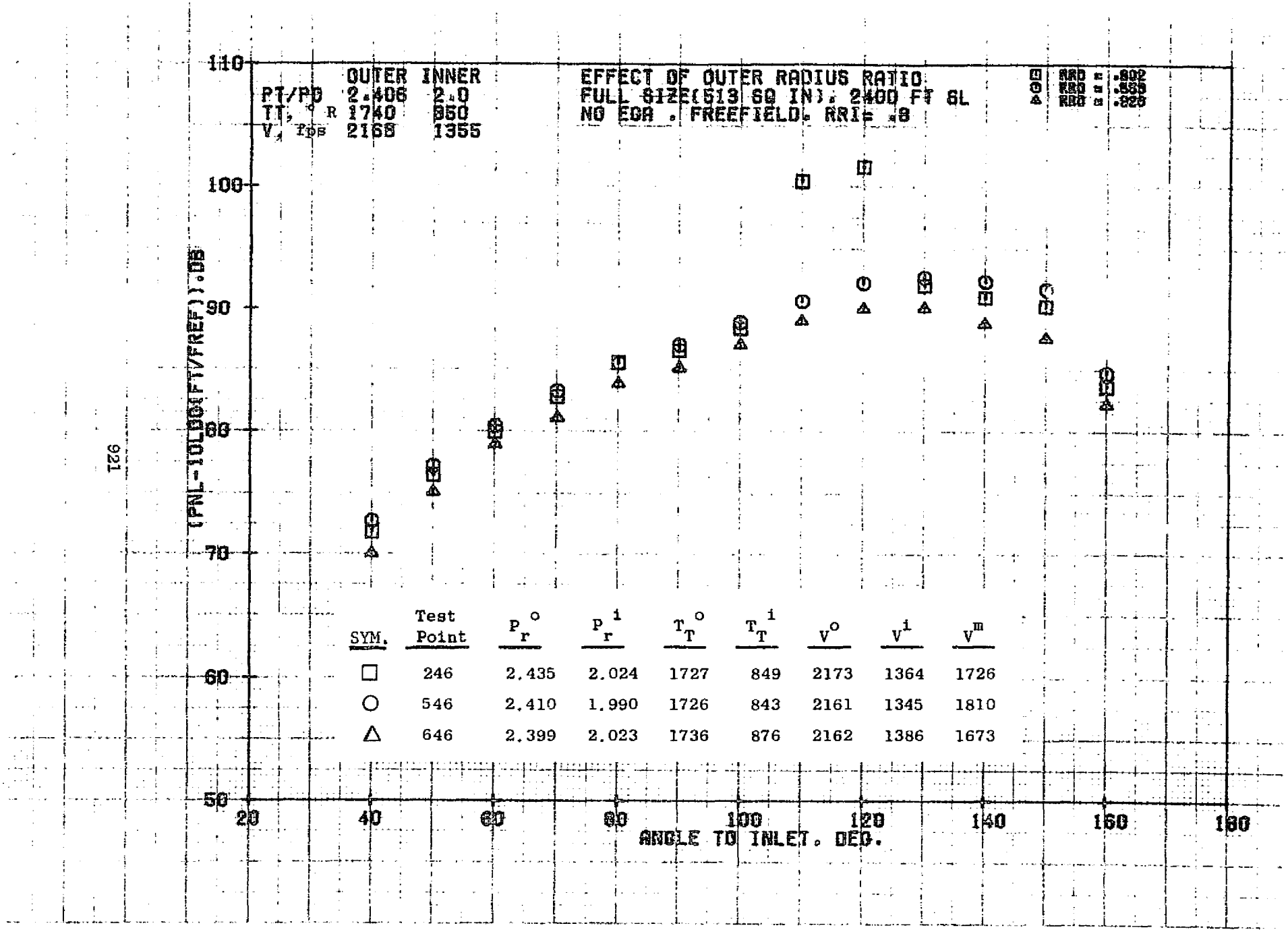


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	245	2.697	3.041	1747	841	2293	1659	1895
○	545	2.739	3.006	1796	832	2341	1643	1987
△	645	2.759	2.989	1724	821	2300	1628	1835

10/27/76
1X824-001

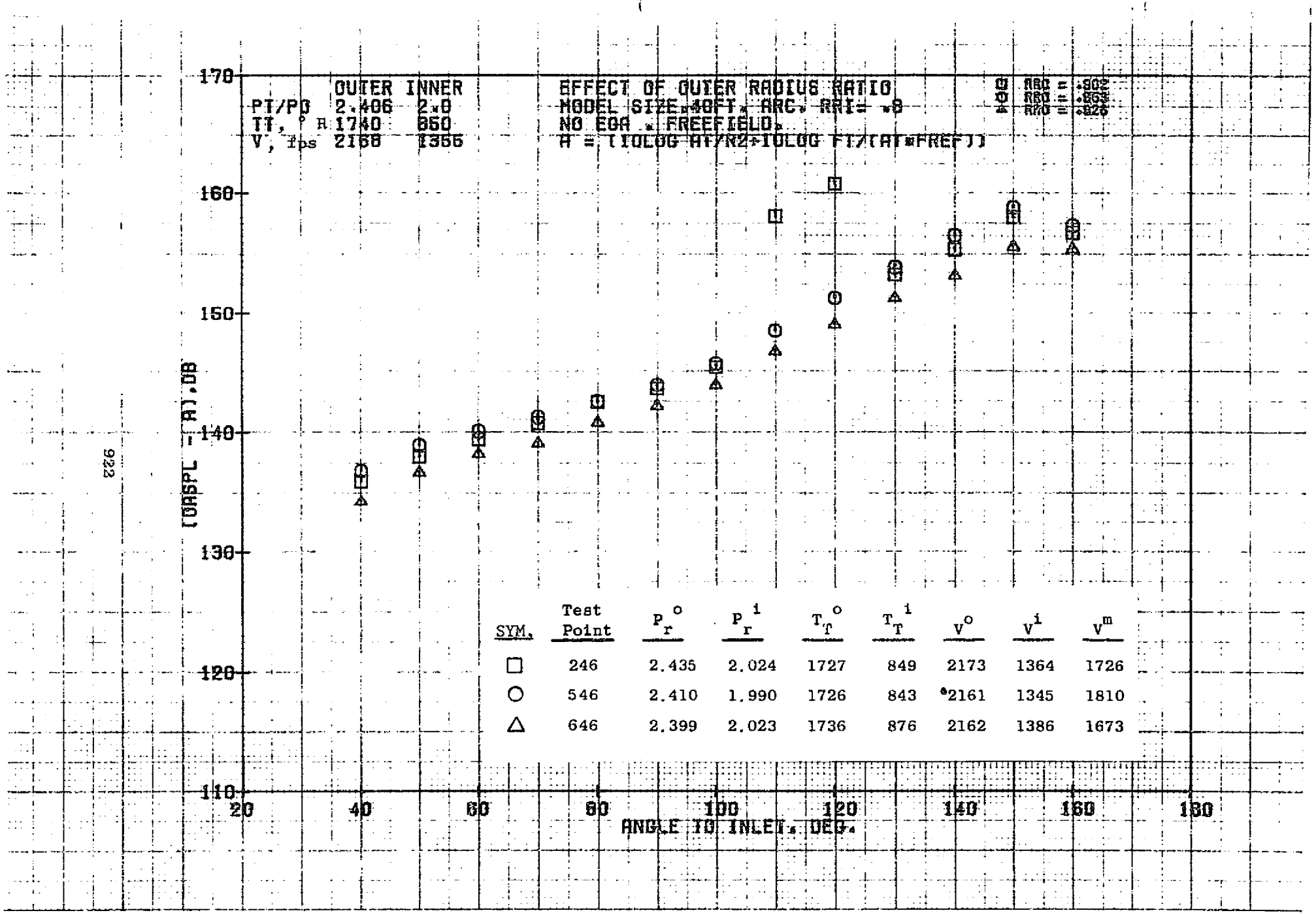
73KOLLSTEDT



921

10/29/76
18124-001

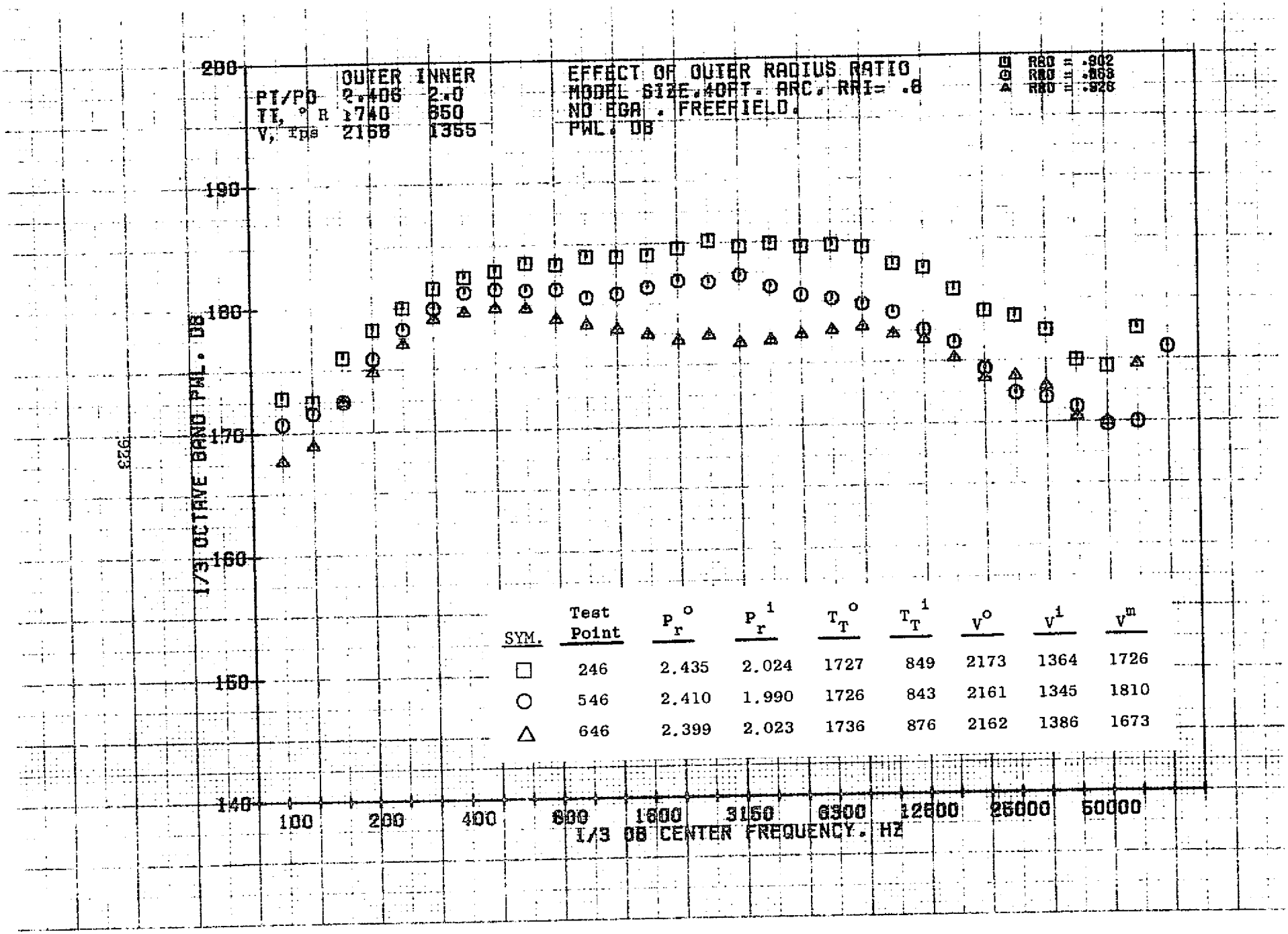
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	246	2.435	2.024	1727	849	2173	1364	1726
○	546	2.410	1.990	1726	843	*2161	1345	1810
△	646	2.399	2.023	1736	876	2162	1386	1673

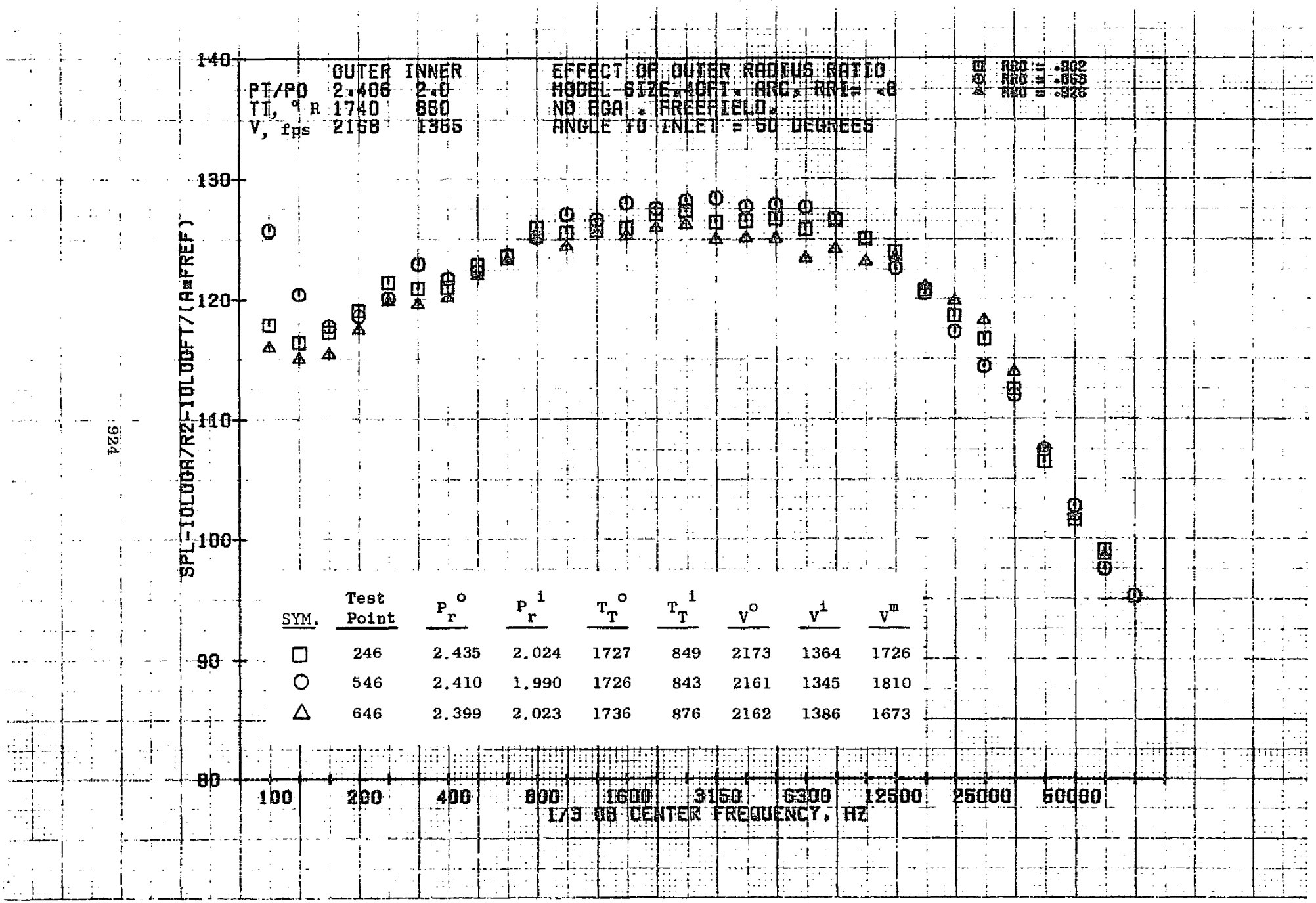
10/27/76
IX824-001

73KOLLSTEDT



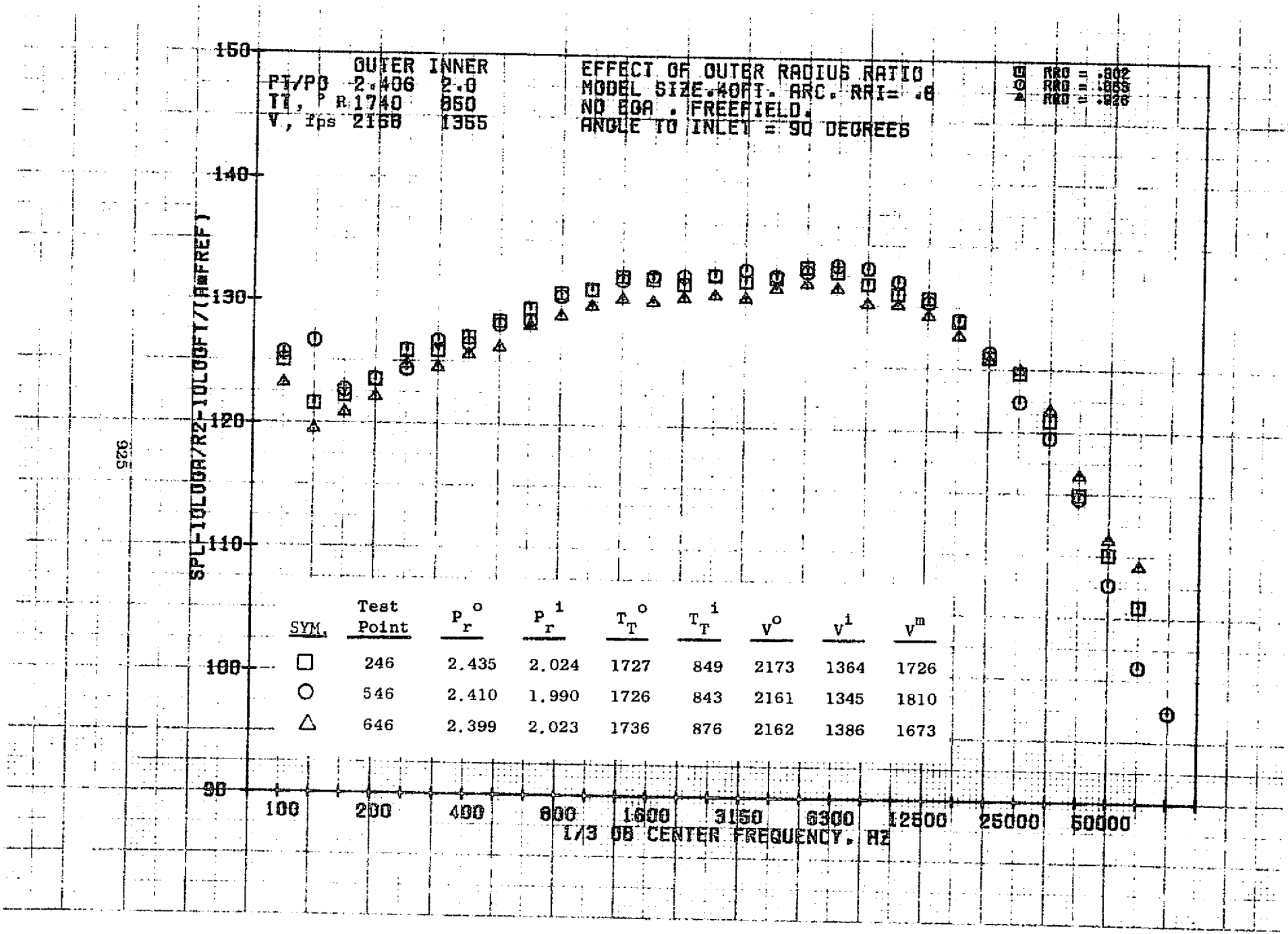
10/27/76
1X824-001

73KOLLSTEDT



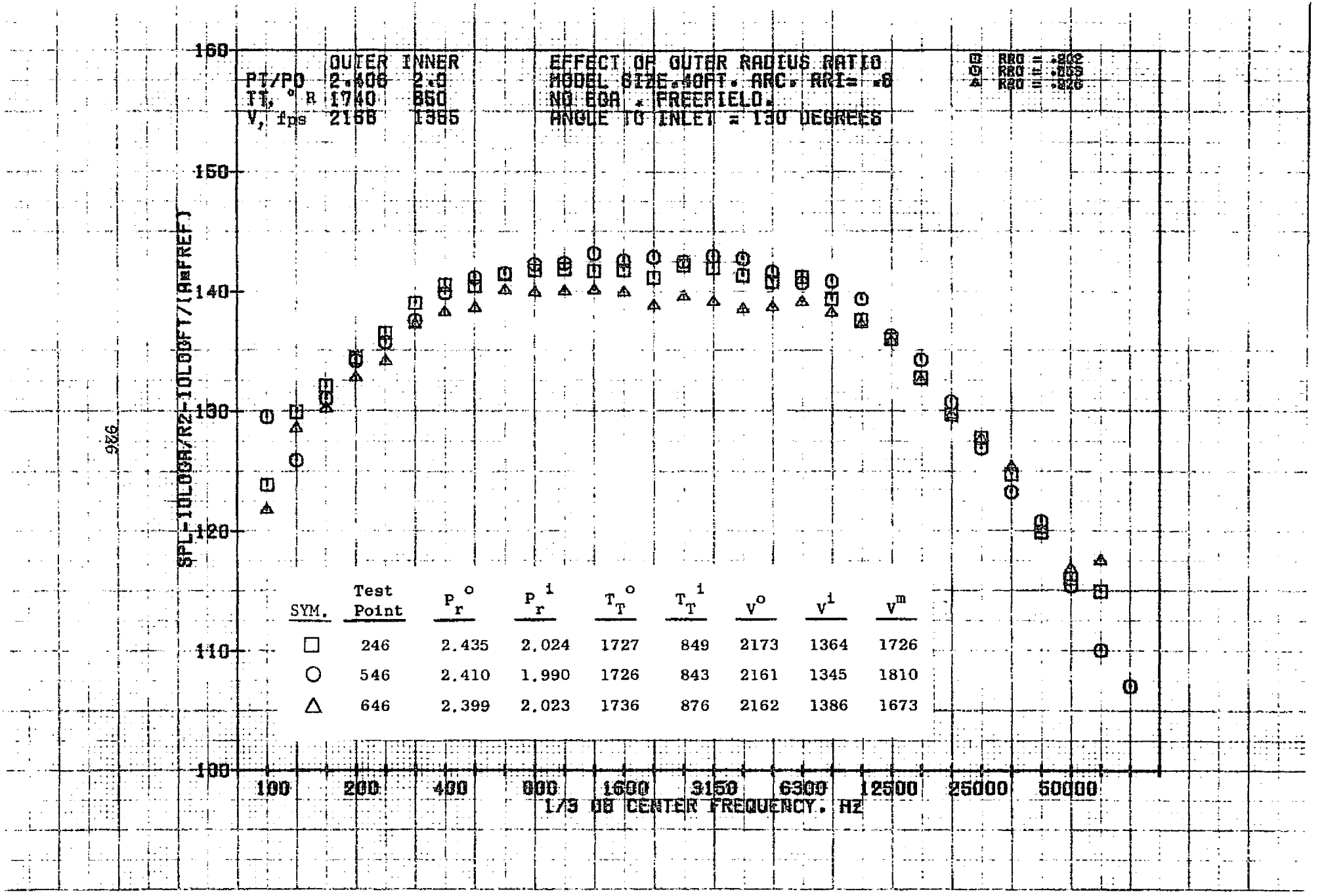
10/27/76
1X824-001

73KOLLSTEDT



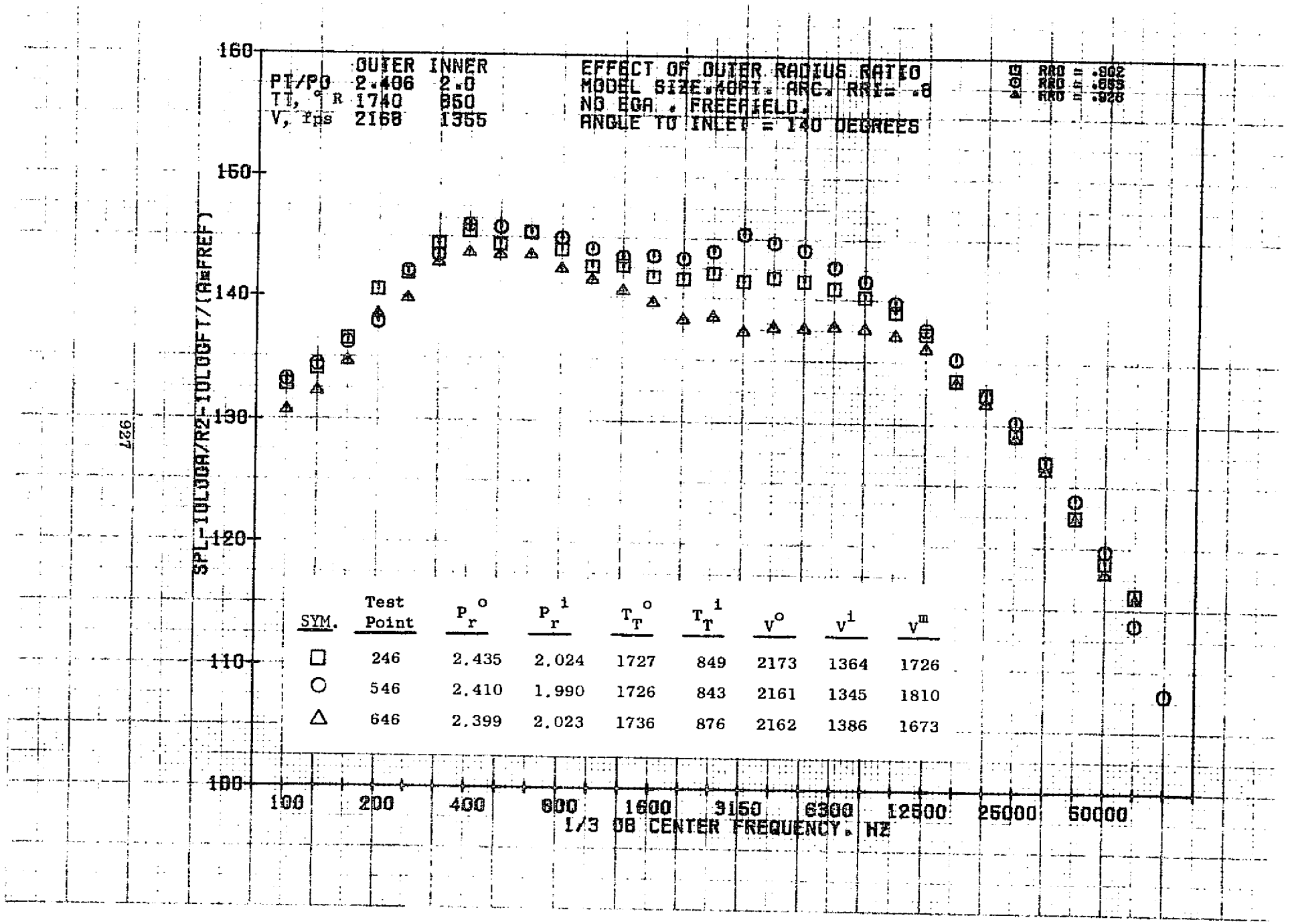
10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1X824-001

73KOLLSTEDT



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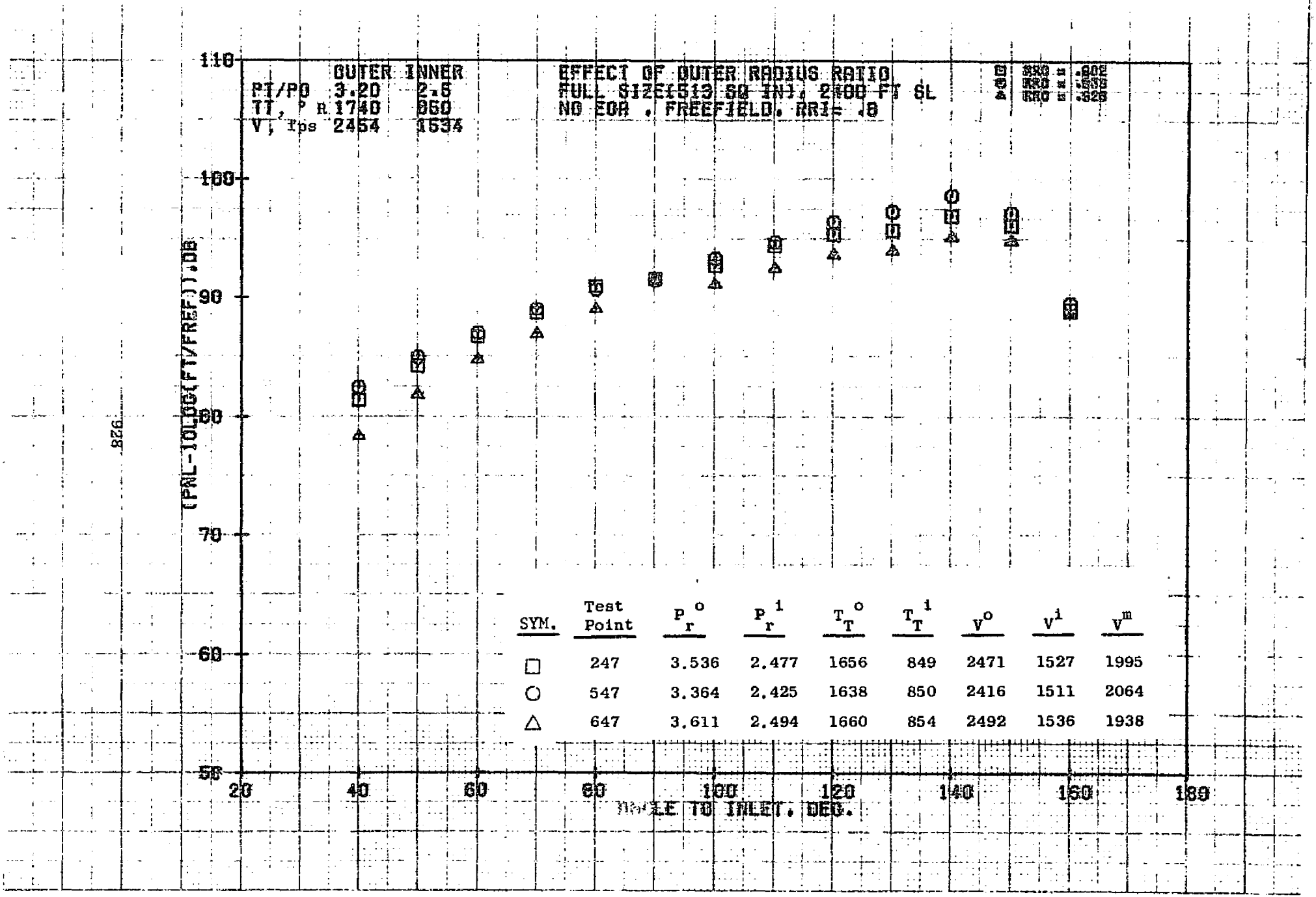
1X824-001

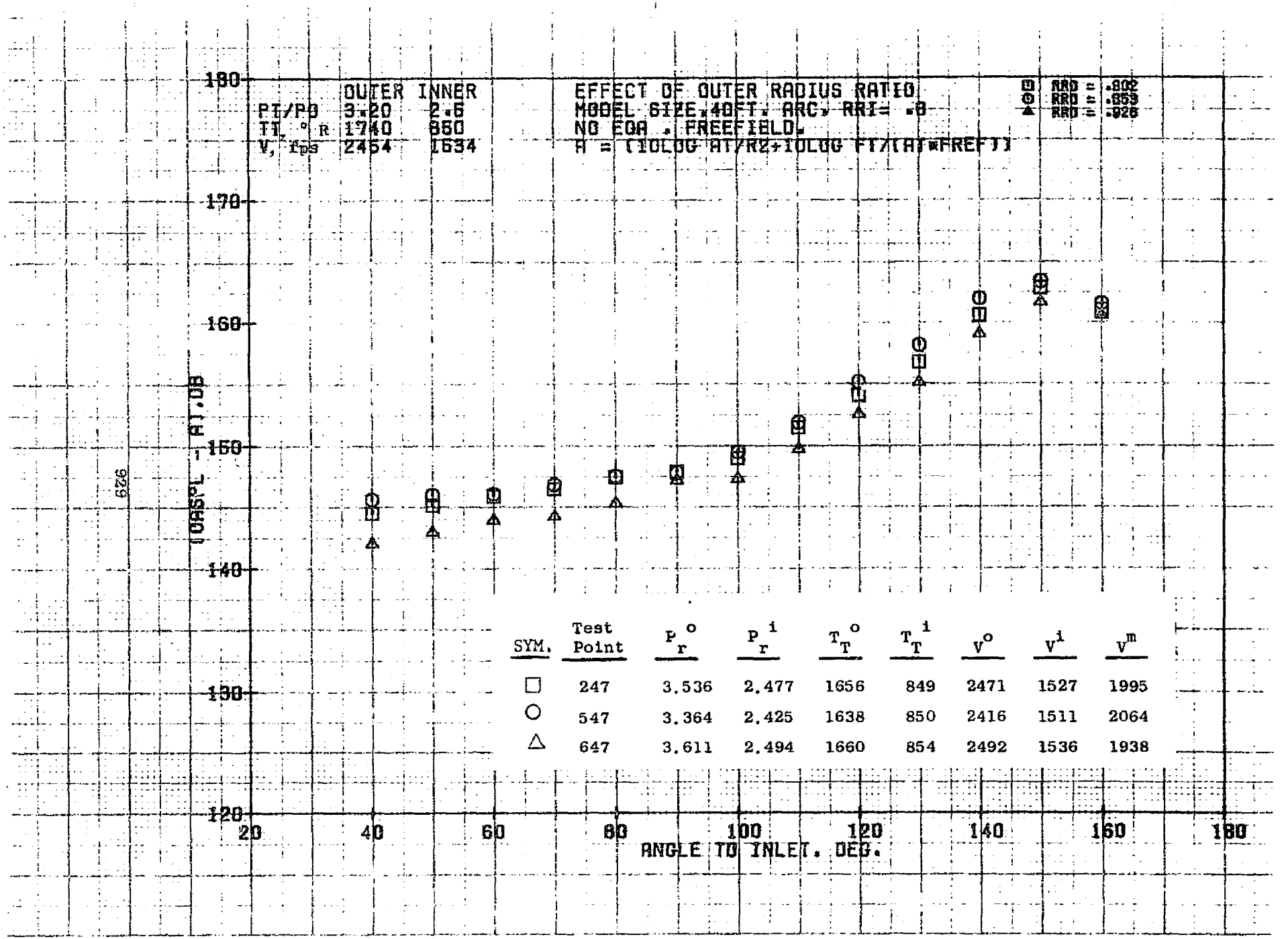
73KOLLSTEDT



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	247	3.536	2.477	1656	849	2471	1527	1995
○	547	3.364	2.425	1638	850	2416	1511	2064
△	647	3.611	2.494	1660	854	2492	1536	1938

10/29/76
IB124-001

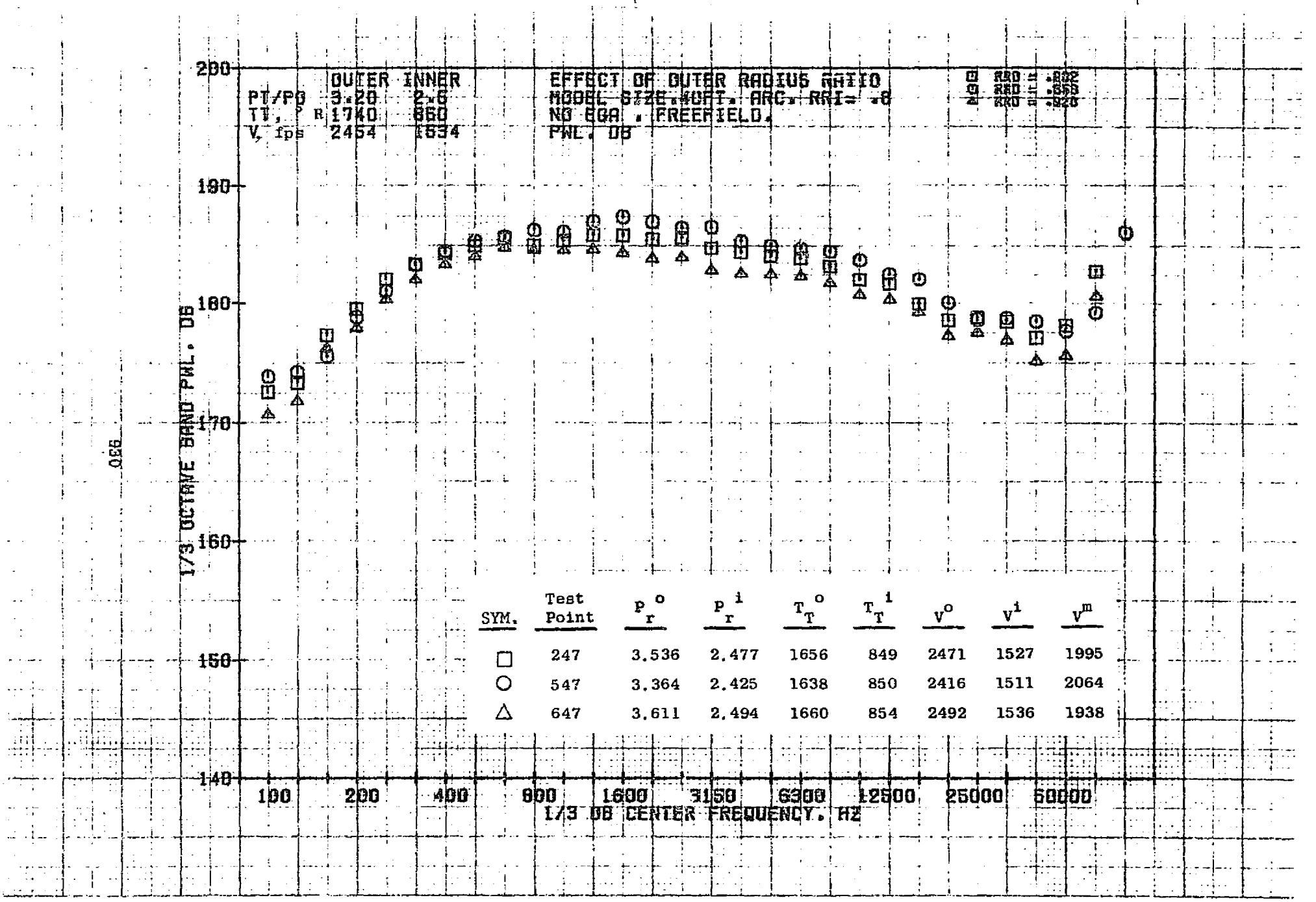
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	247	3.536	2.477	1656	849	2471	1527	1995
○	547	3.364	2.425	1638	850	2416	1511	2064
△	647	3.611	2.494	1660	854	2492	1536	1938

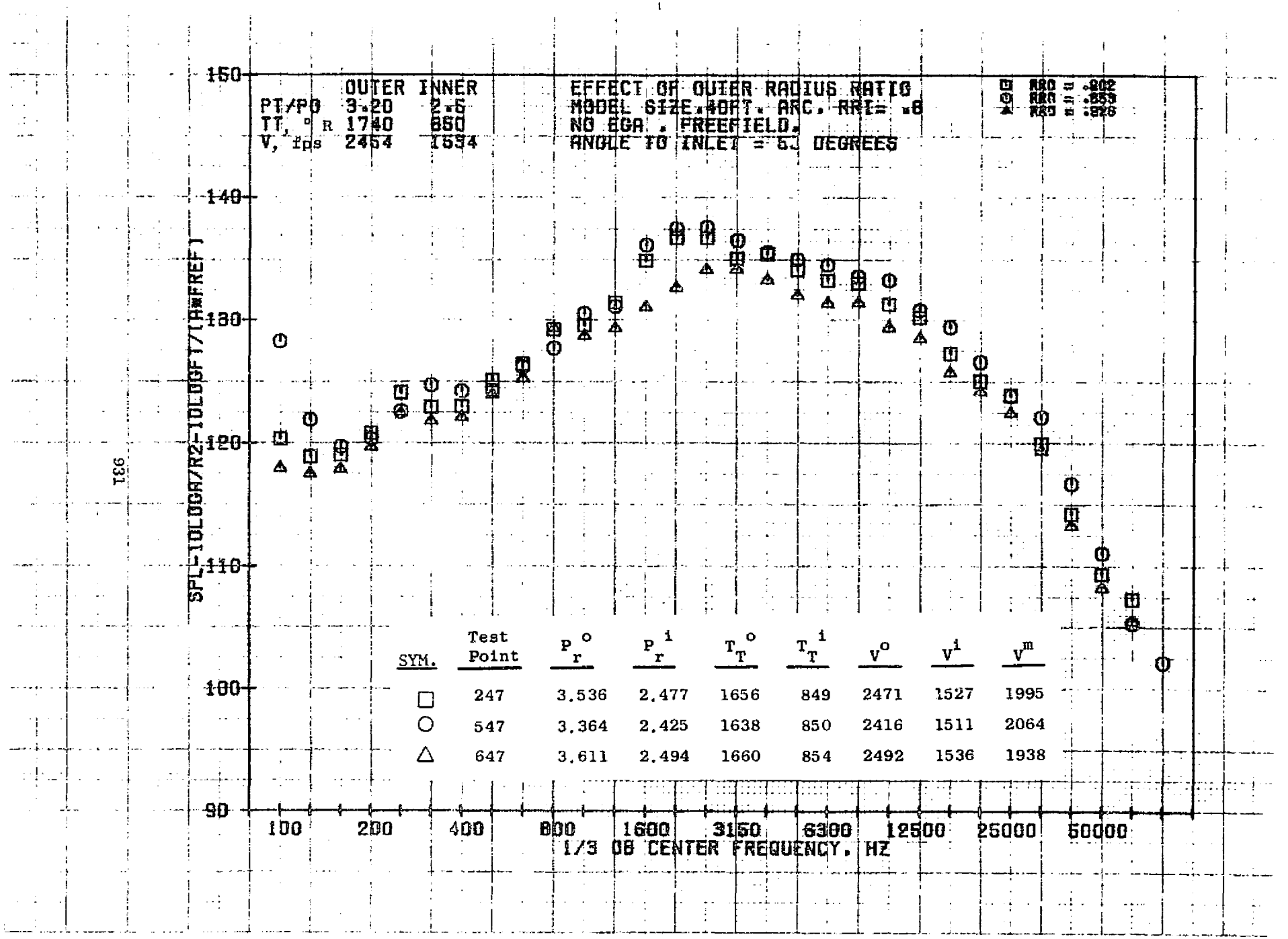
10/27/76
1X824-001

73KOLLSTEDT



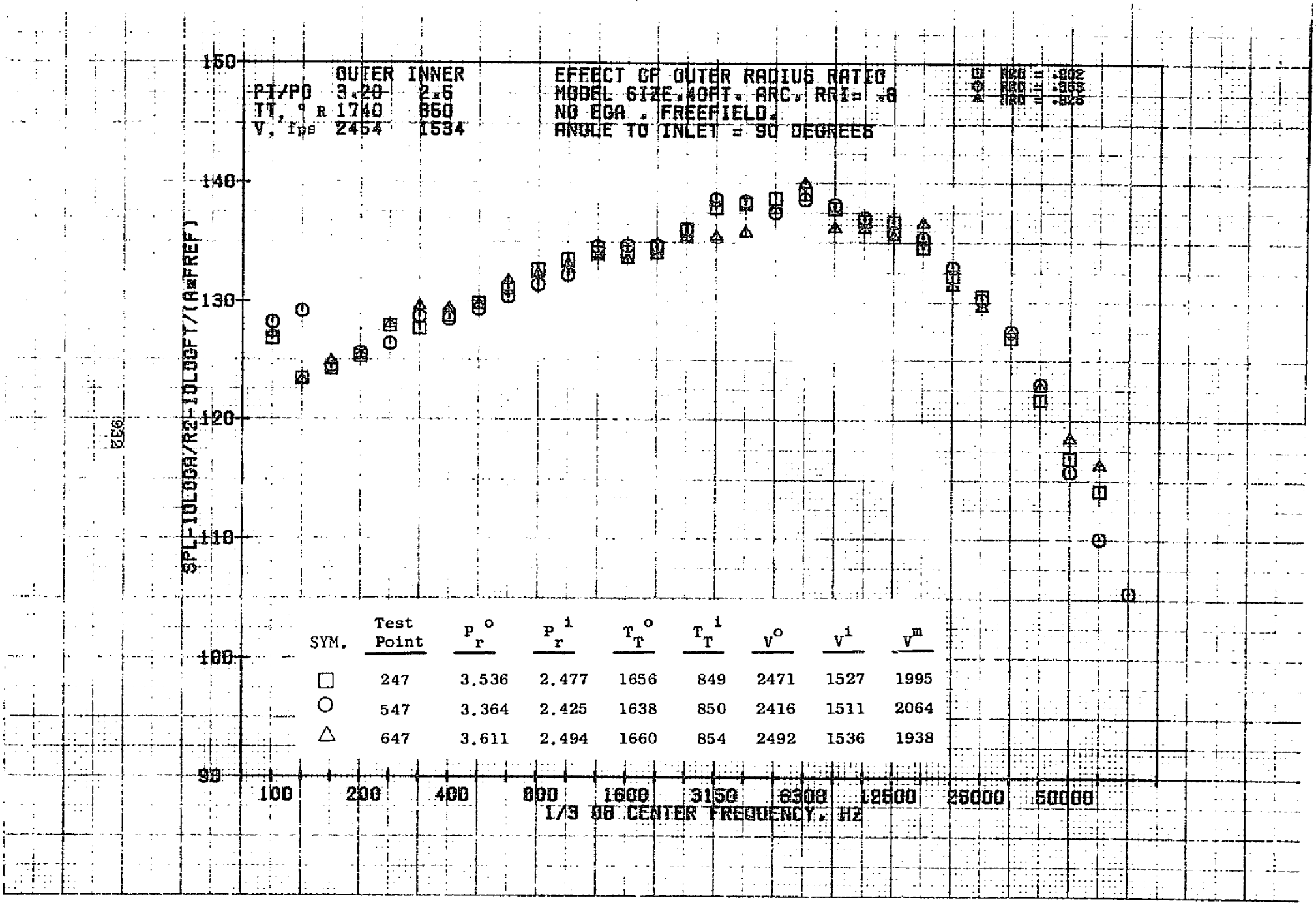
10/27/76
1X824-001

73KOLLSTEDT



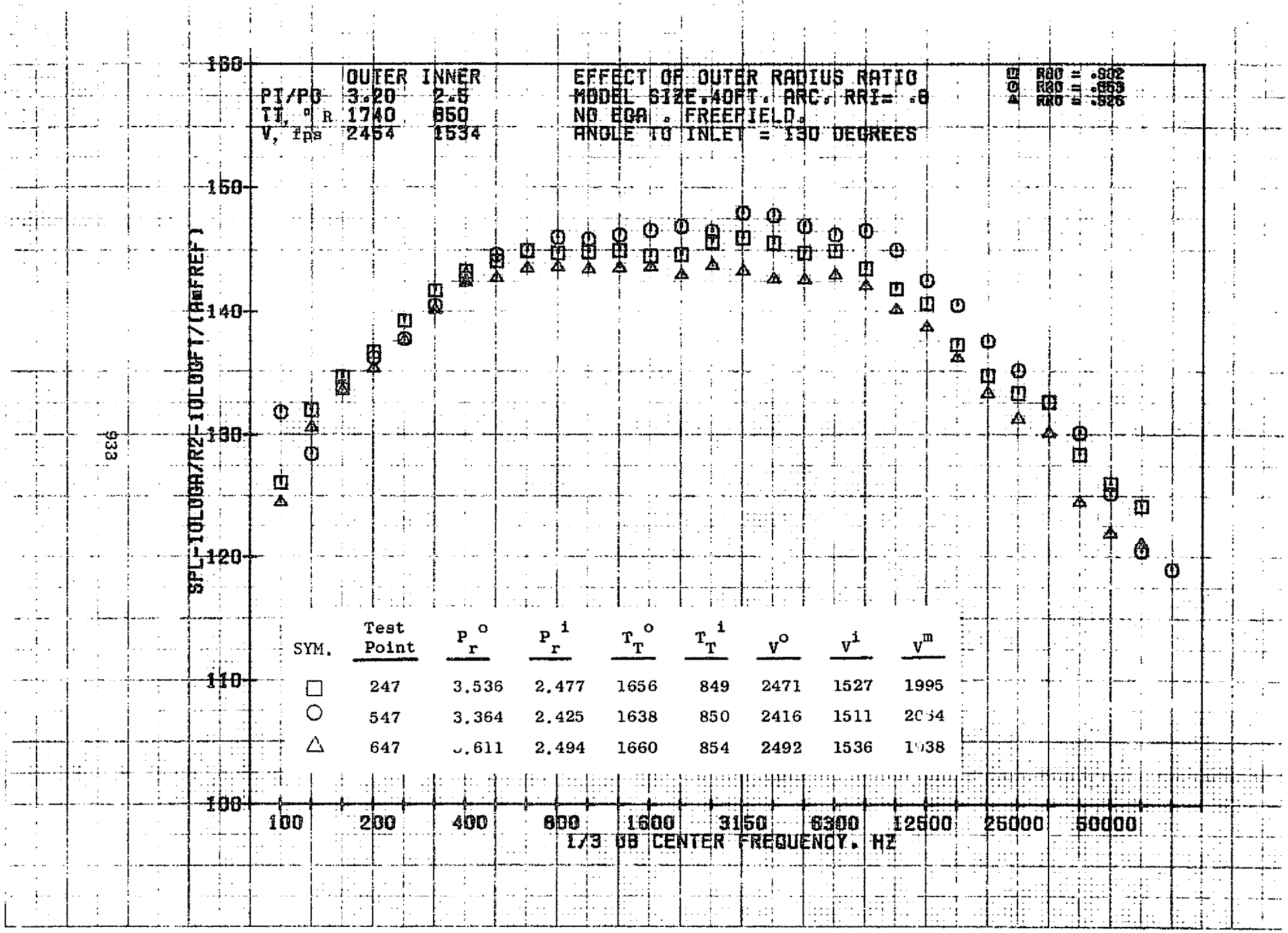
10/27/76
1X824-001

73KOLLSTEDT



10/27/76
1X824-001

73KOLLSTED



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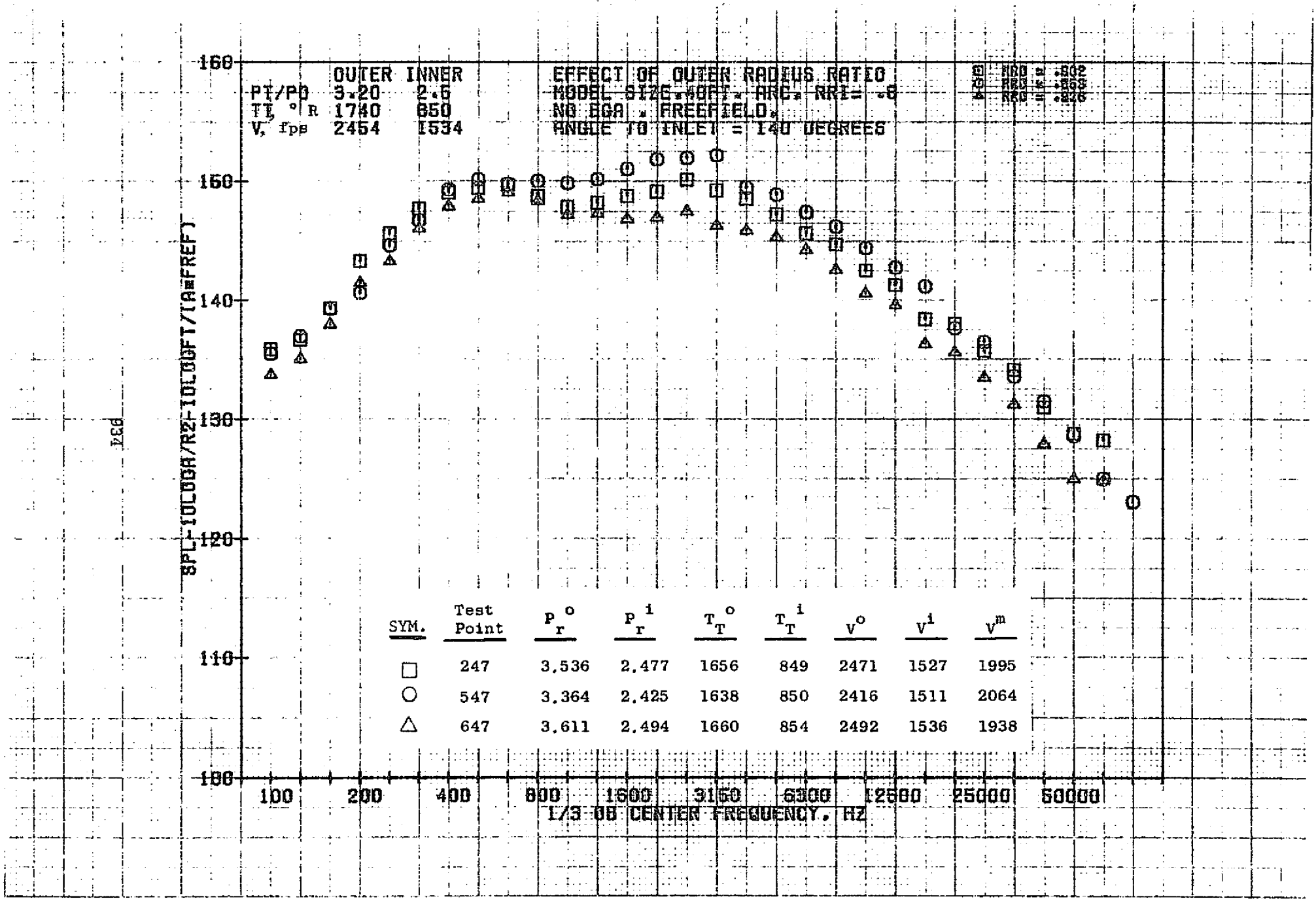
1X824-001

73KOLLSTEDT



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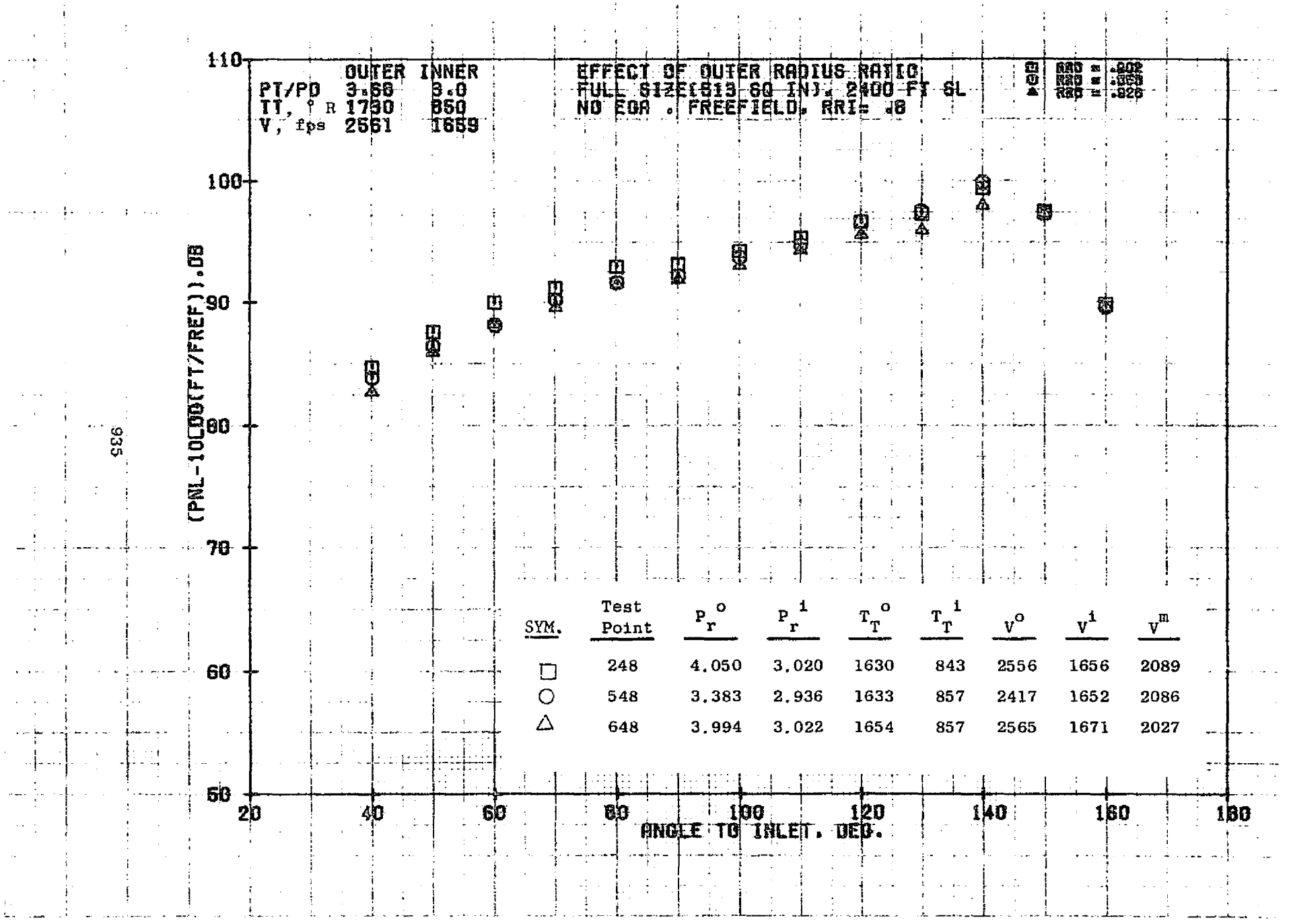
IX824-001

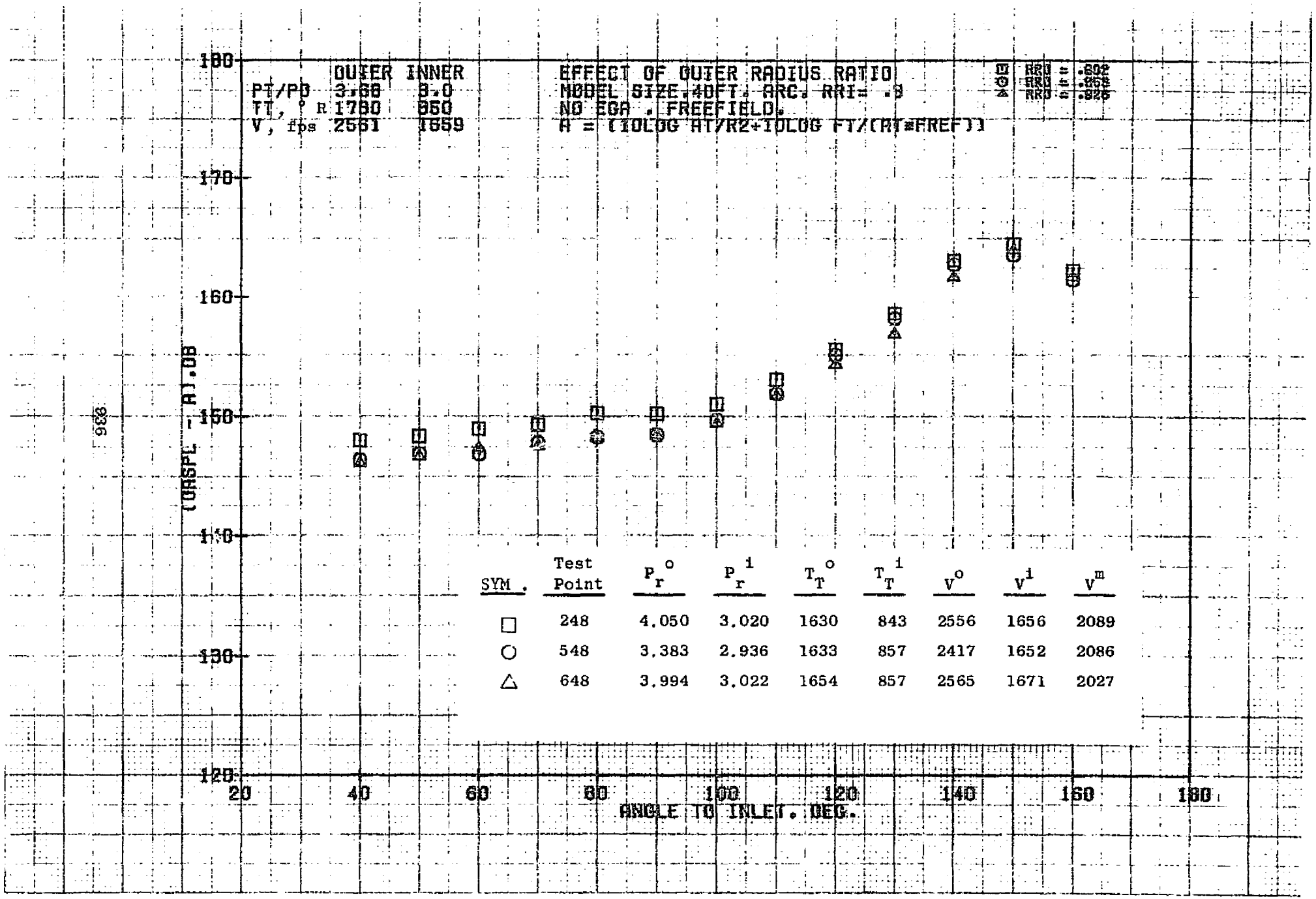
73KOLLSTEDT



935

10/29/76
1B124-001

79 BURCH A.



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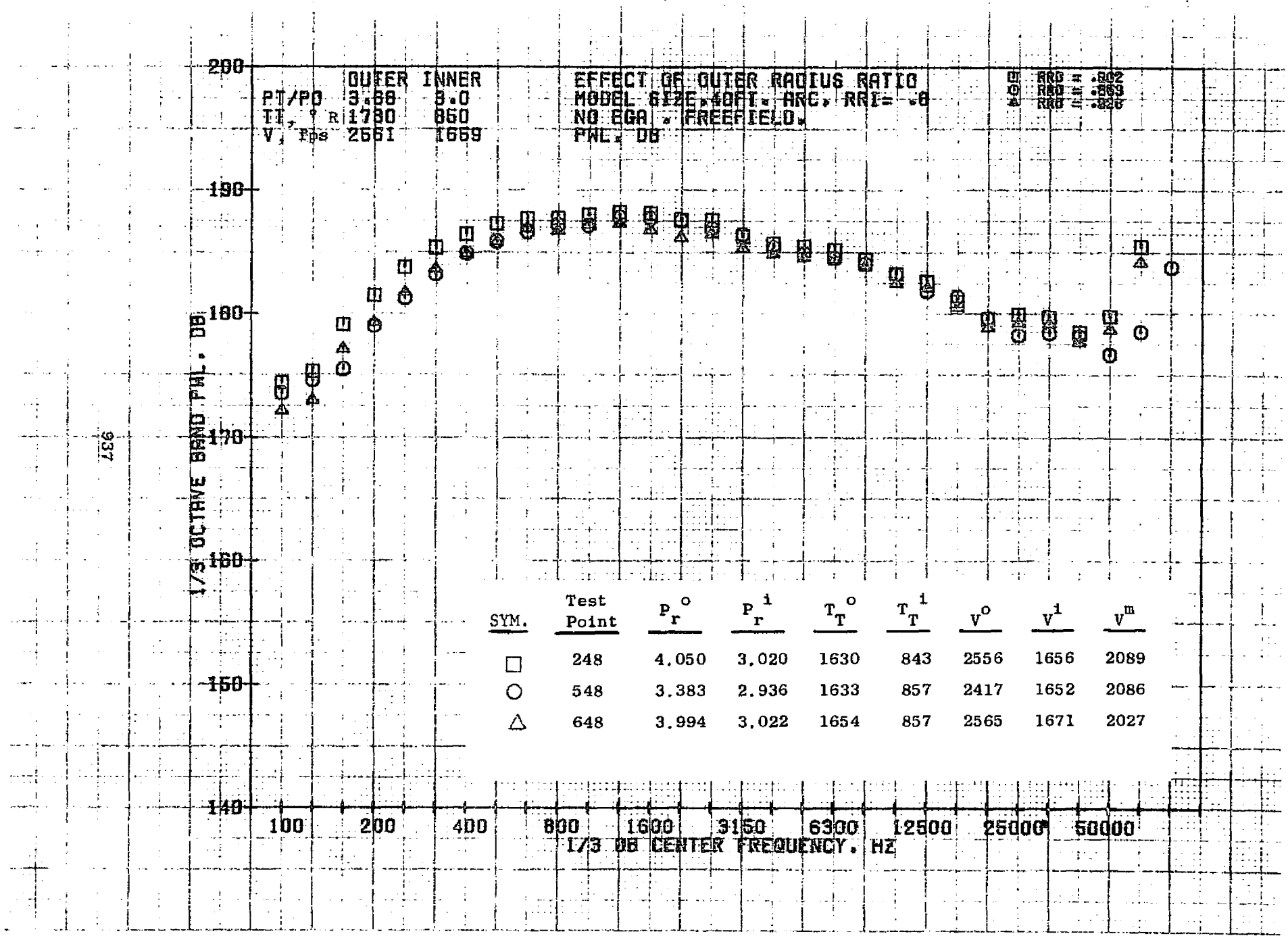
1X824-001

73KOLLSTEDT



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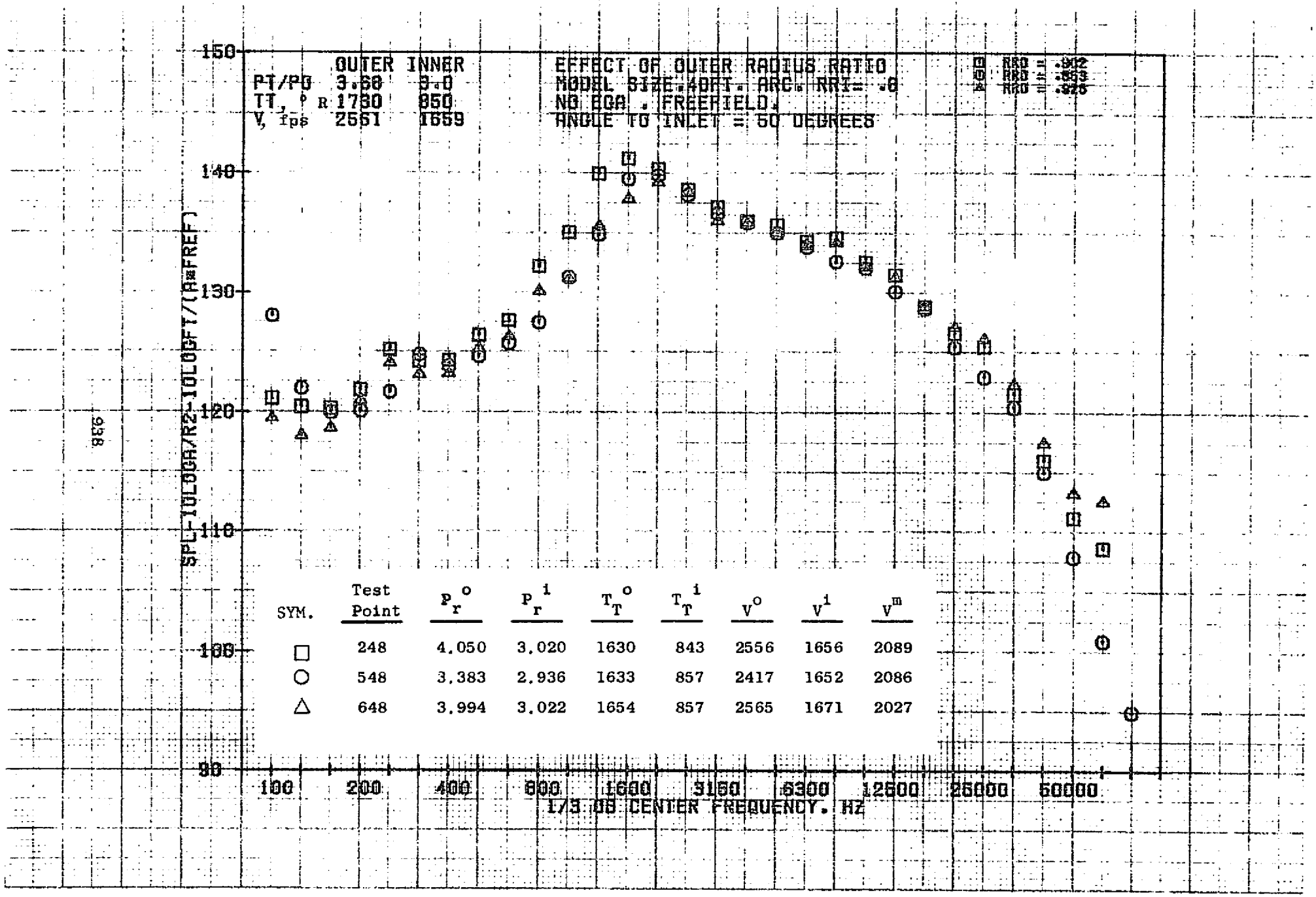

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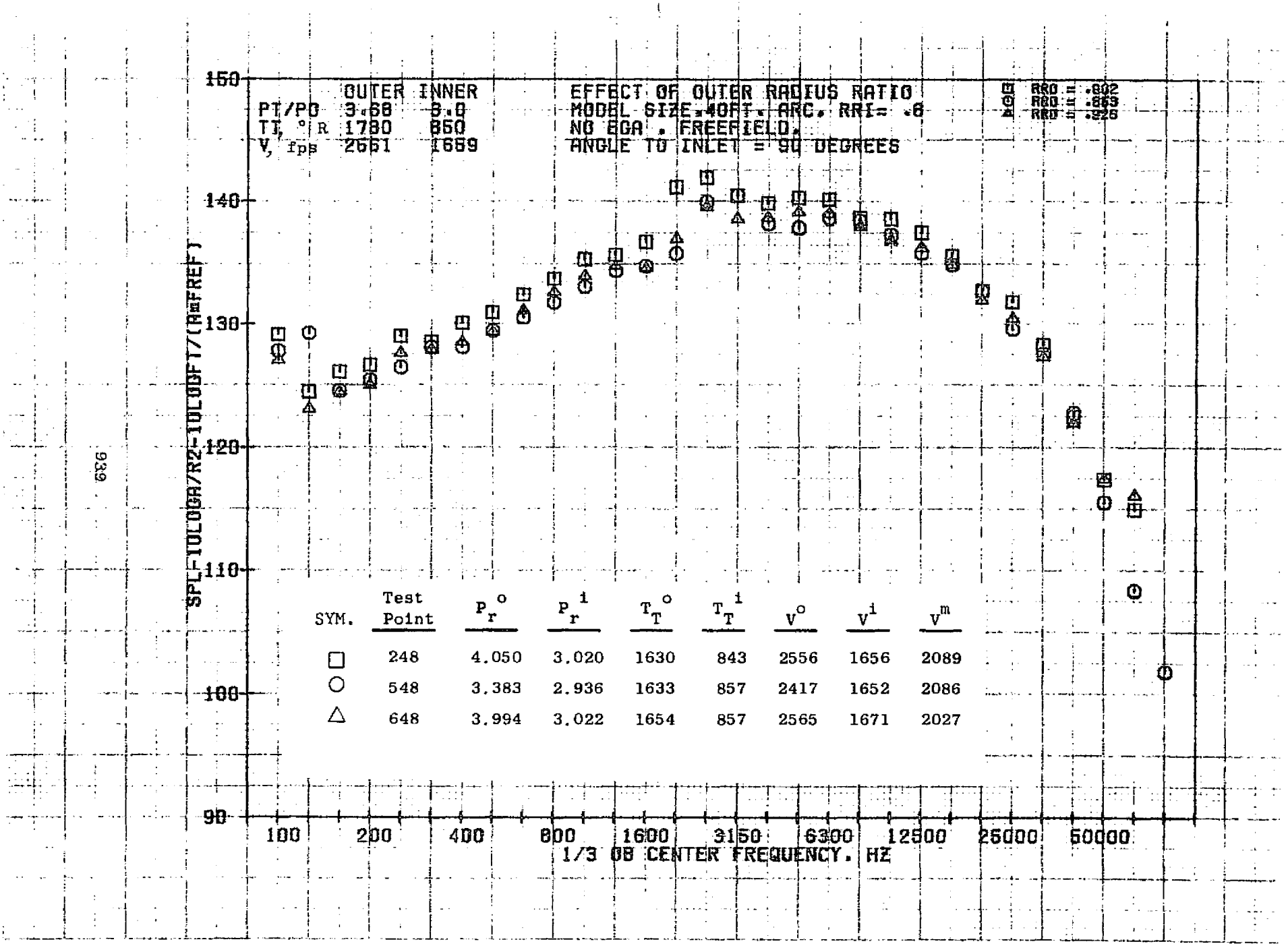

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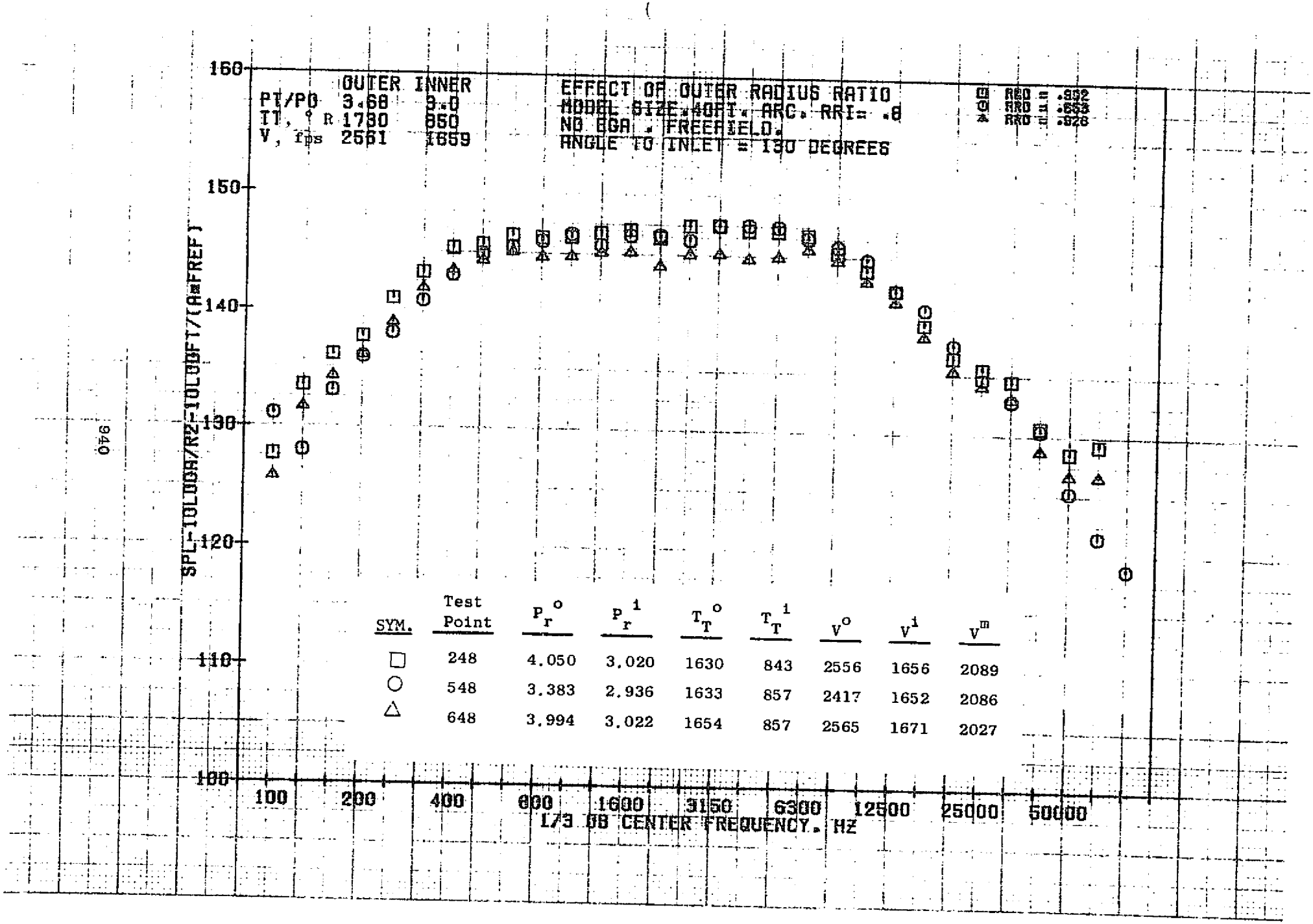

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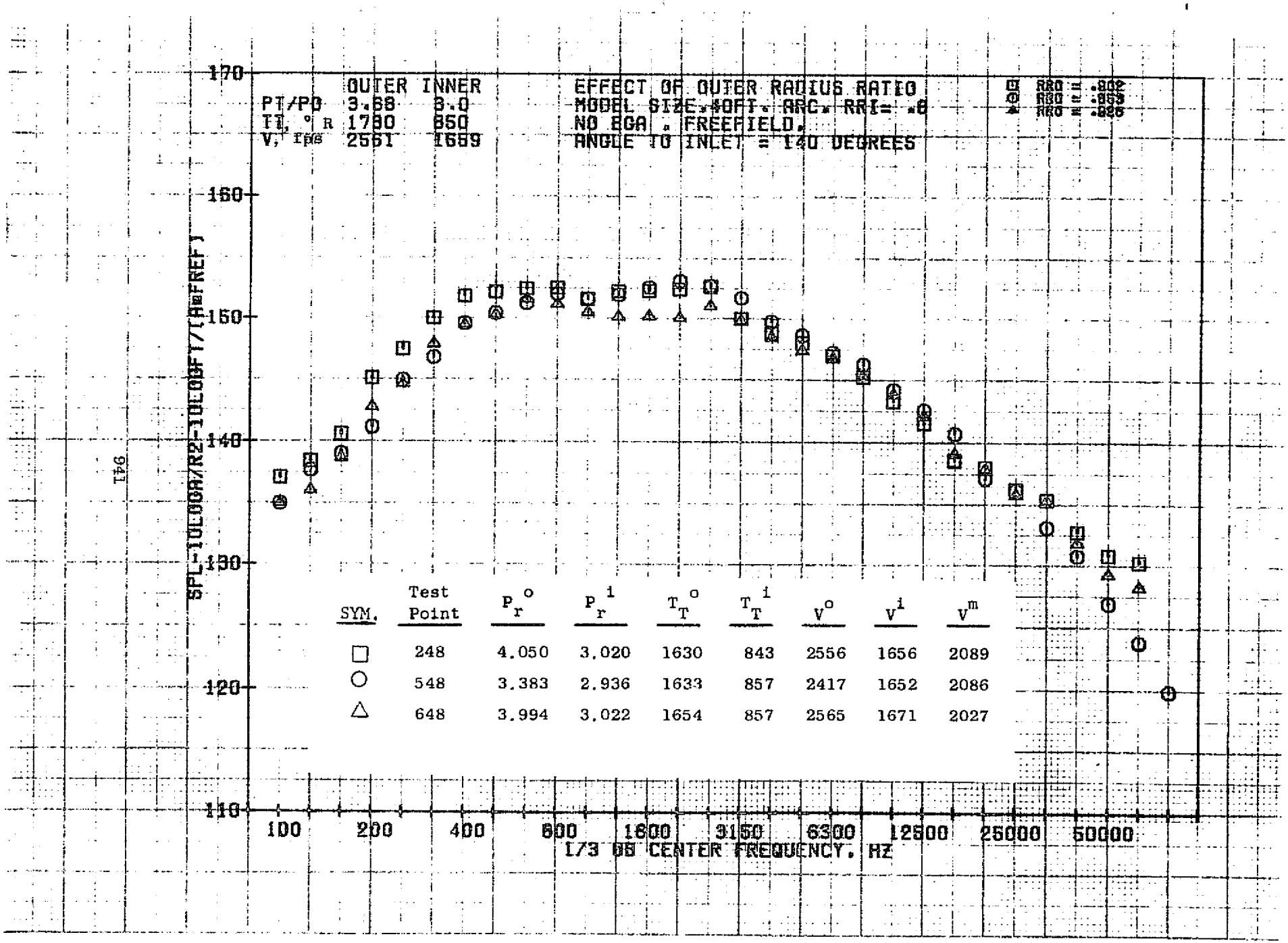

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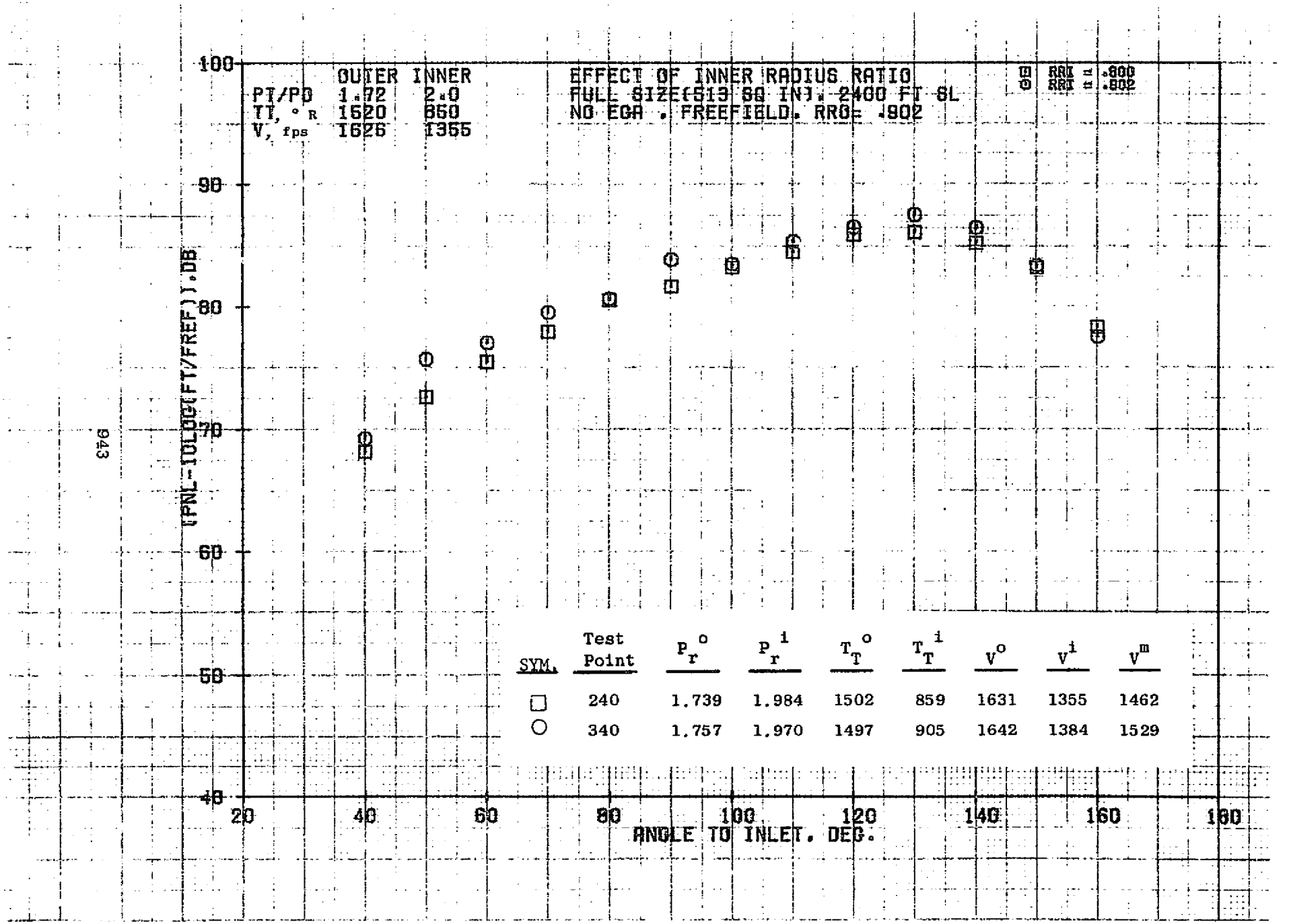
73KOLLSTEDT

7.4.2 Effect of Inner Radius Ratio

Configurations 2 and 3 have the same outer radius ratio (0.902) but different inner radius ratios, 0.800 and 0.902, respectively. The acoustic results are compared in this section. Configurations 5 and 7 are also compared. These two configurations have a 0.853 outer radius ratio and inner radius ratios of 0.800 and 0.902, respectively.



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1B124-001

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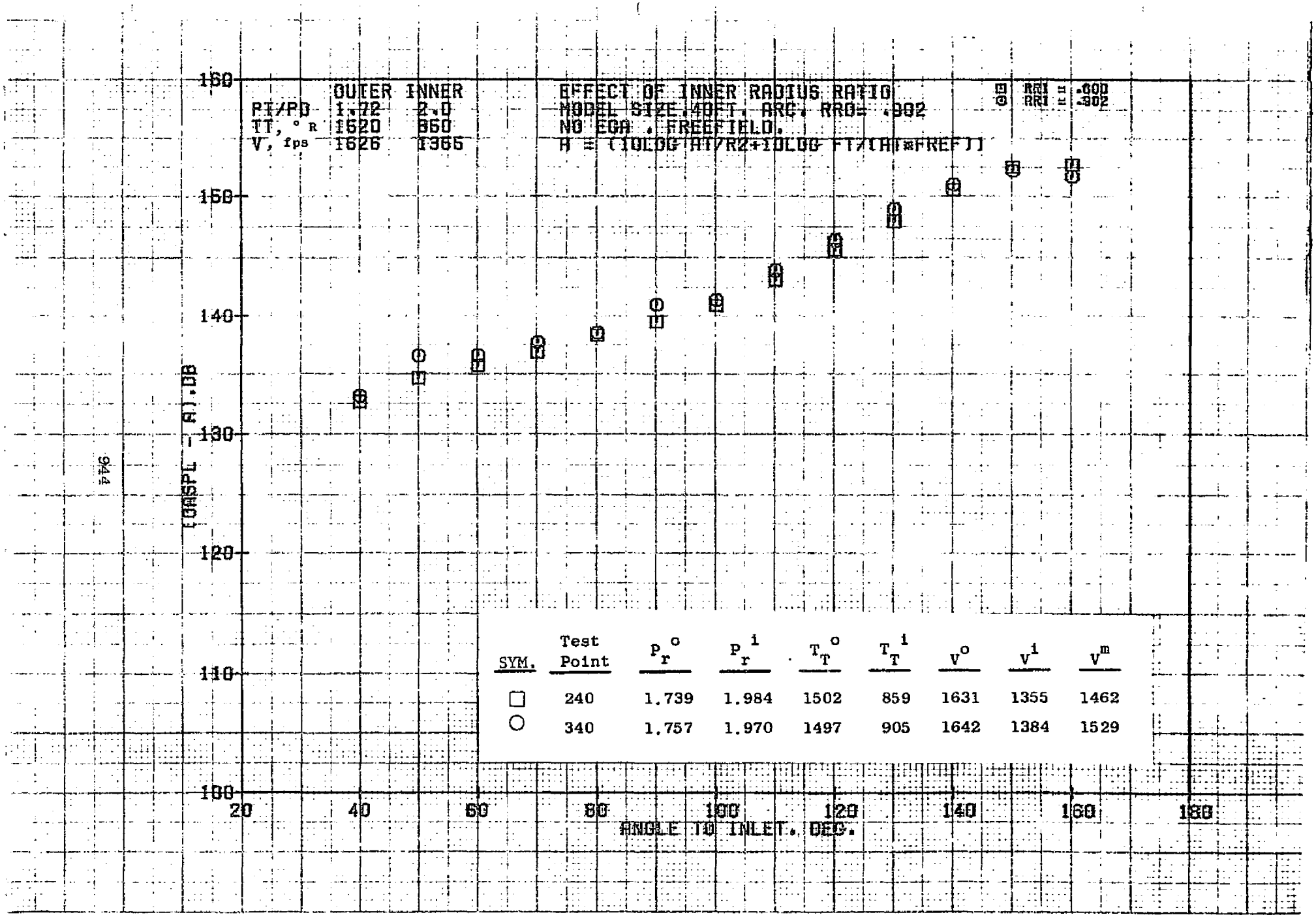

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18161-001

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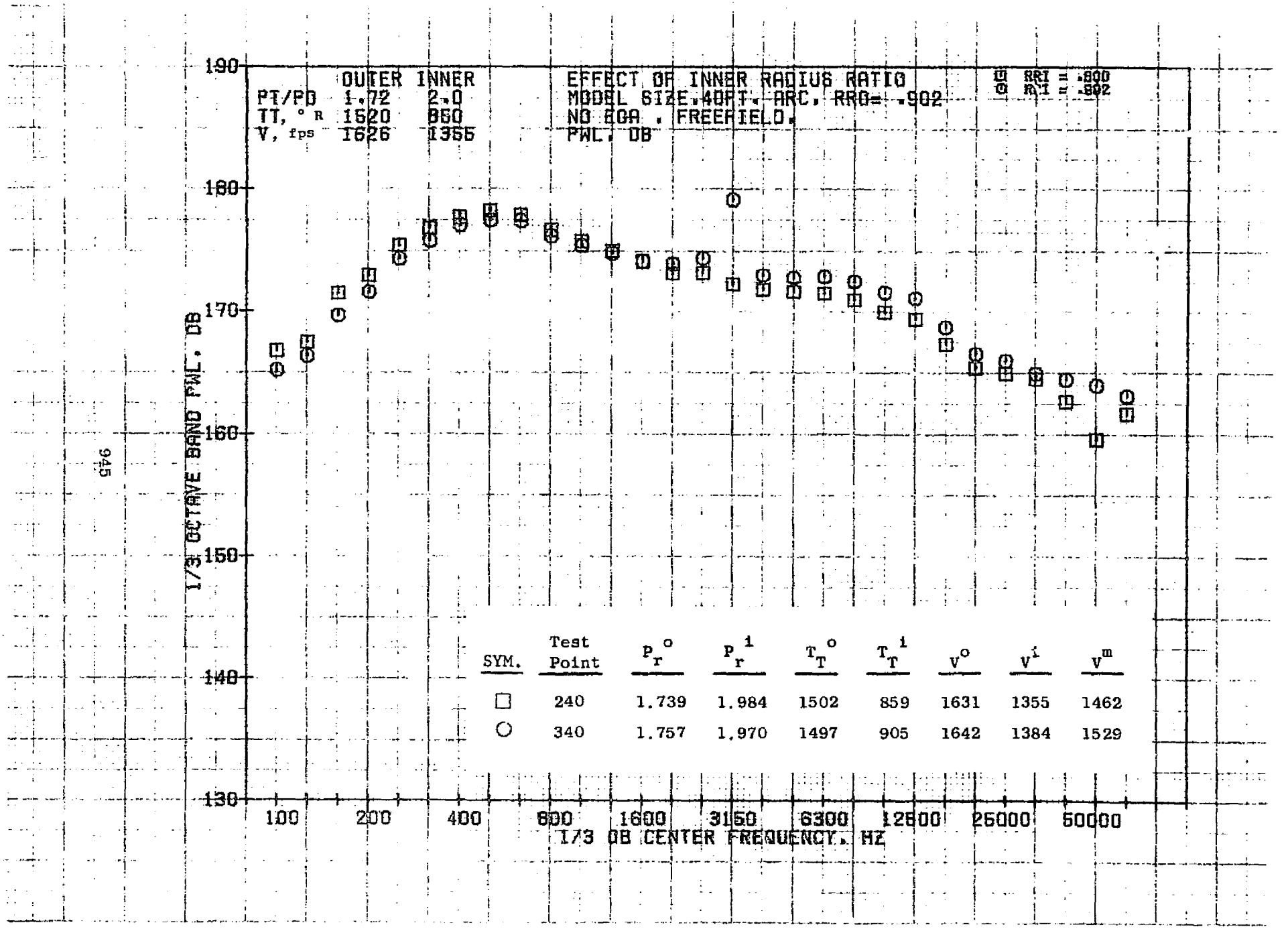

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18161-001

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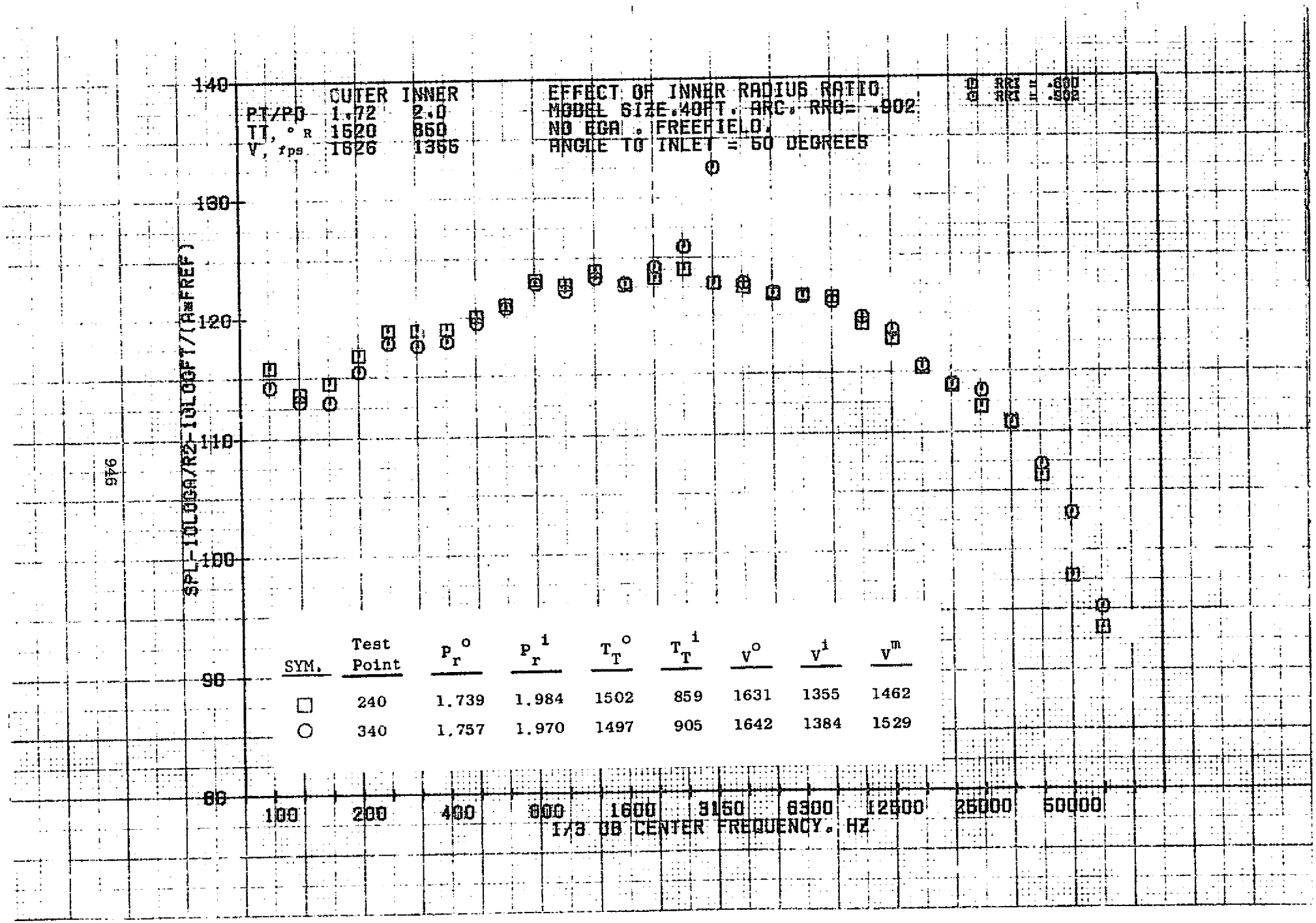

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18161-001

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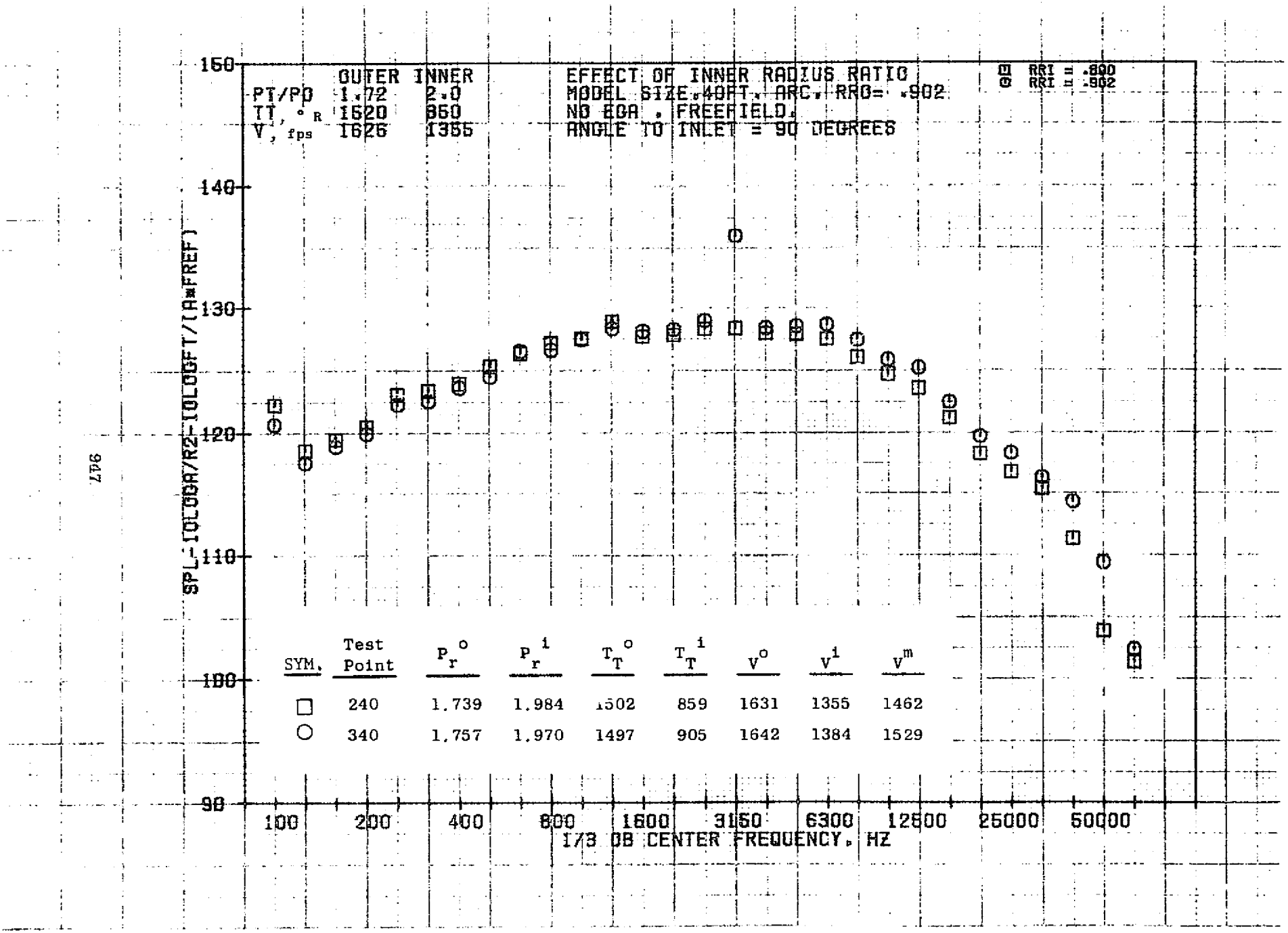

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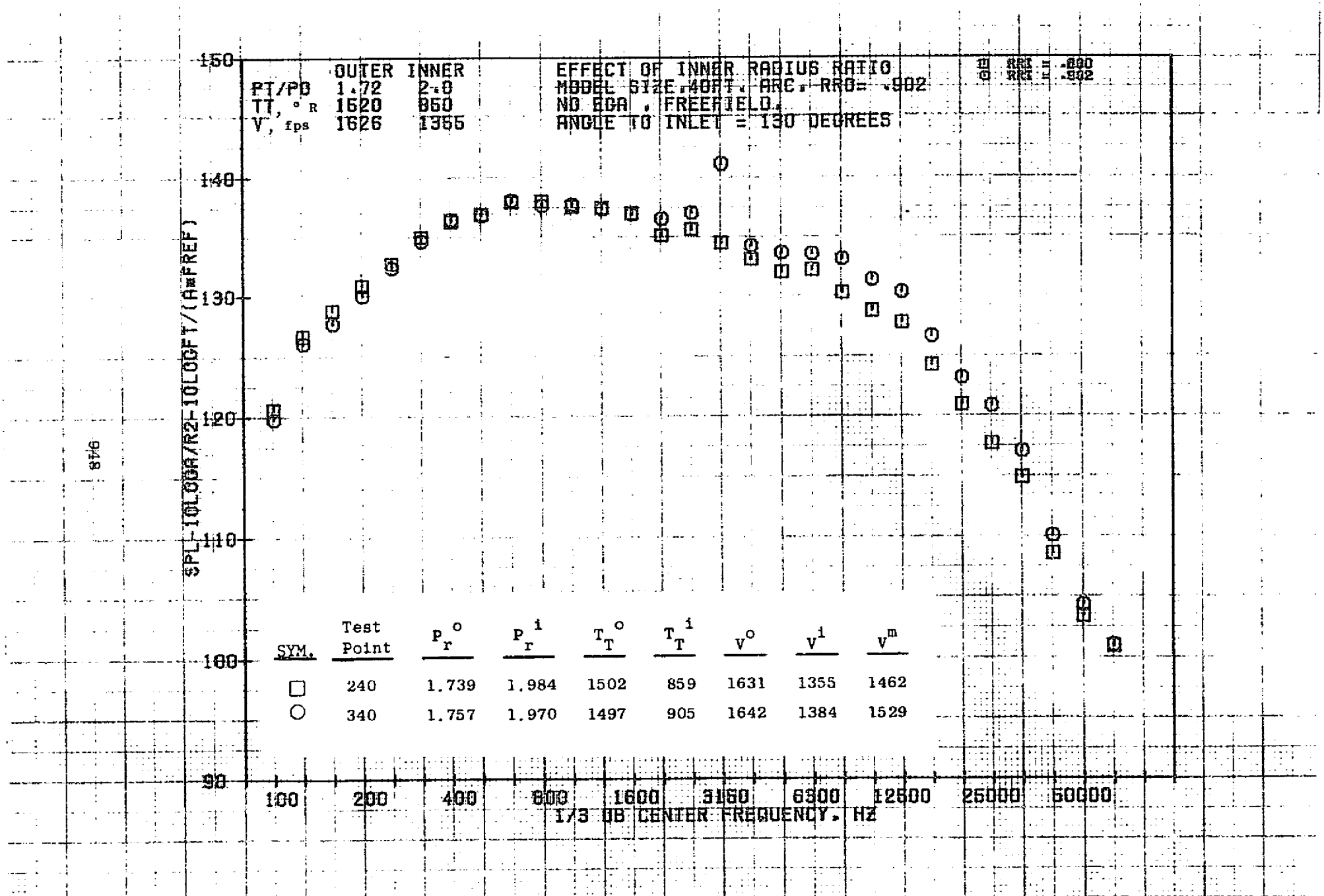

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18161-001

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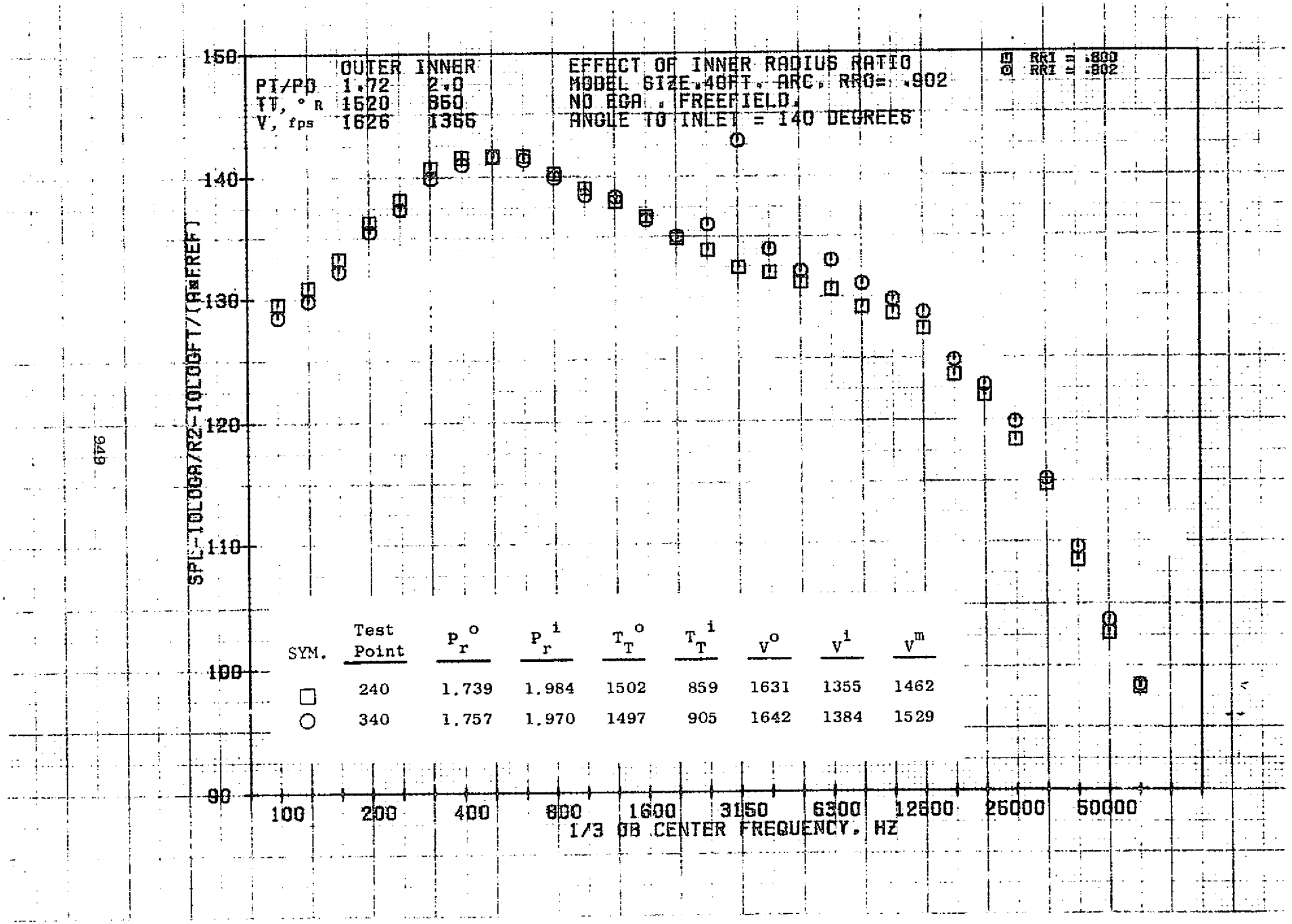

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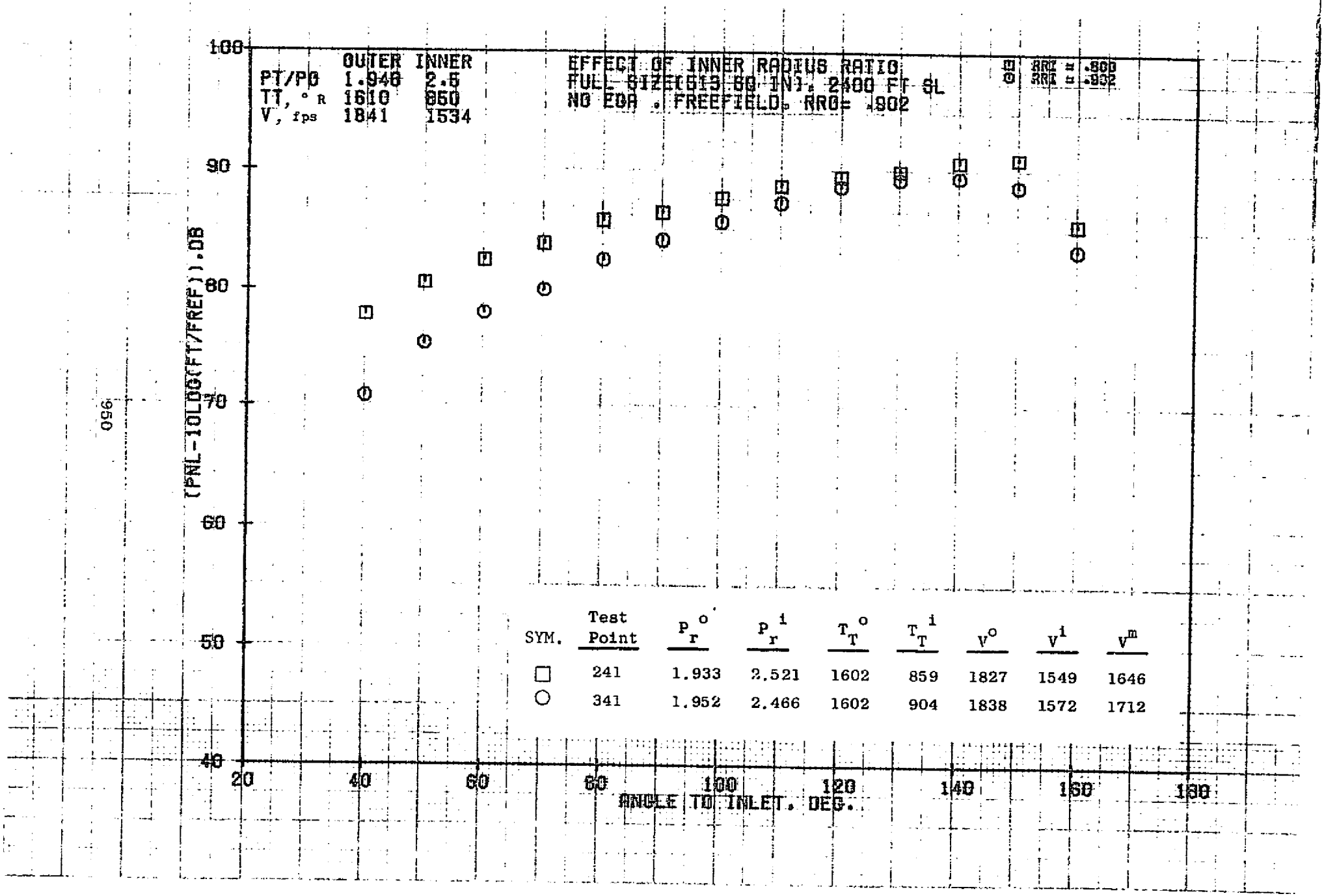

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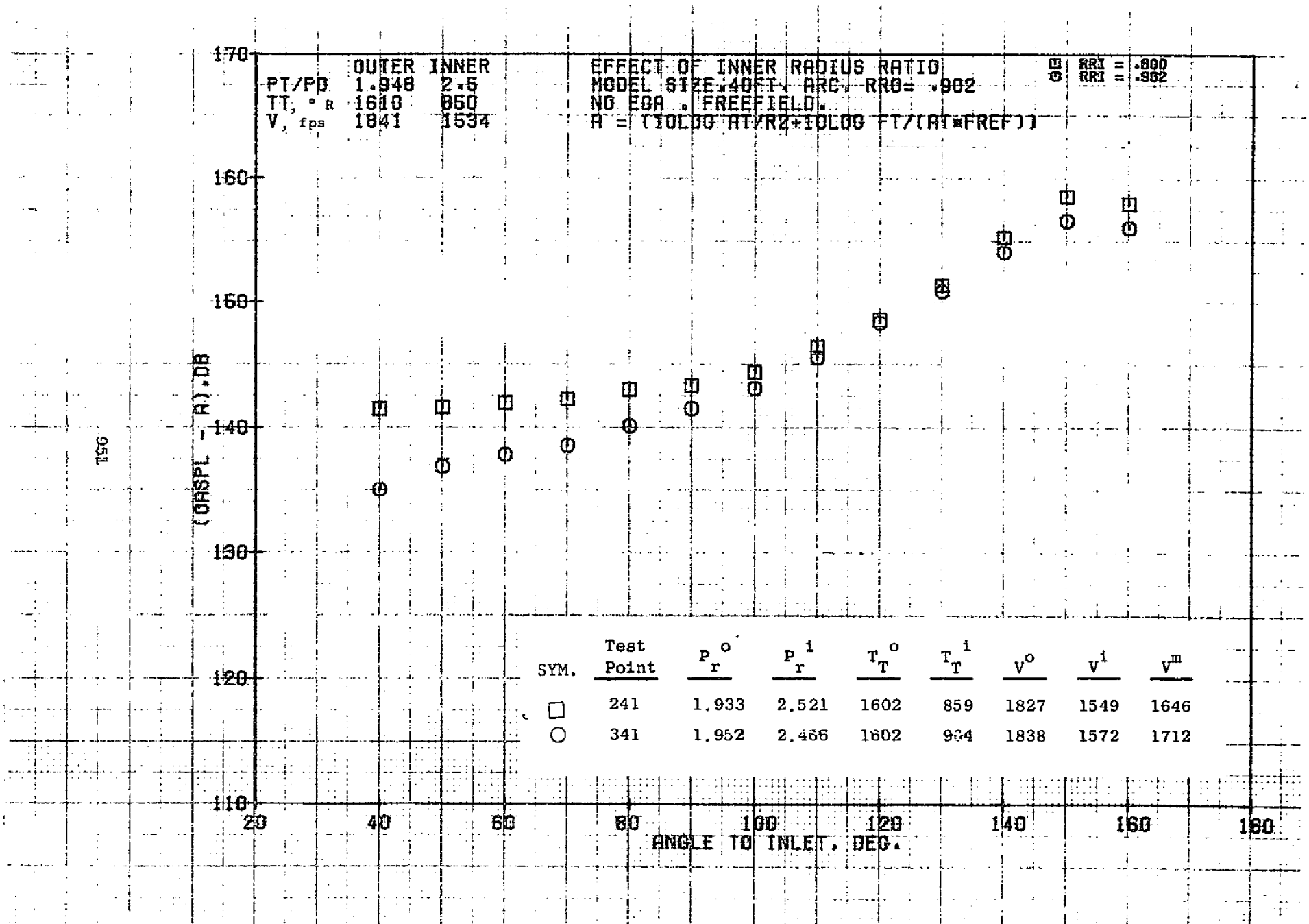

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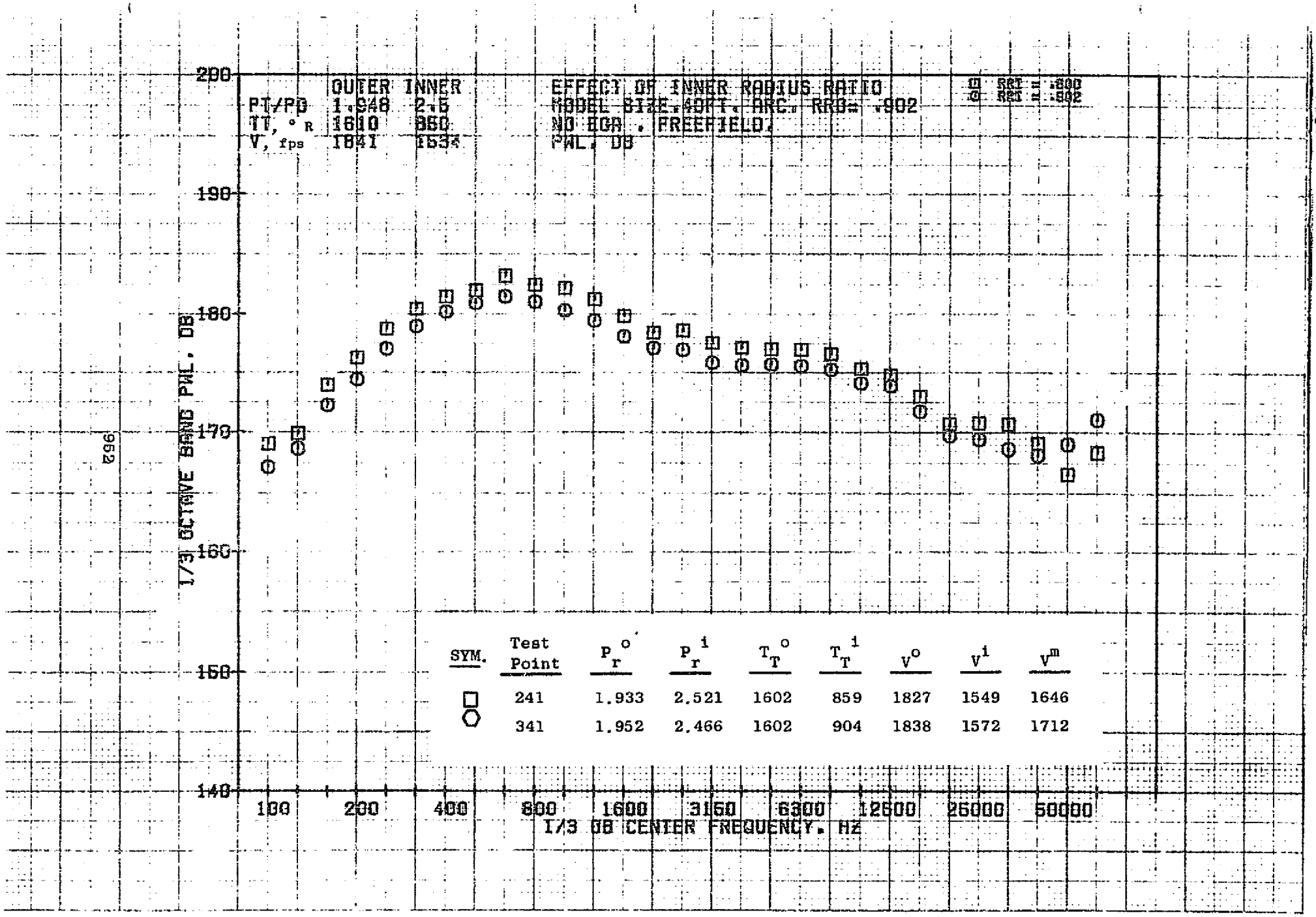

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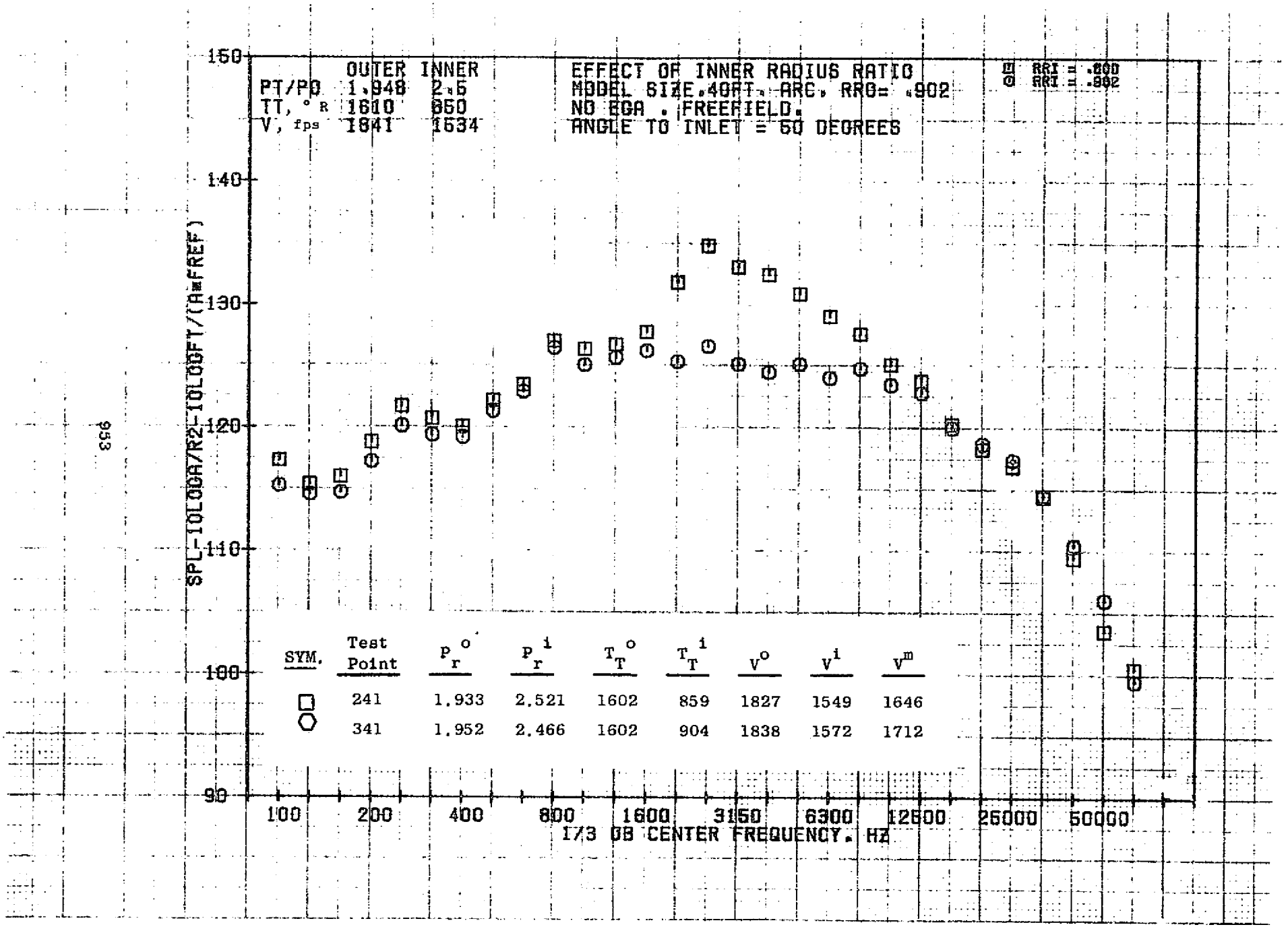

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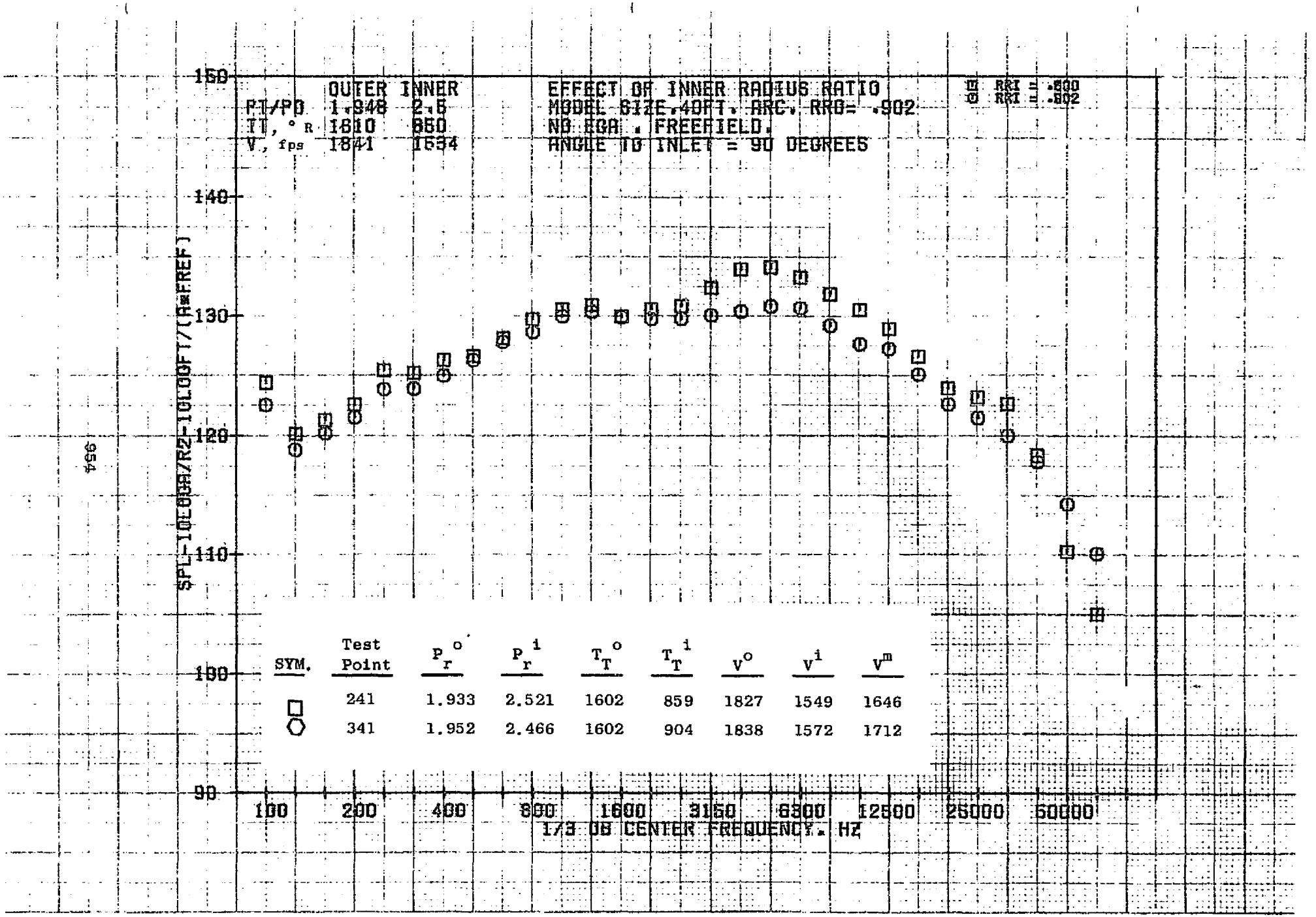

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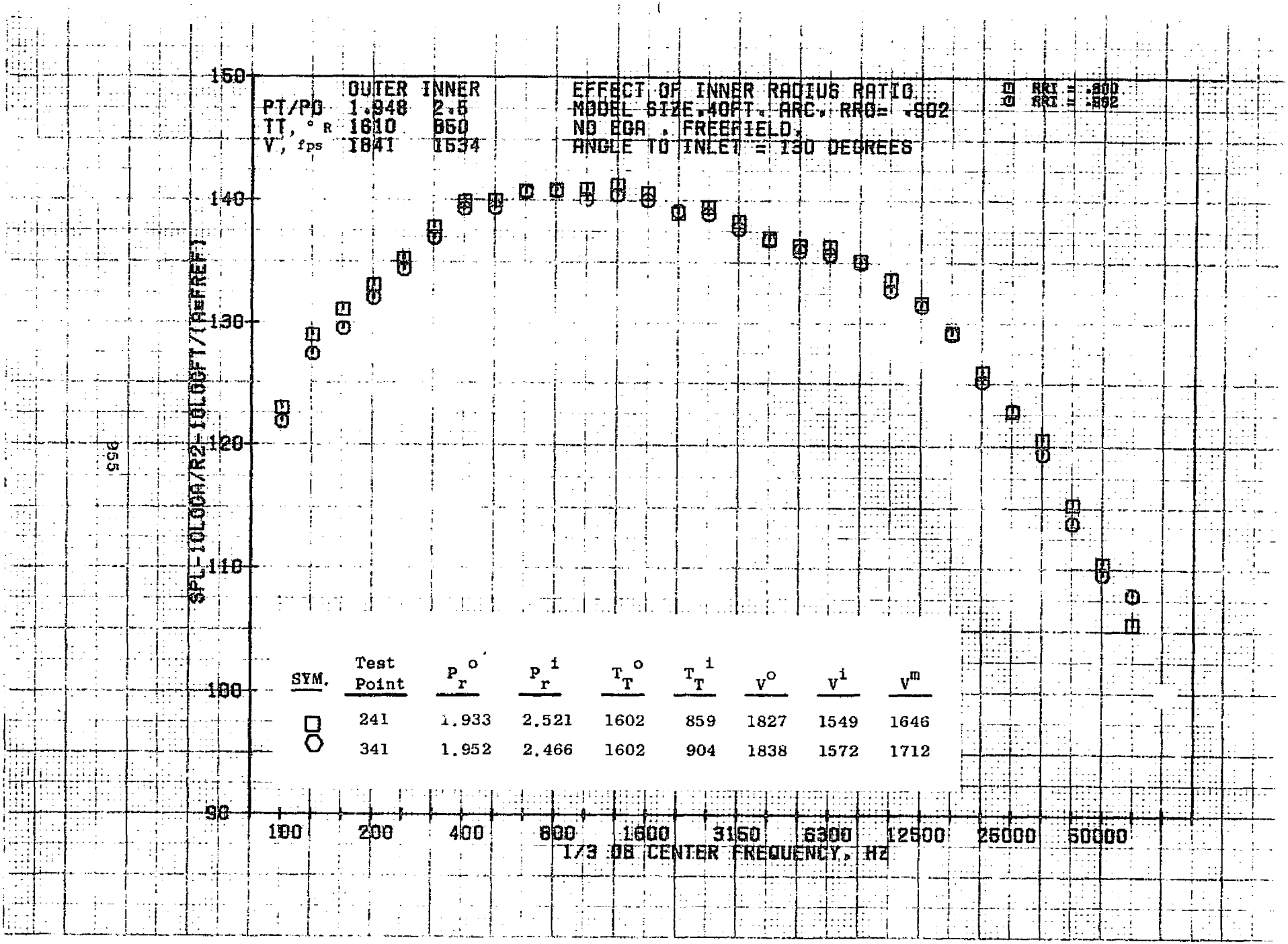

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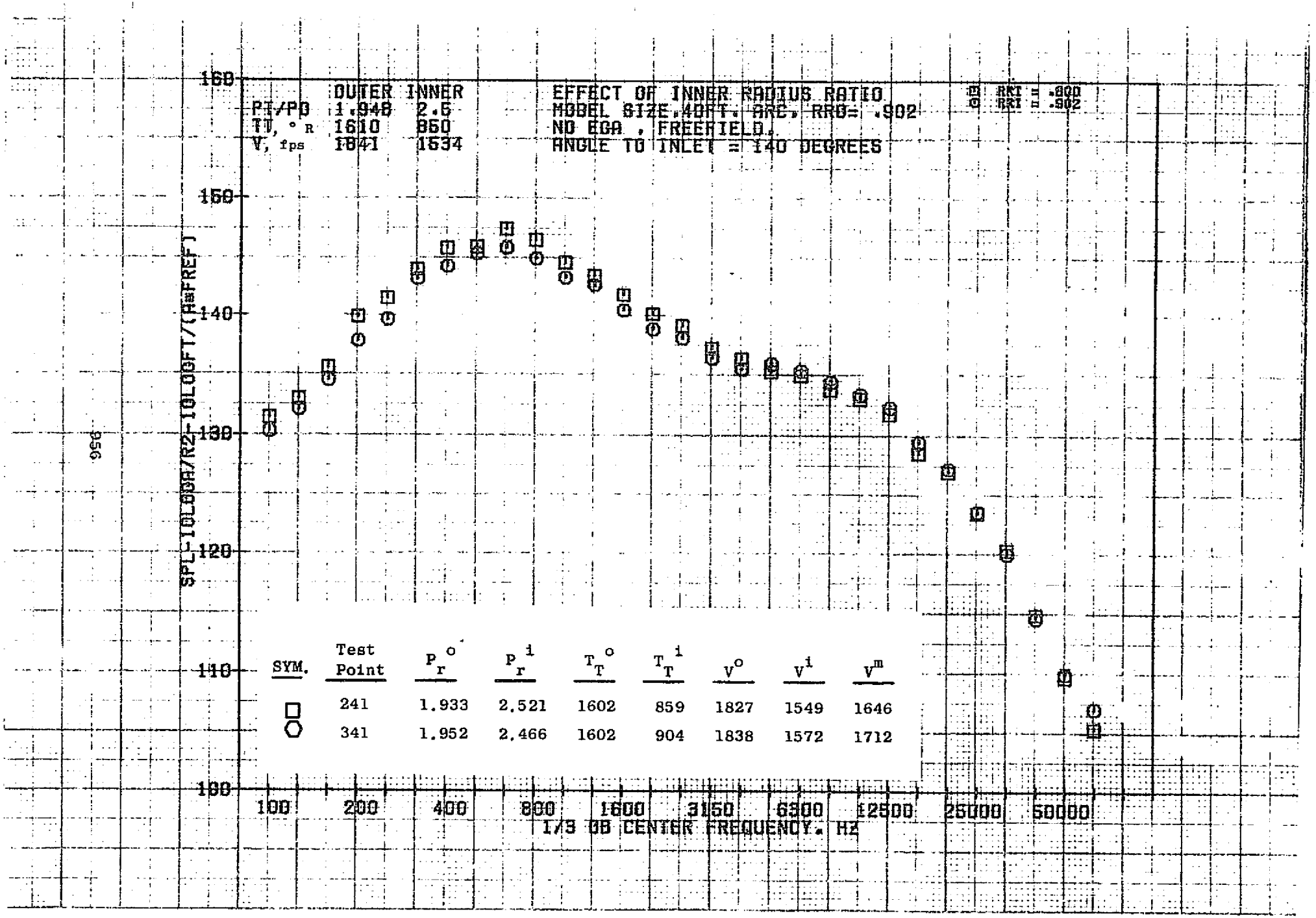

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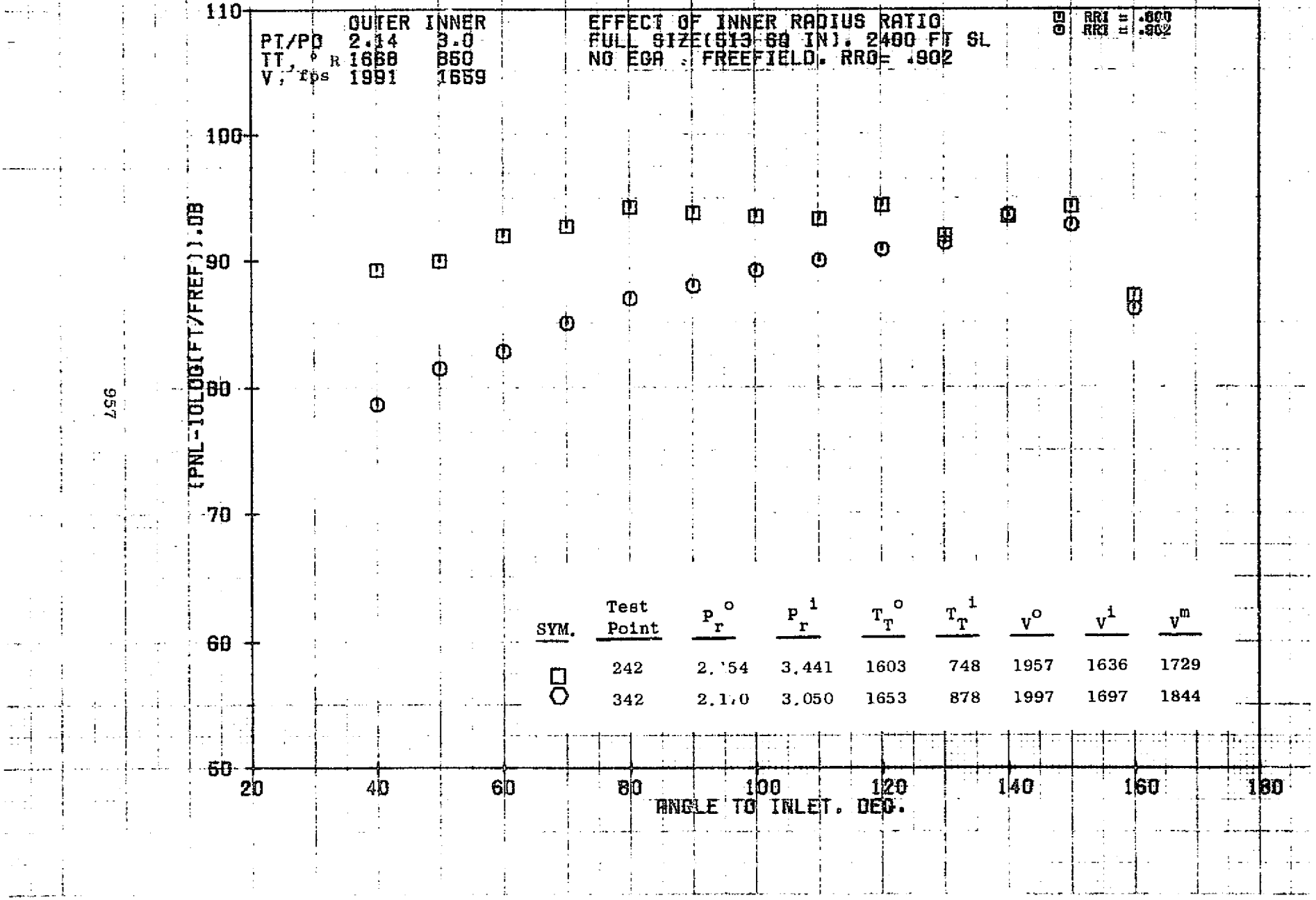

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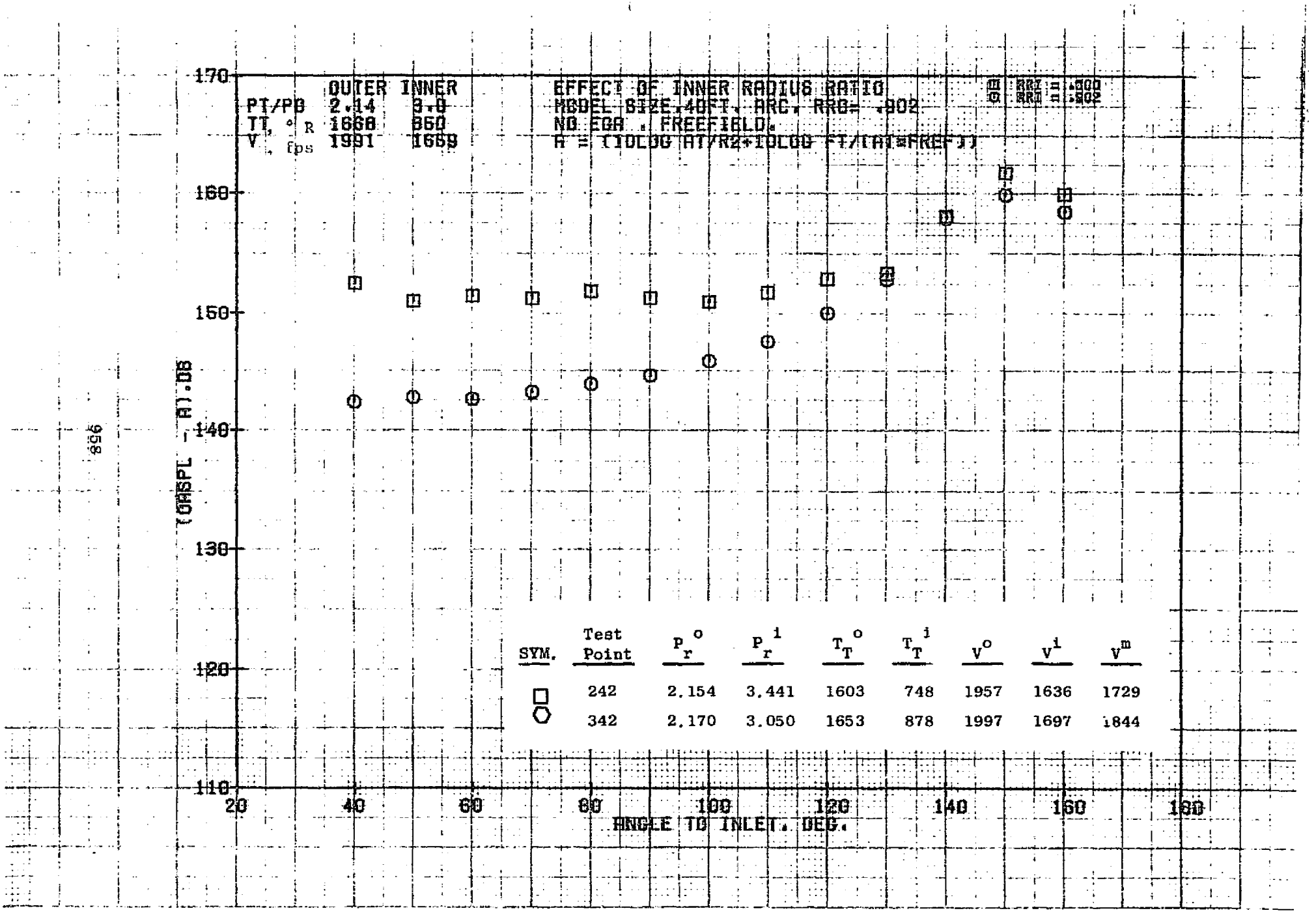

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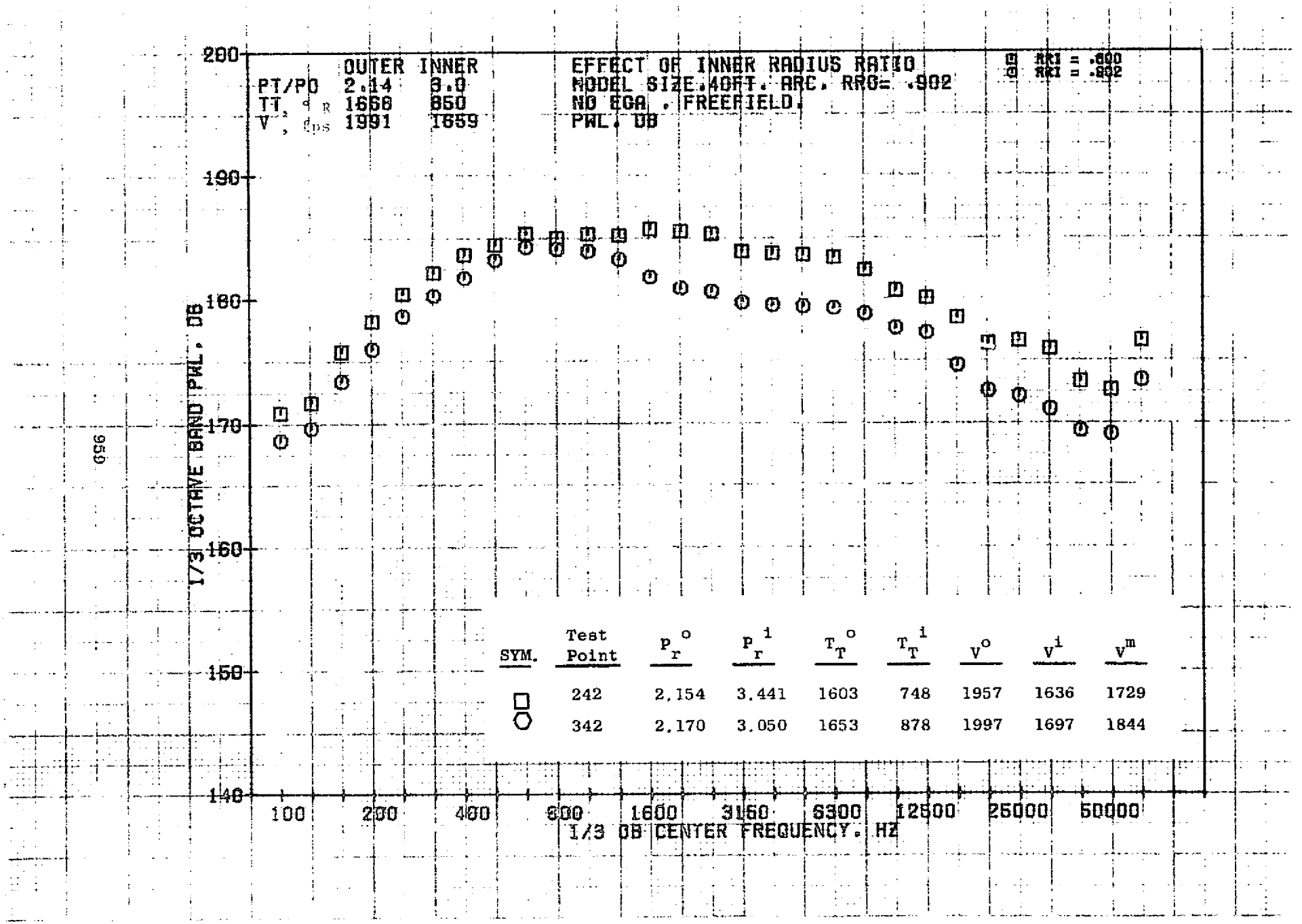

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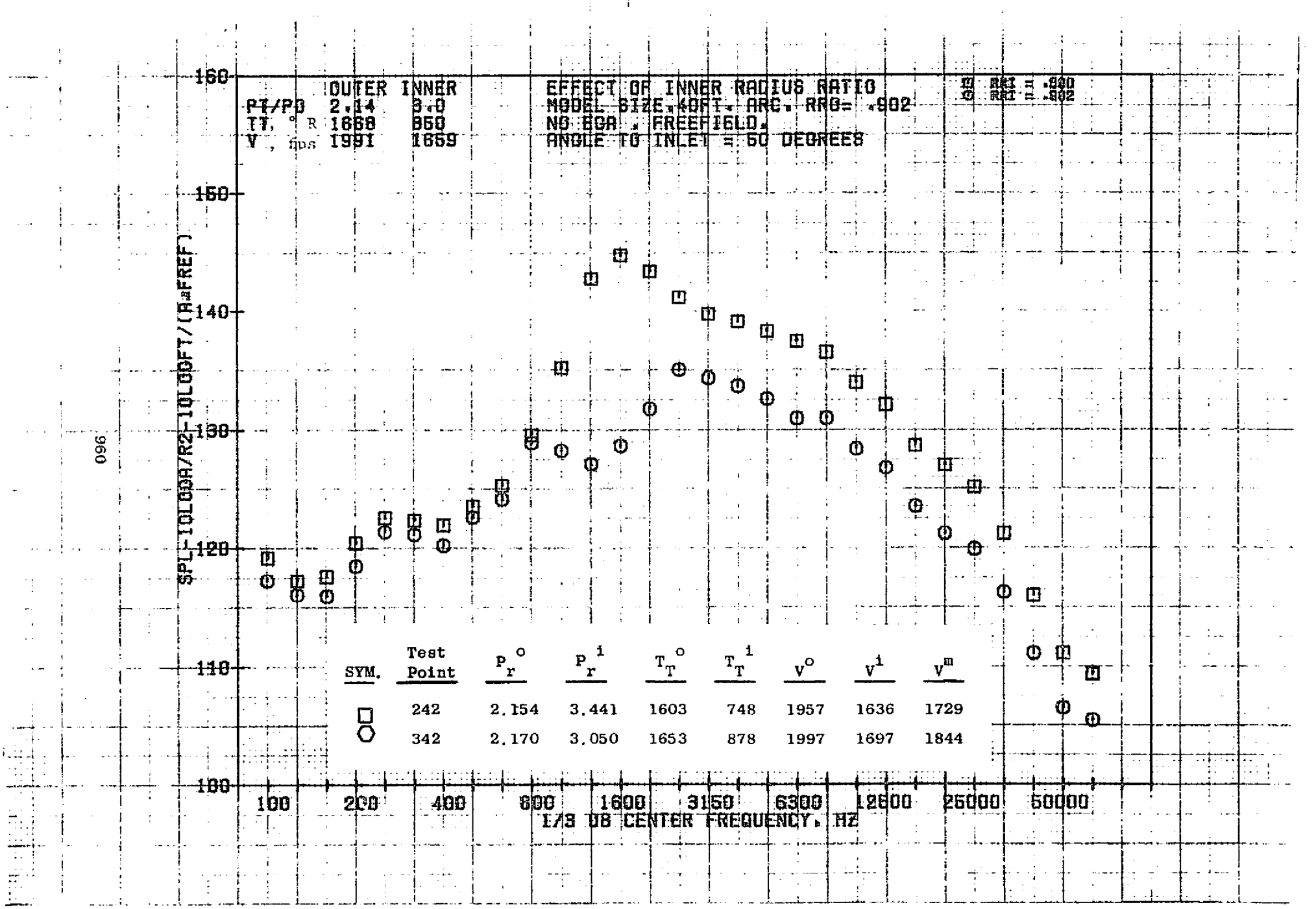

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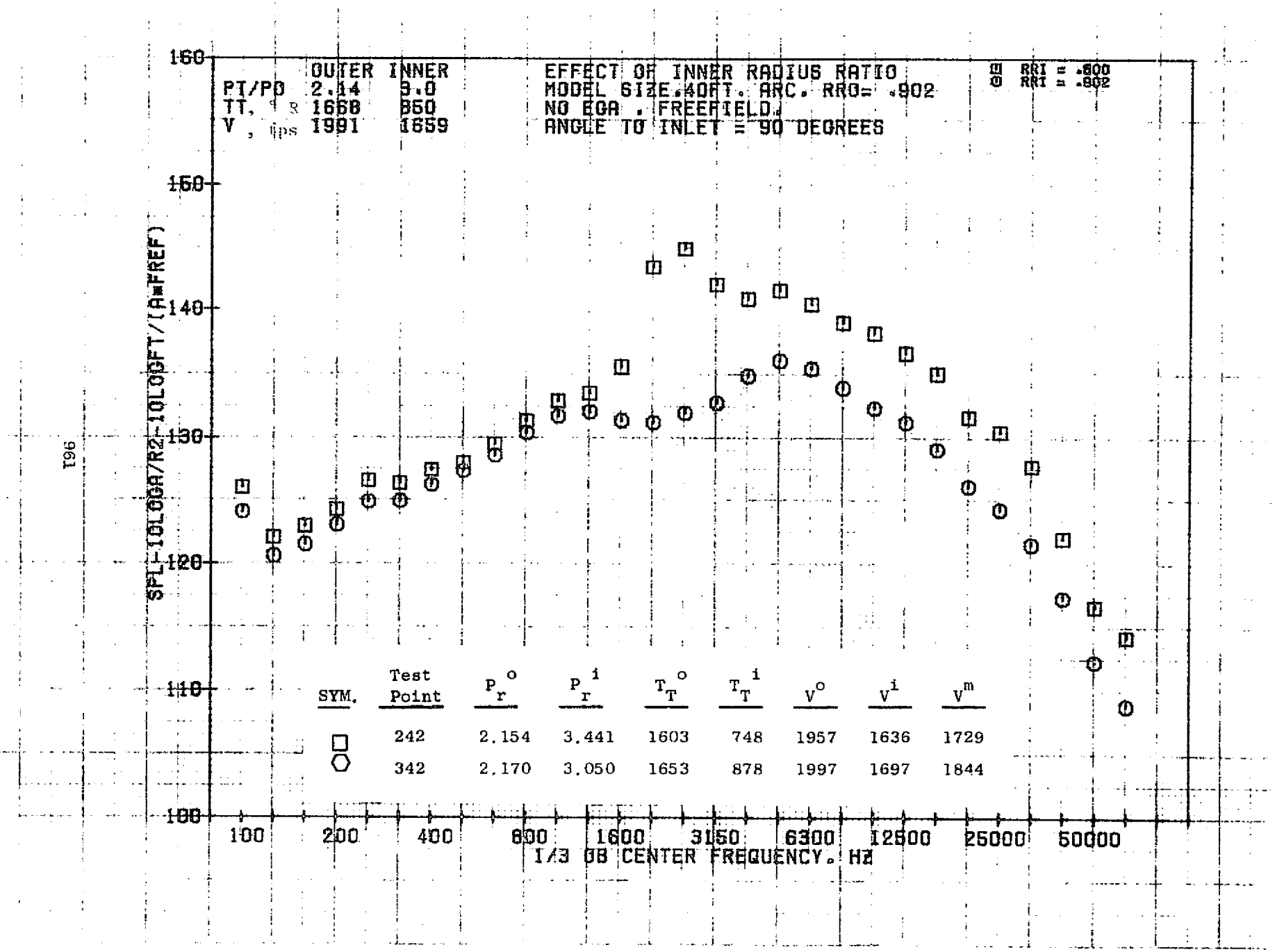

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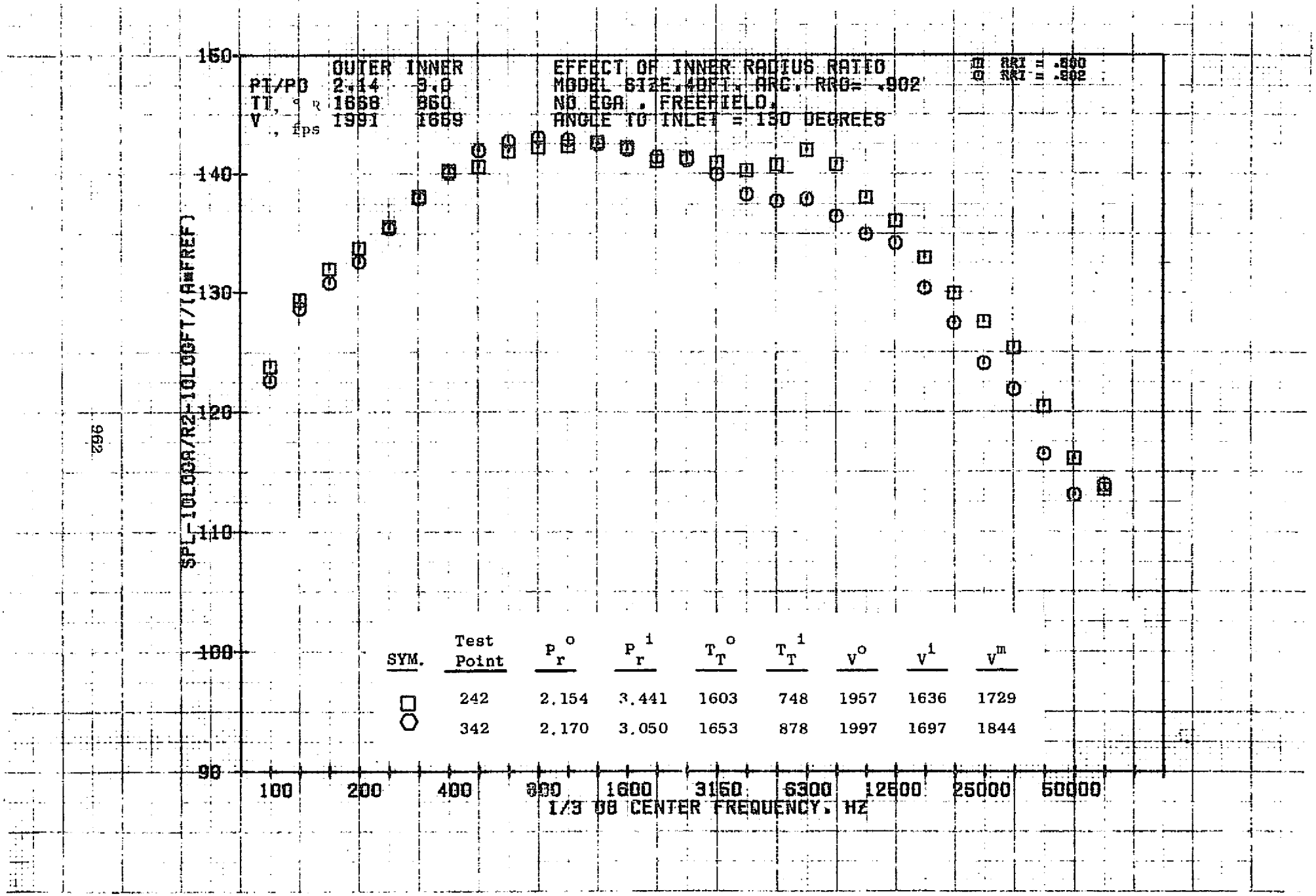

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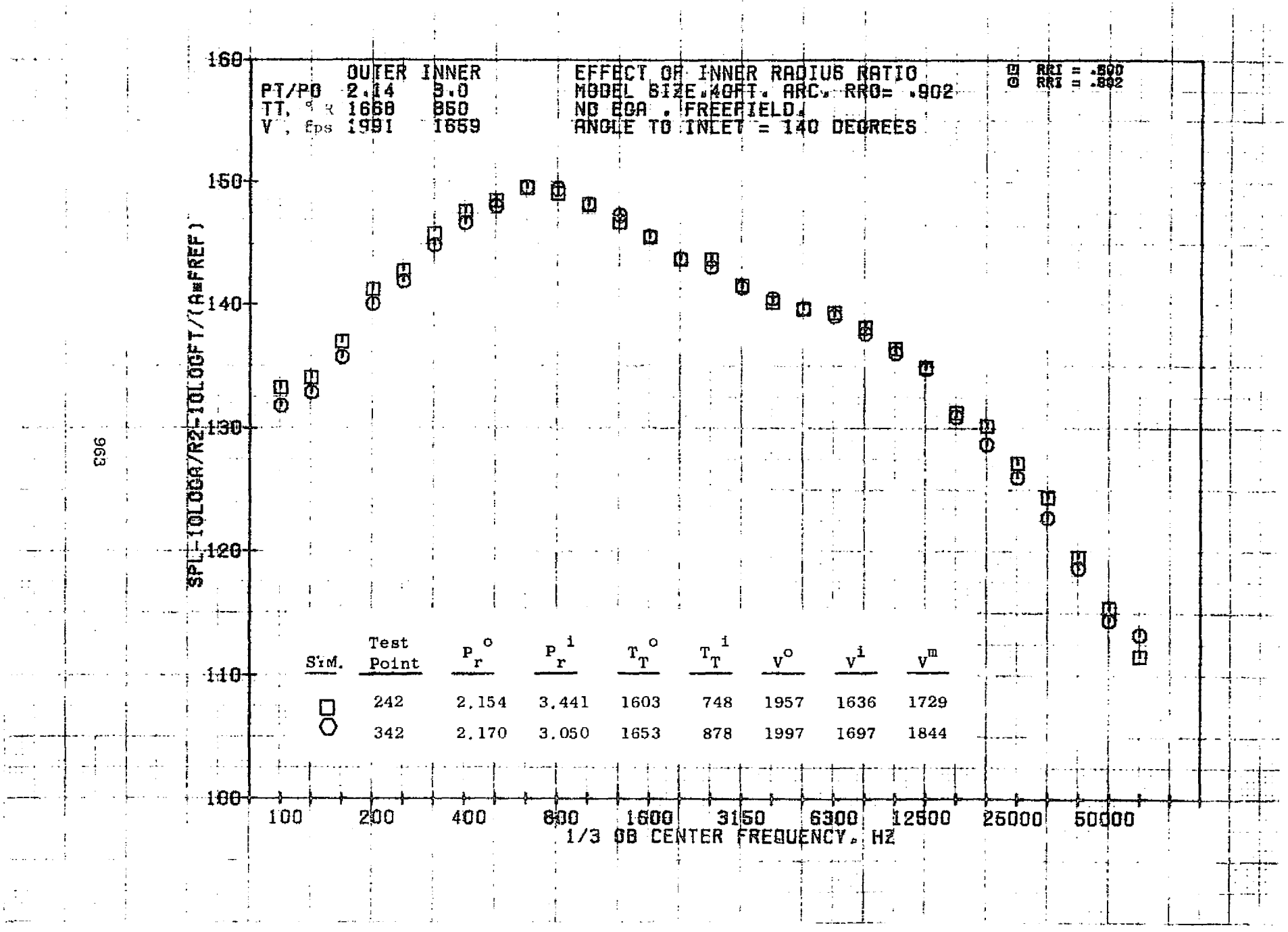

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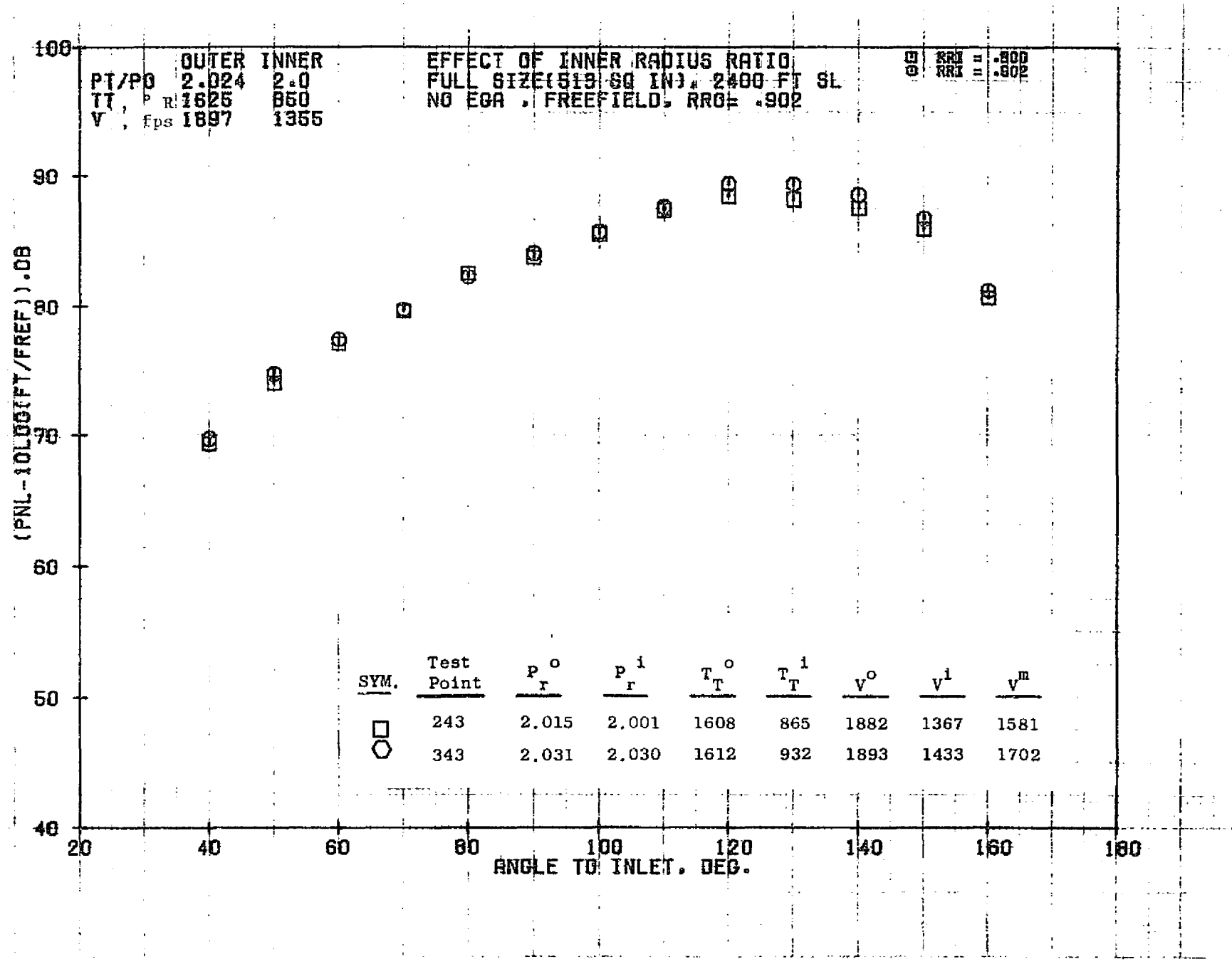

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18124-001

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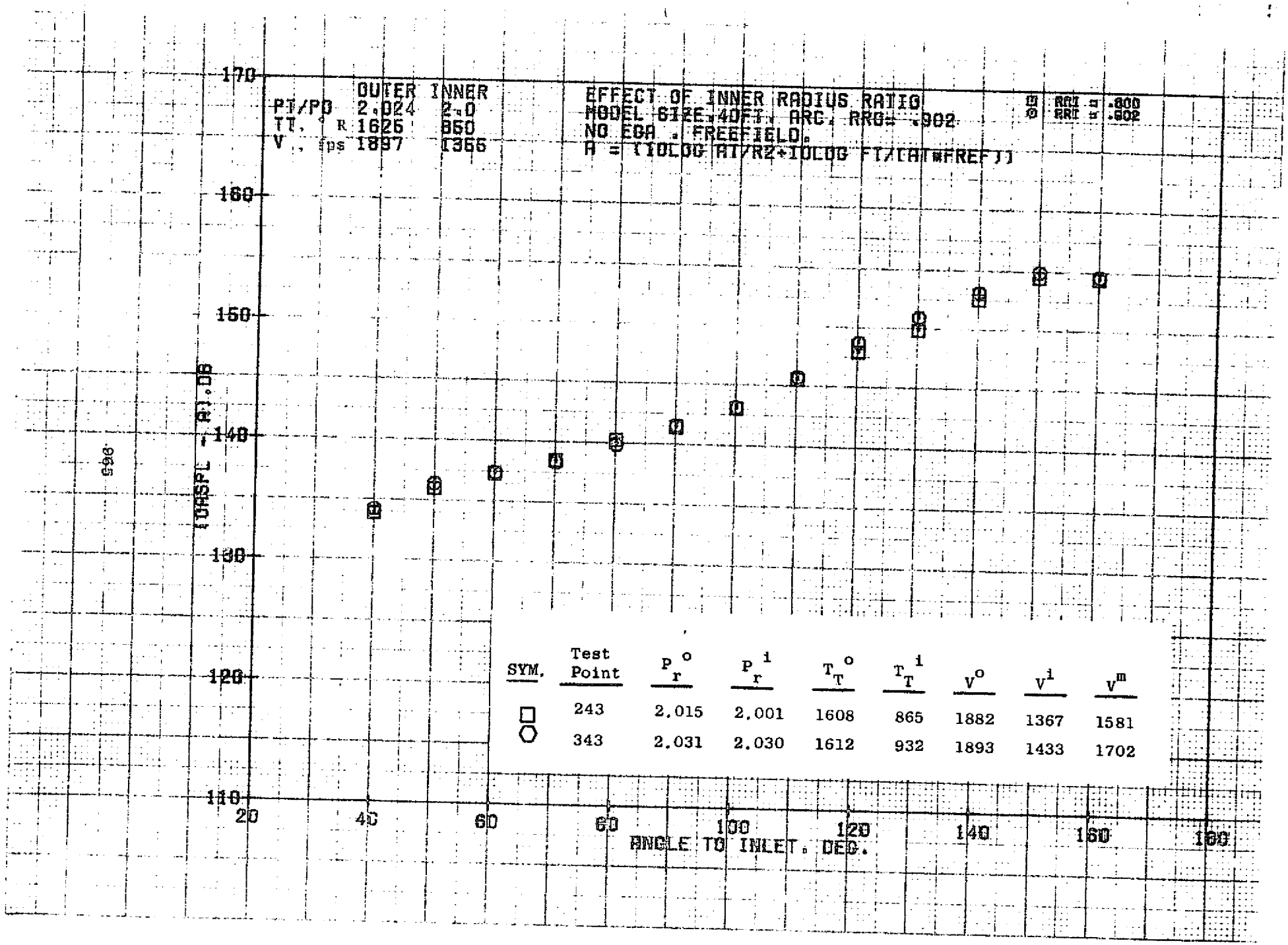

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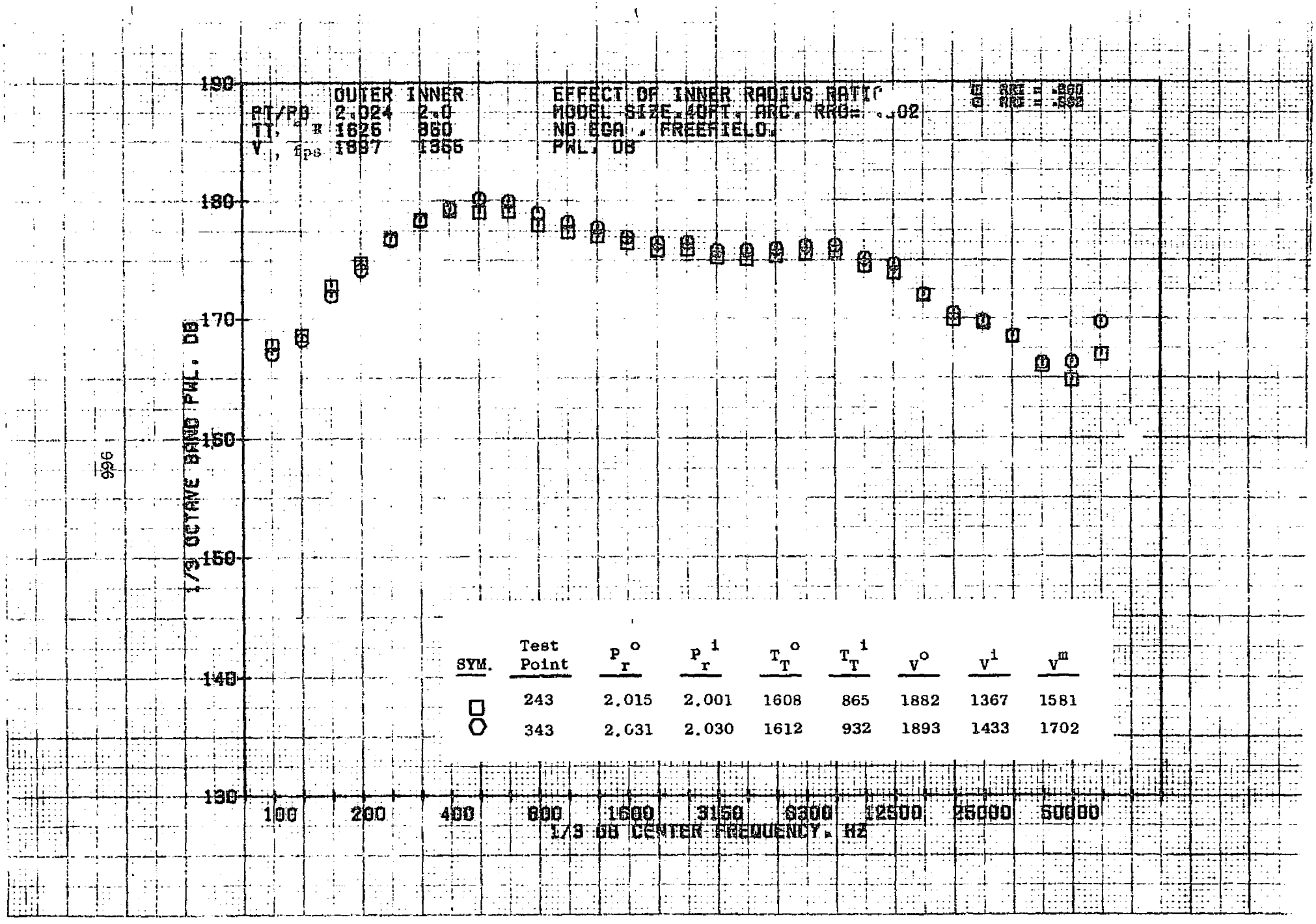

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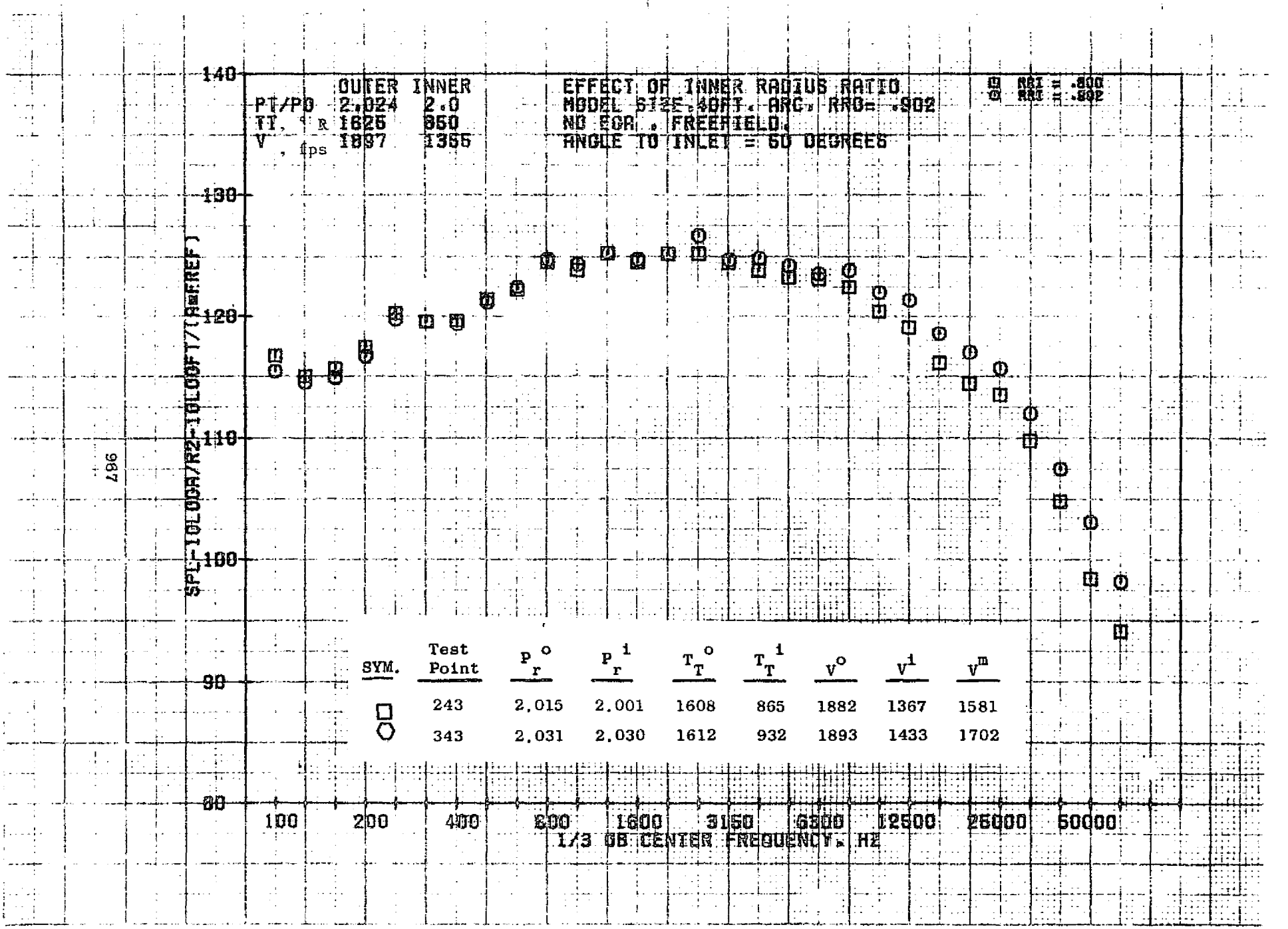

10/29/76
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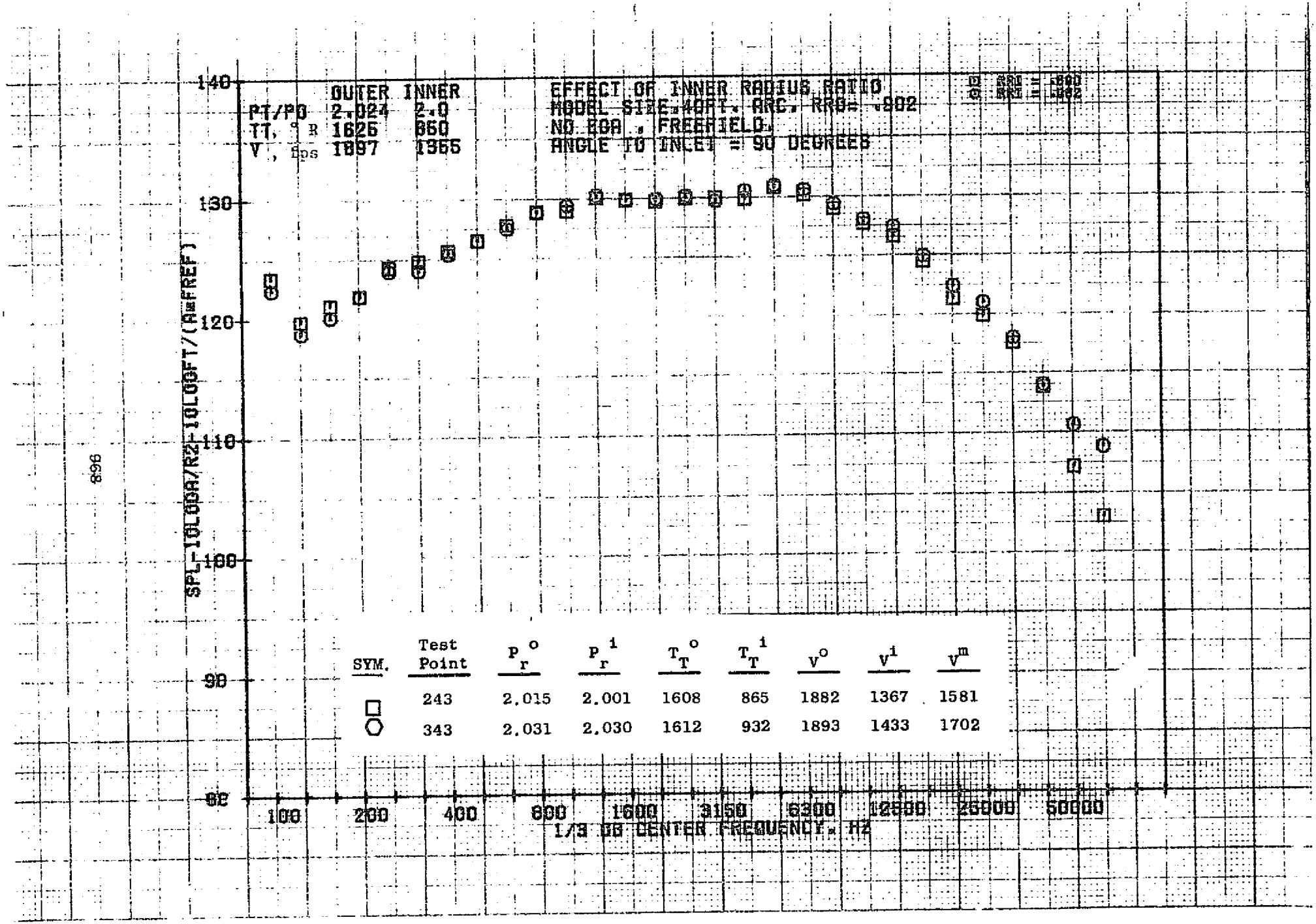

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18161-001

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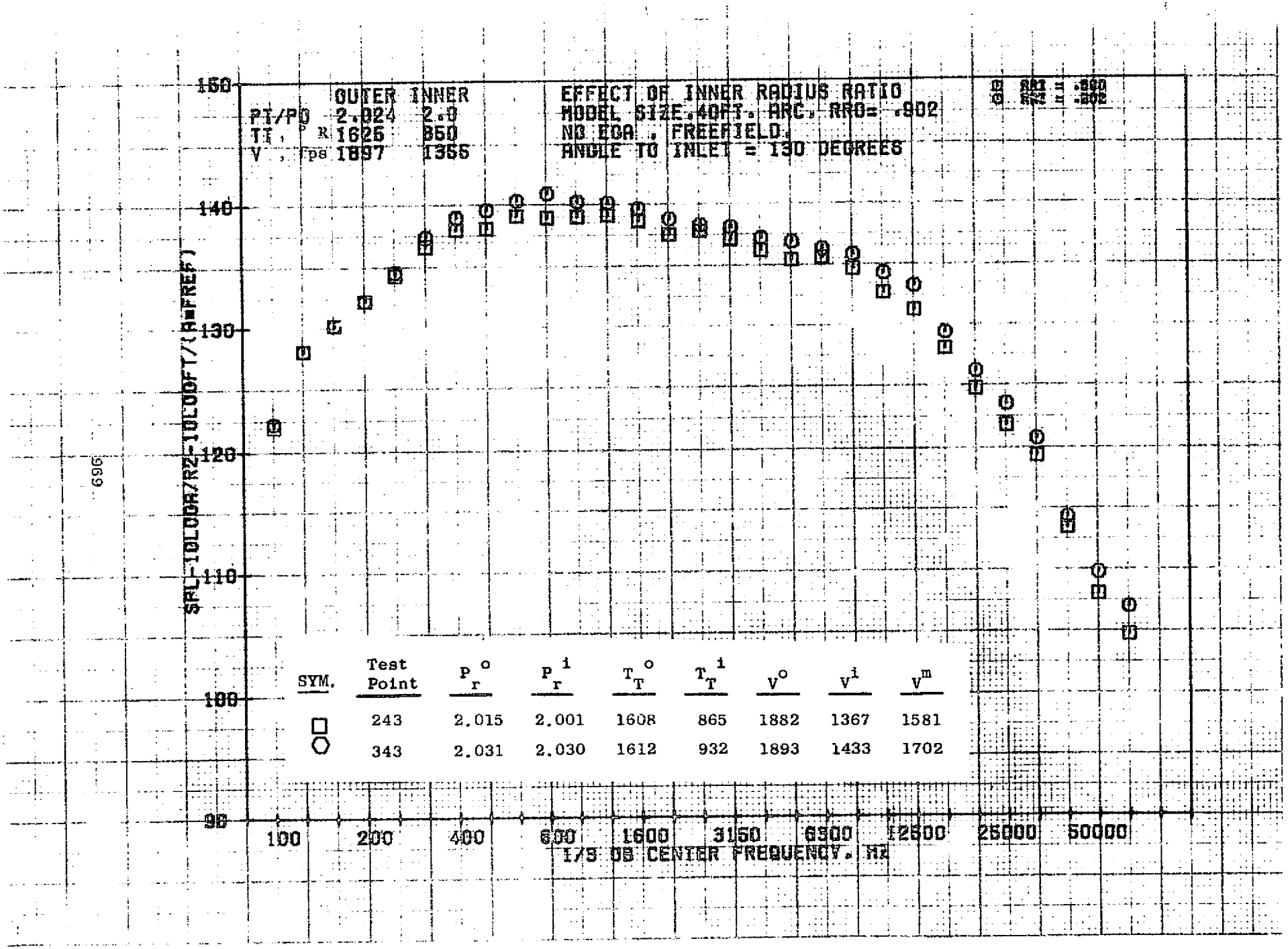

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1B161-001

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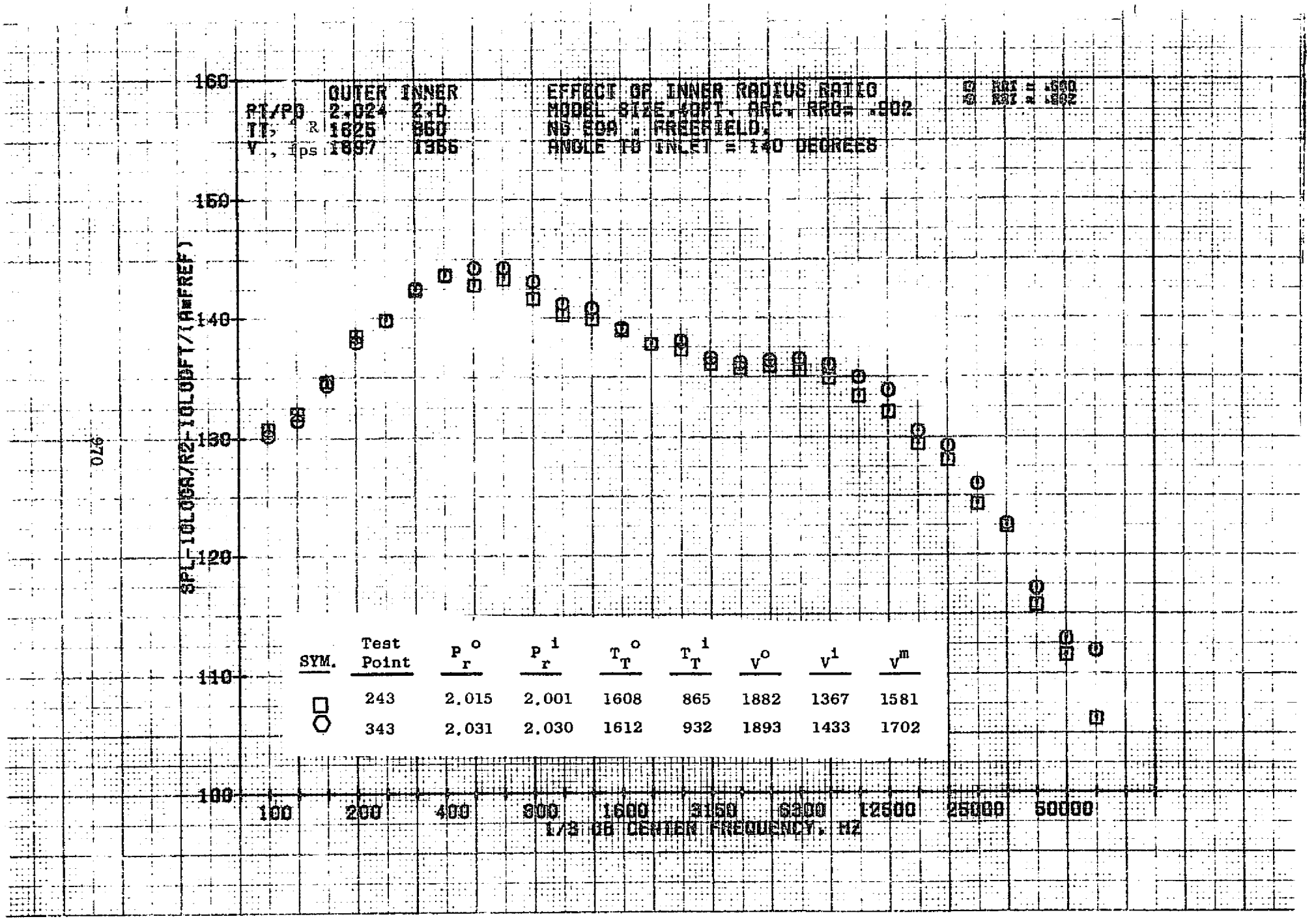

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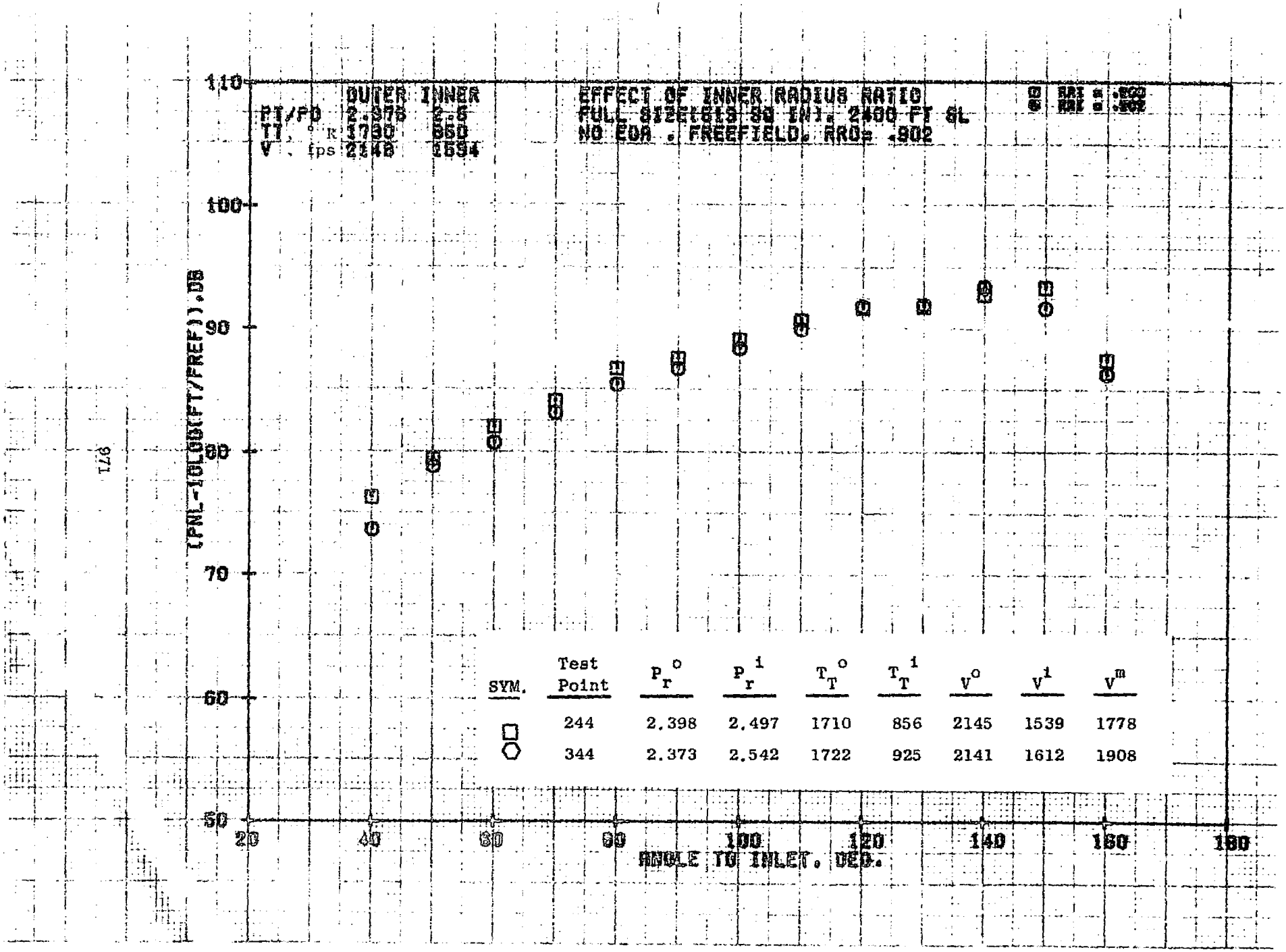

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18690-001

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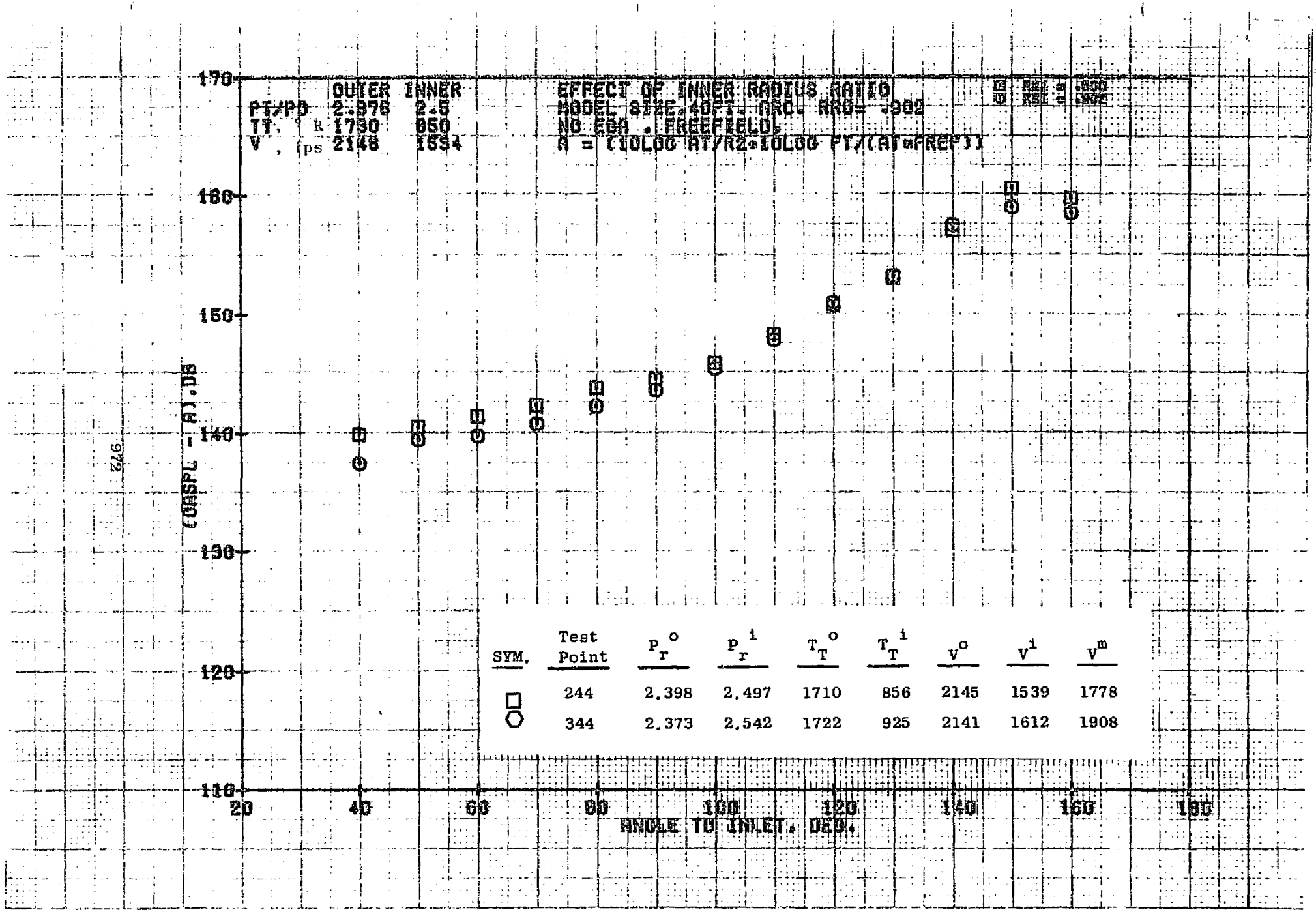

11/04/76
18727-001

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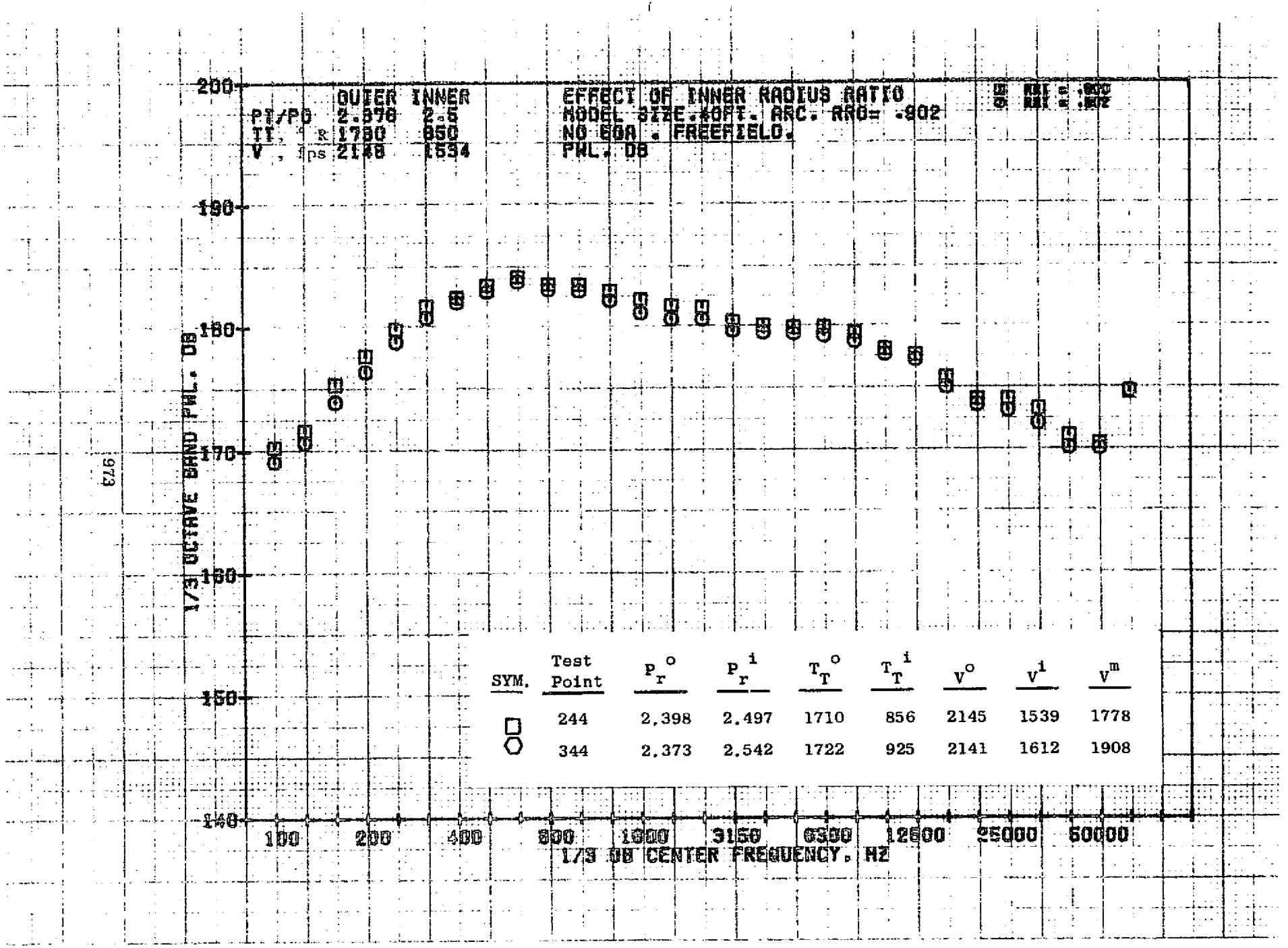

11/04/76
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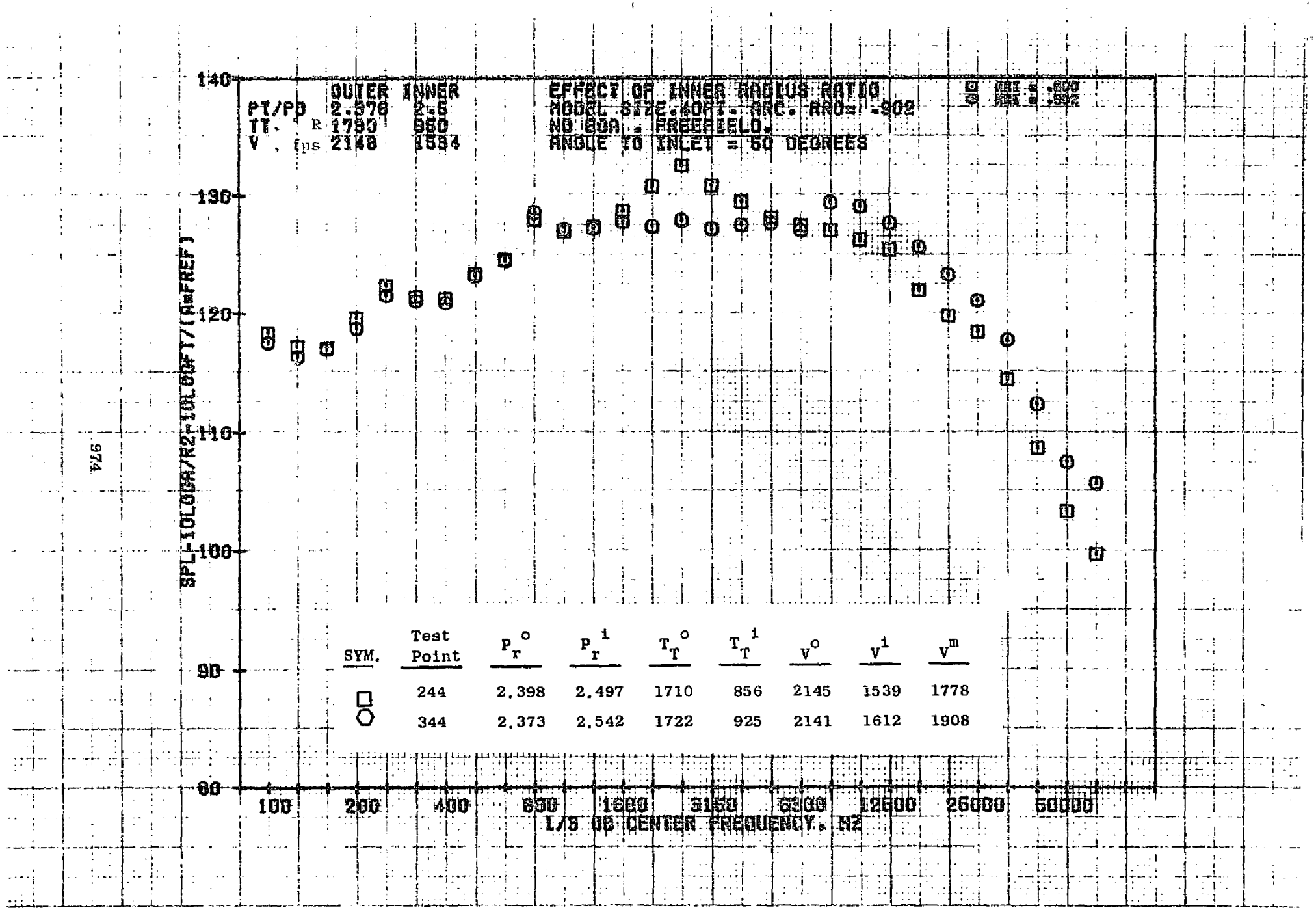

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18727-001

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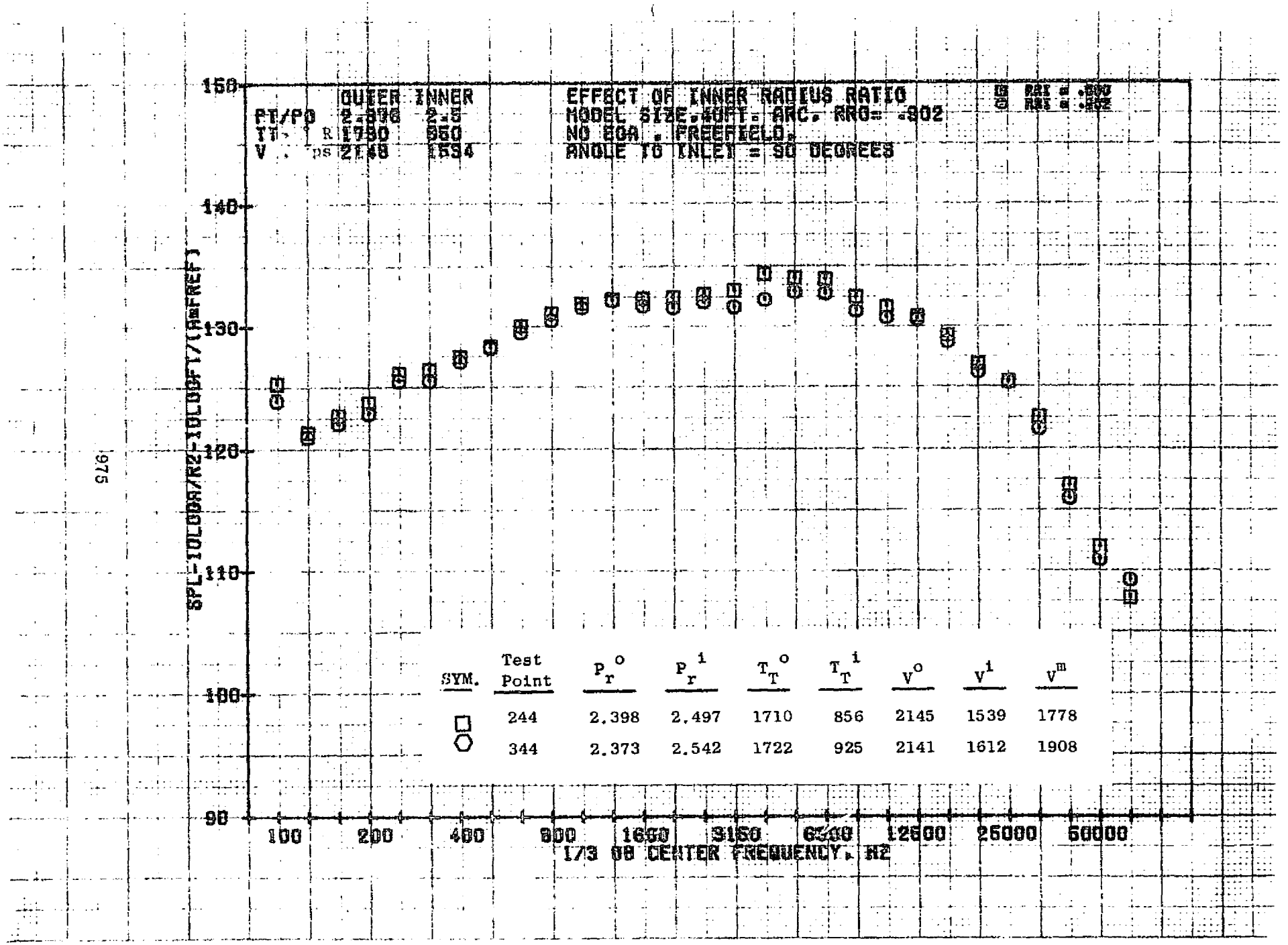

11/04/78
18727-001

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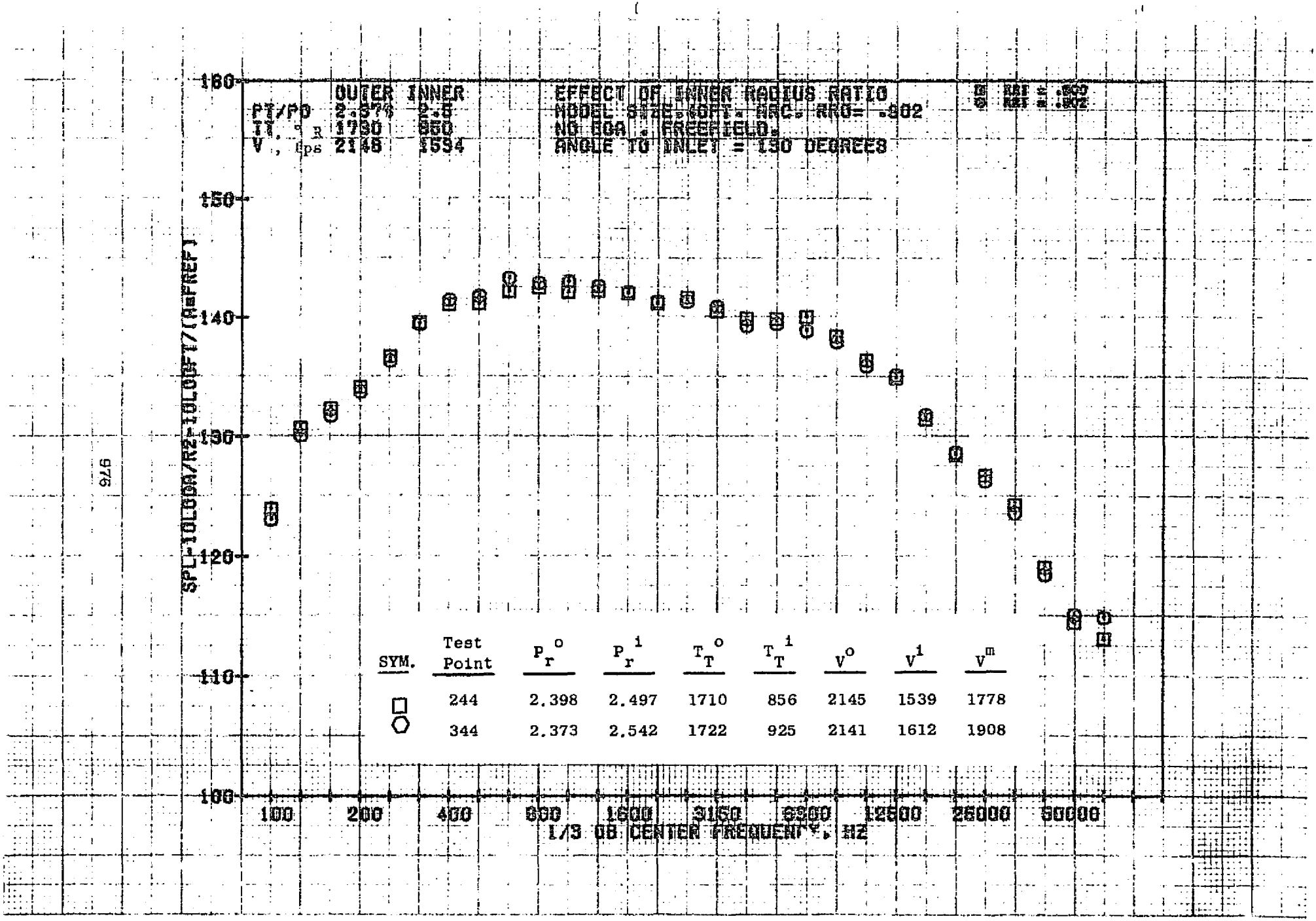

11/04/76
18727-001

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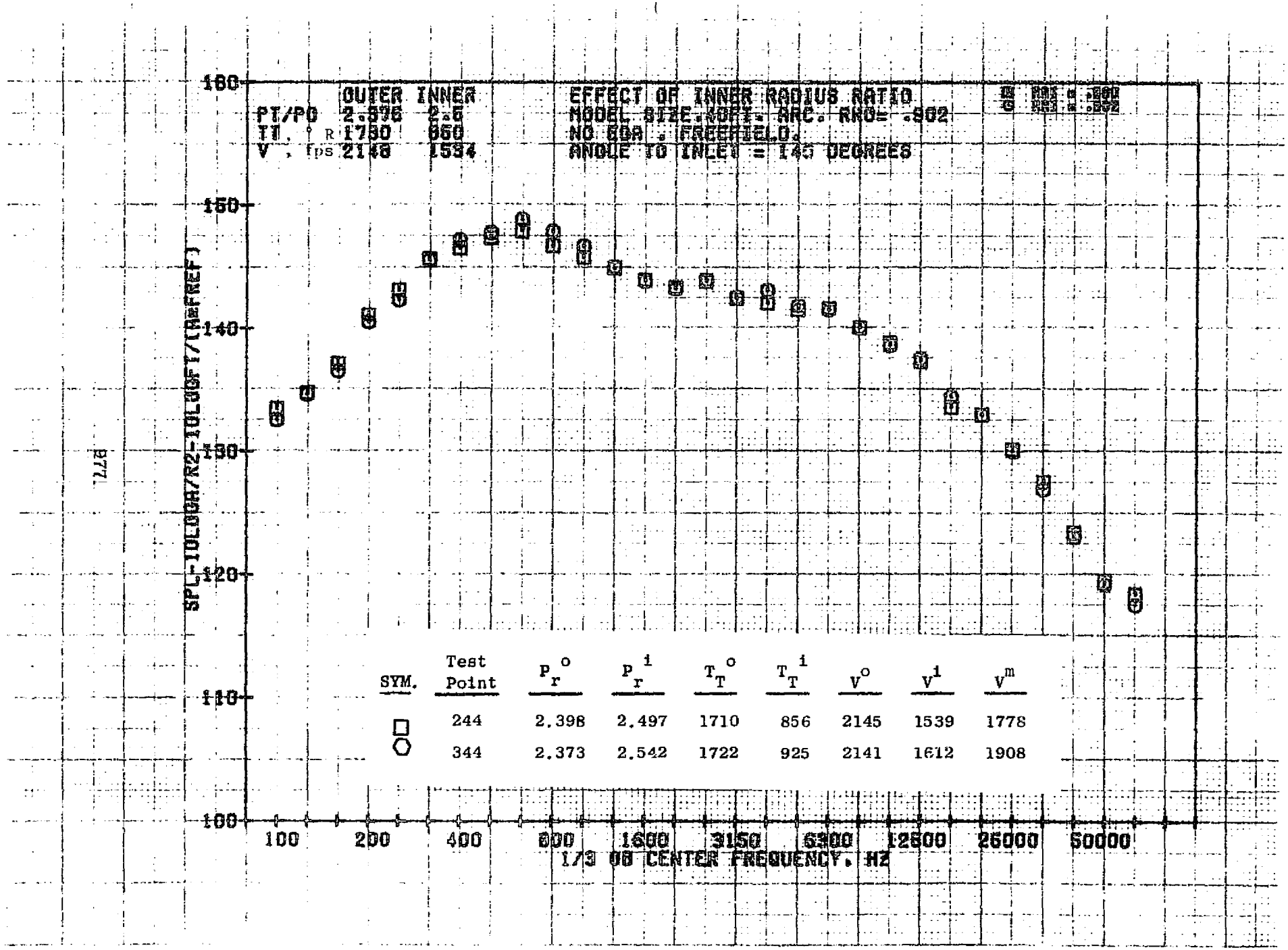

11/04/76
18727-001

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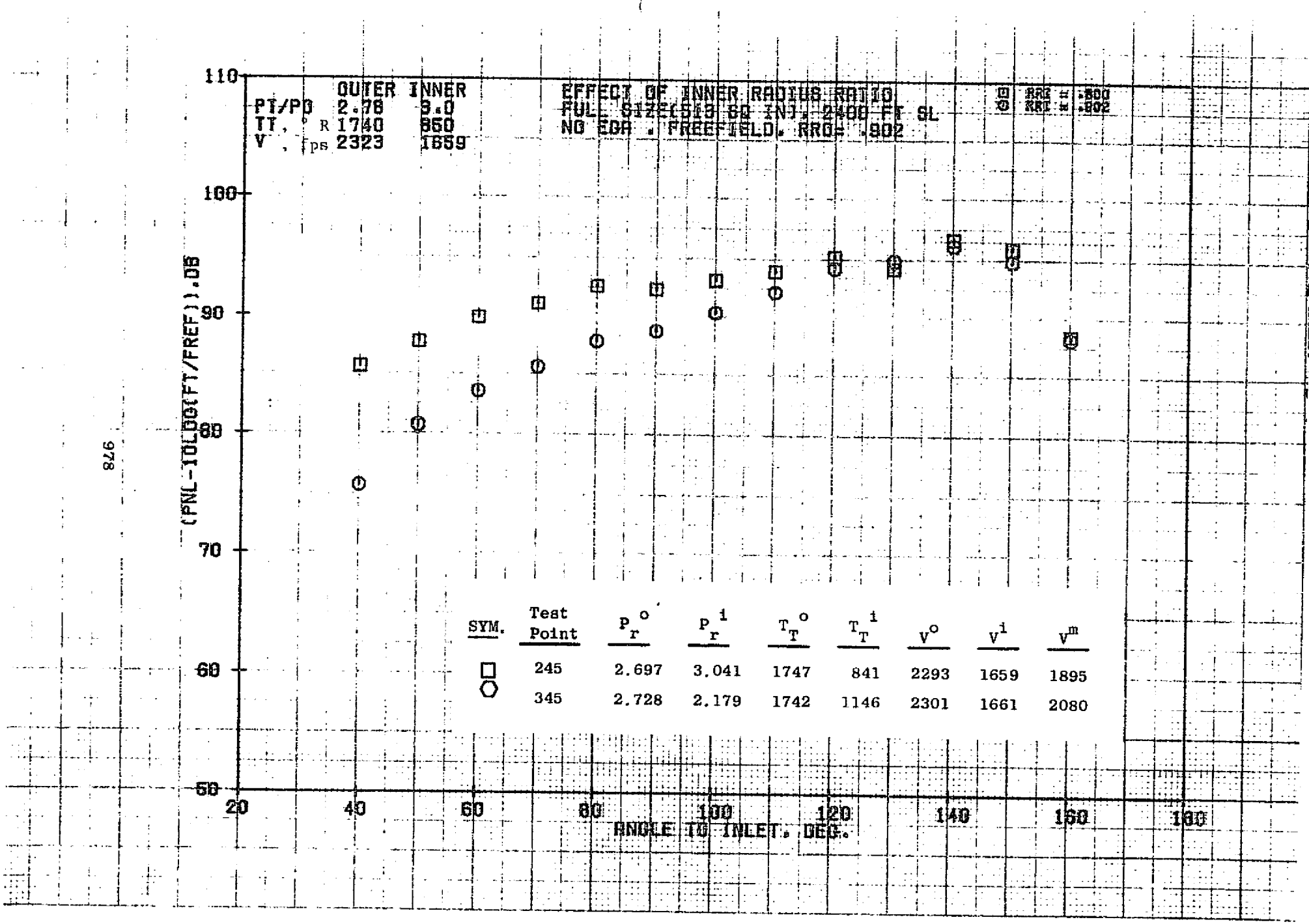

978

10/29/76
18124-001

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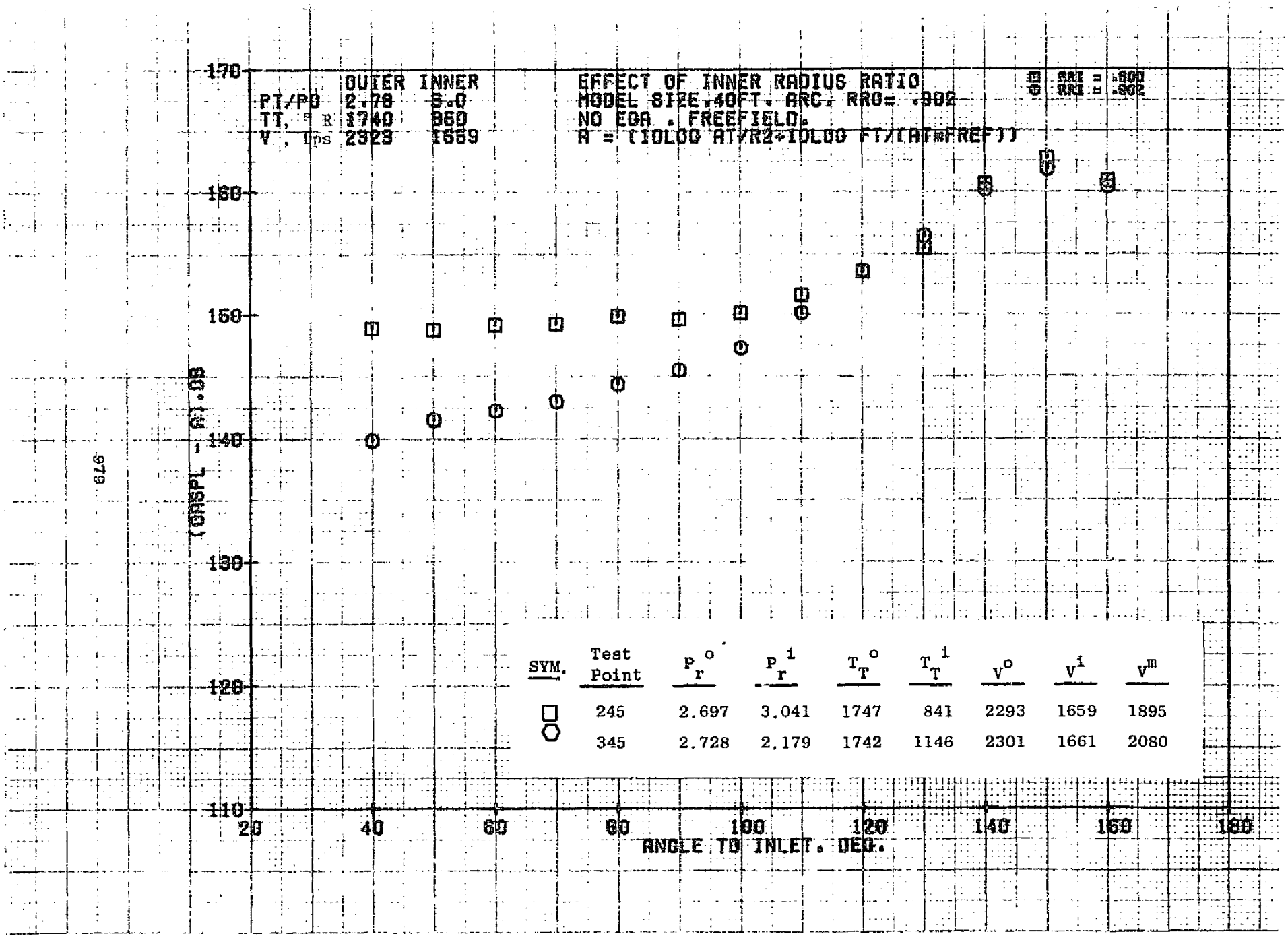

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1B161-001

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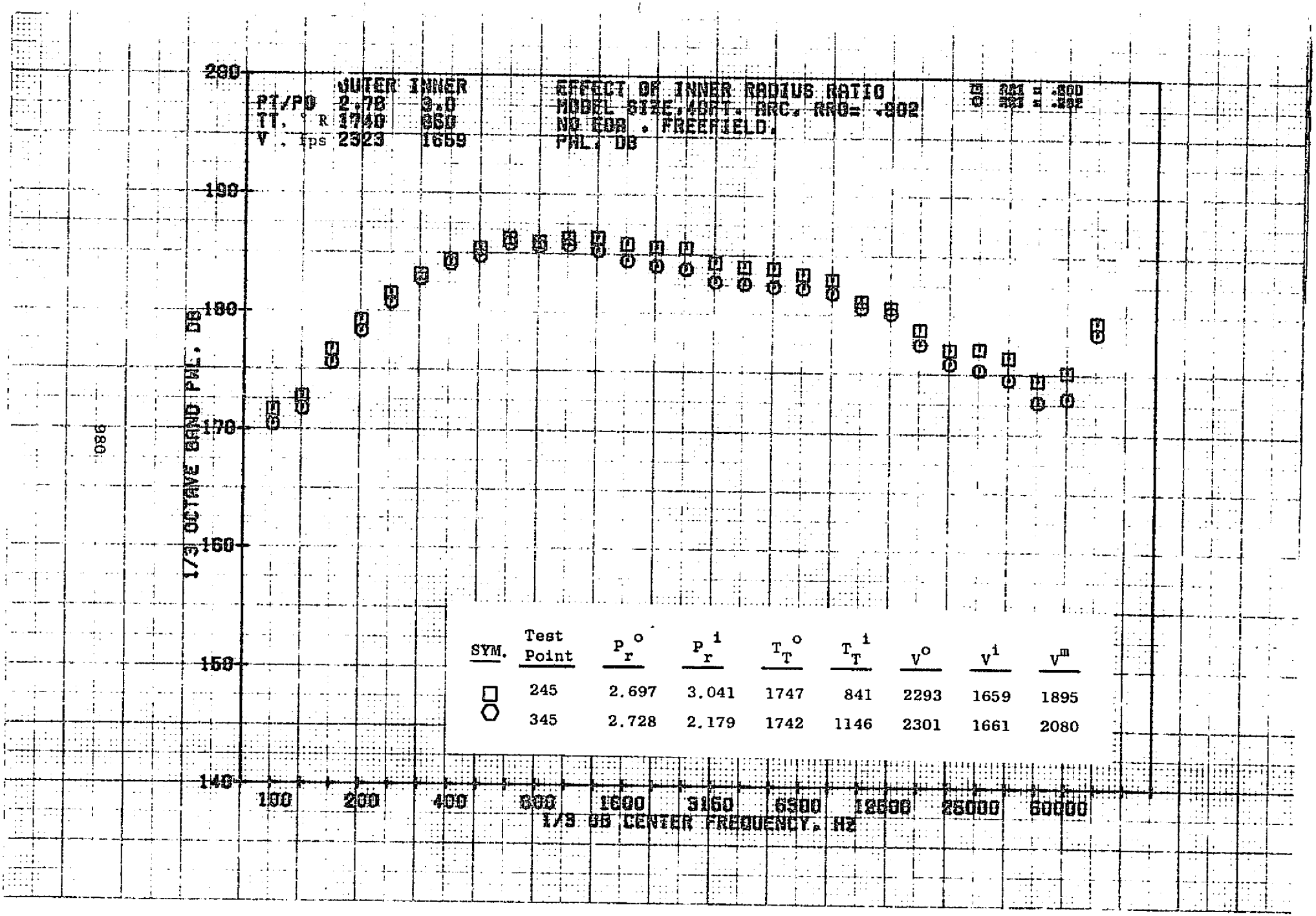

10/29/76
18161-001

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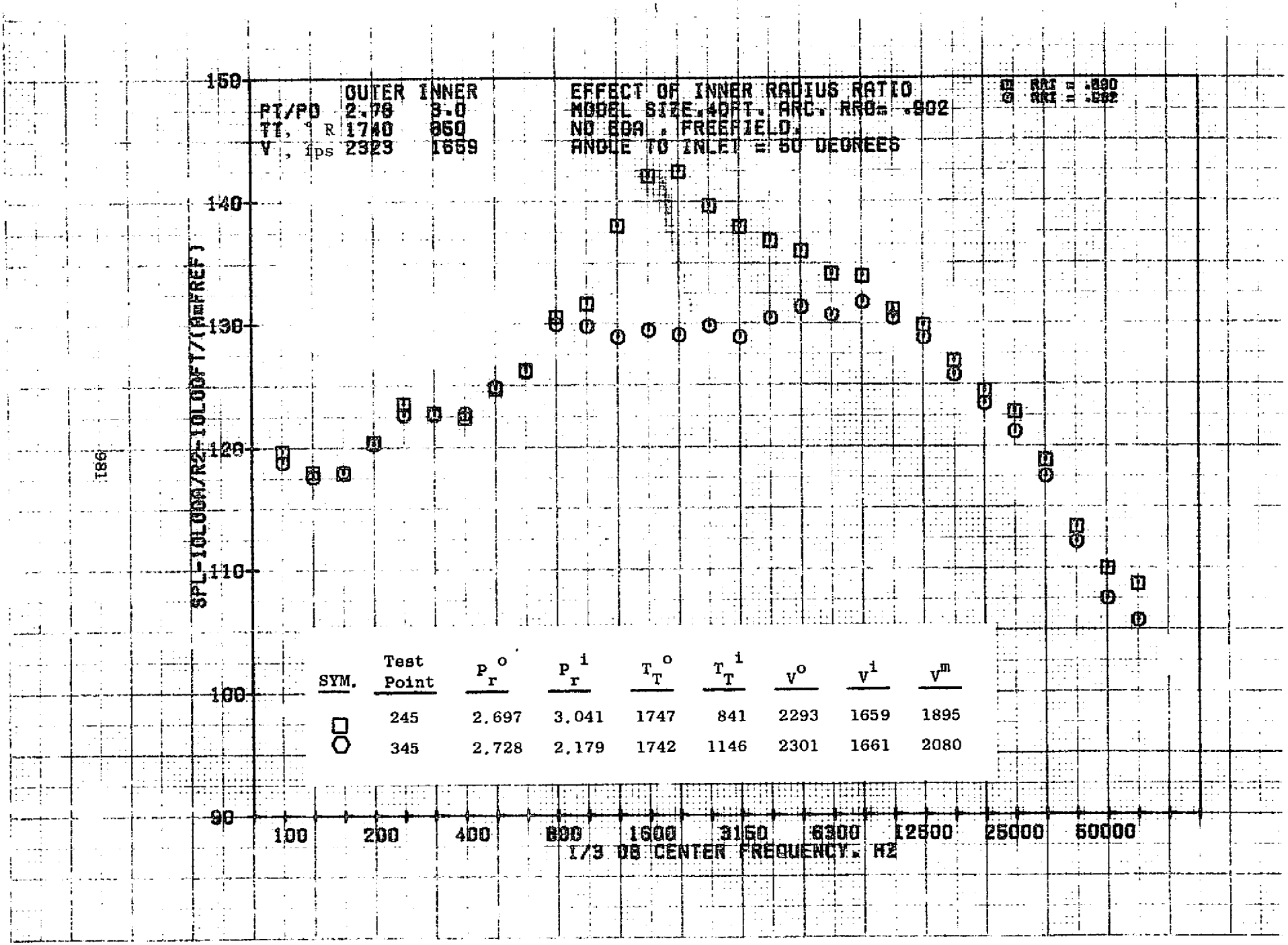

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18161-001

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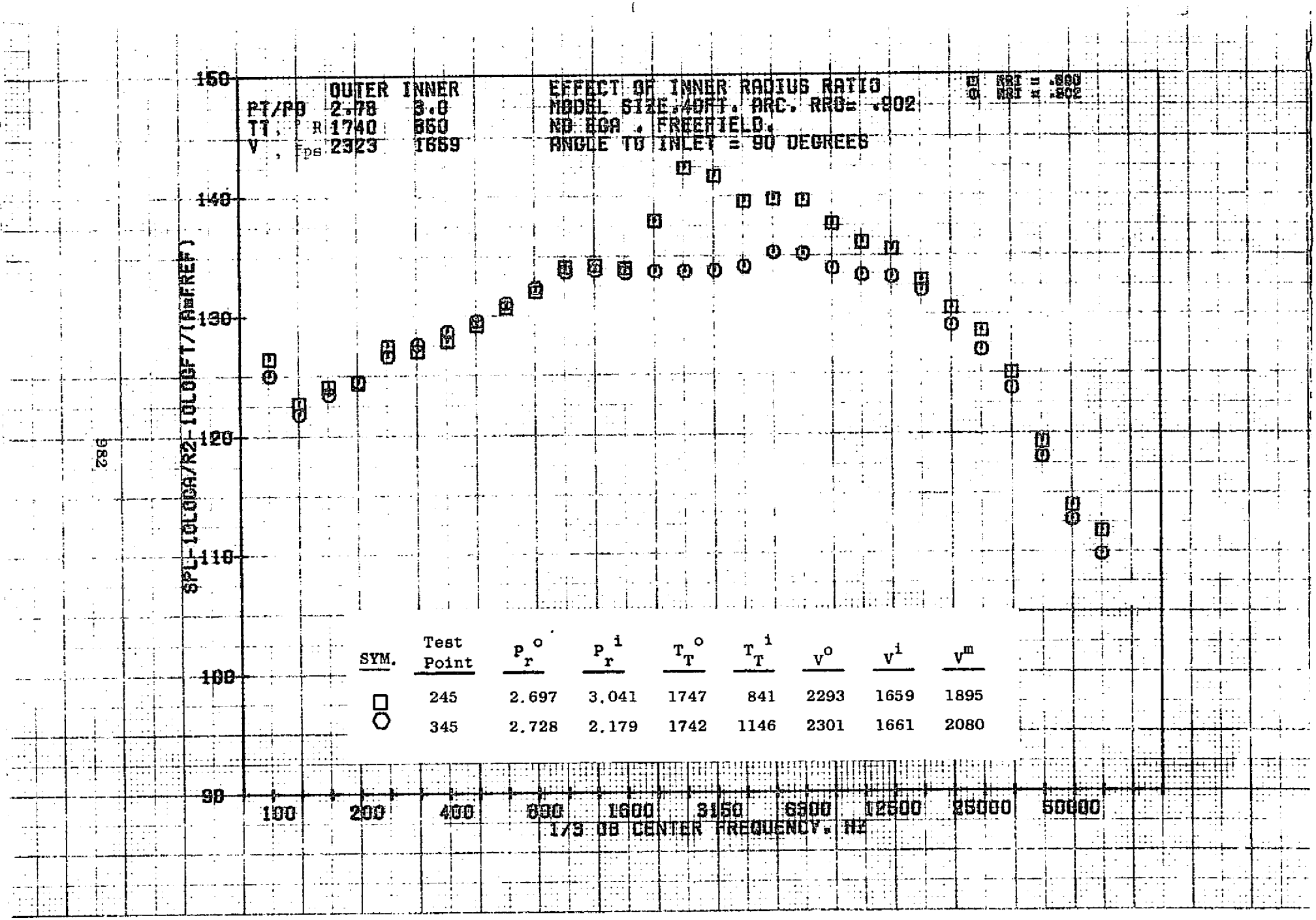

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18161-001

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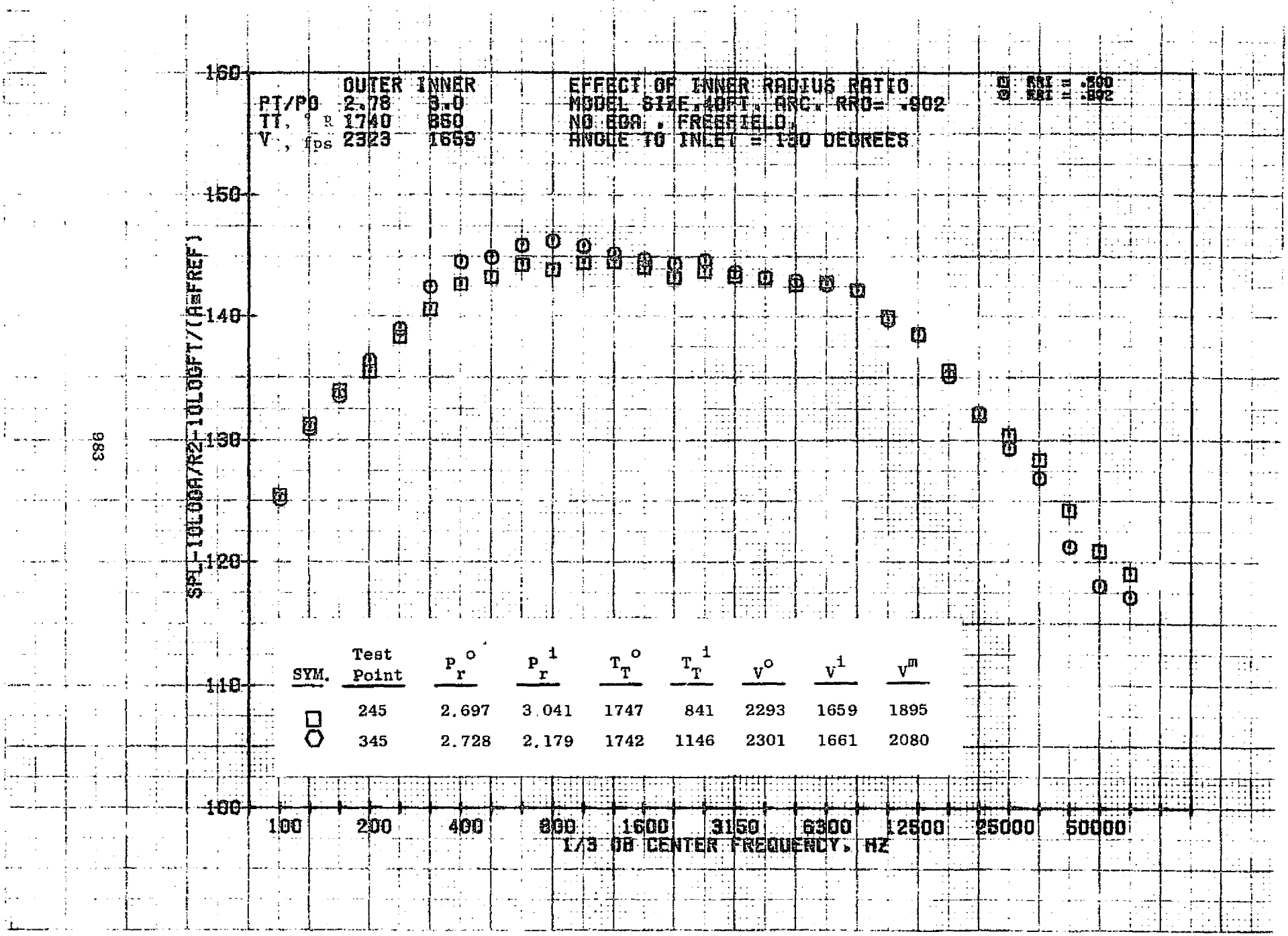

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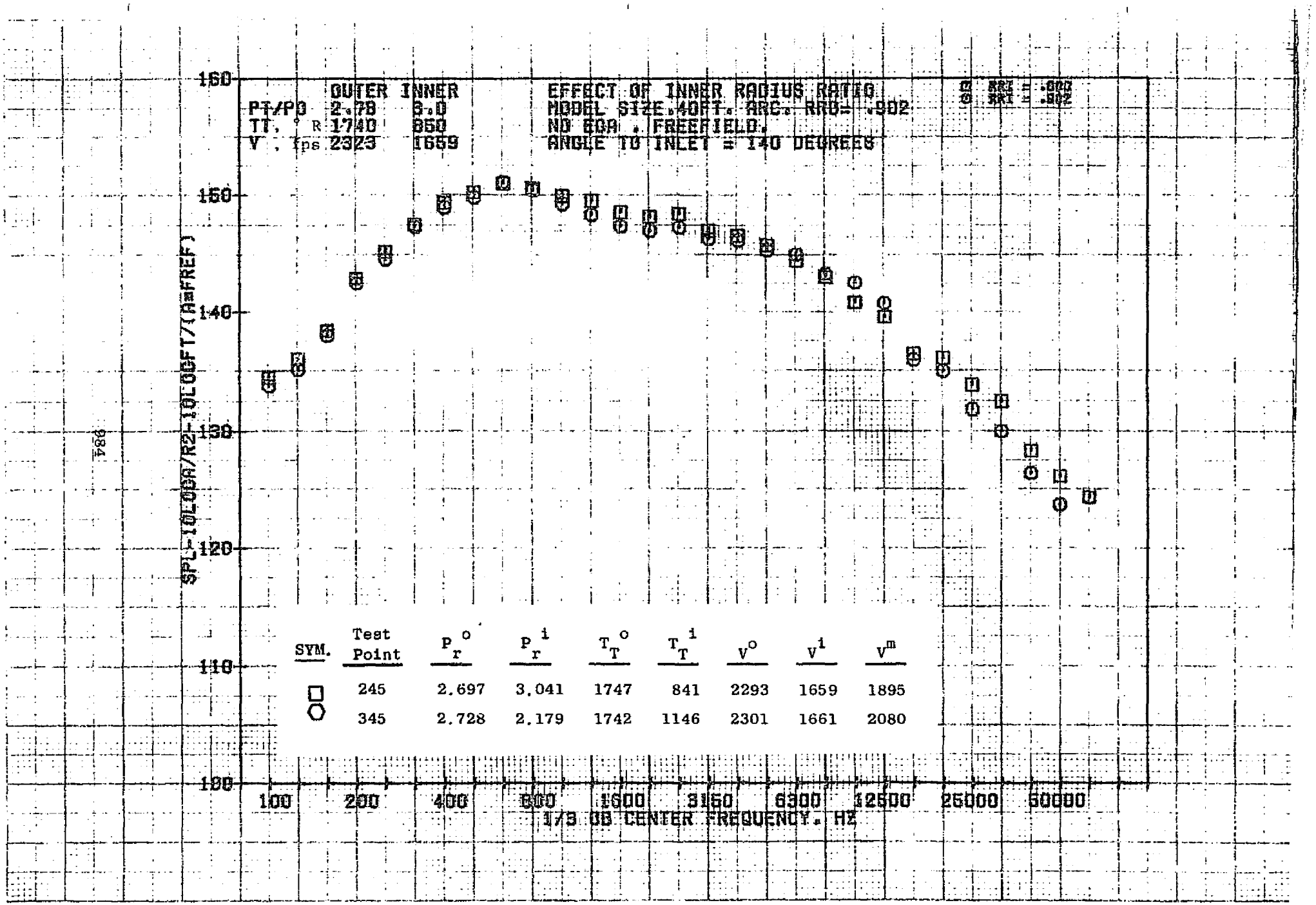

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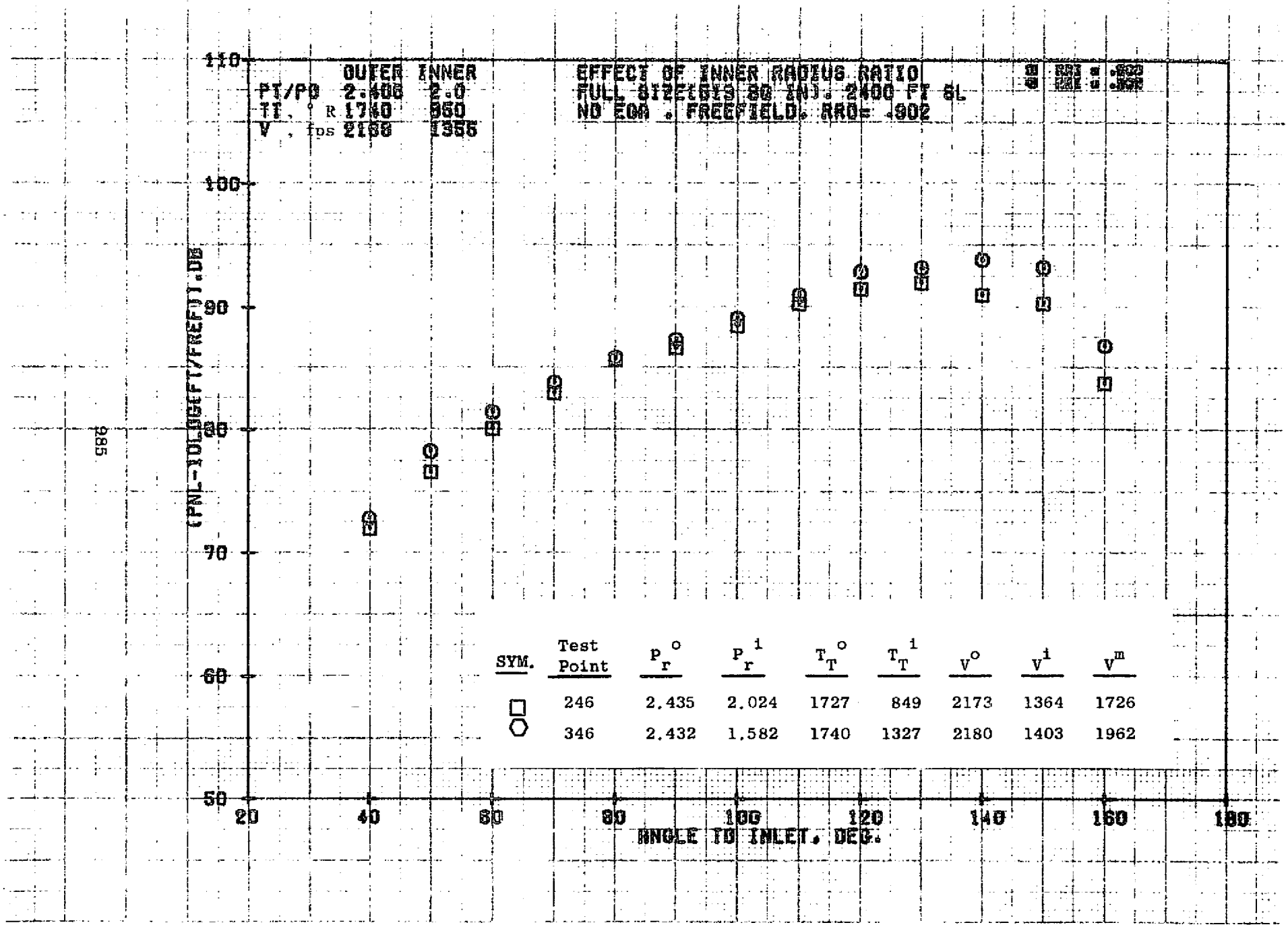

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18680-001

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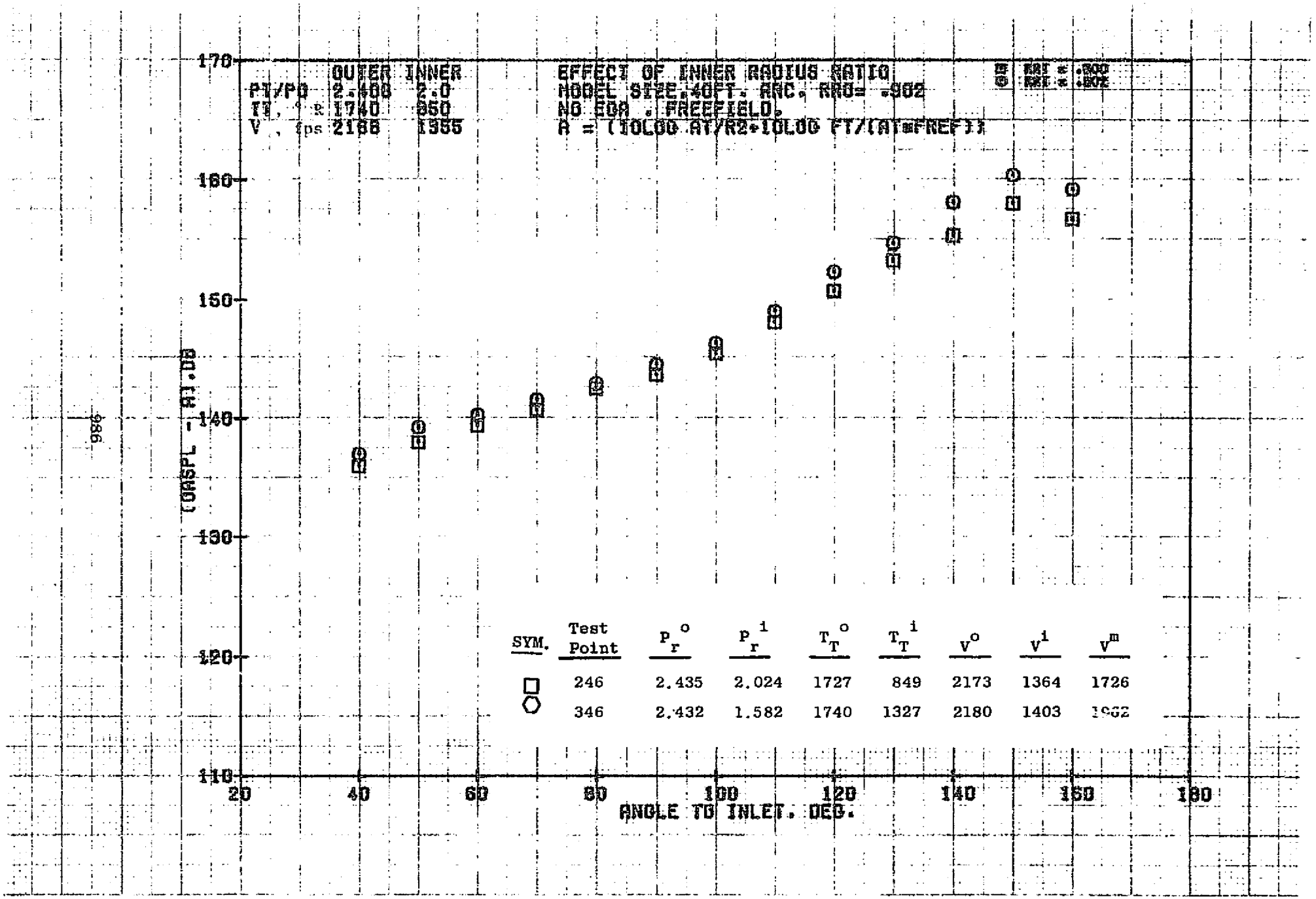

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18727-001

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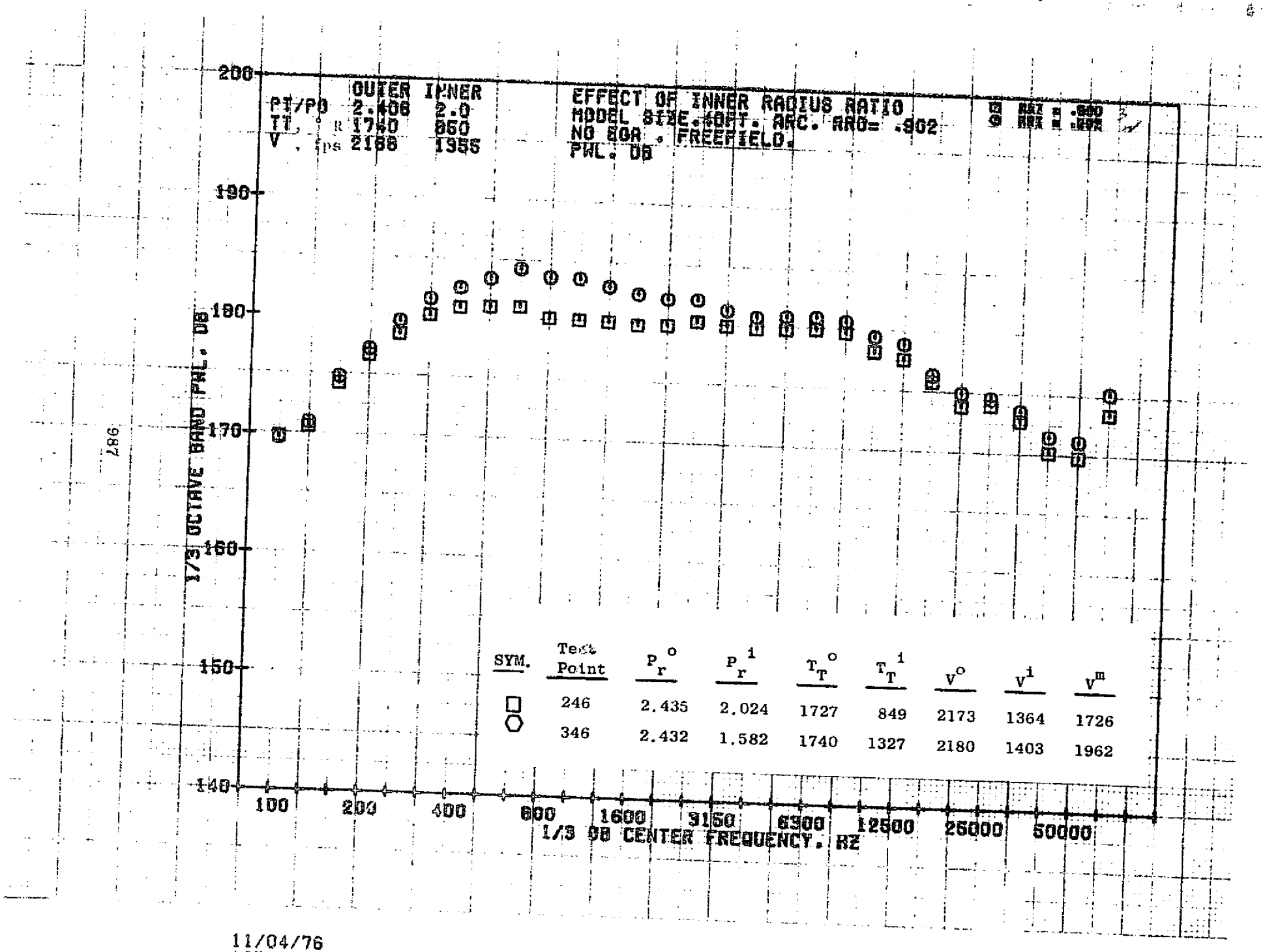

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18727-001

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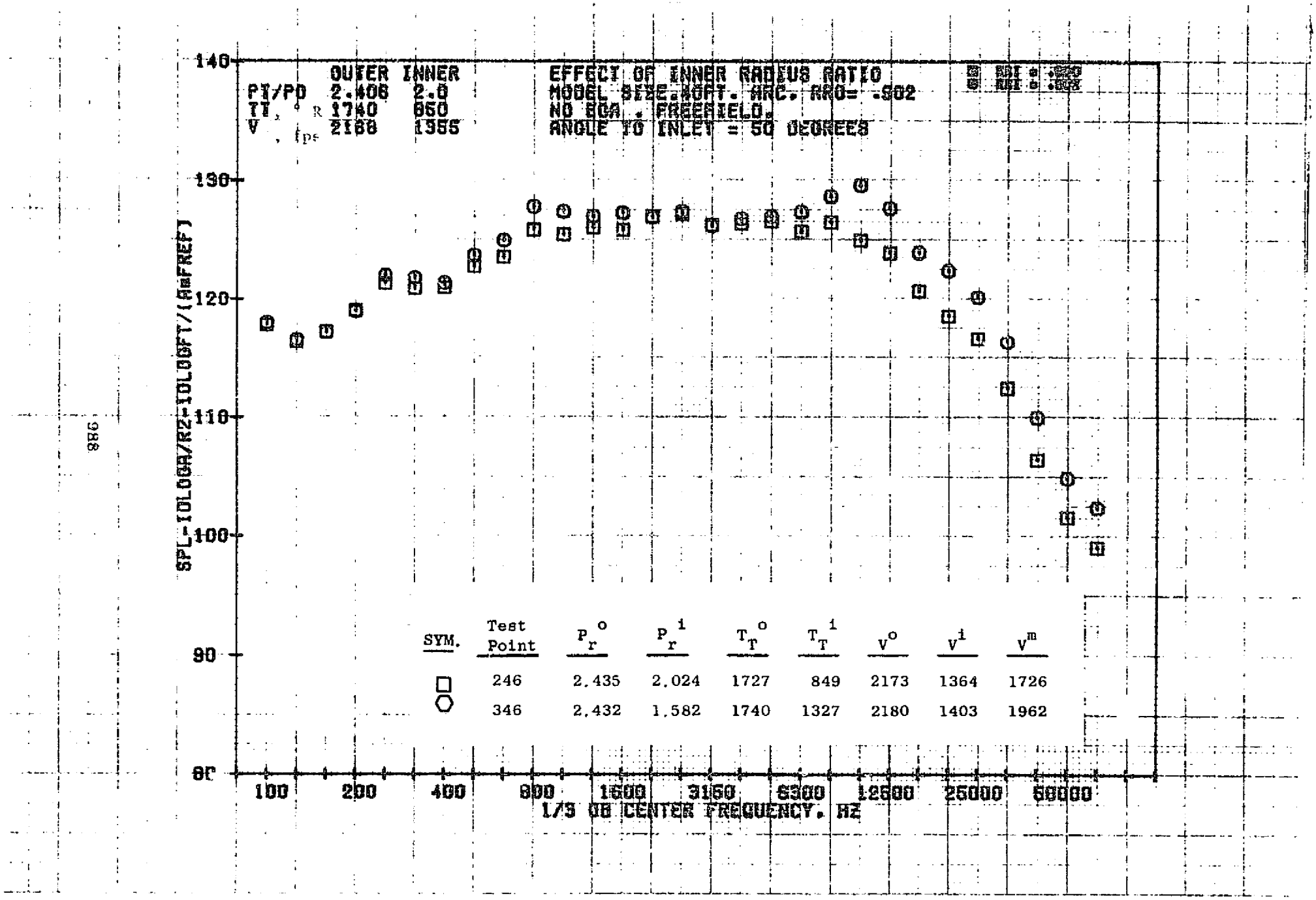

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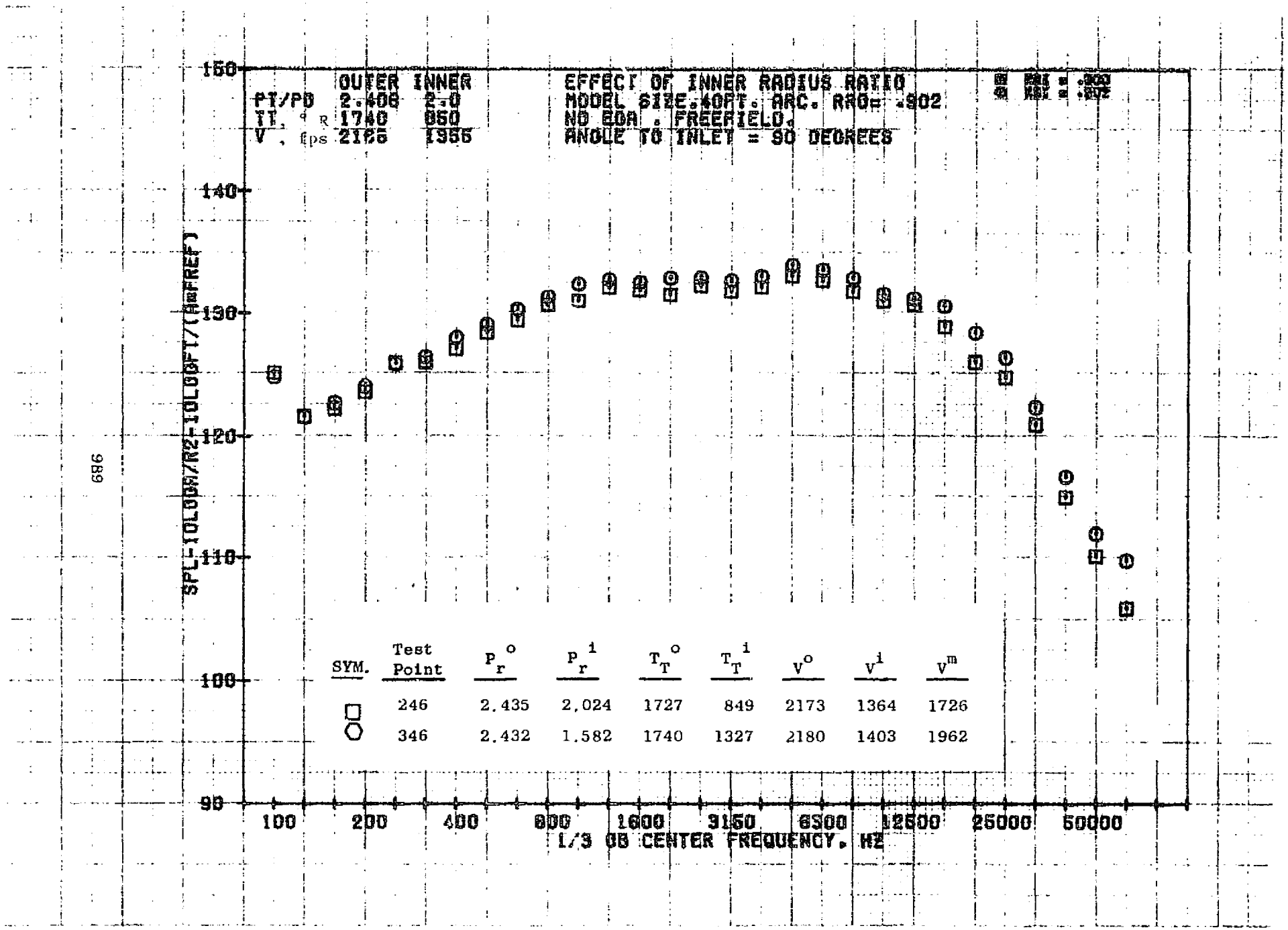

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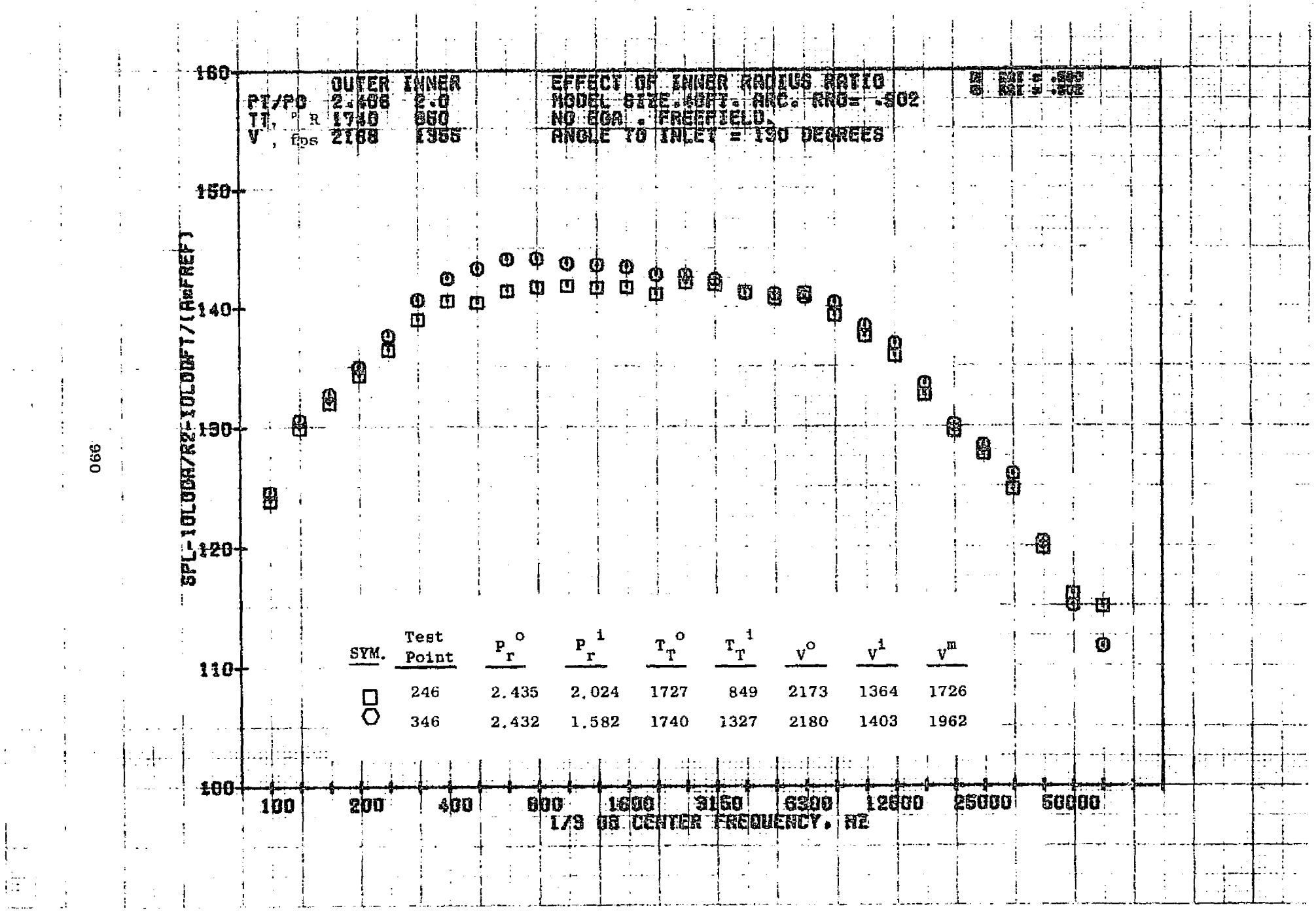

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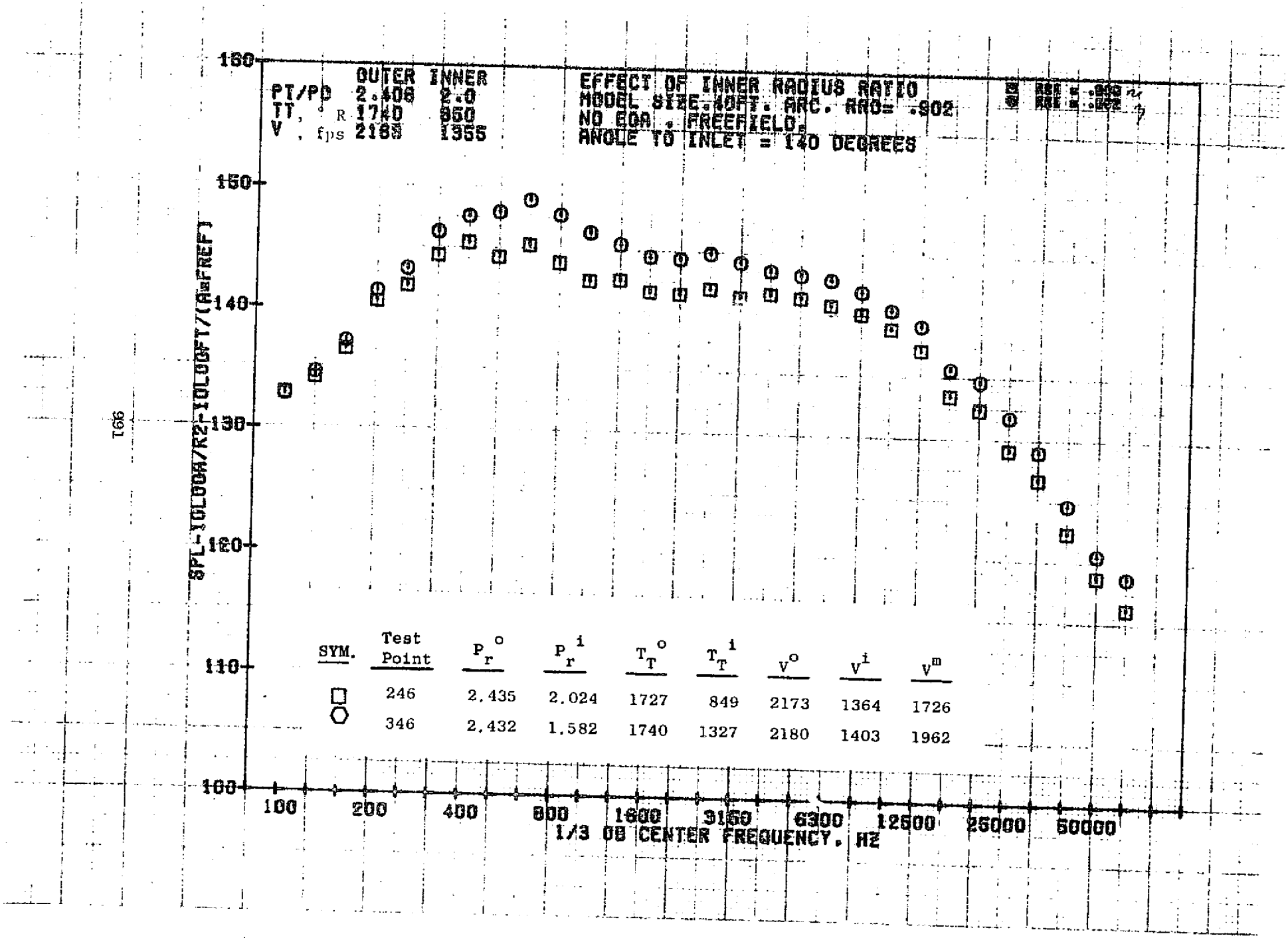

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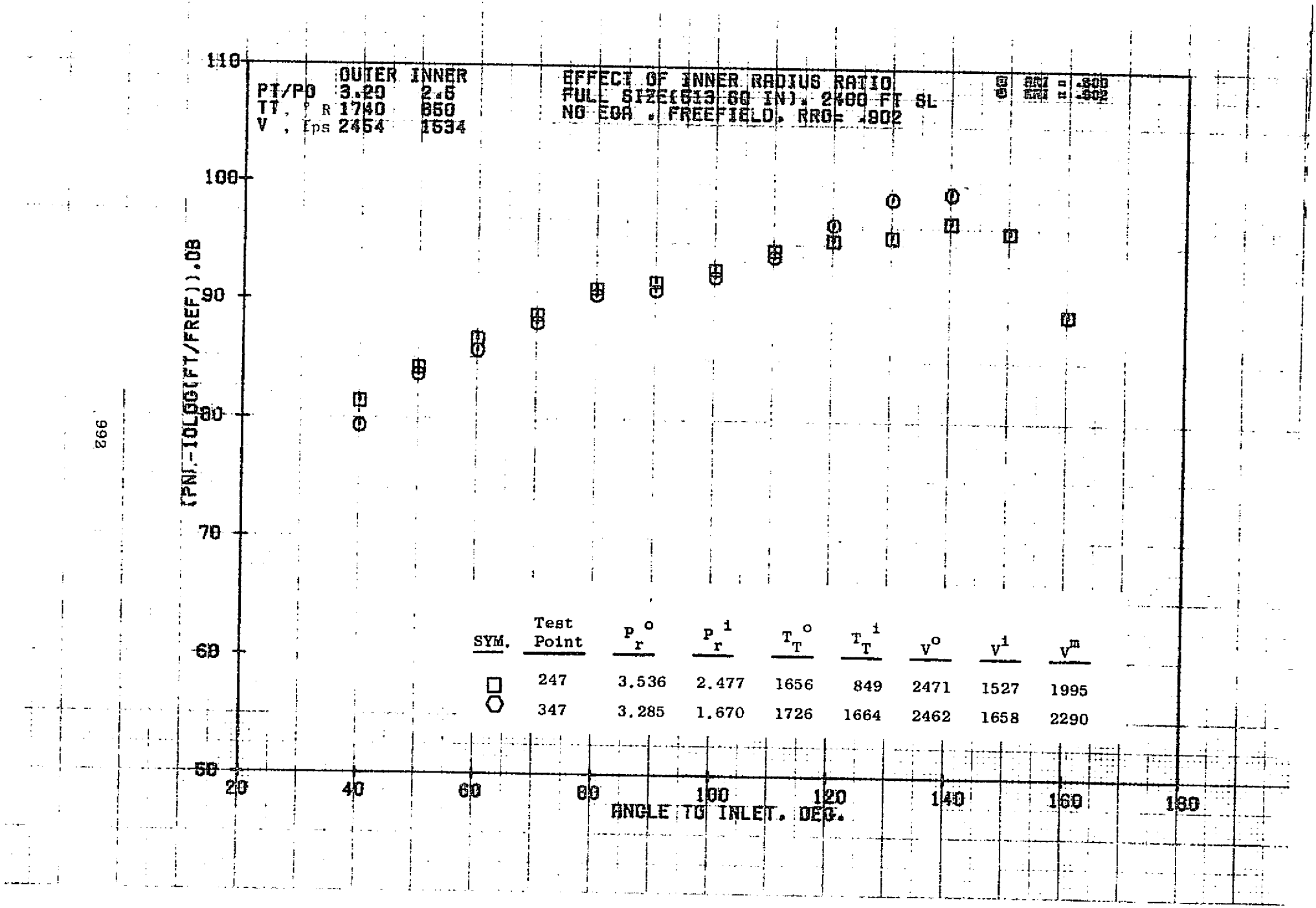

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18124-001

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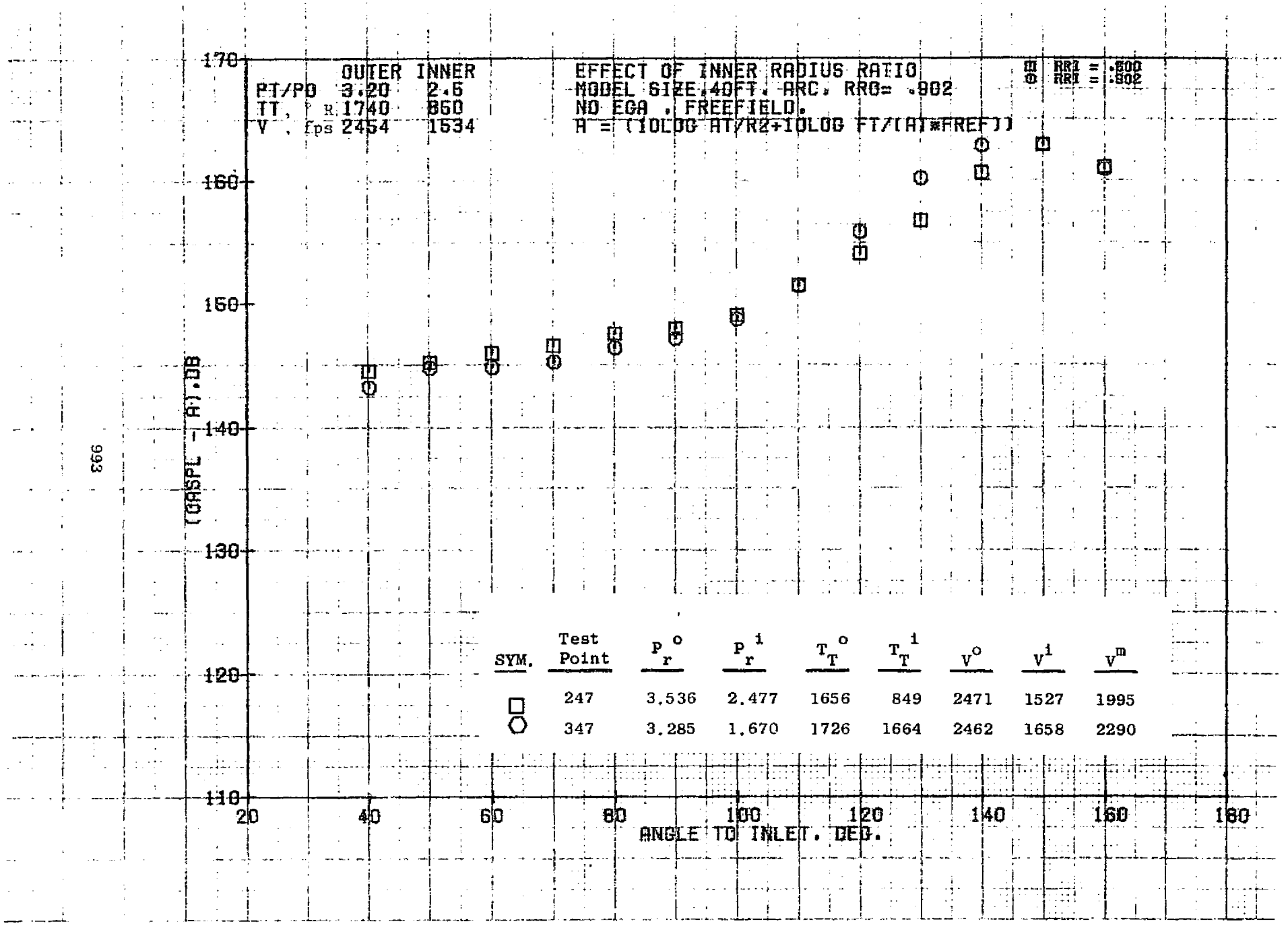

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1B161-001

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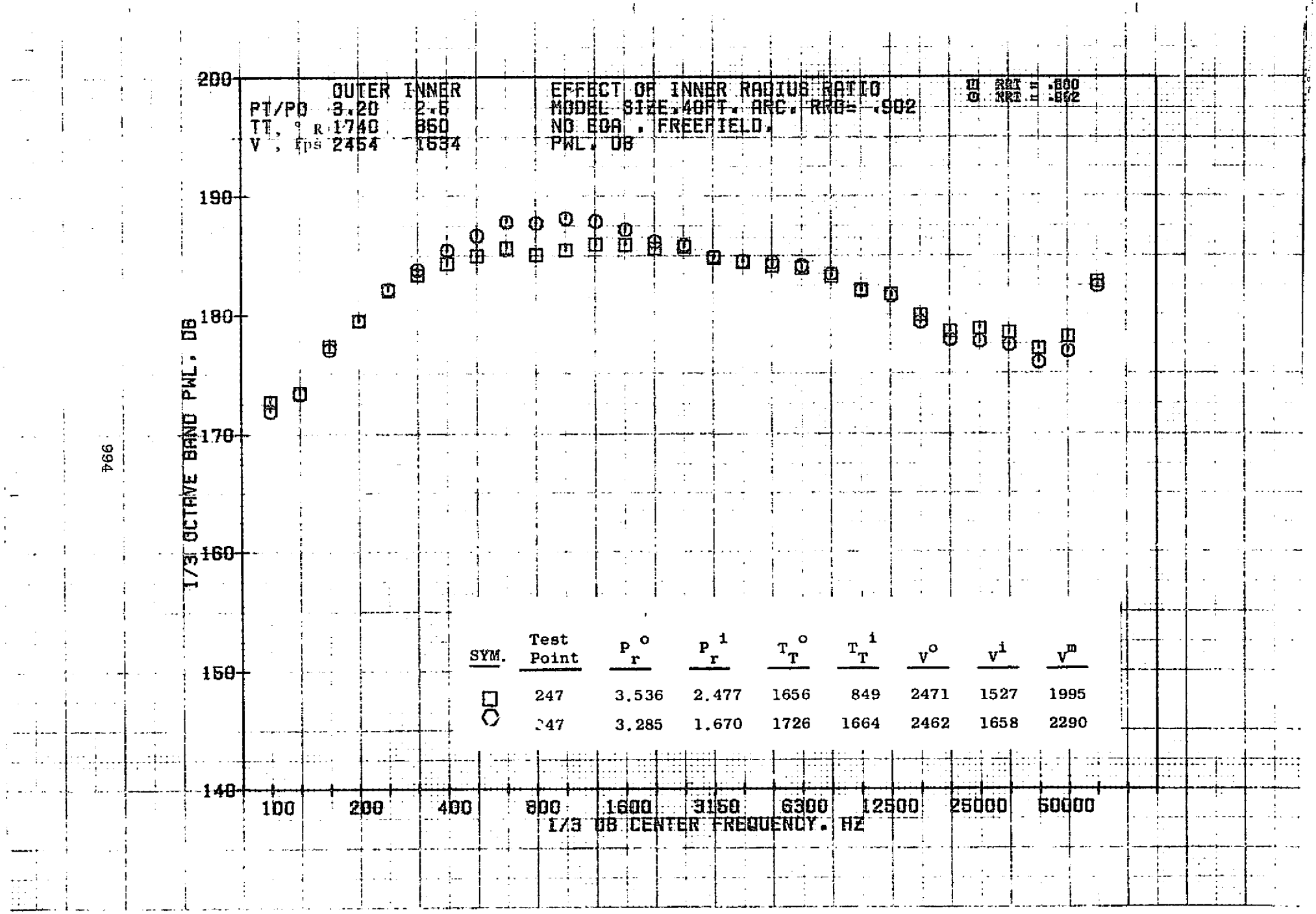

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18161-001

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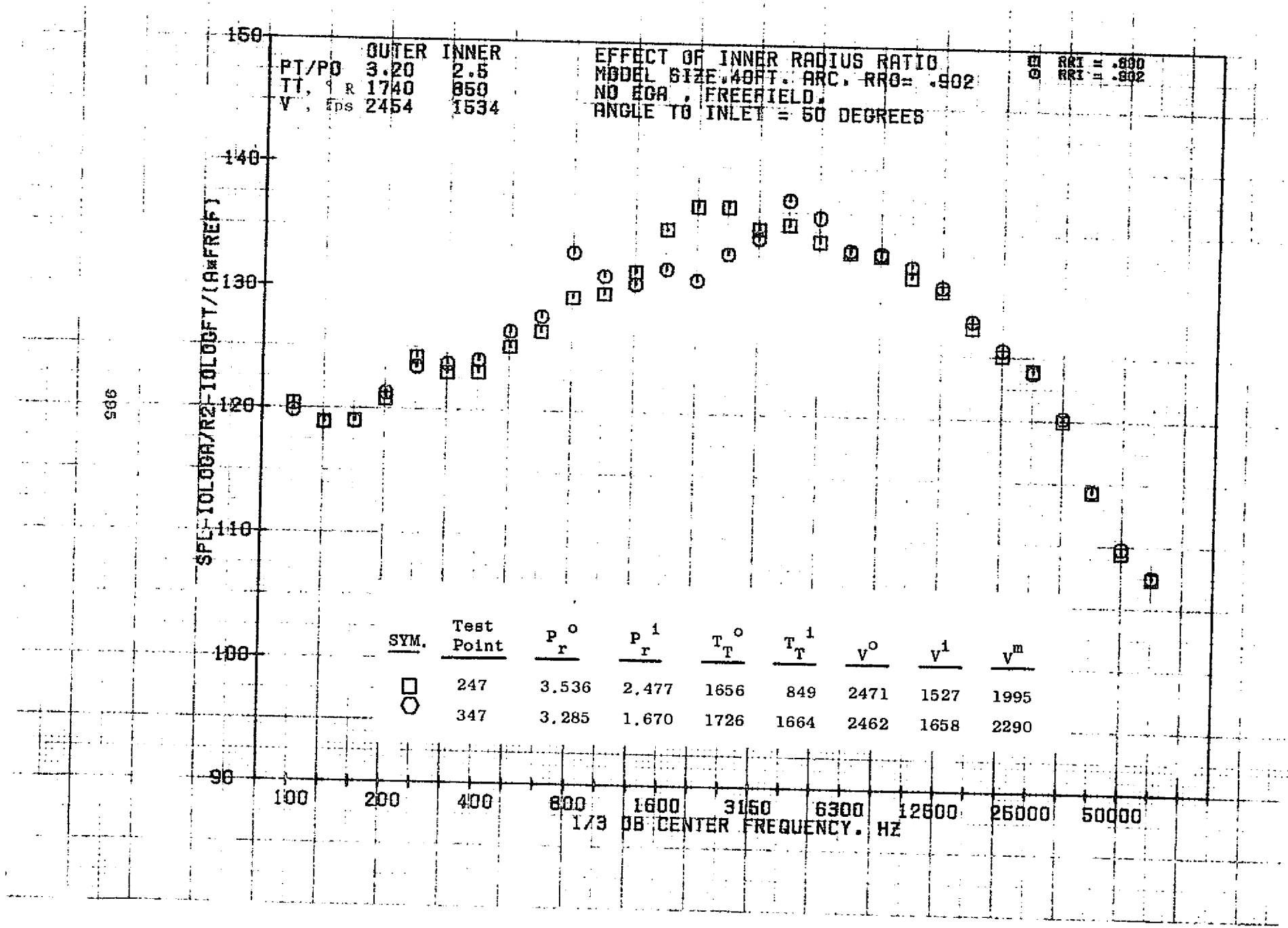

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18161-001

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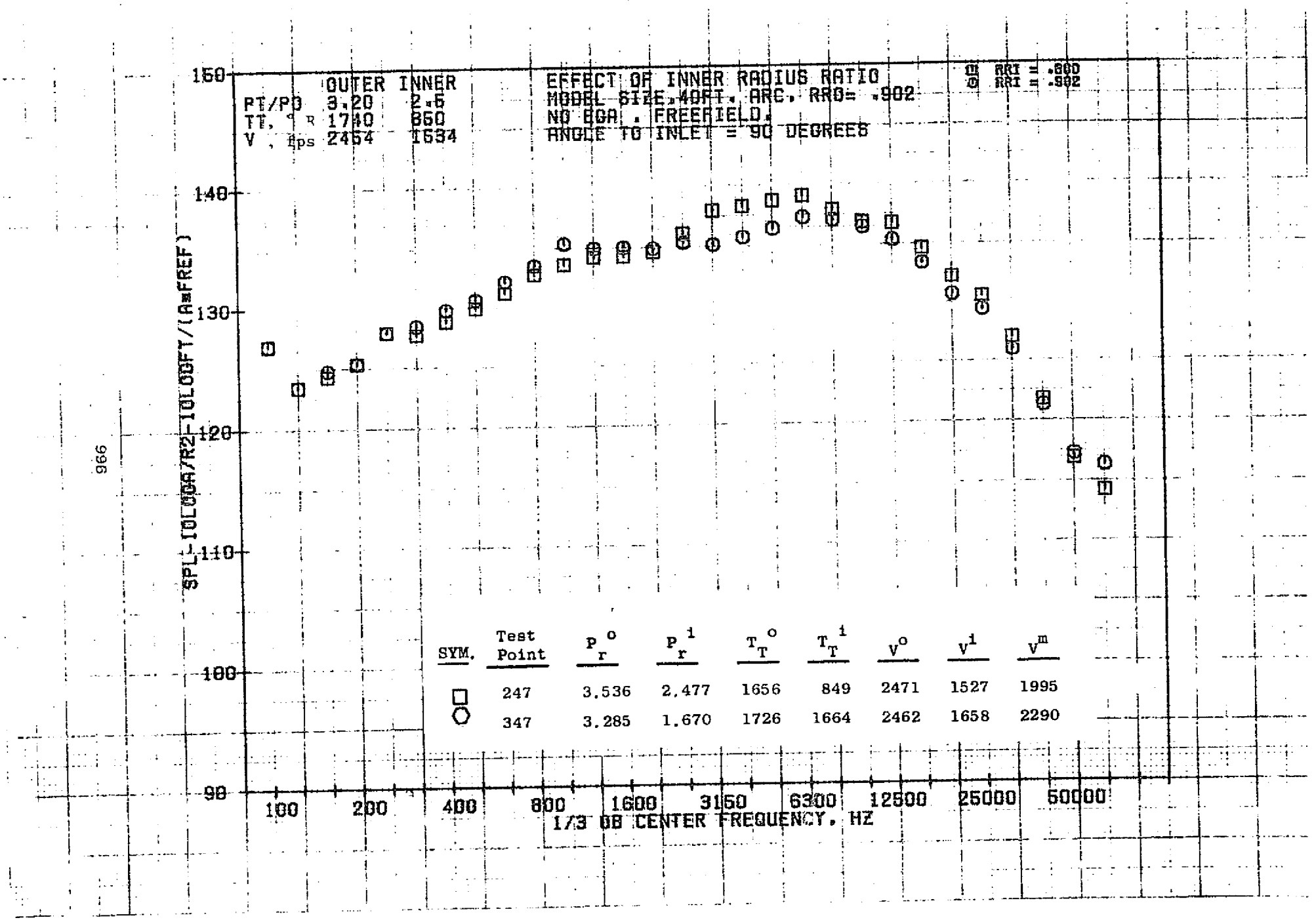

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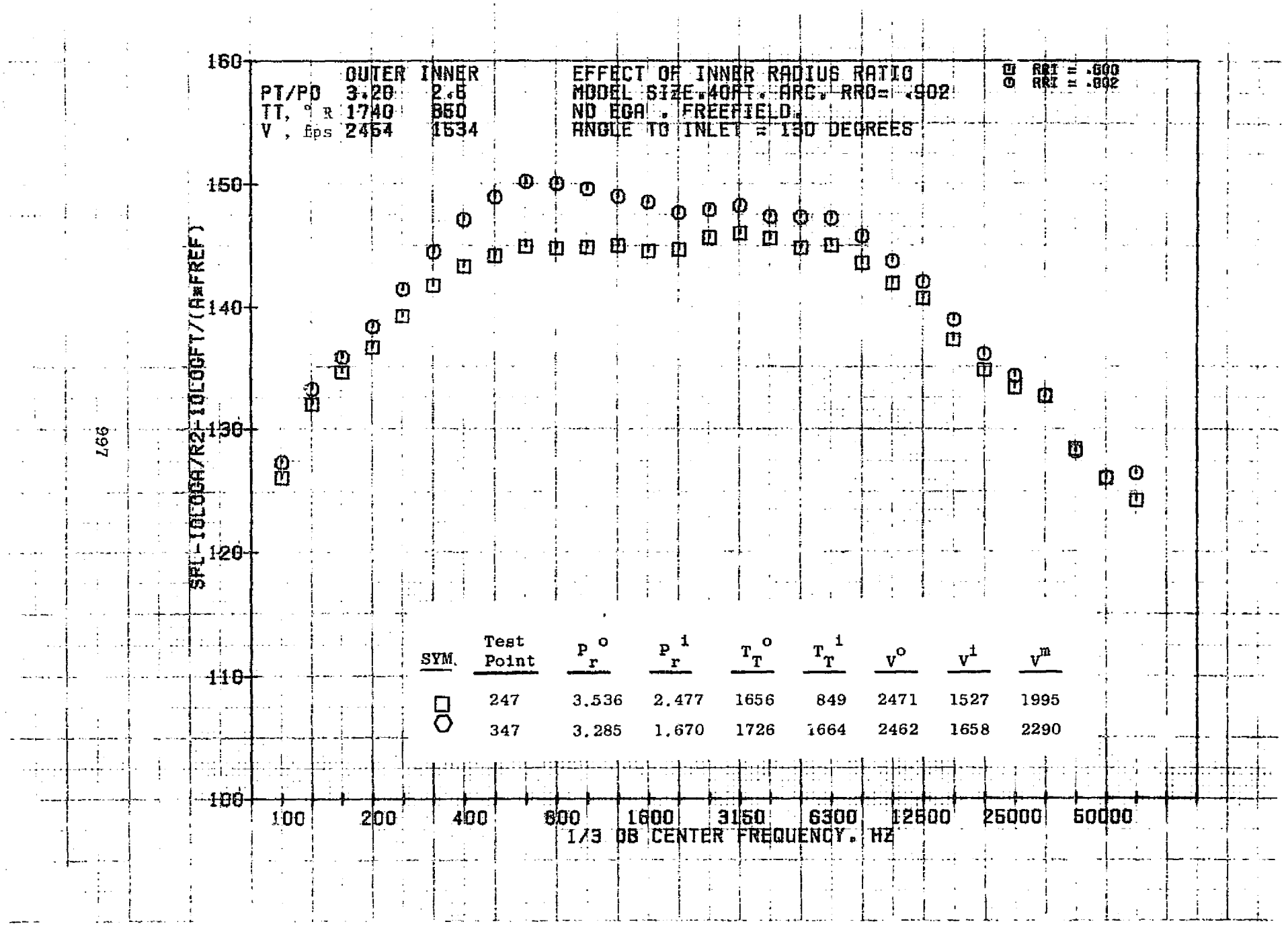

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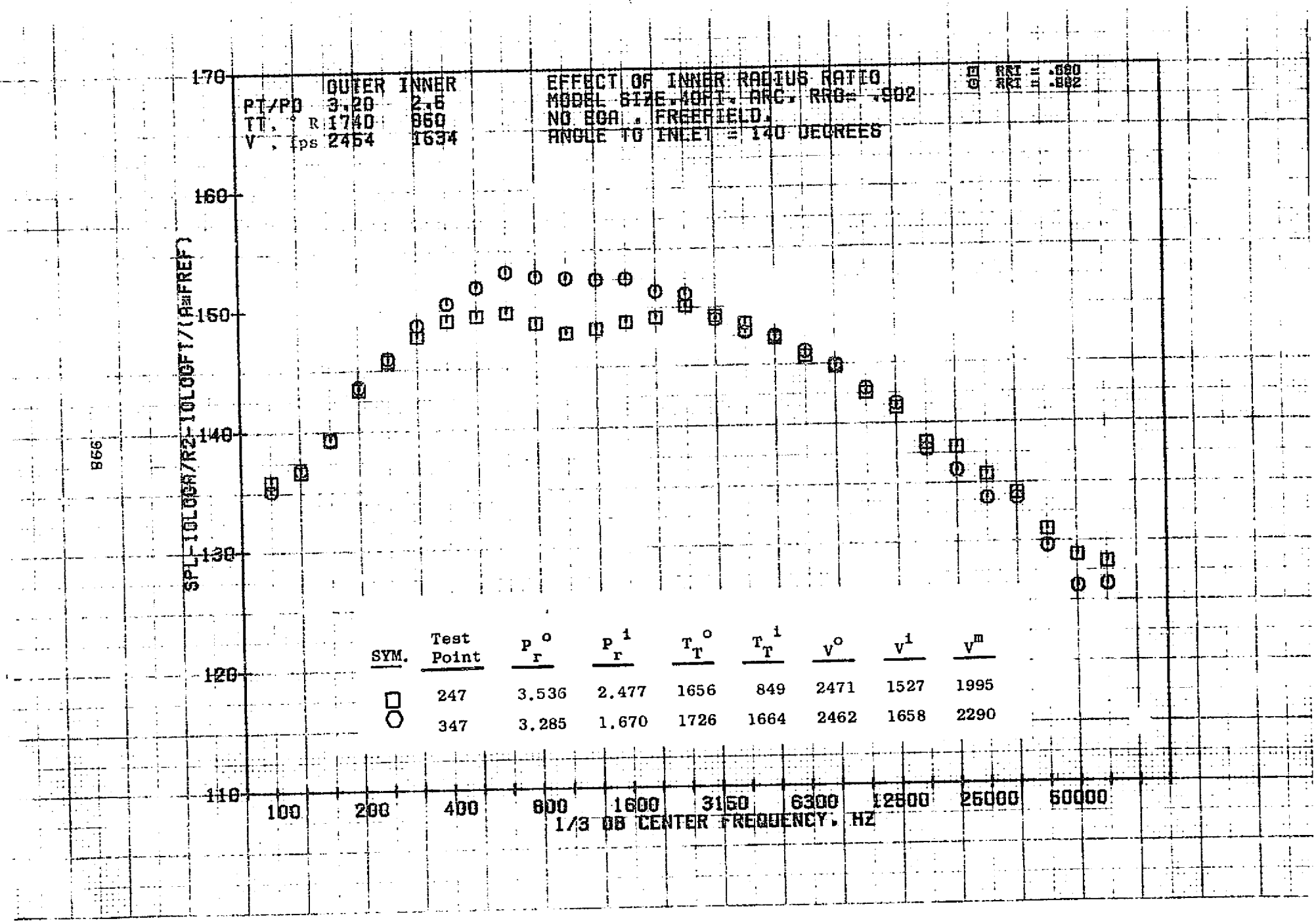

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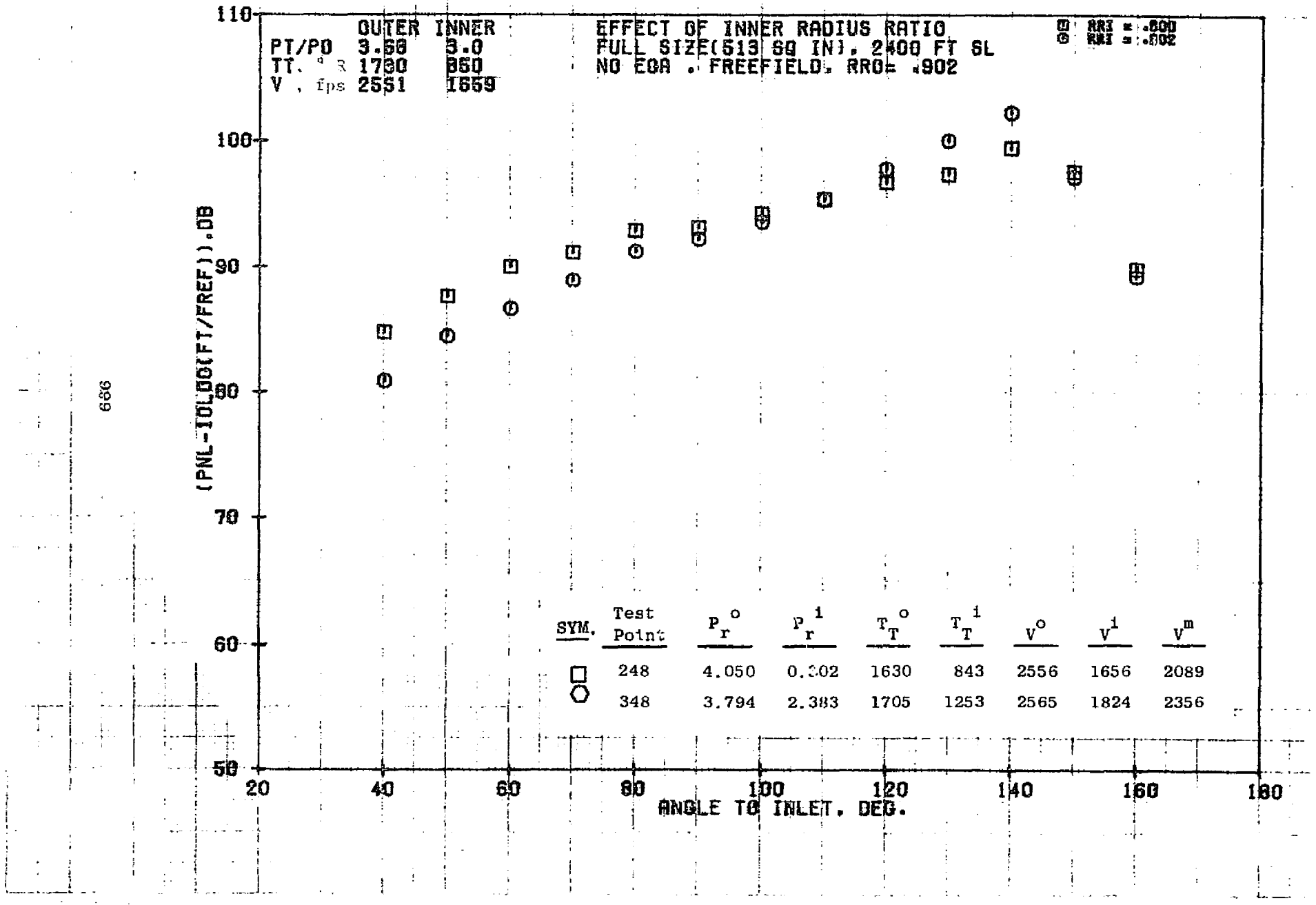

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18124-001

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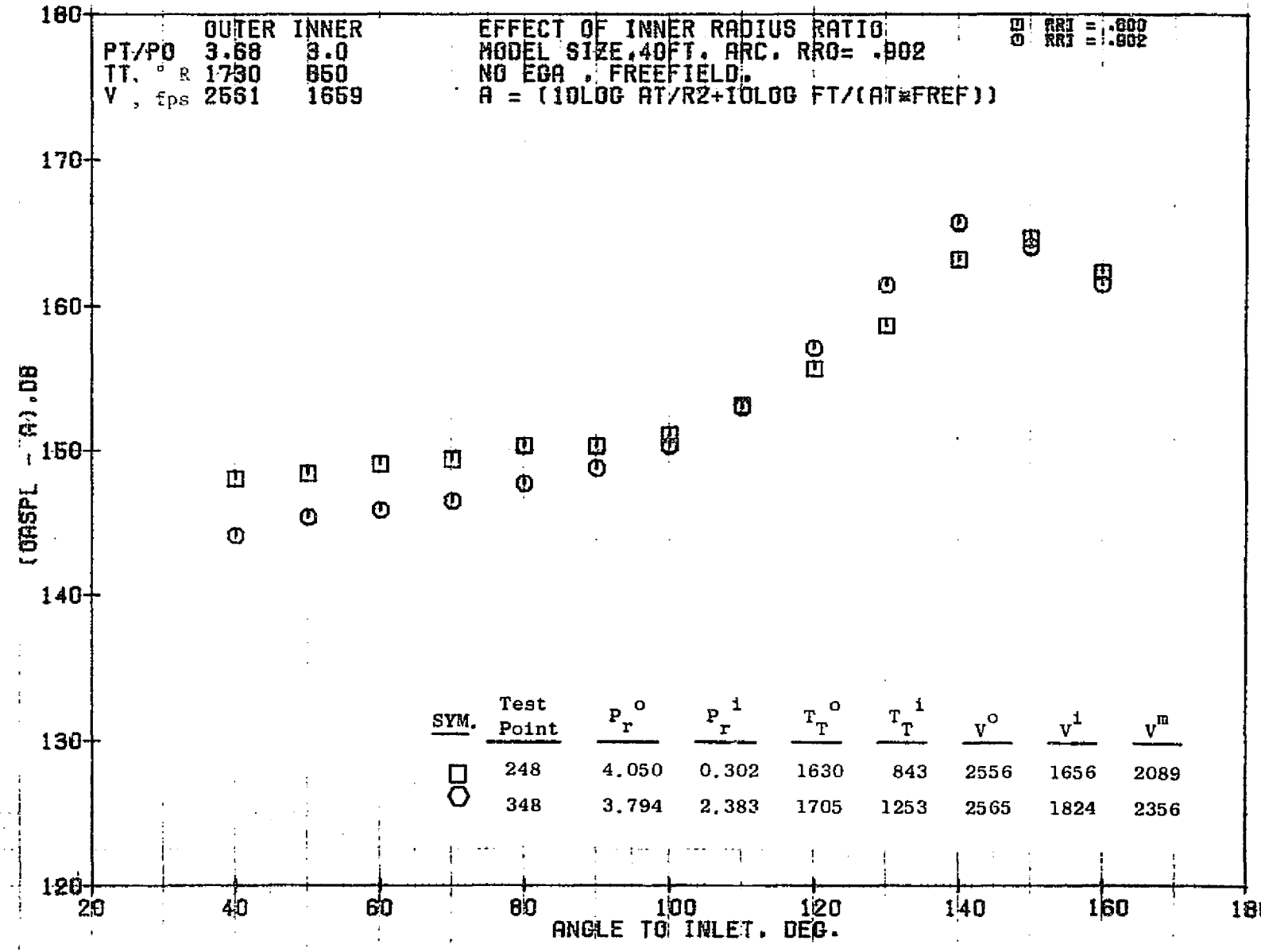

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10/29/76
18161-001

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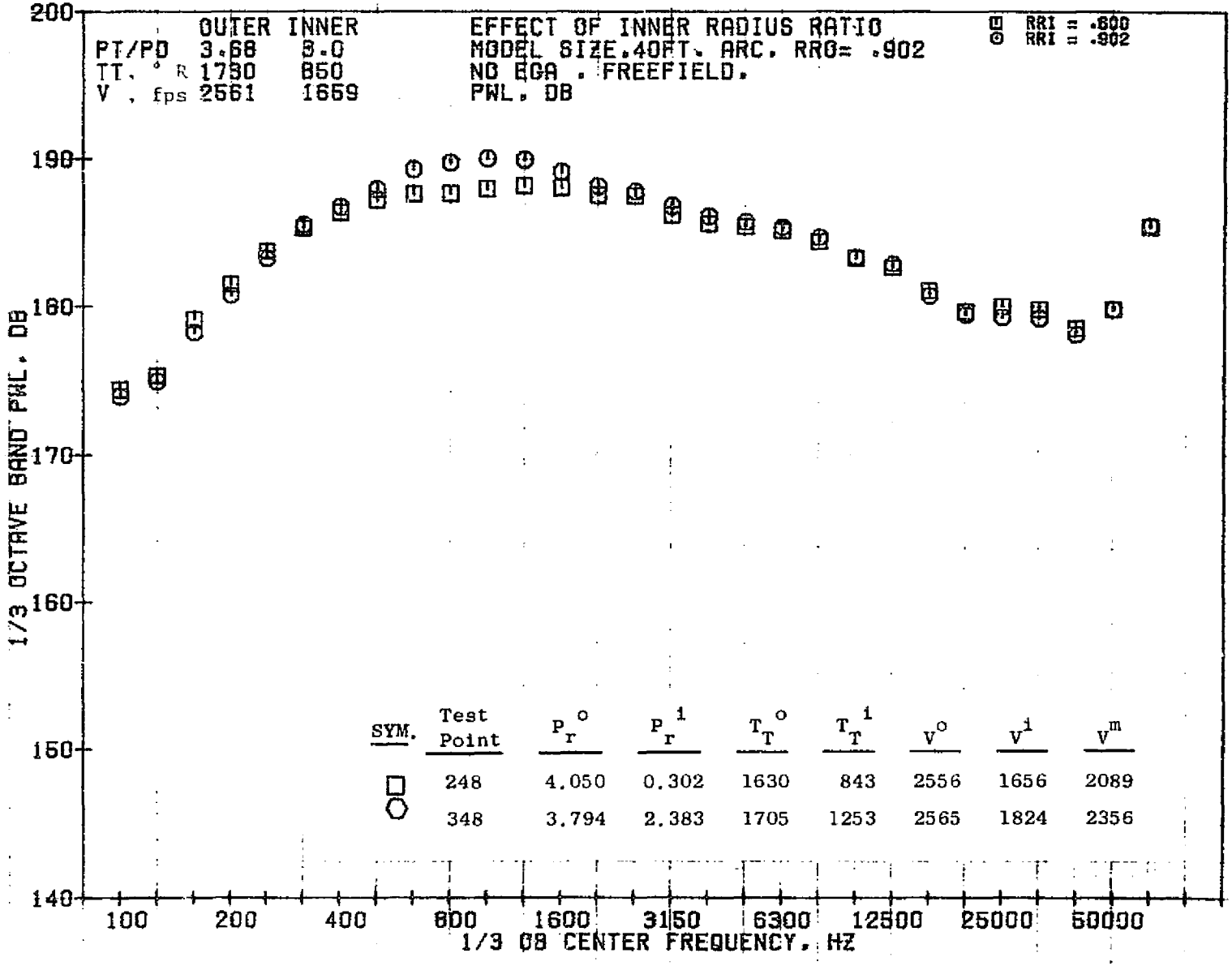

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18161-001

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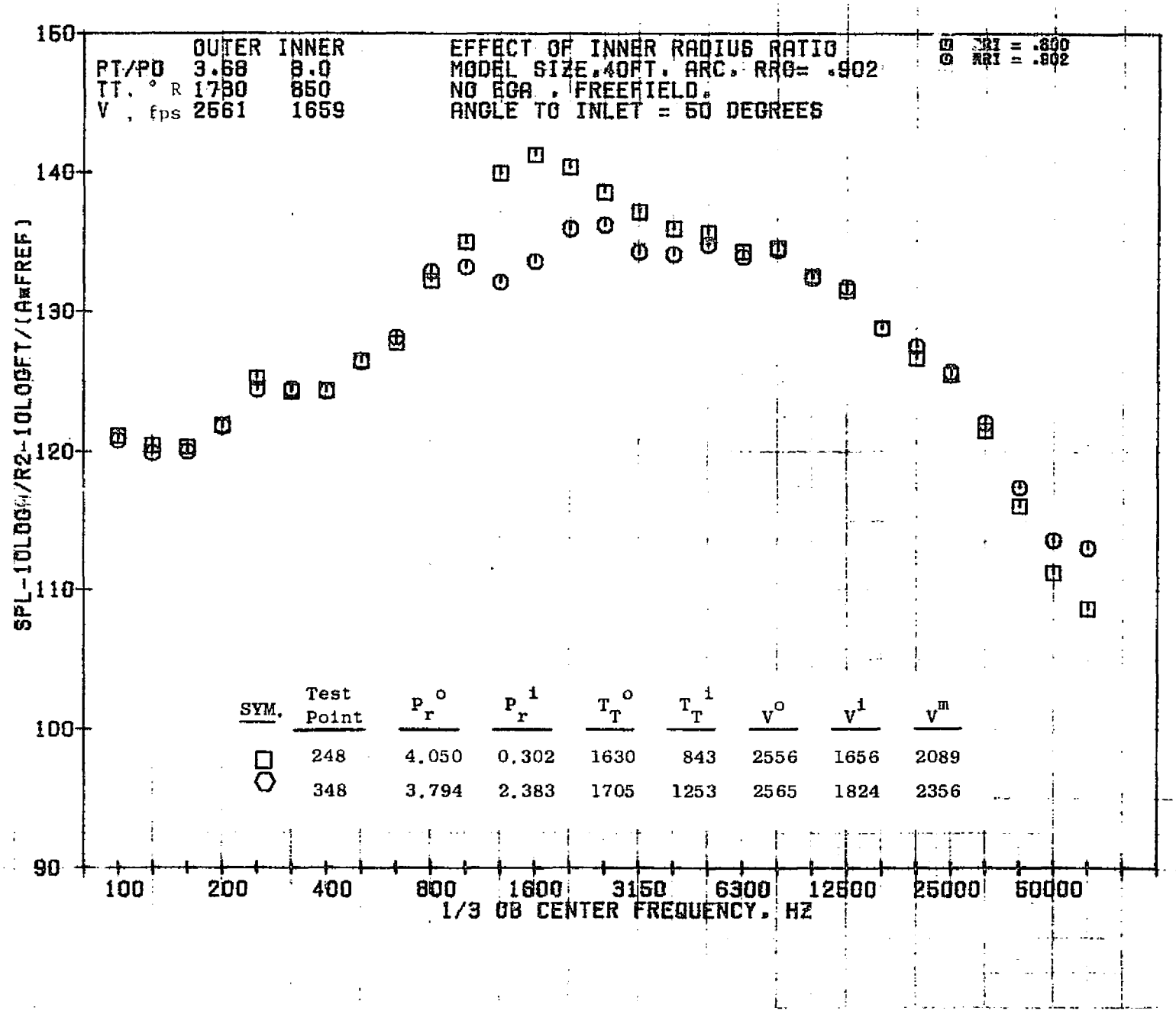

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18161-001

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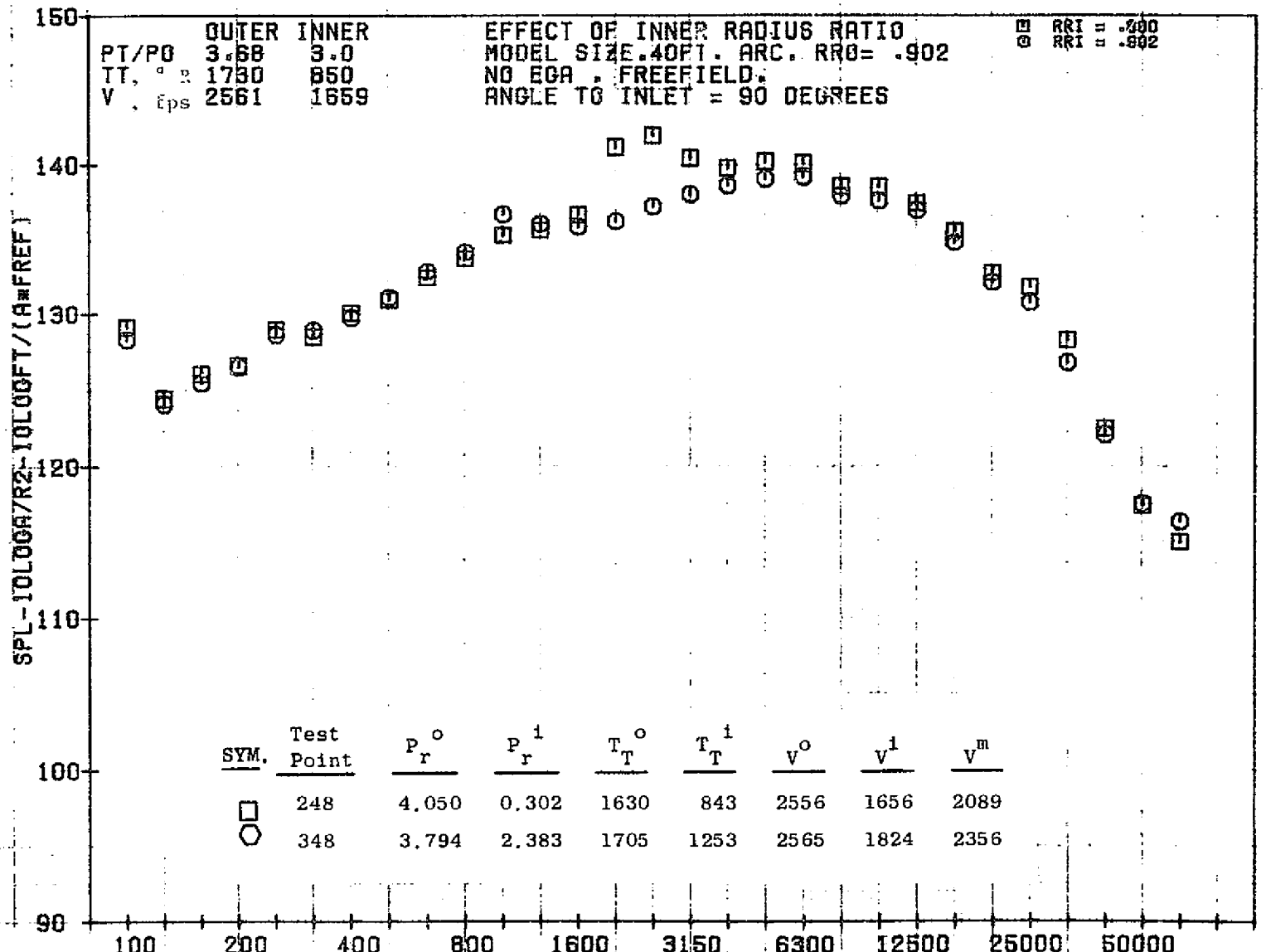

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18161-001

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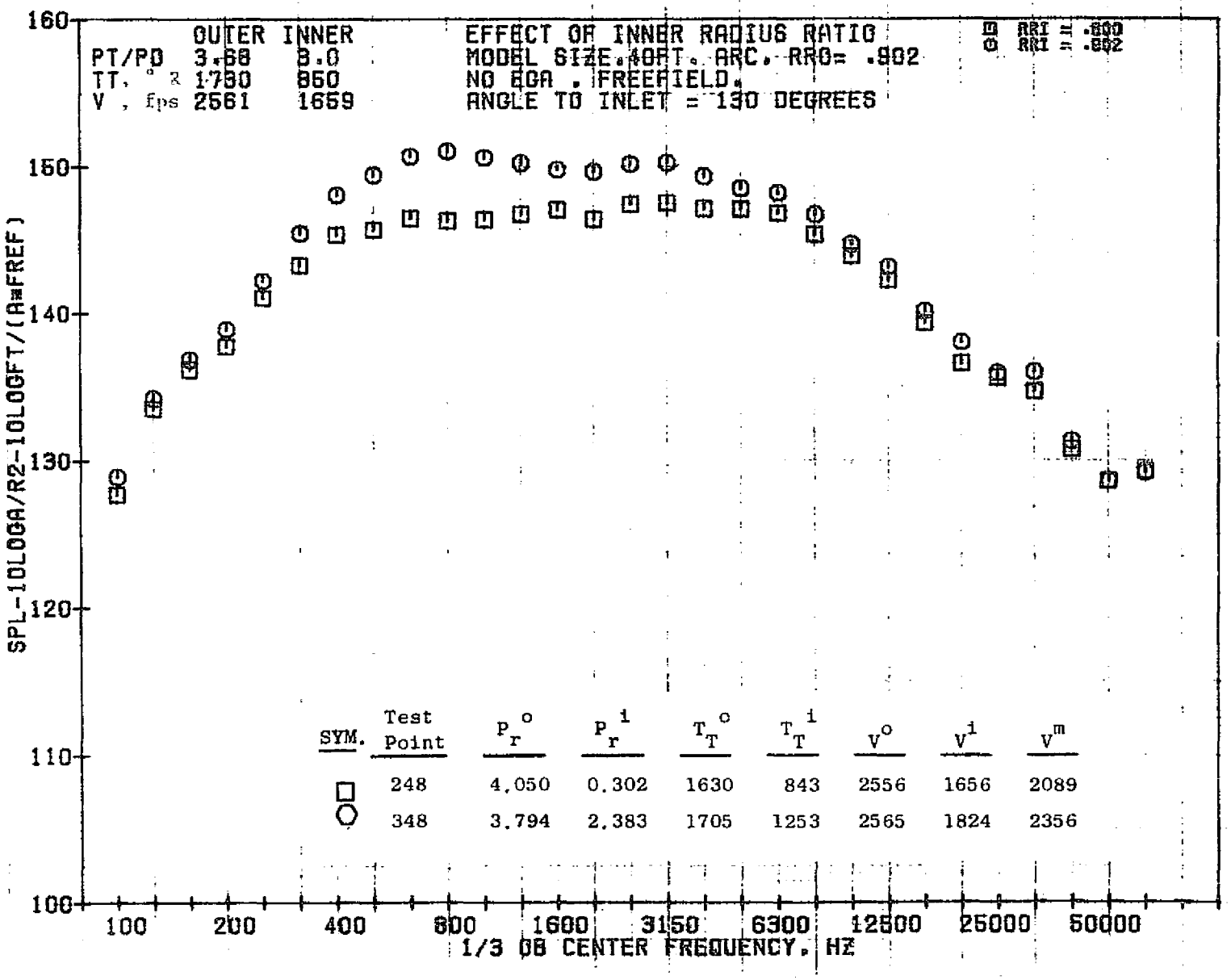

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18161-001

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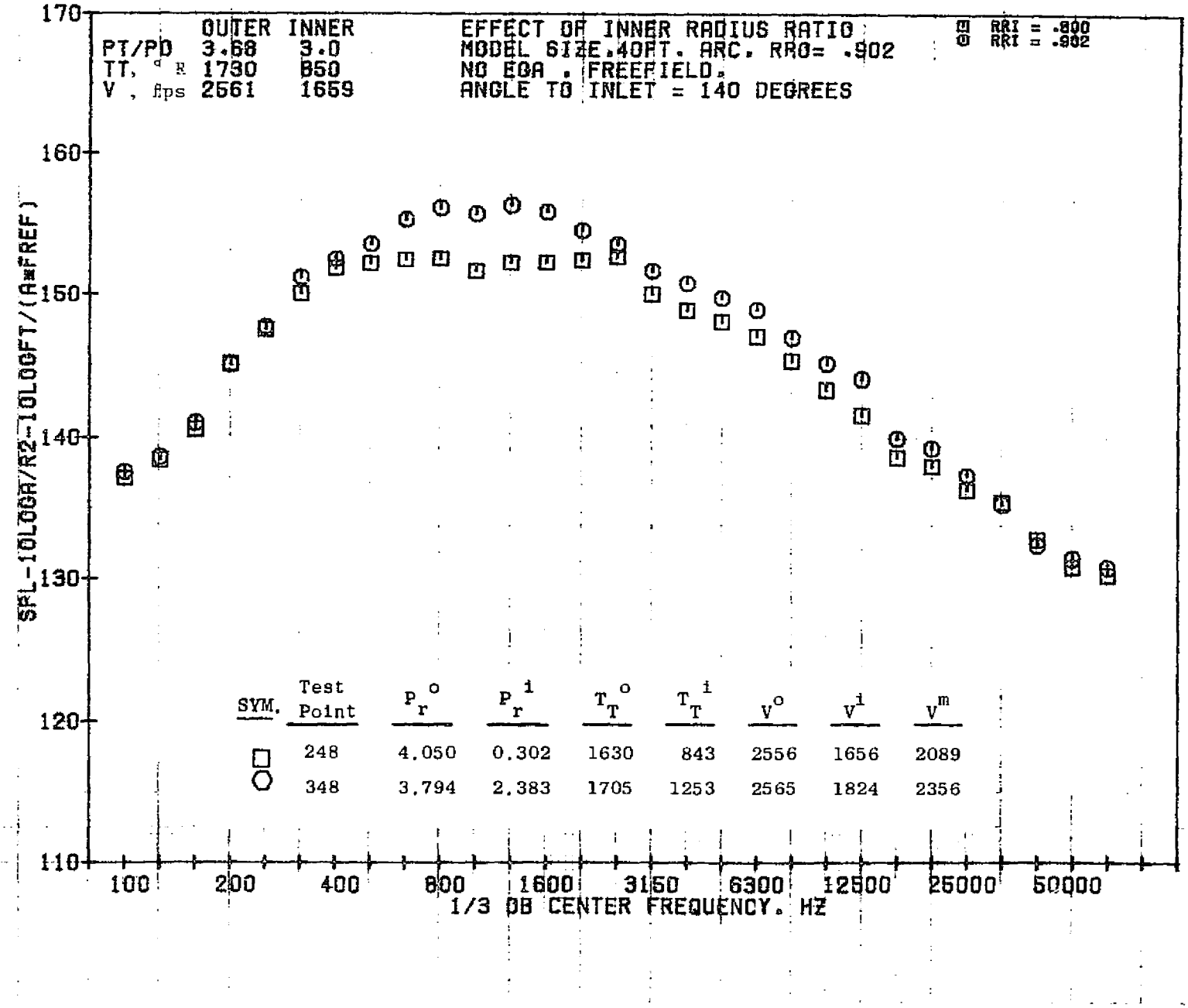

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18161-001

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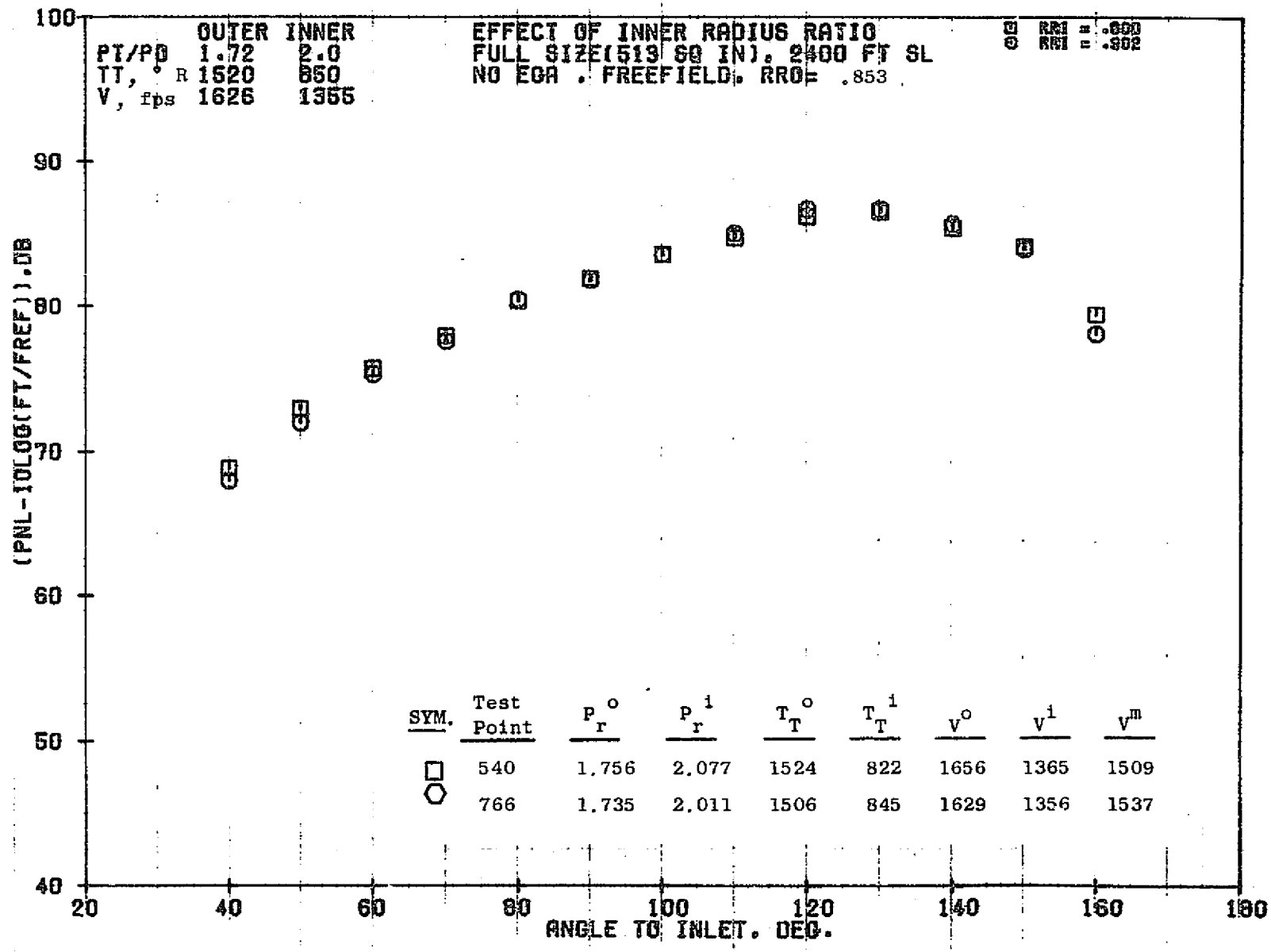

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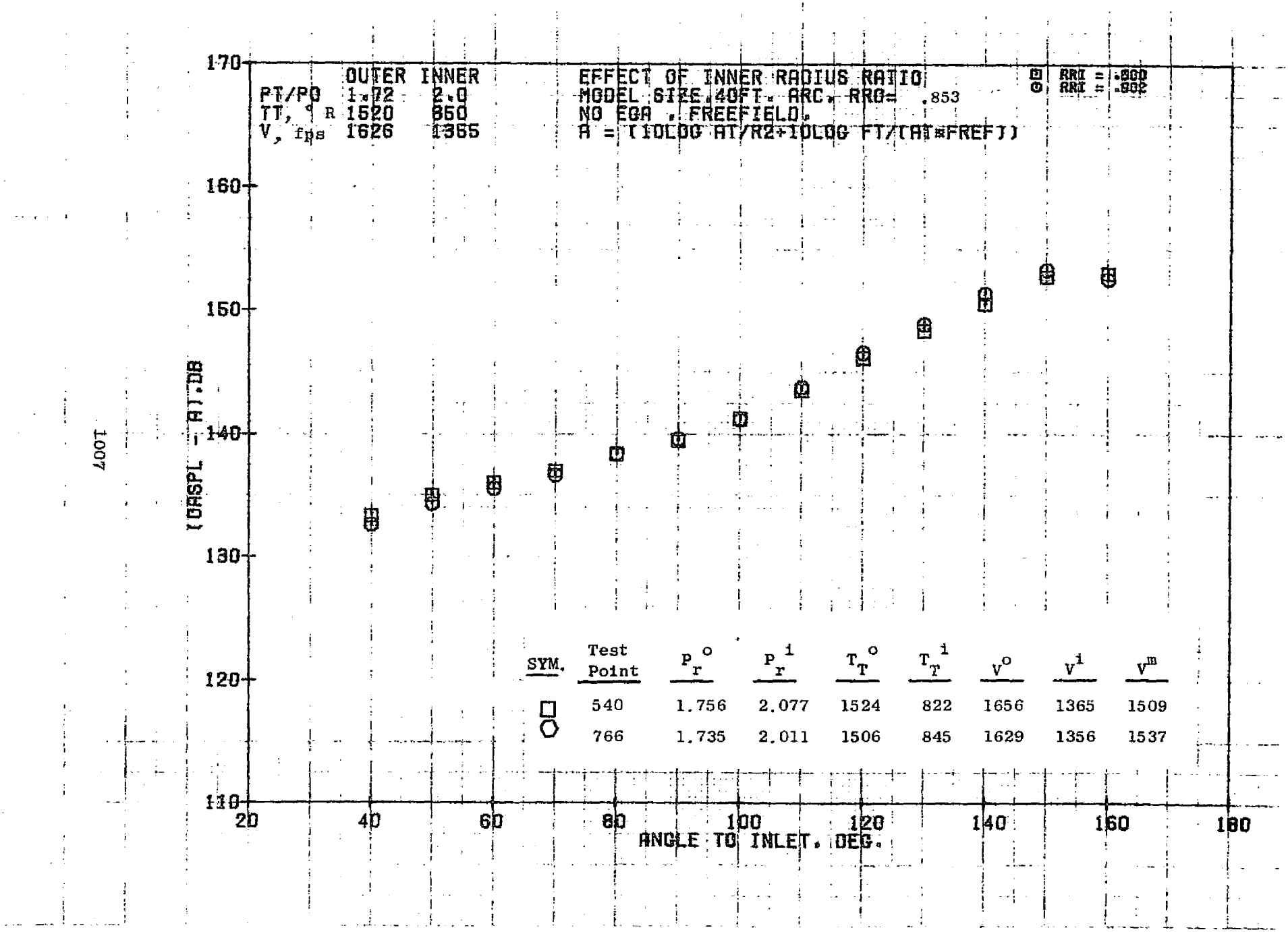

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18161-001

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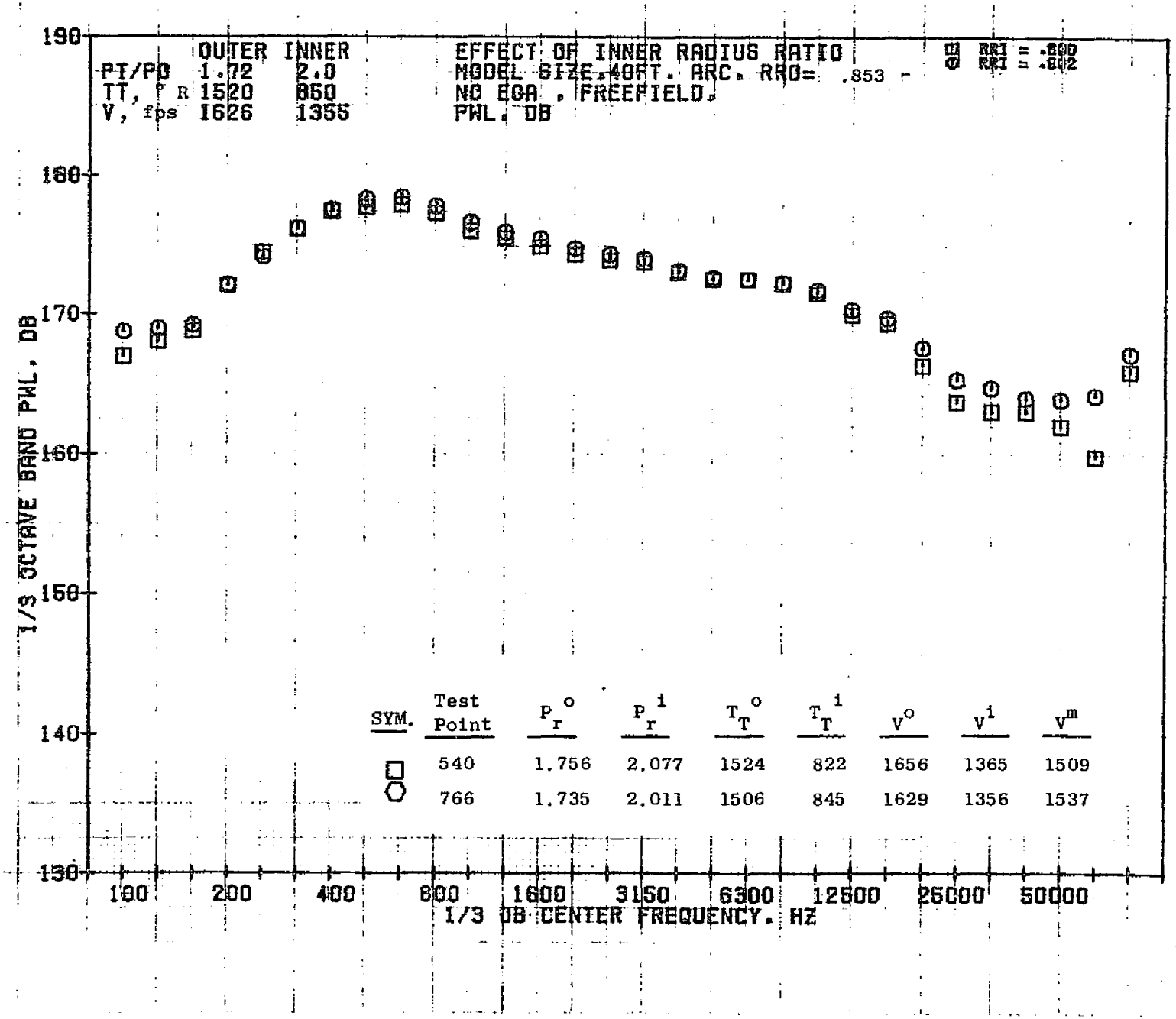

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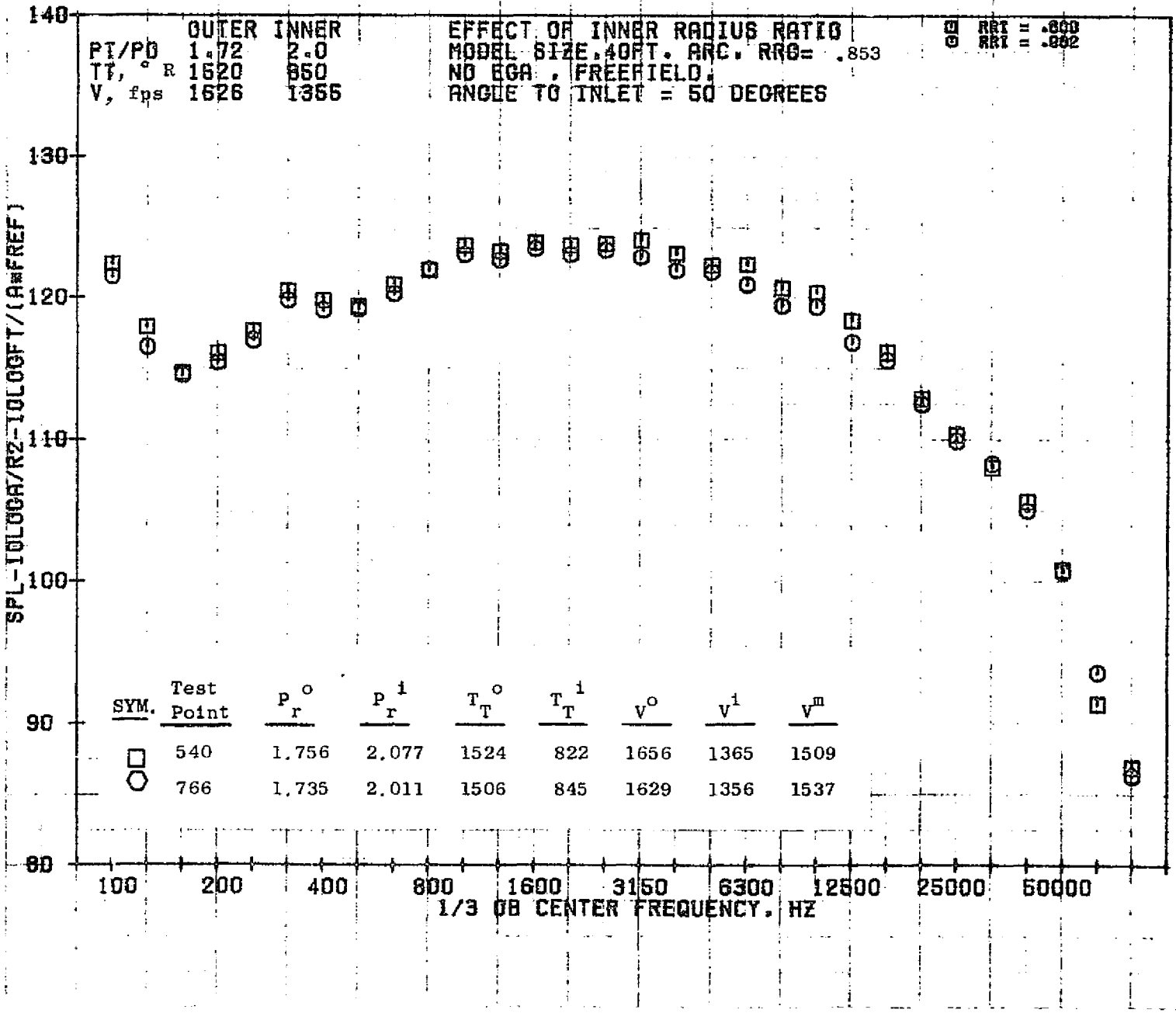

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18161-001

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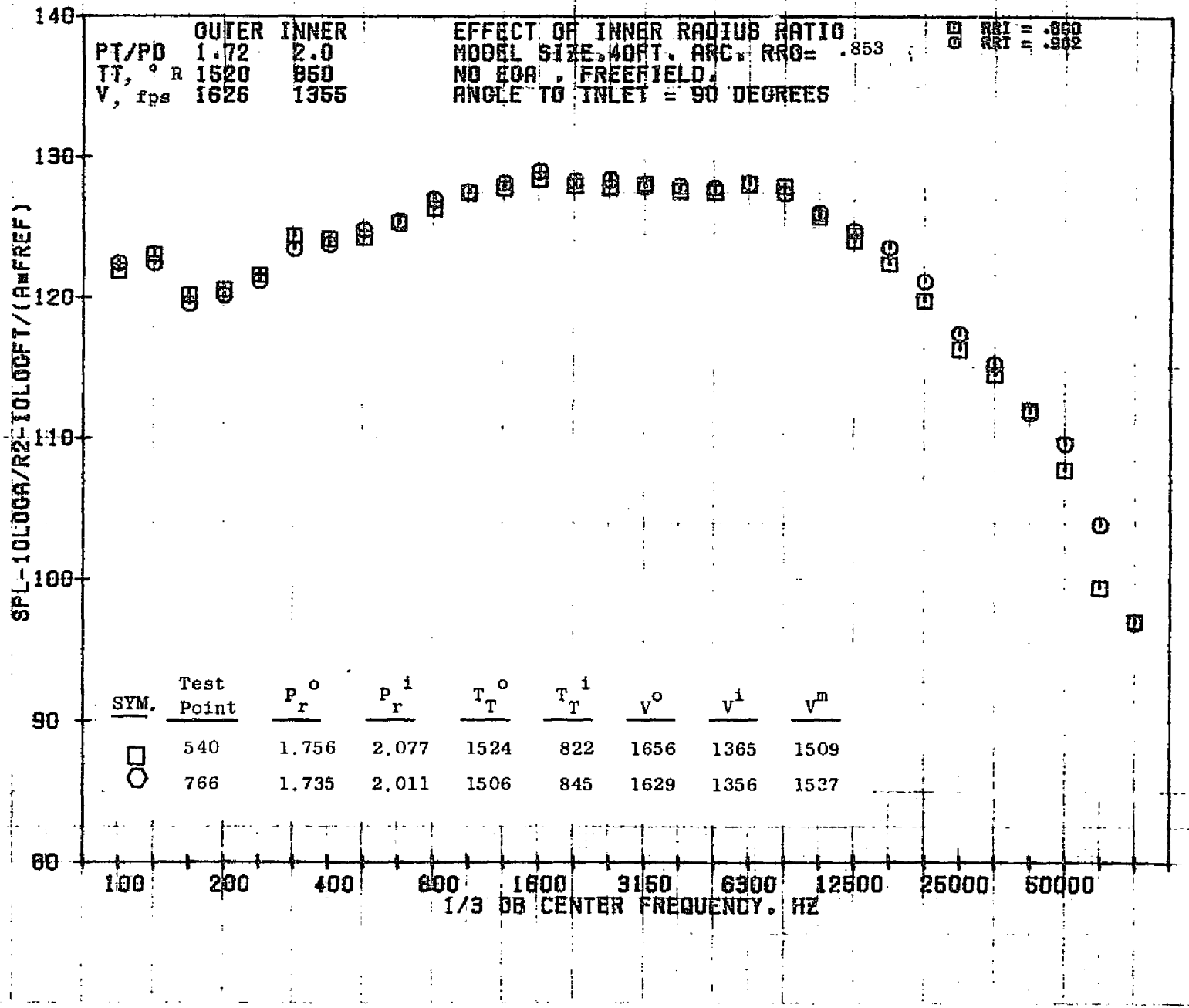

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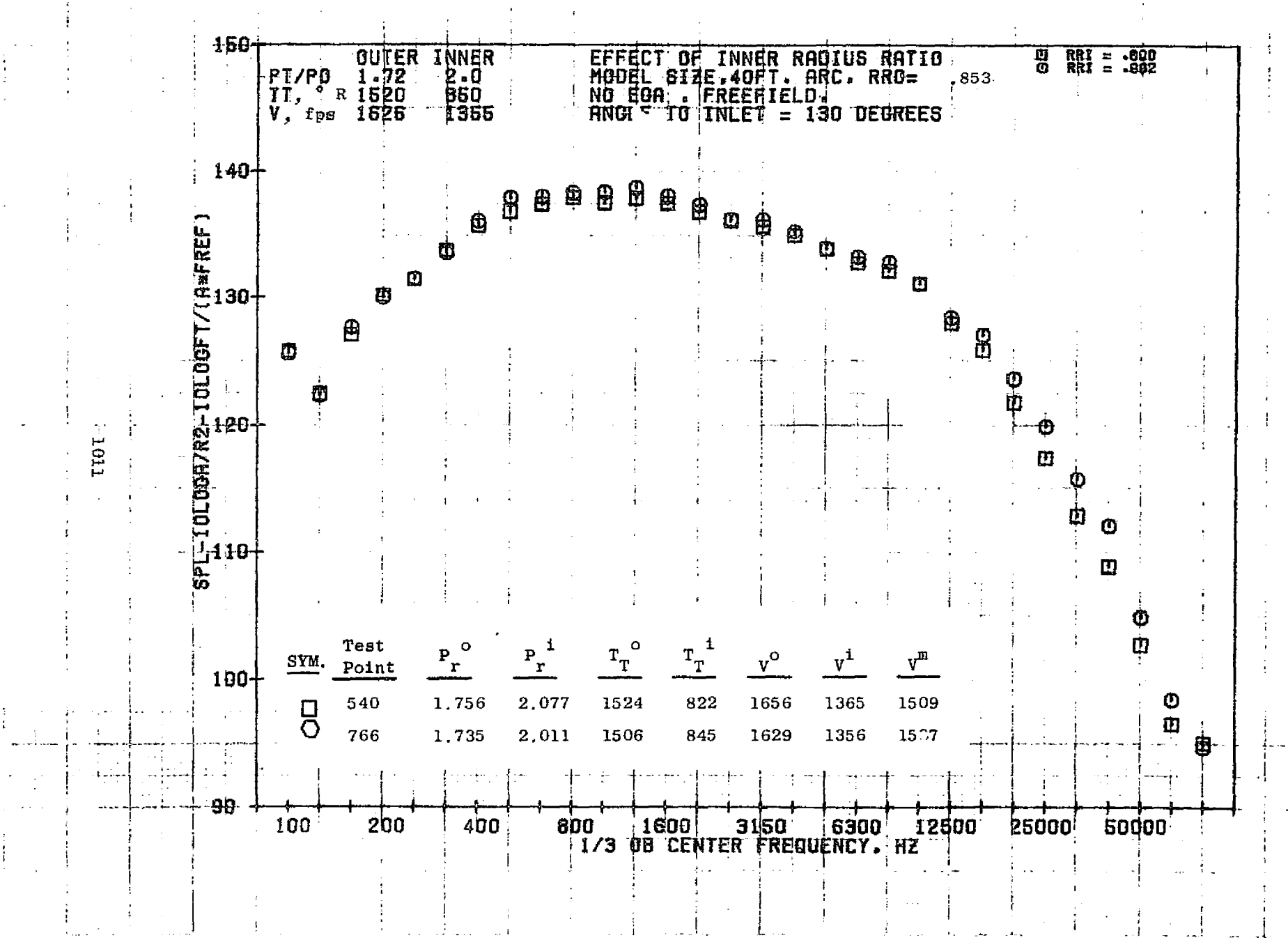

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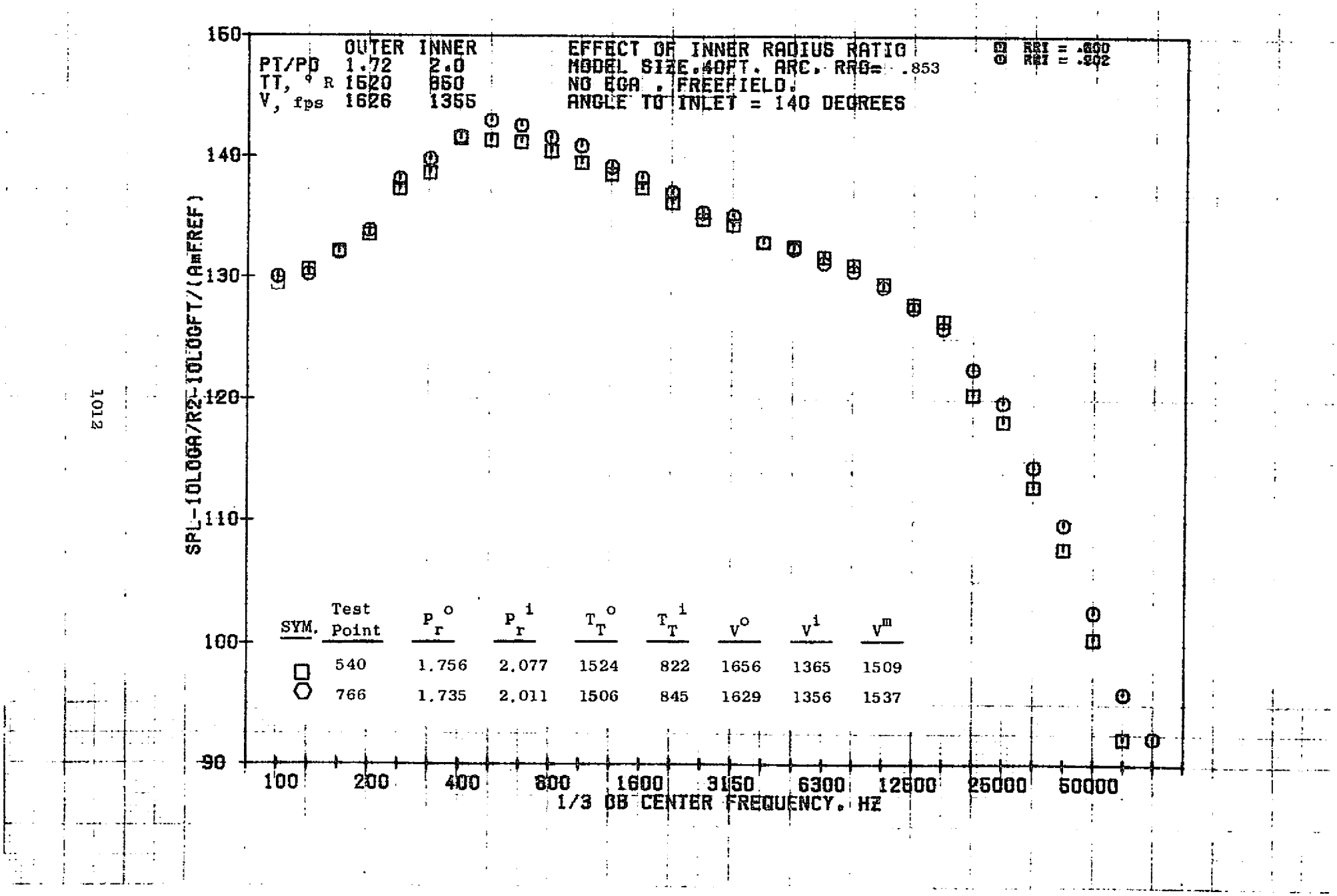

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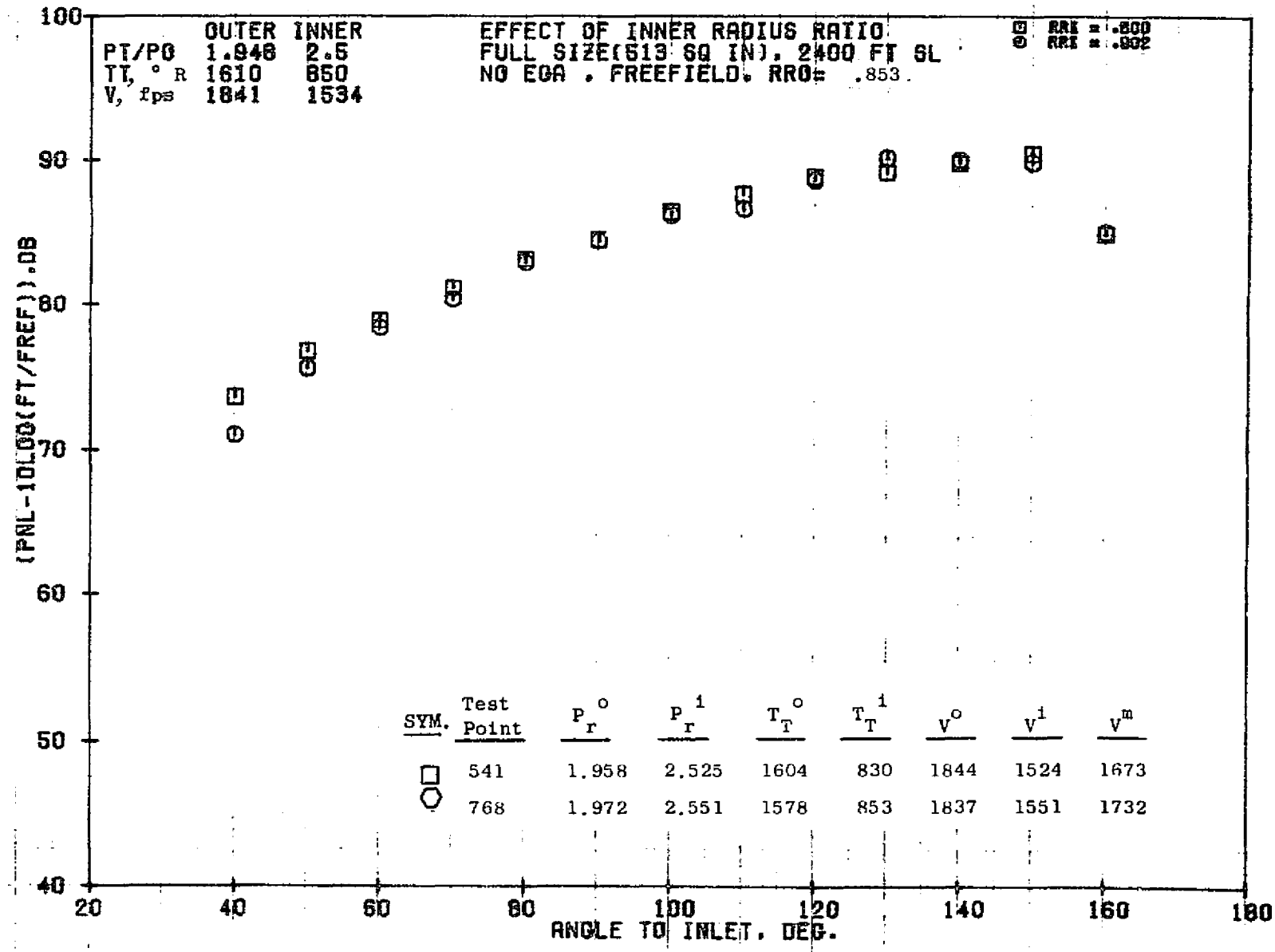

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18124-001

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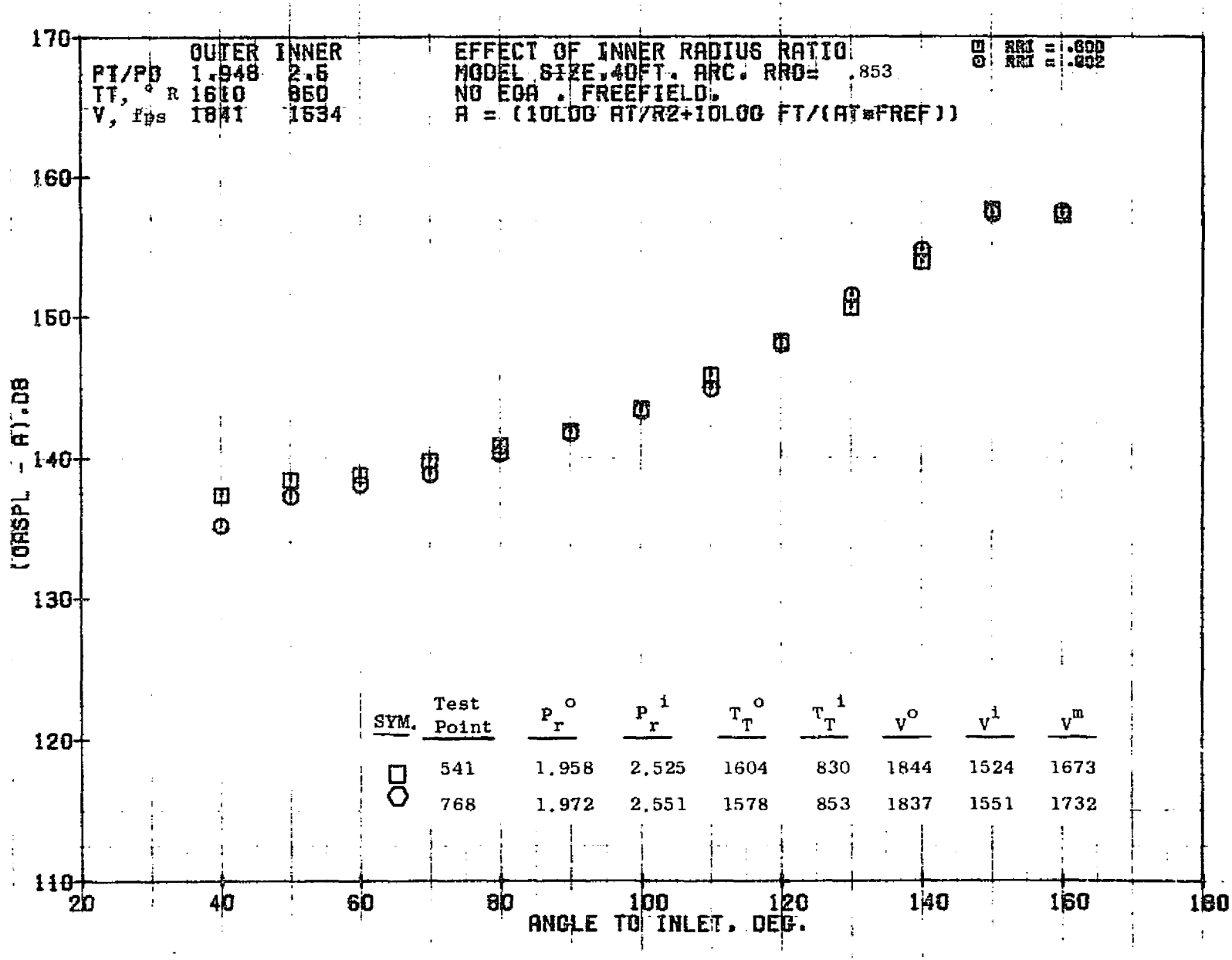

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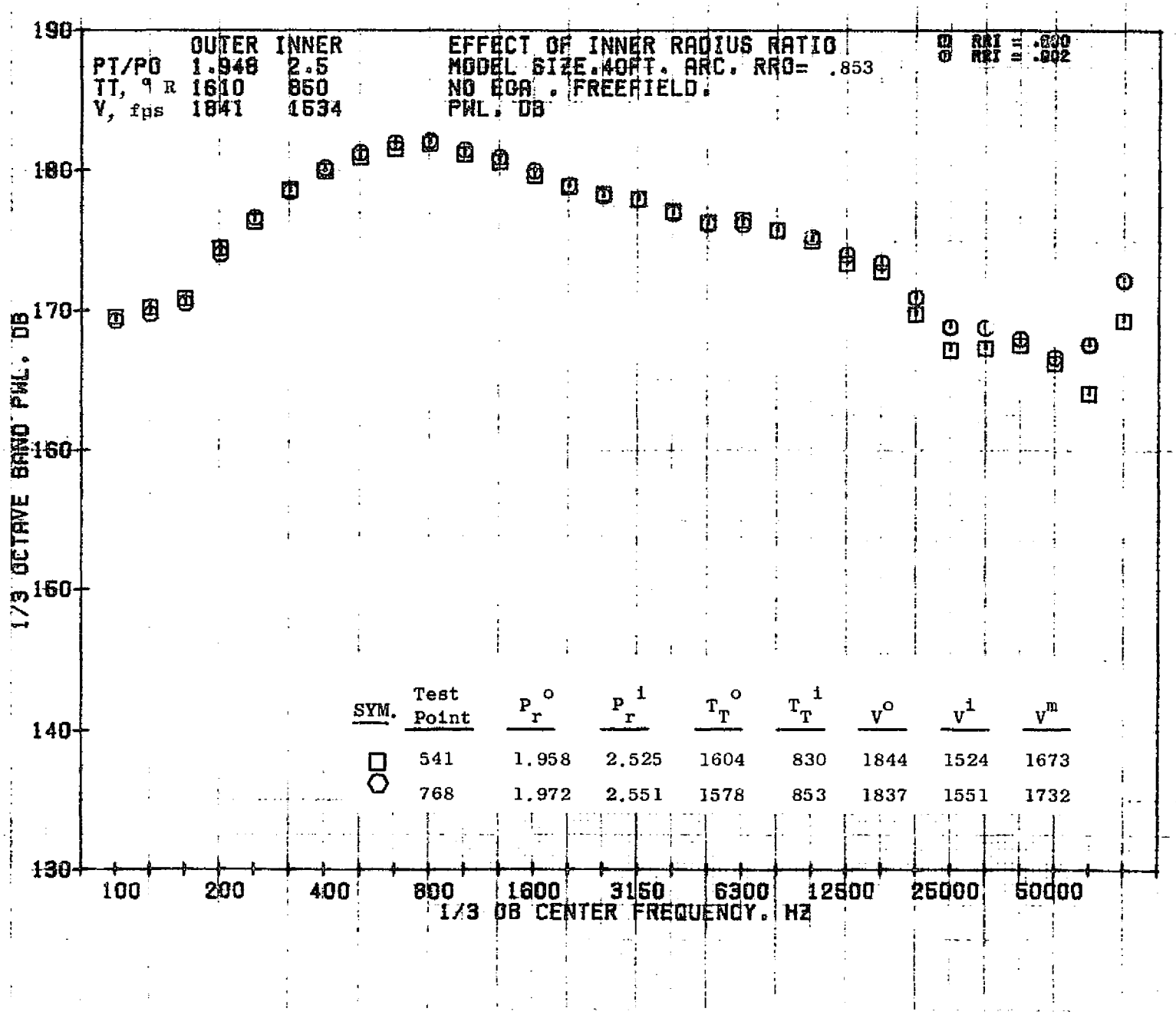

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18161-001

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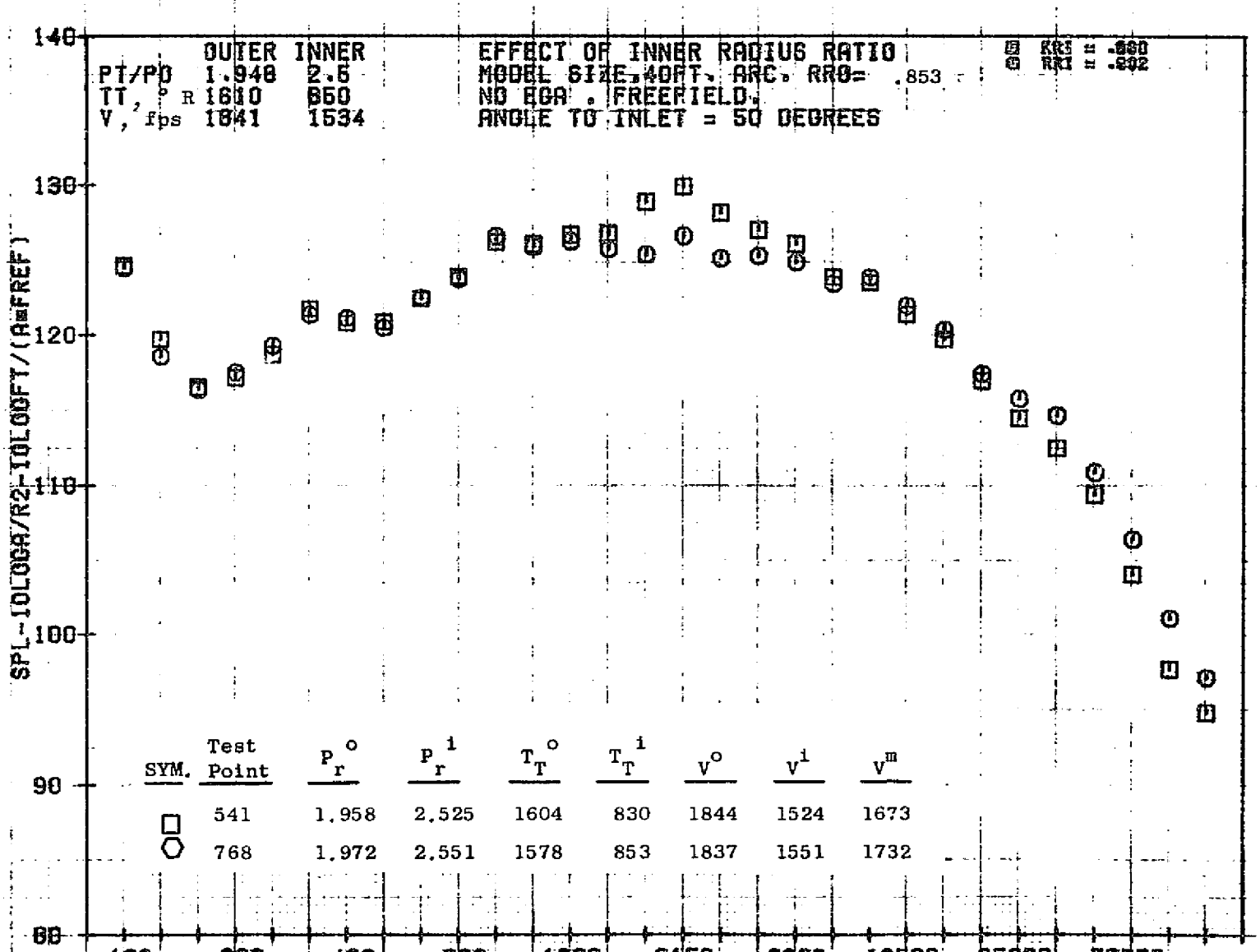

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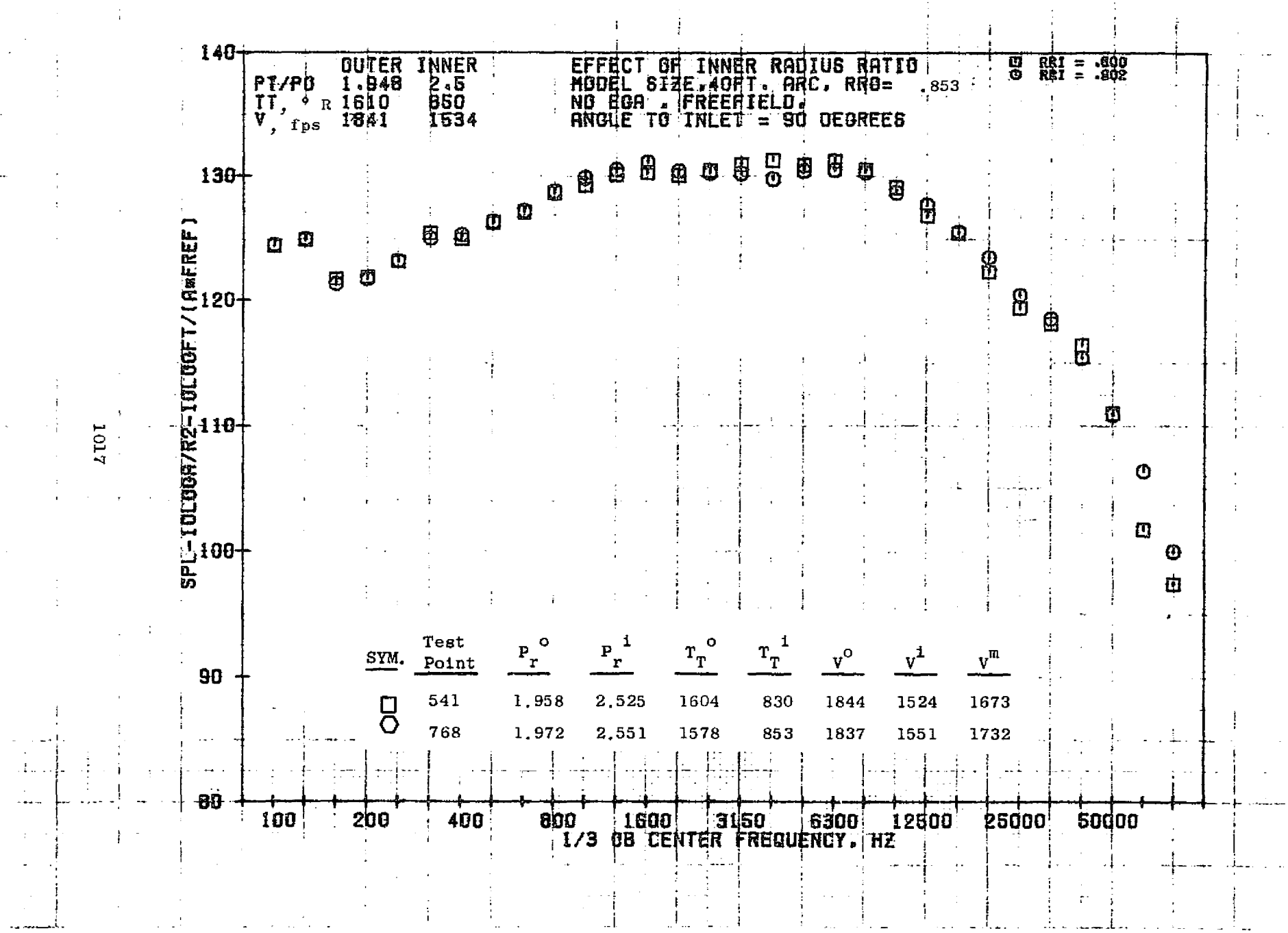

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18161-001

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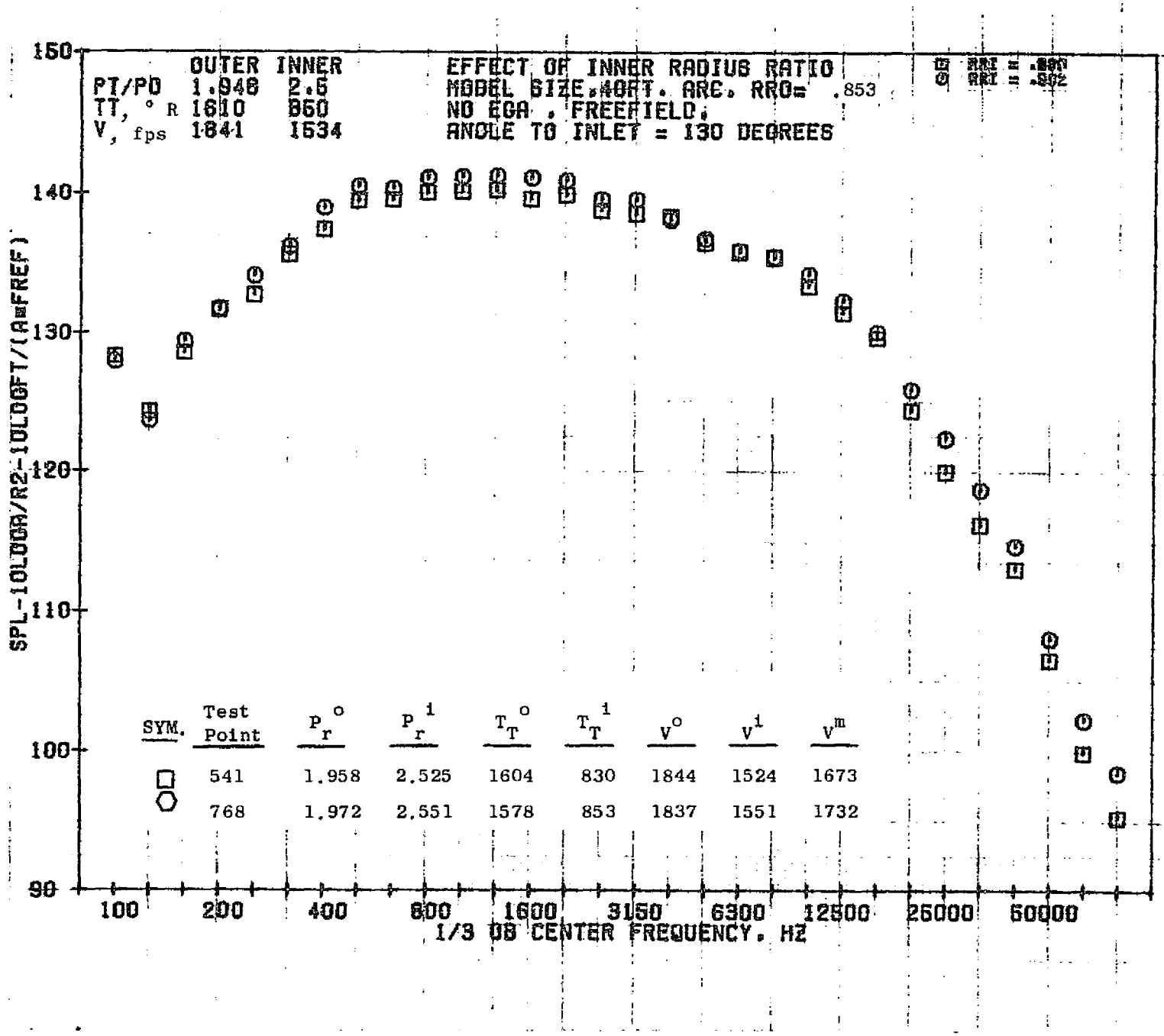

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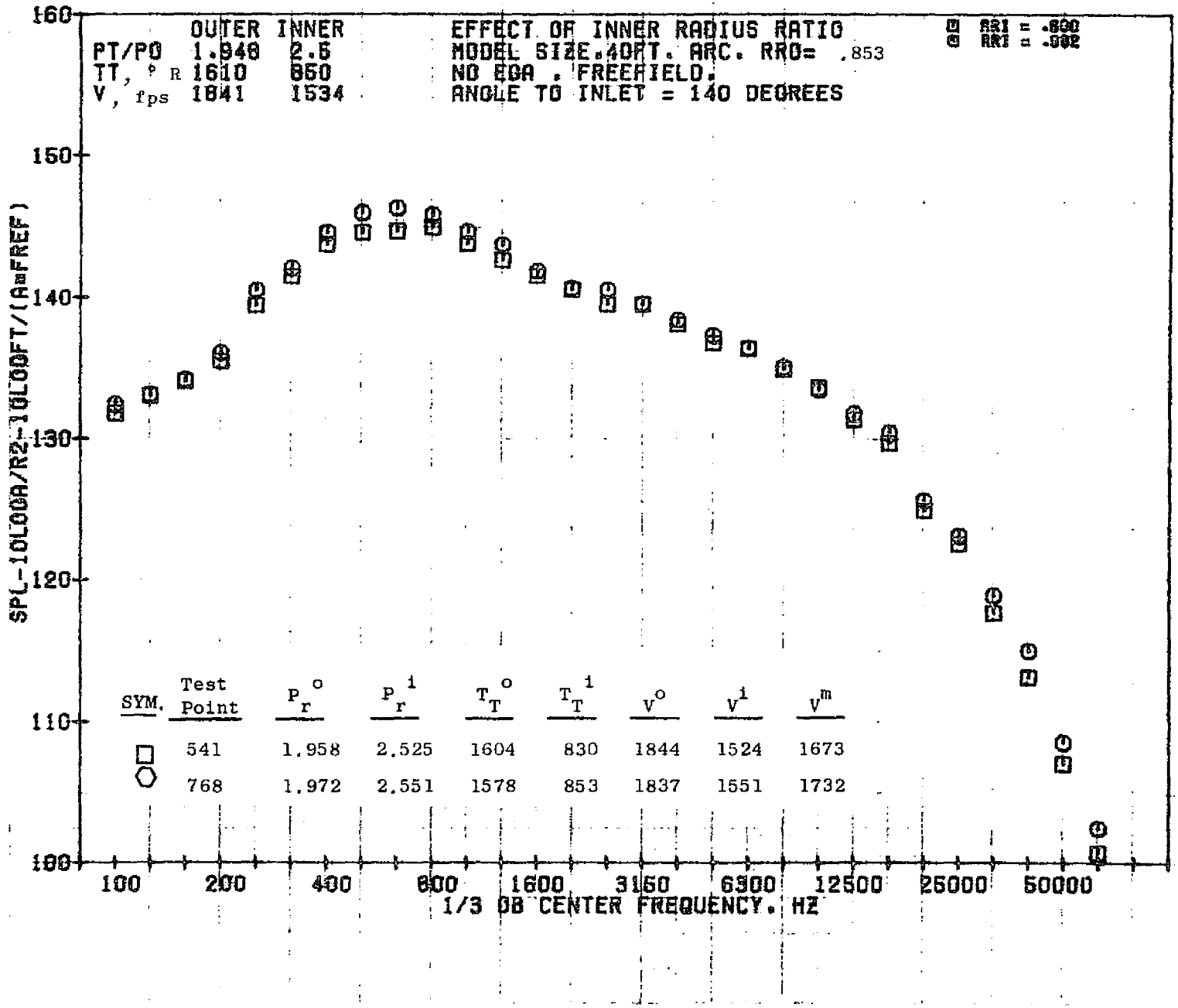

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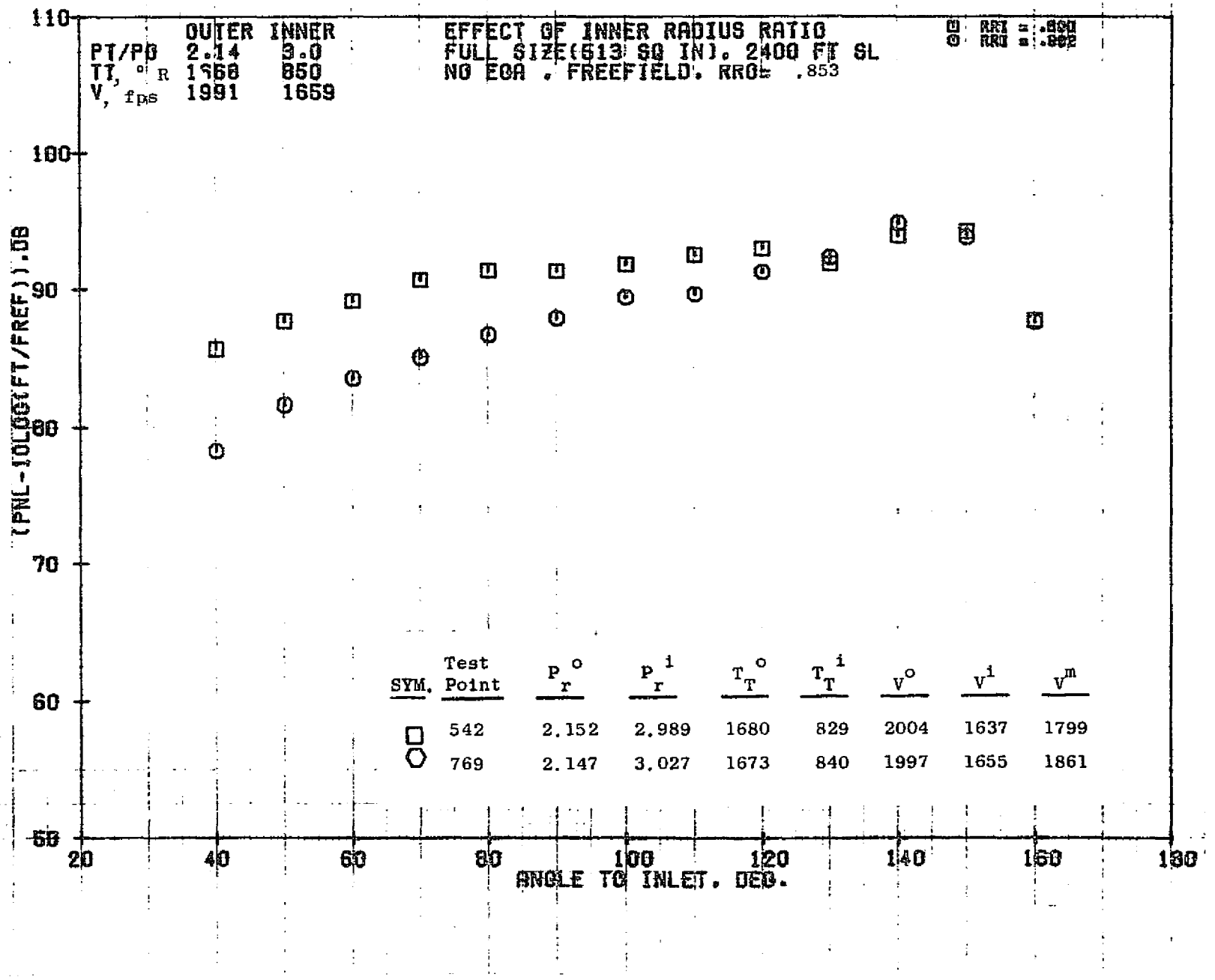

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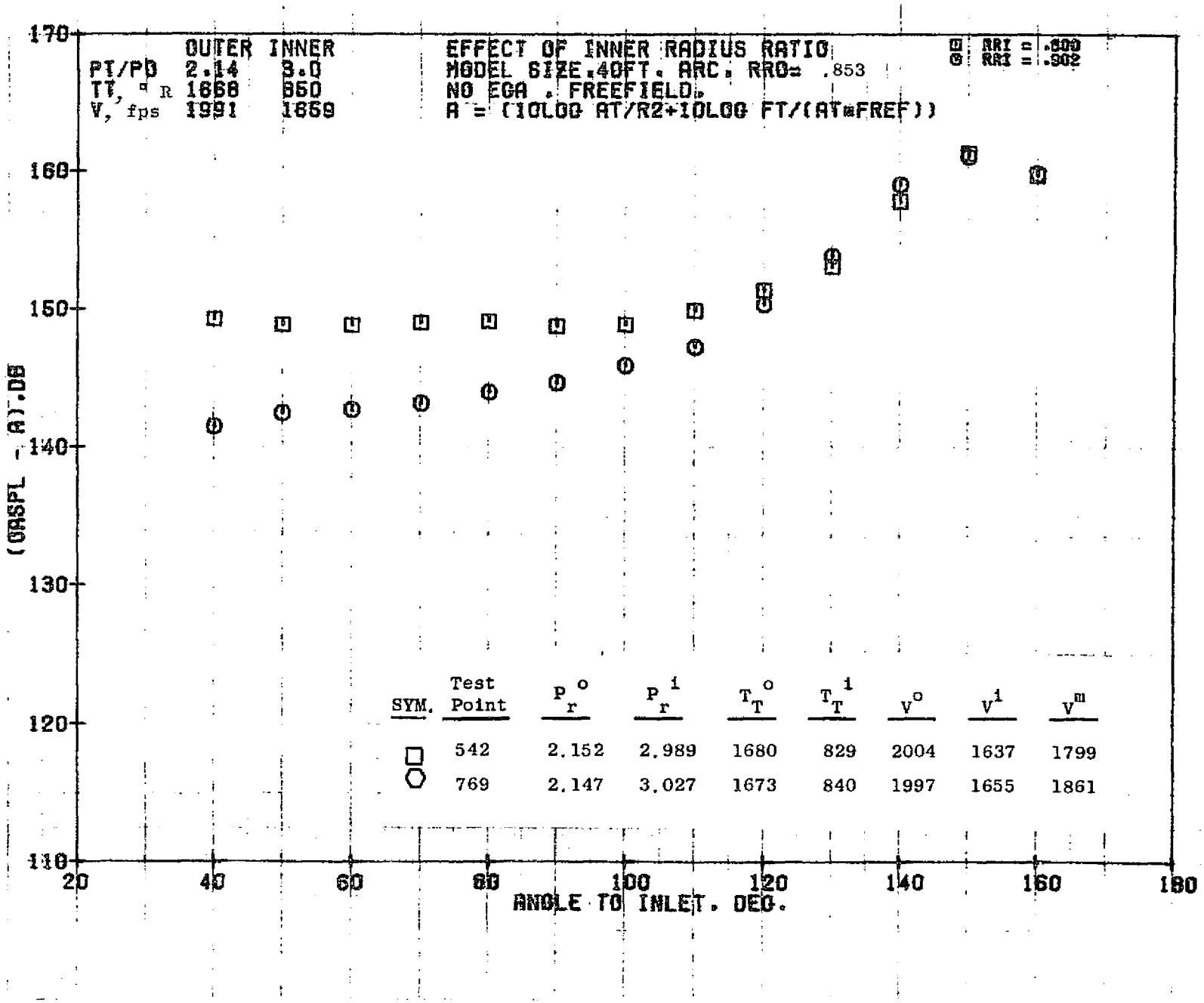

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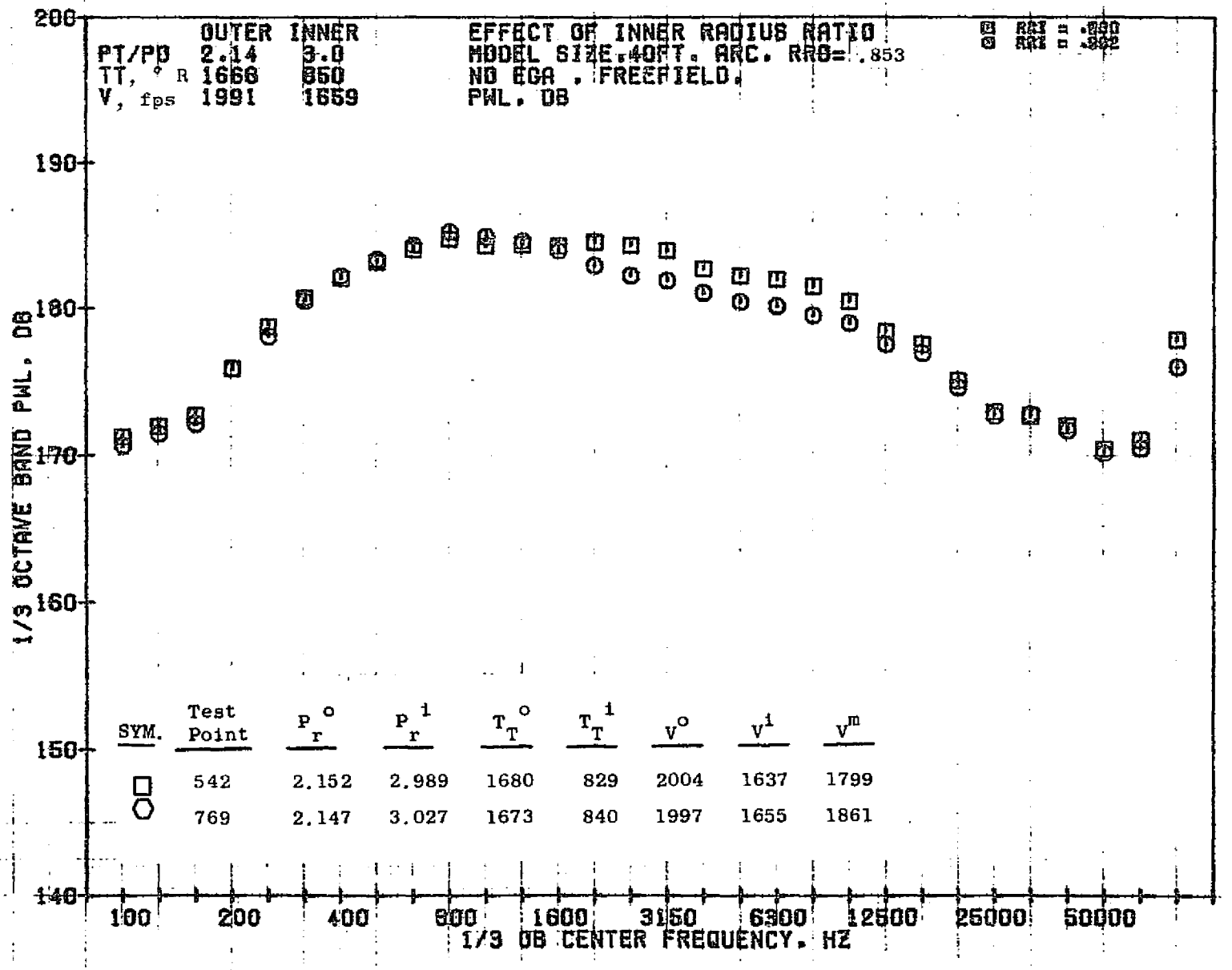

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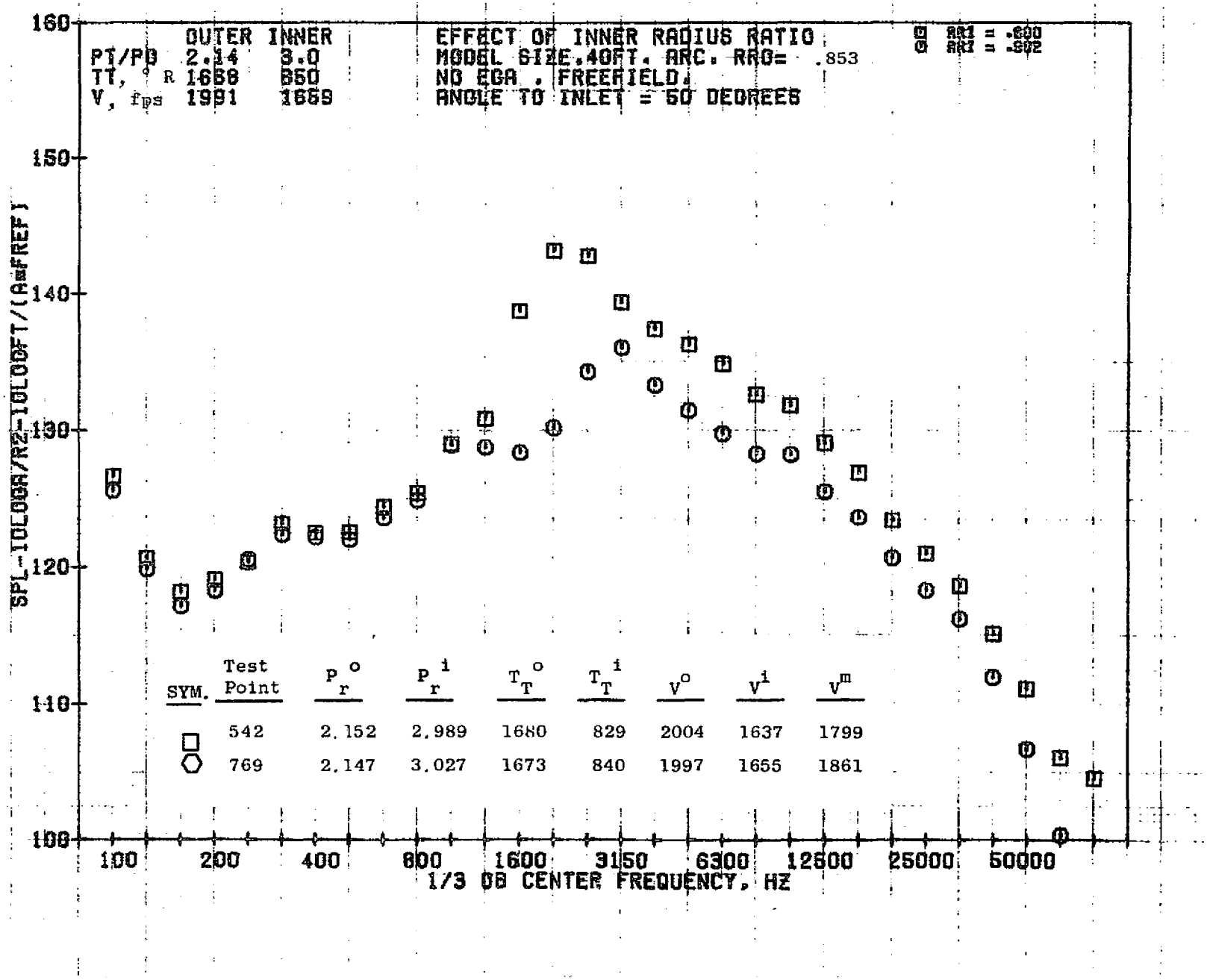

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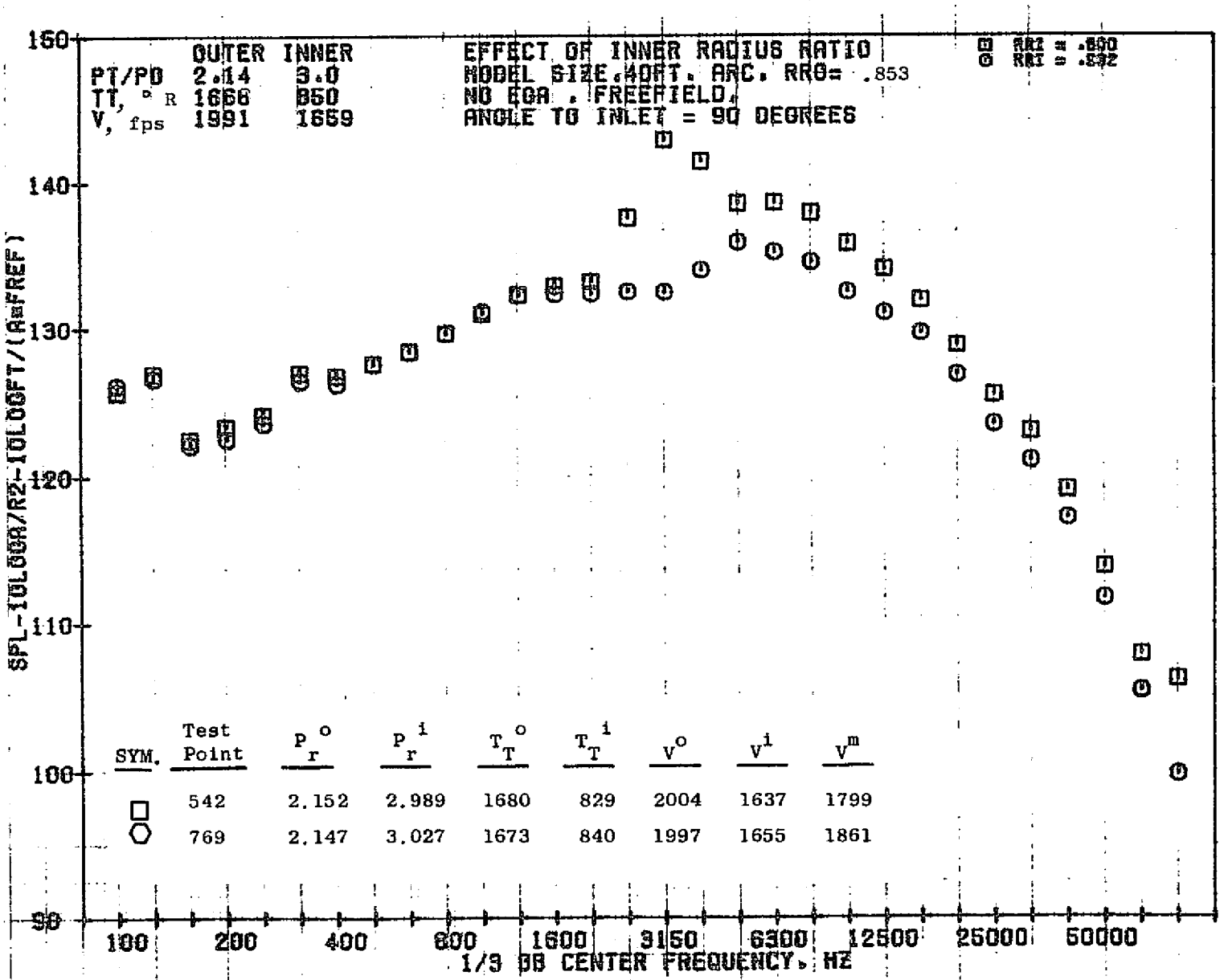

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19161-001

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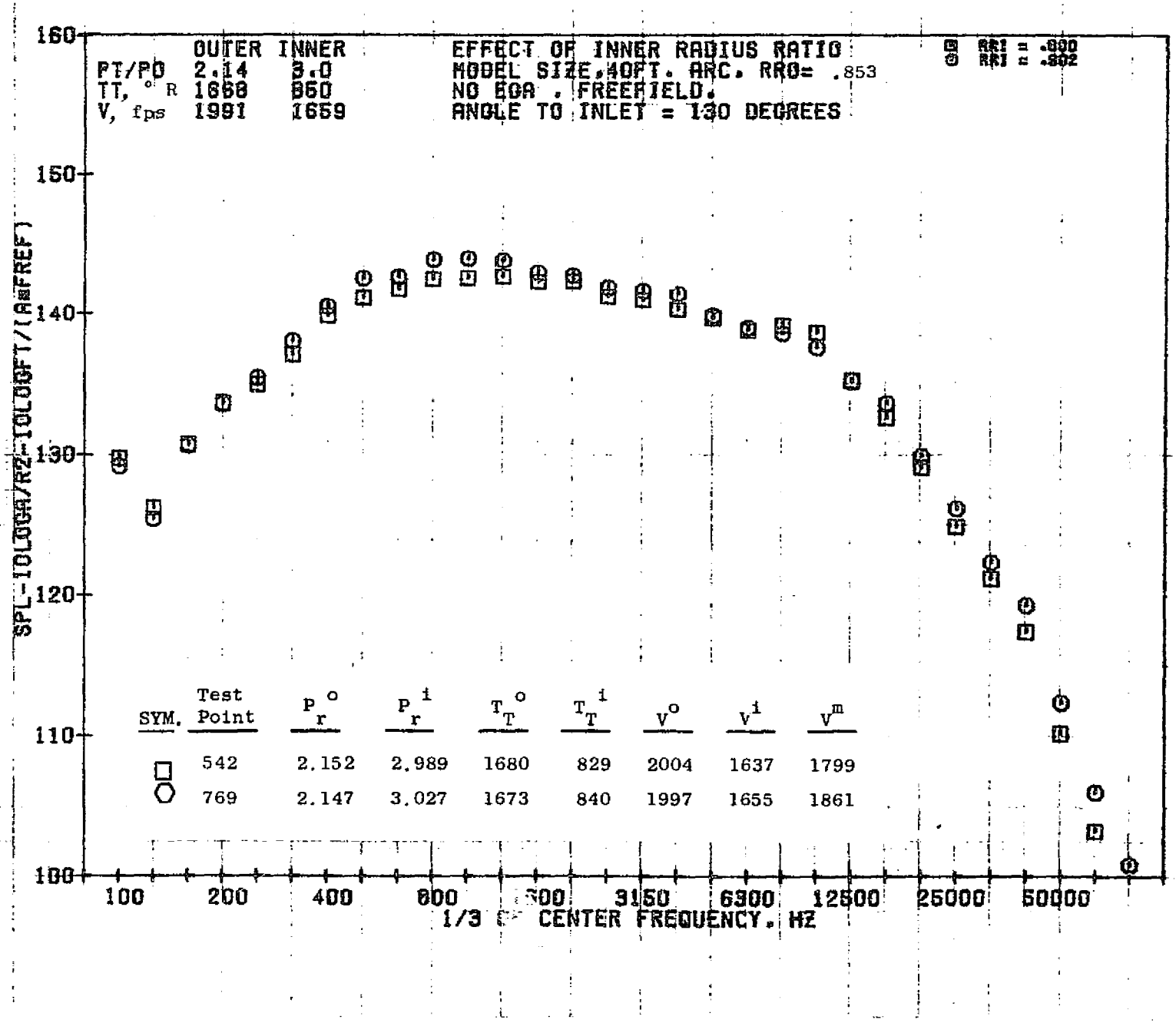

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1B161-001

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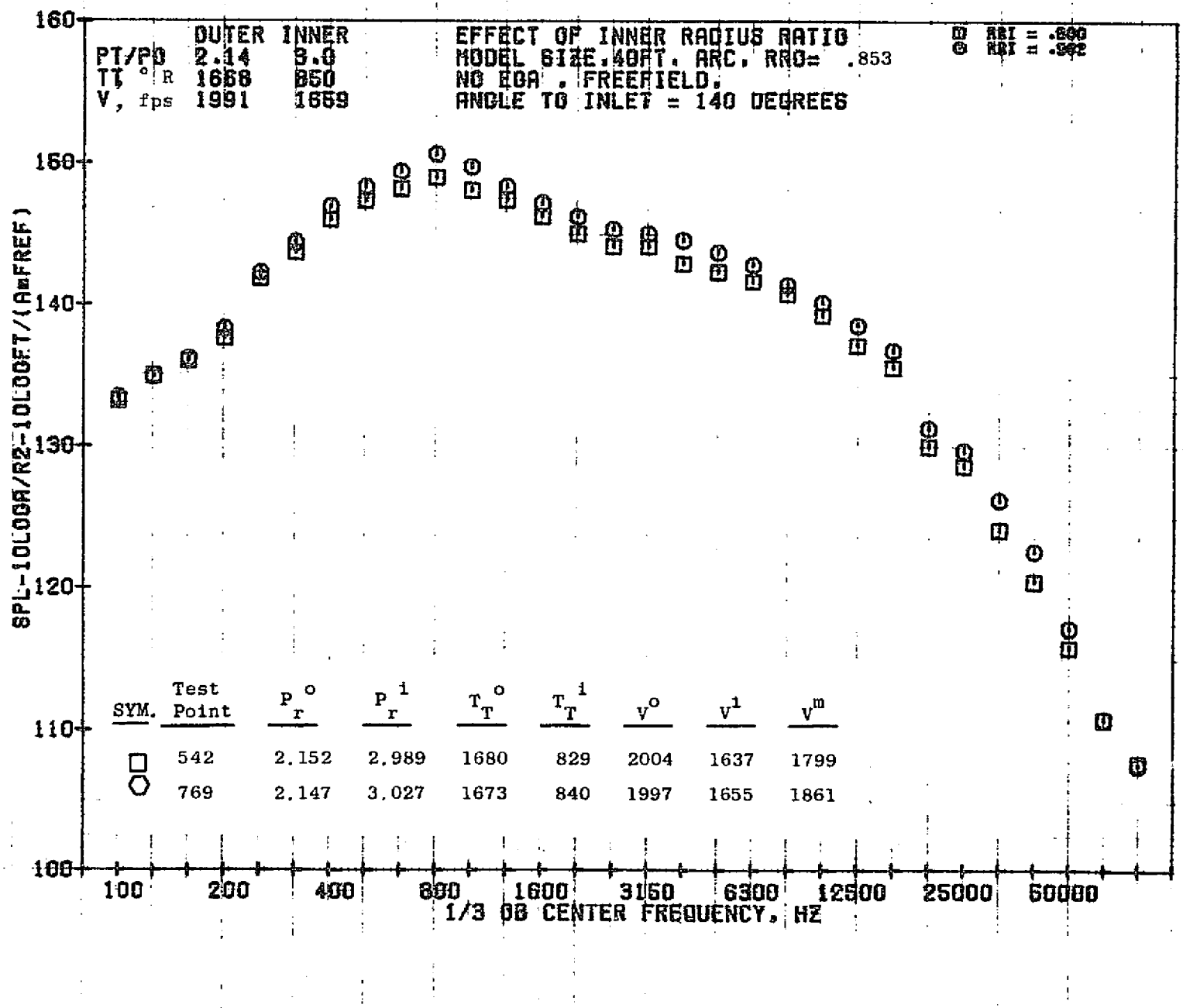

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18161-001

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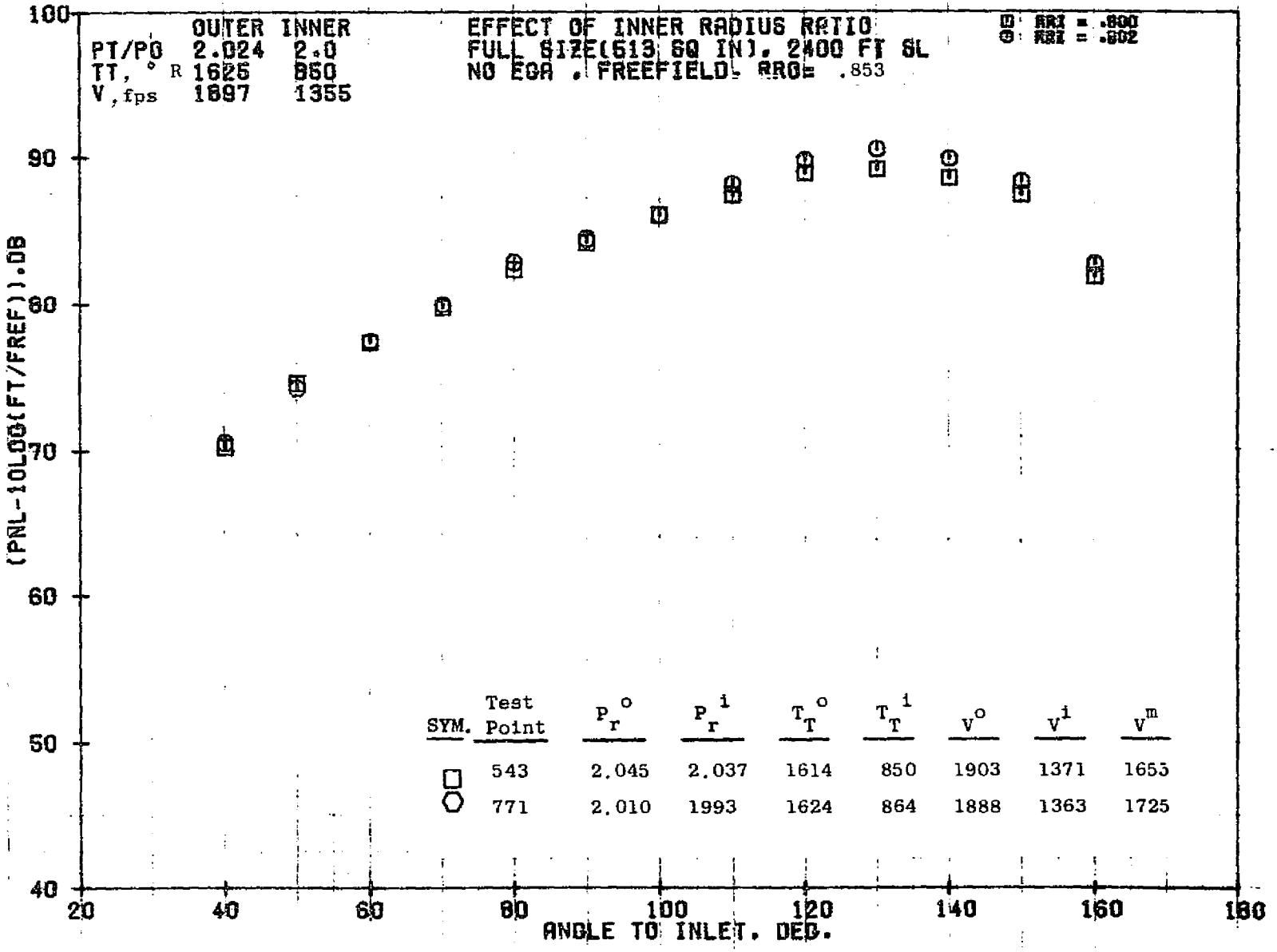

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1B124-001

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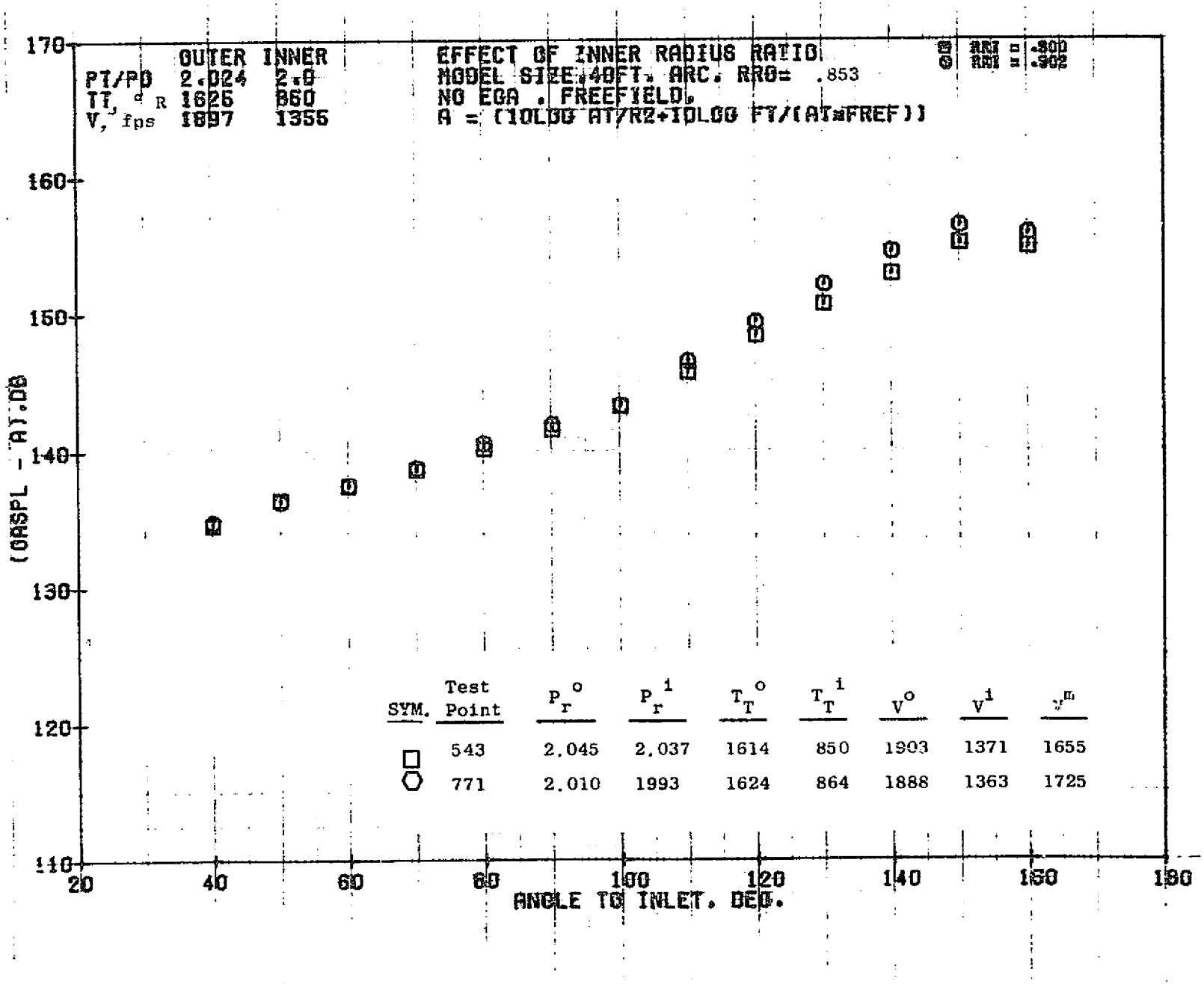

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1B161-001

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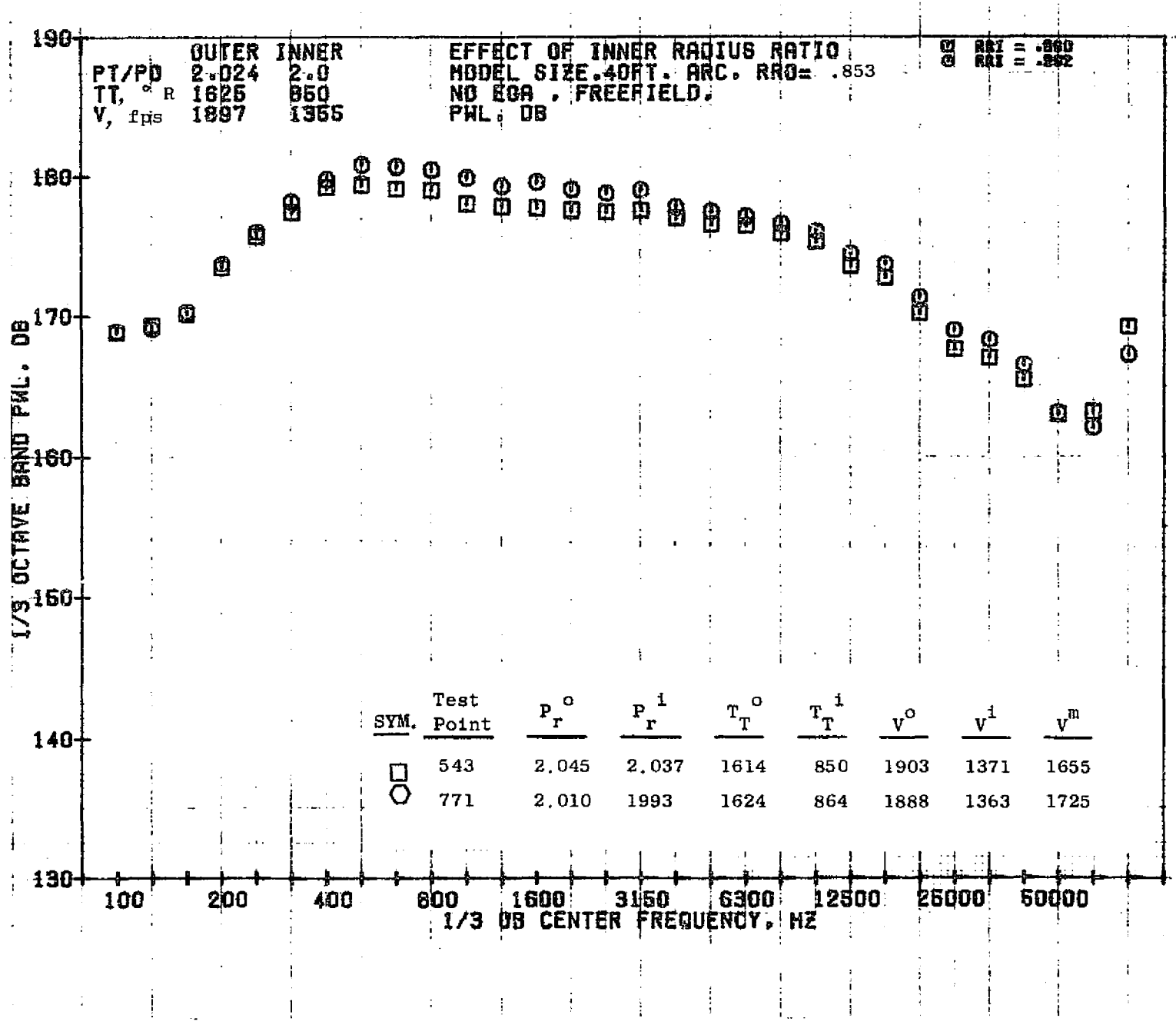

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18161-001

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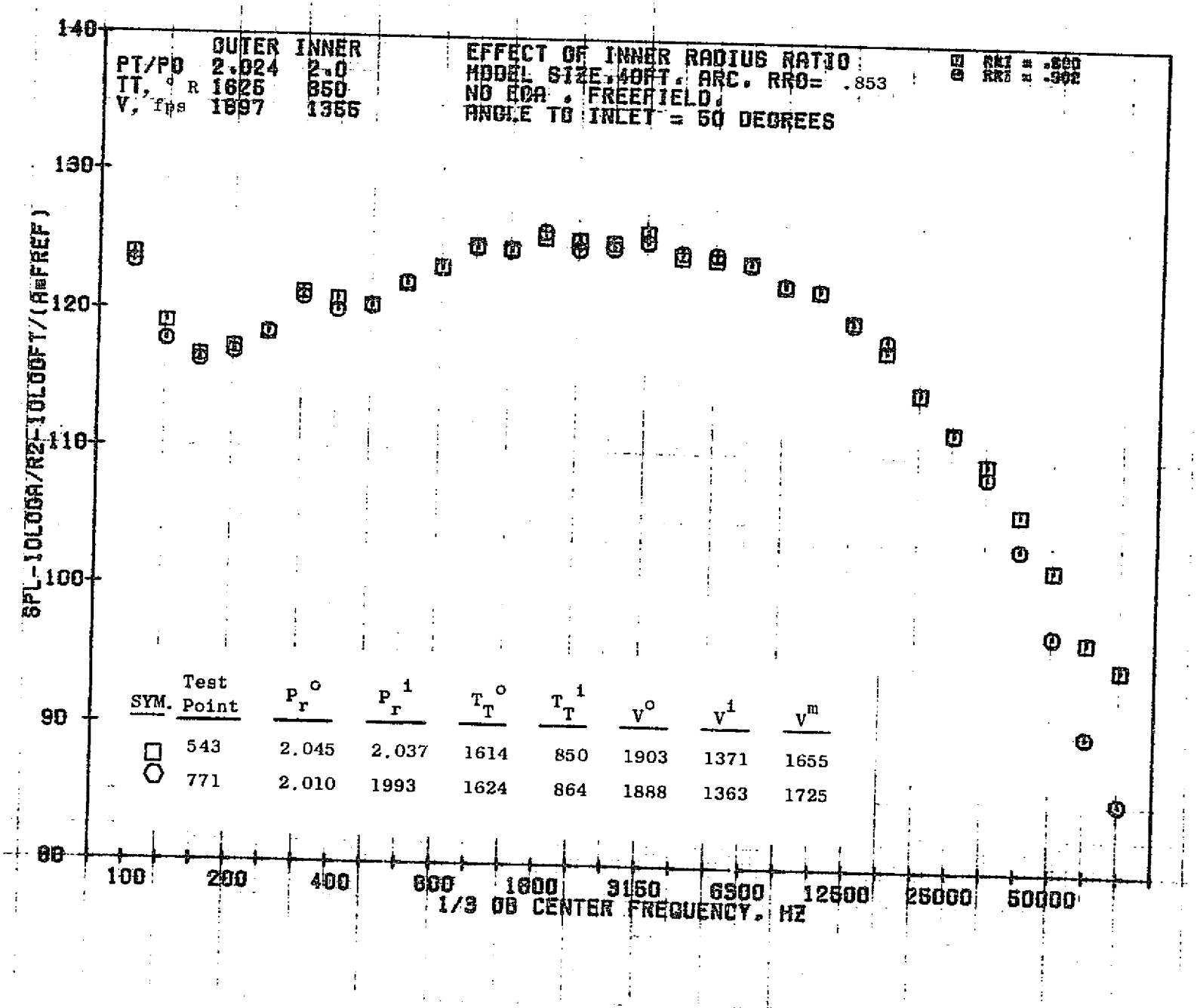

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18161-001

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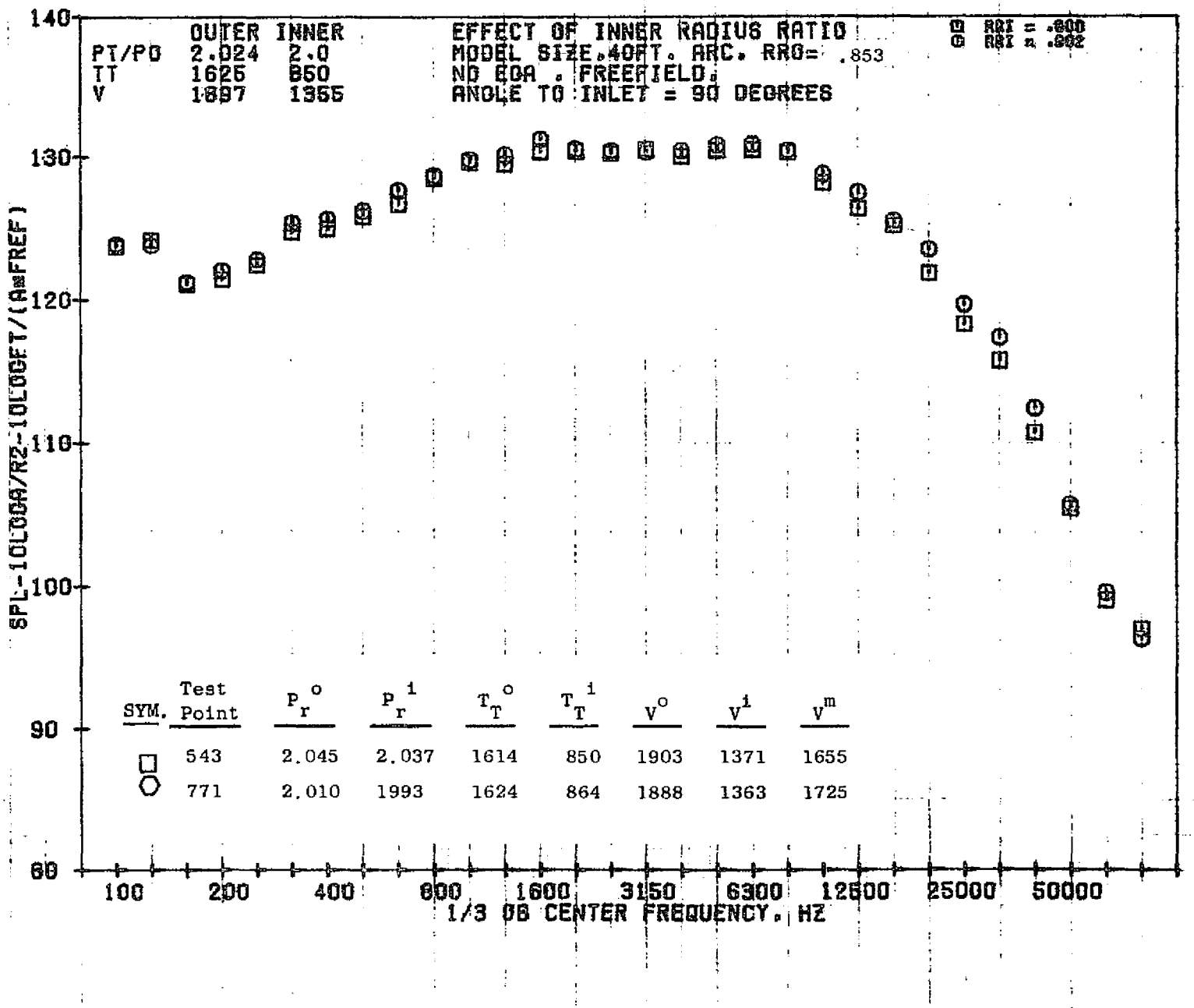

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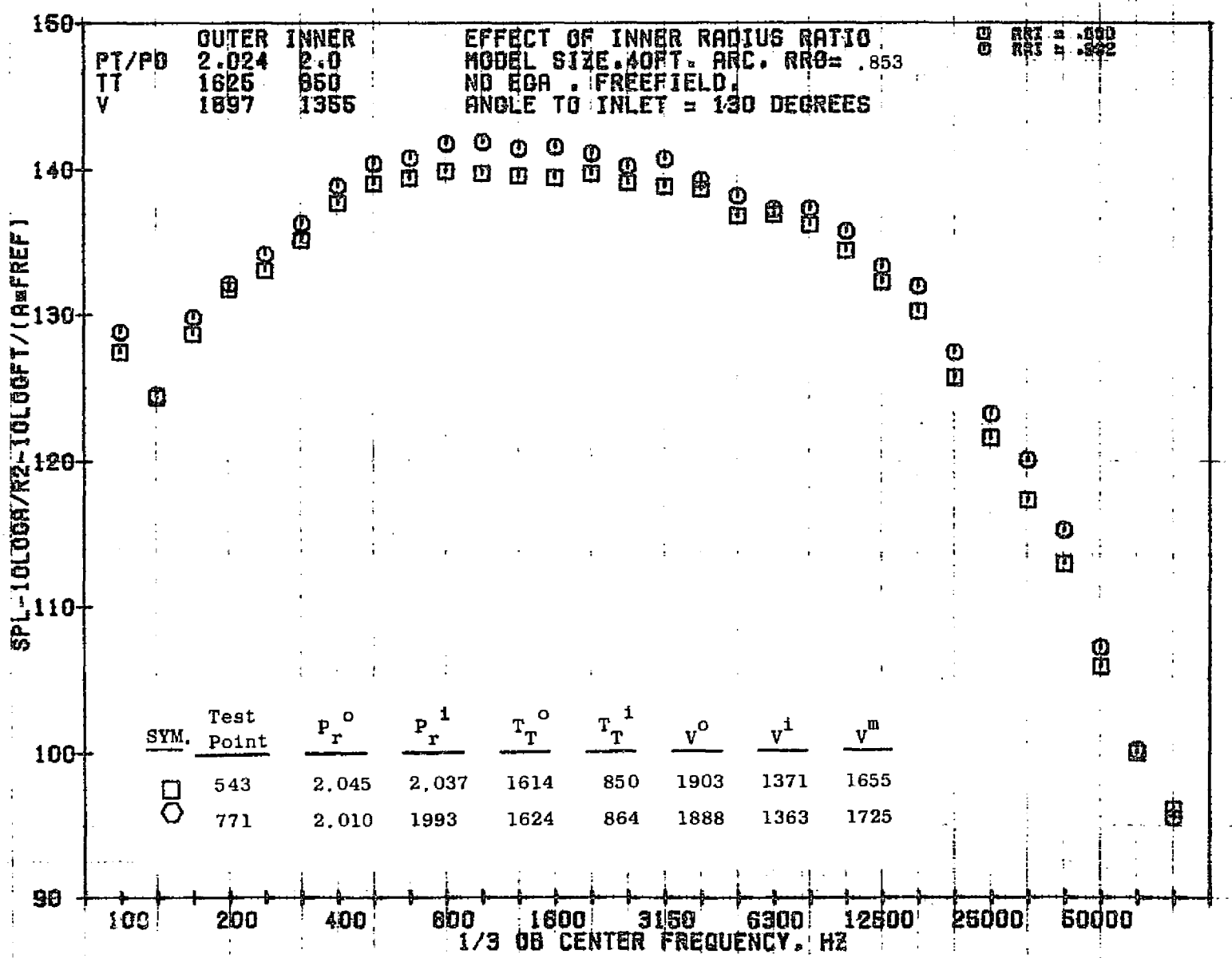

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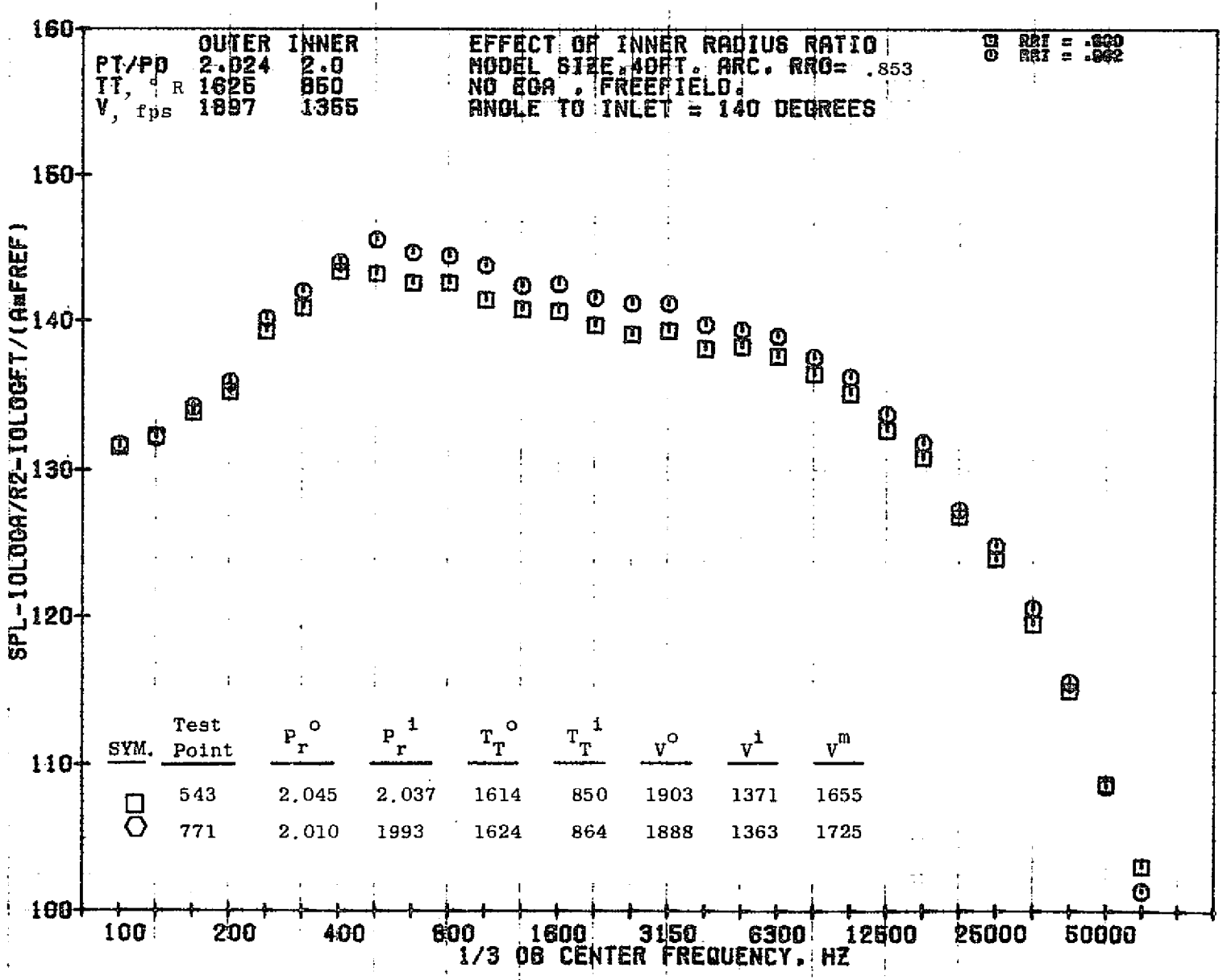

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18161-001

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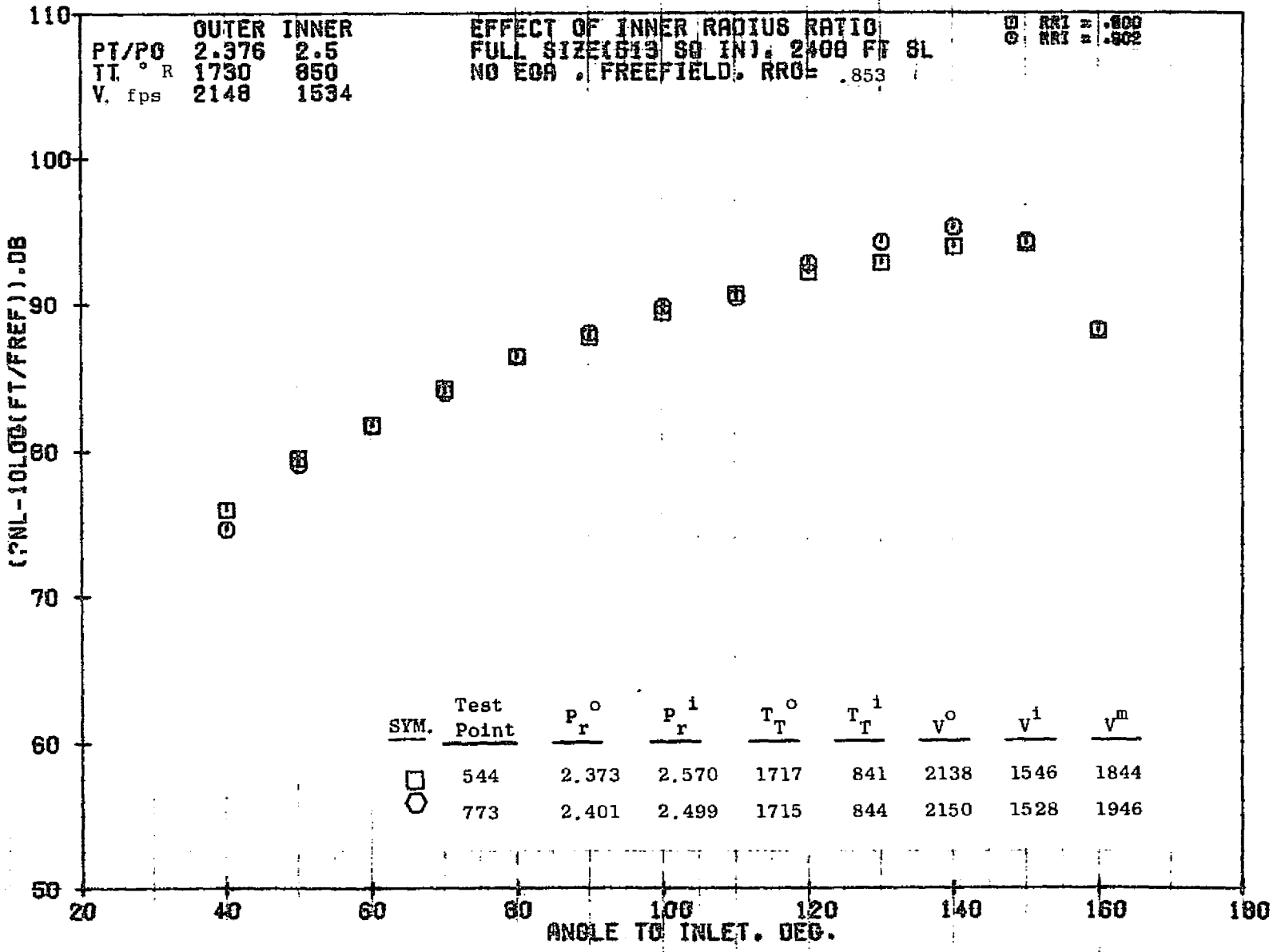

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18124-001

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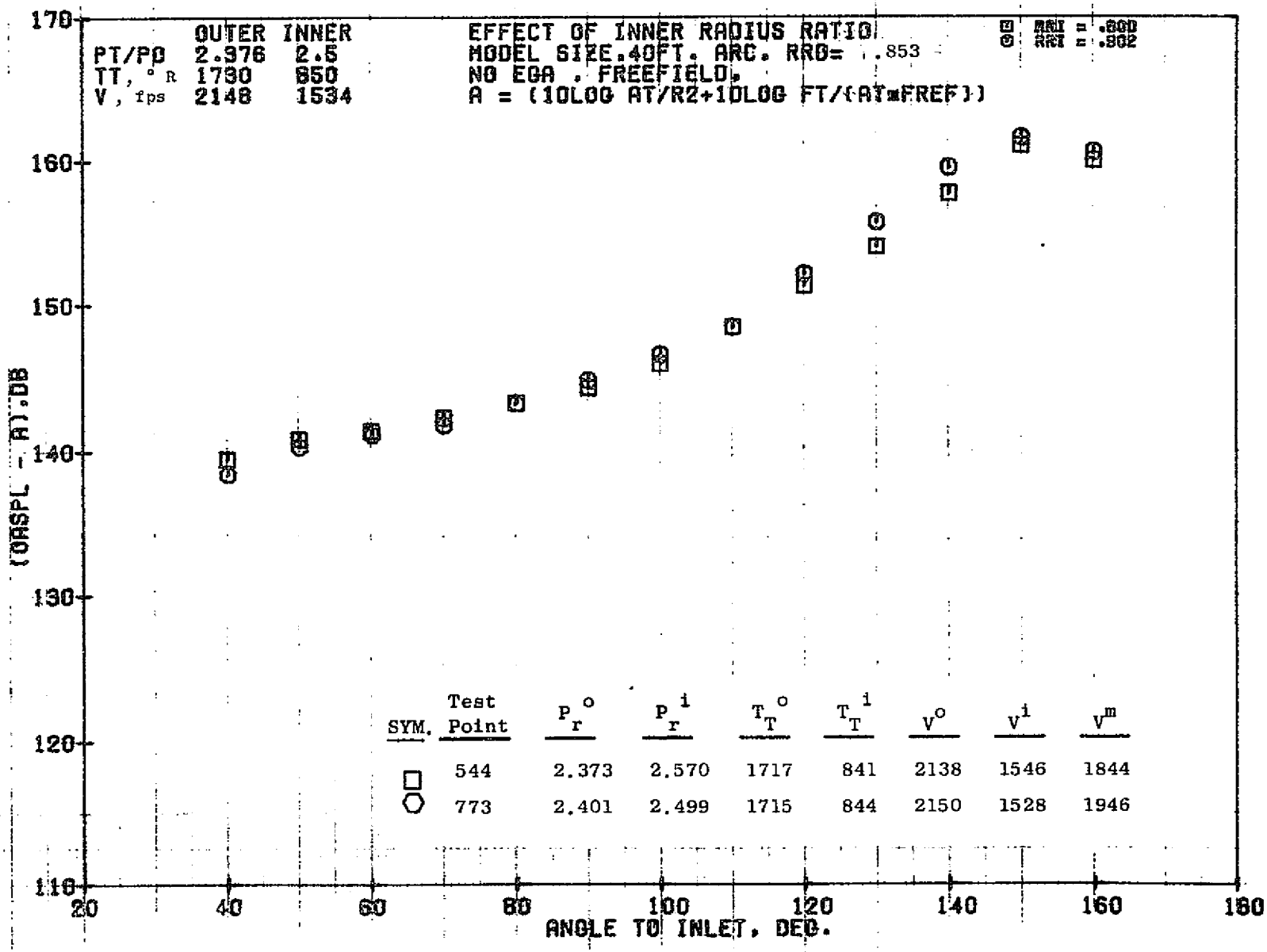

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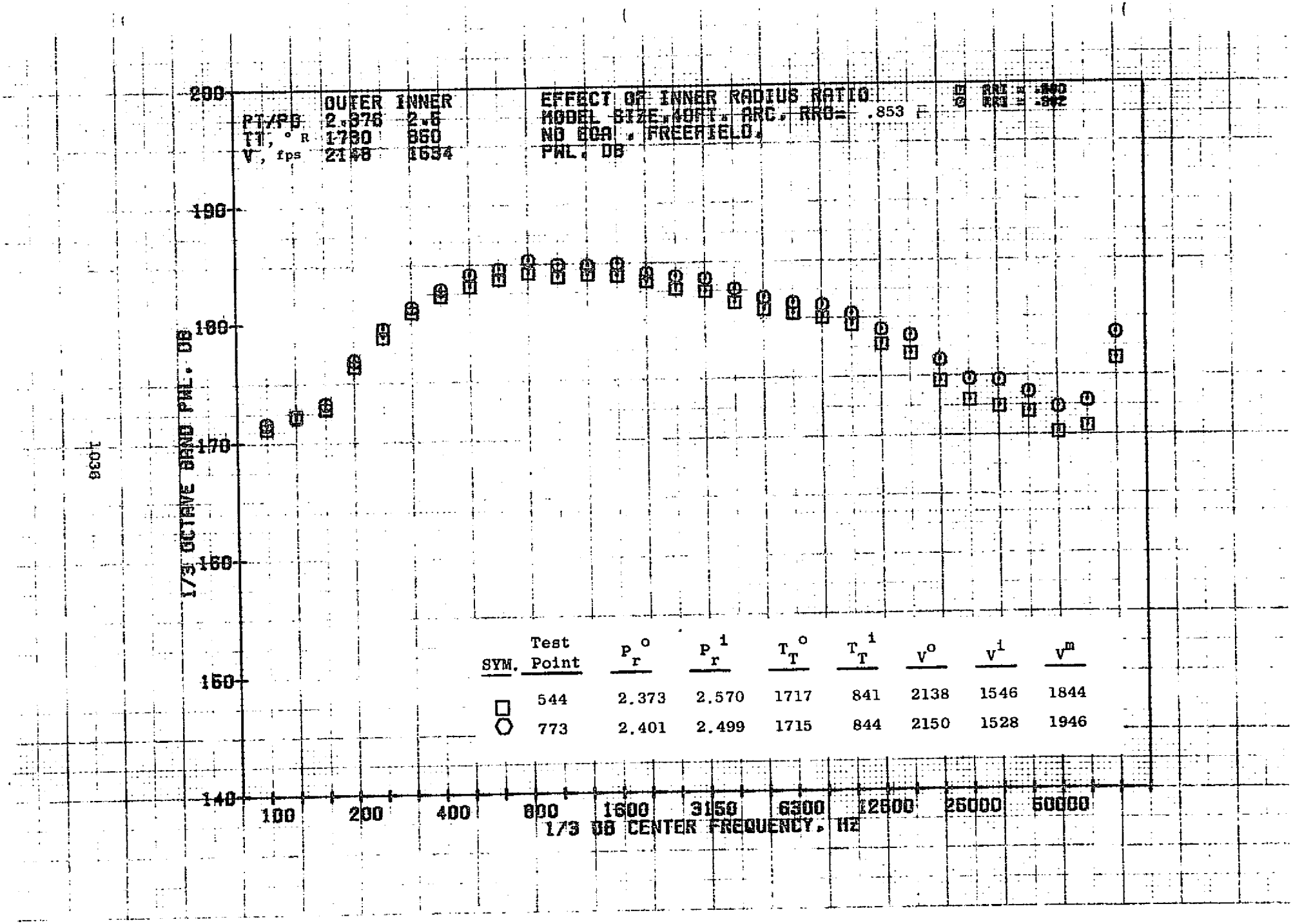

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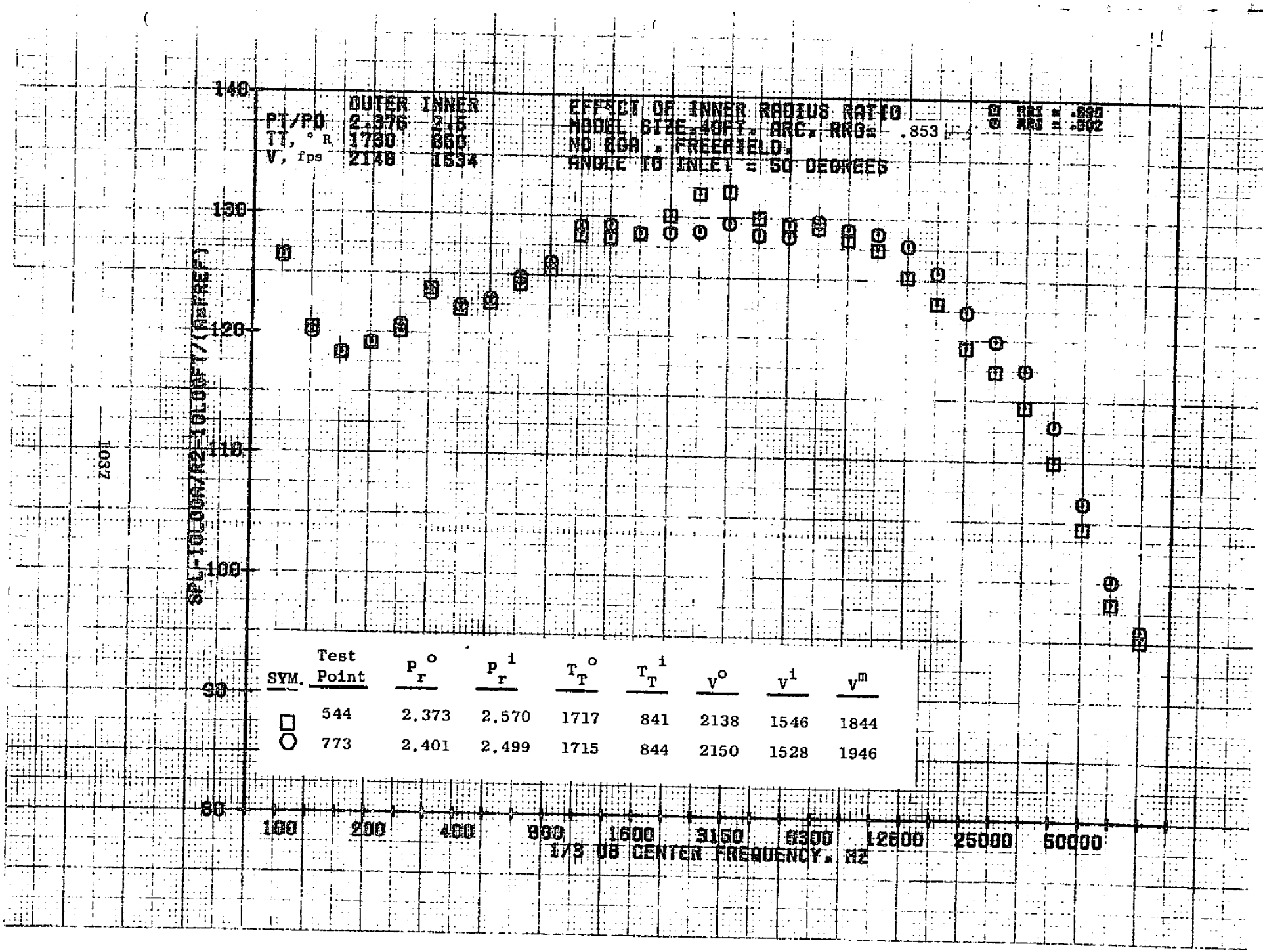

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18161-001

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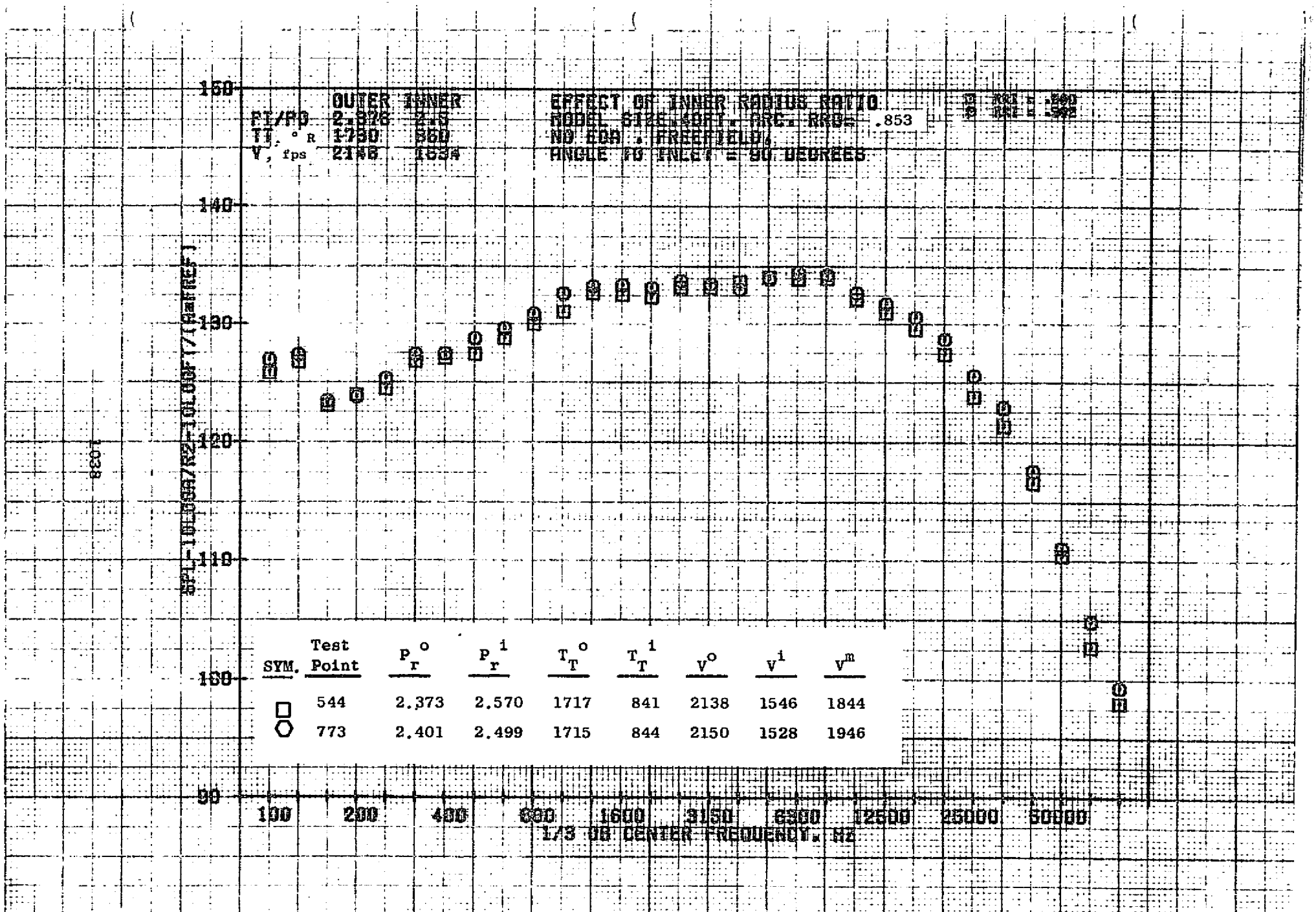

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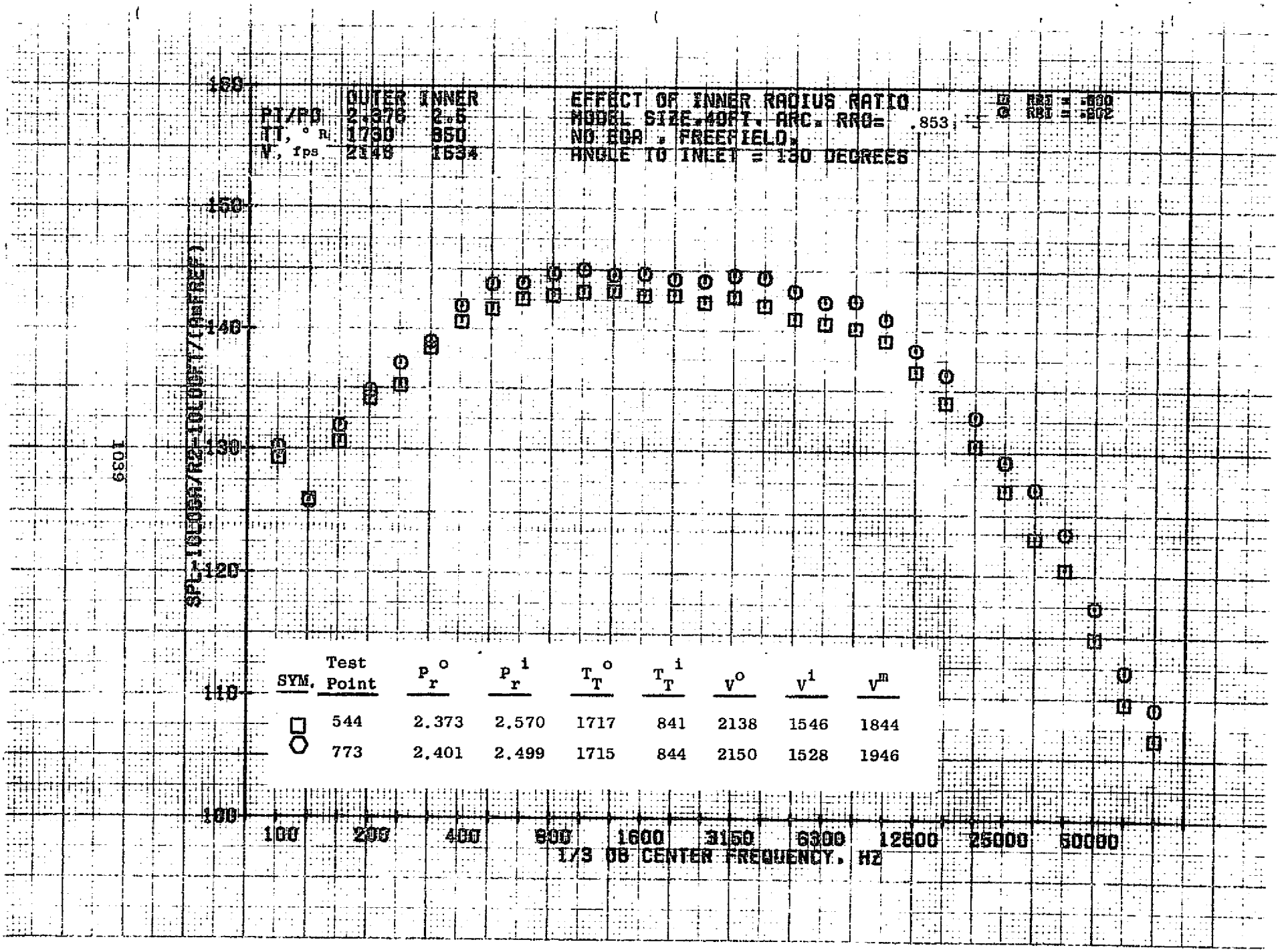

10/29/76
18161-001

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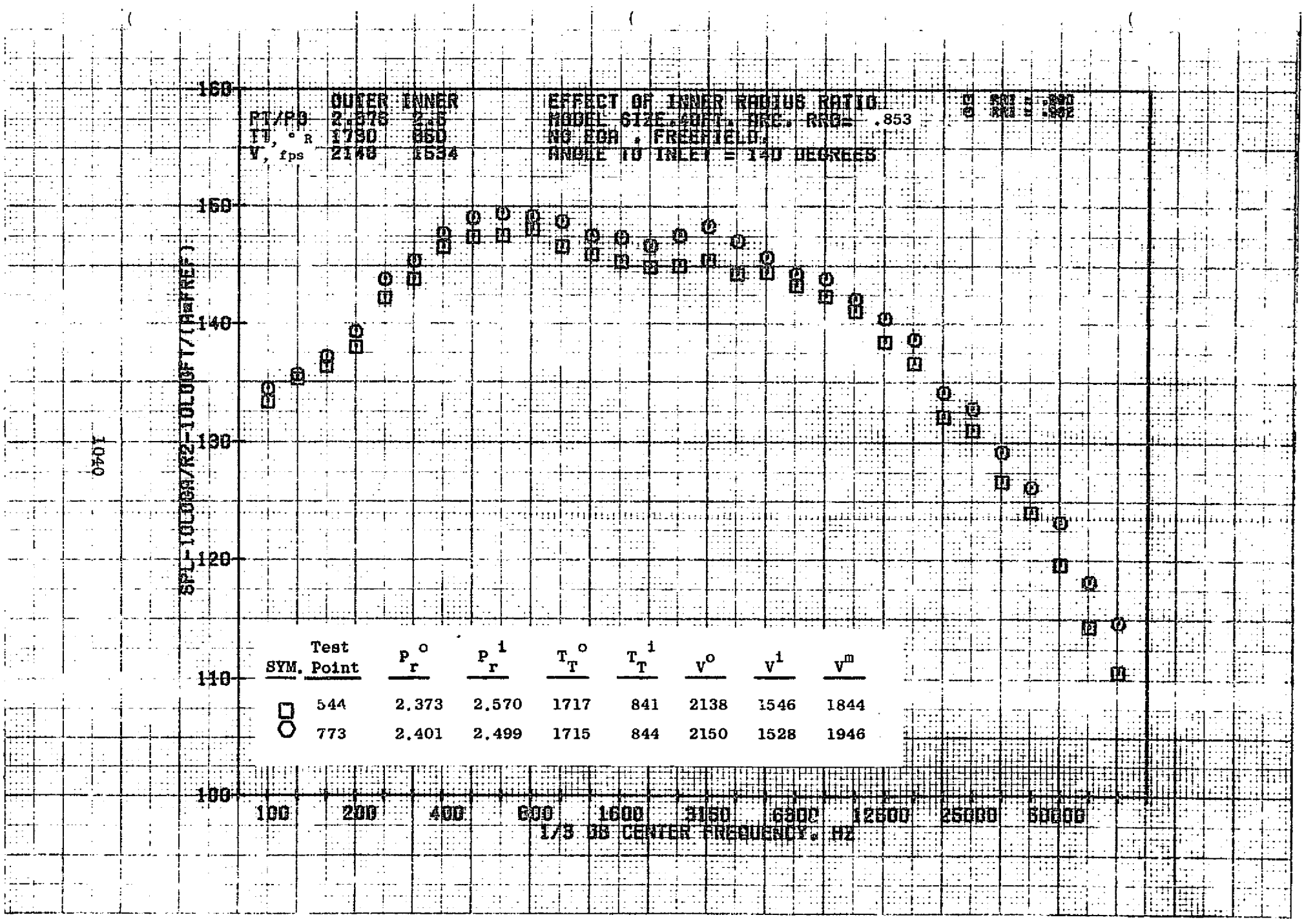

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18161-001

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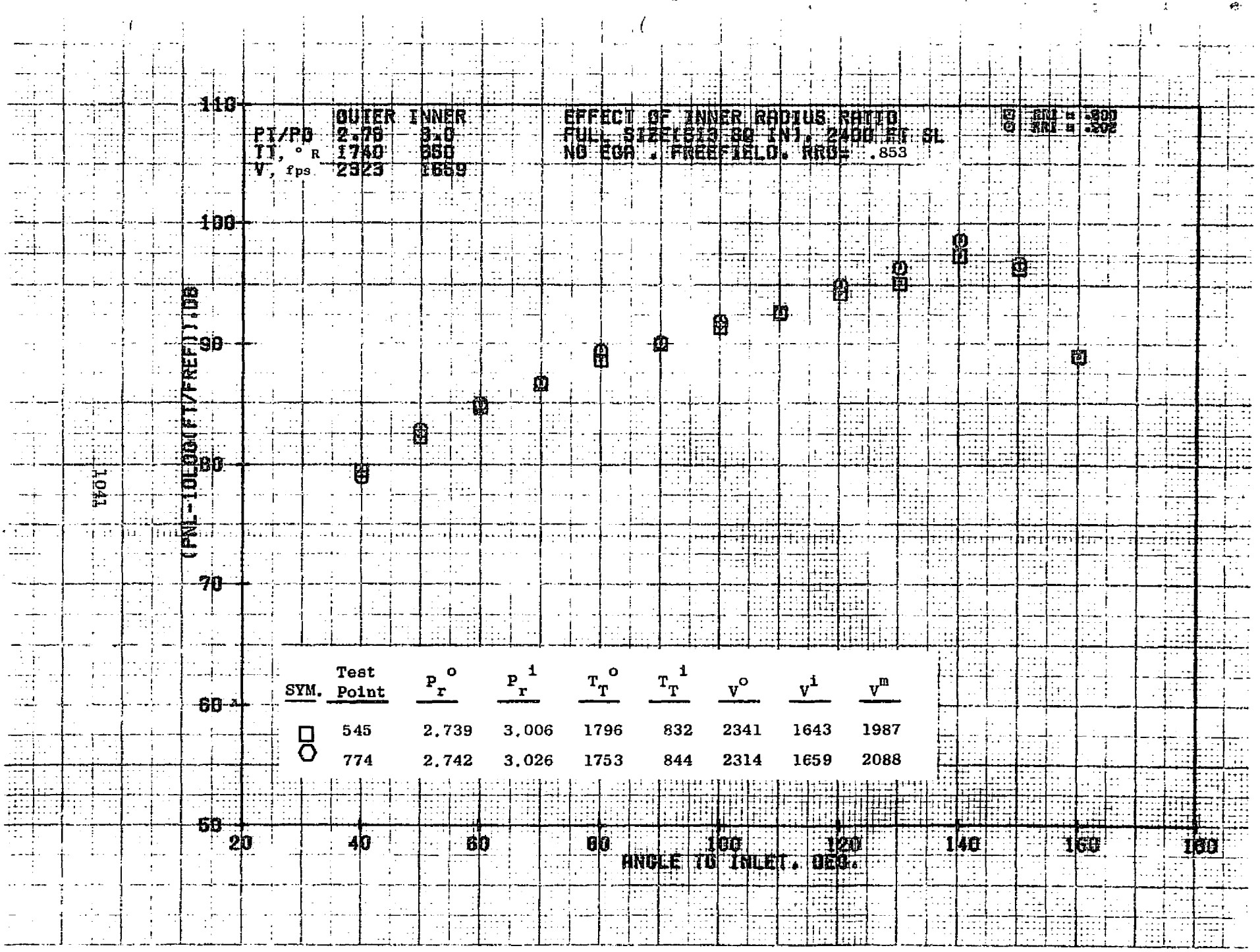

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18124-001

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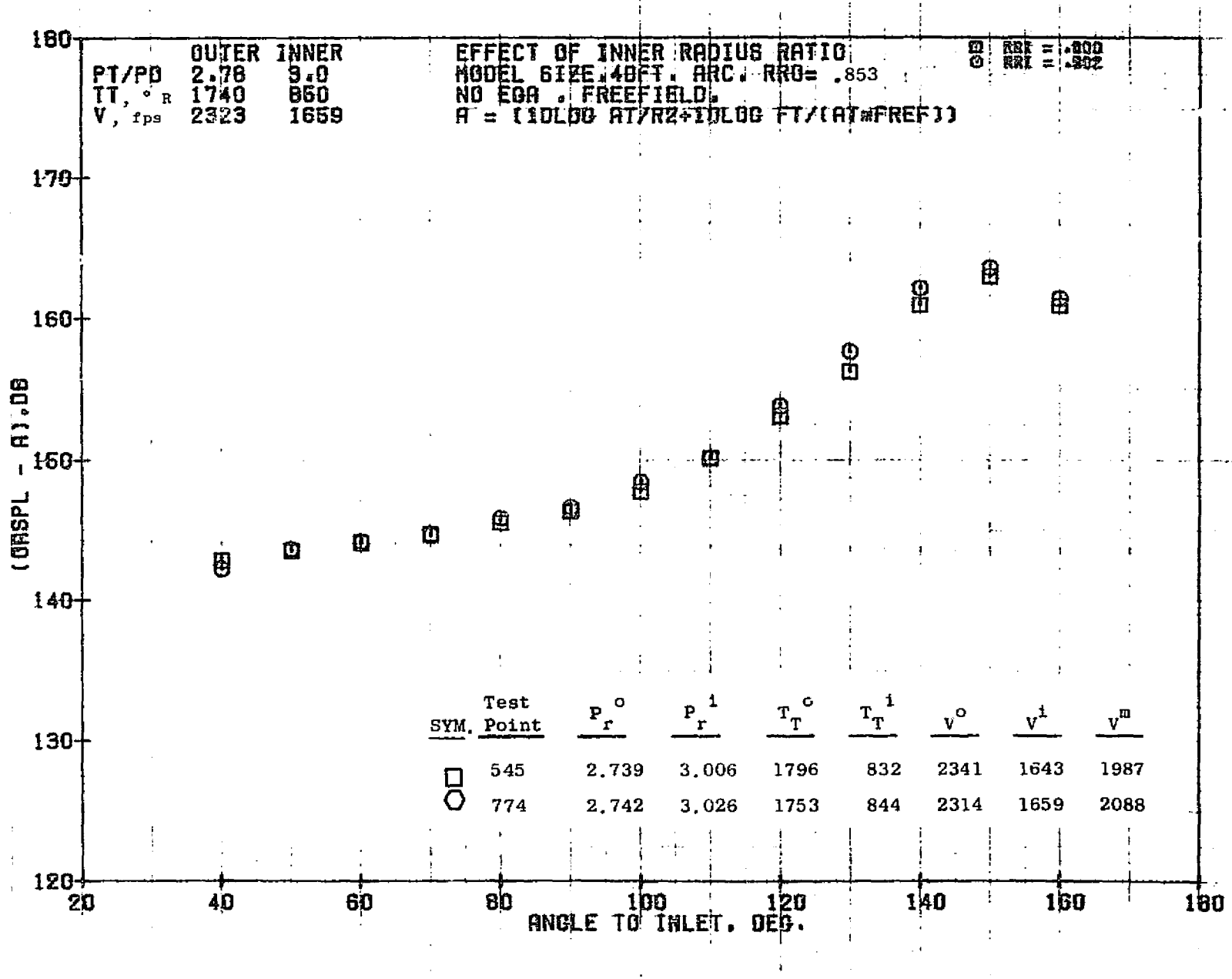

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10/29/76
18161-001

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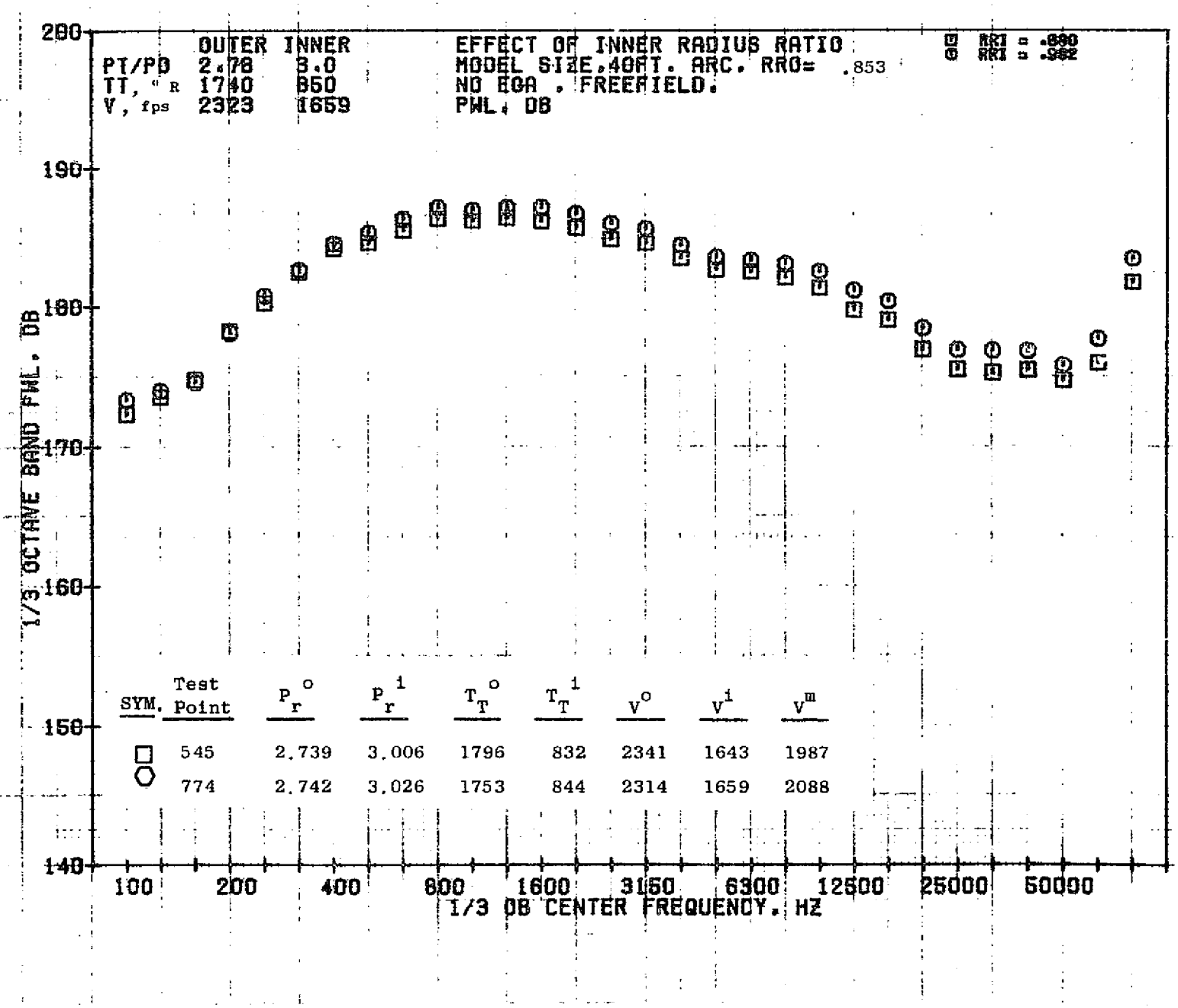

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18161-001

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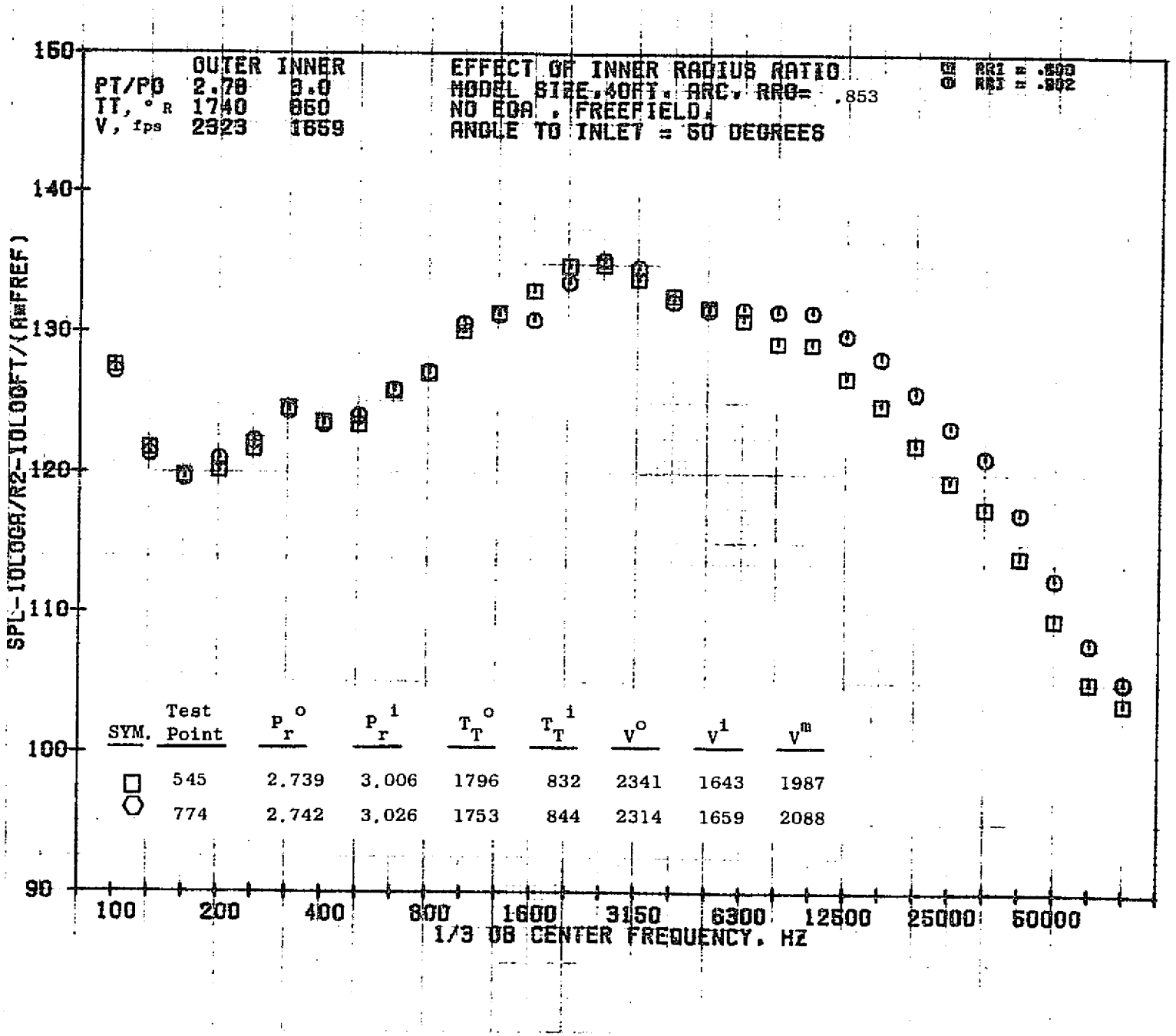

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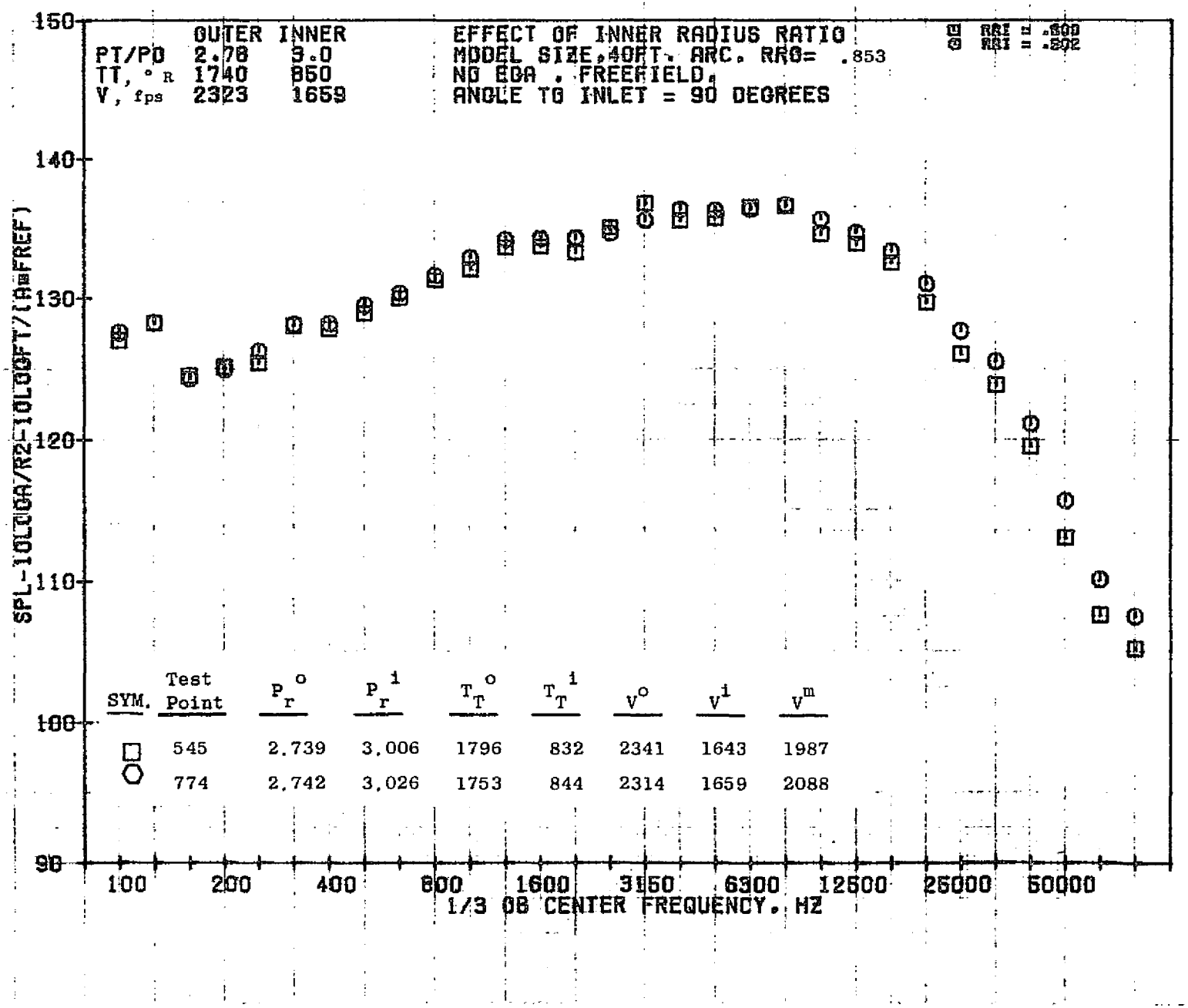

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18161-001

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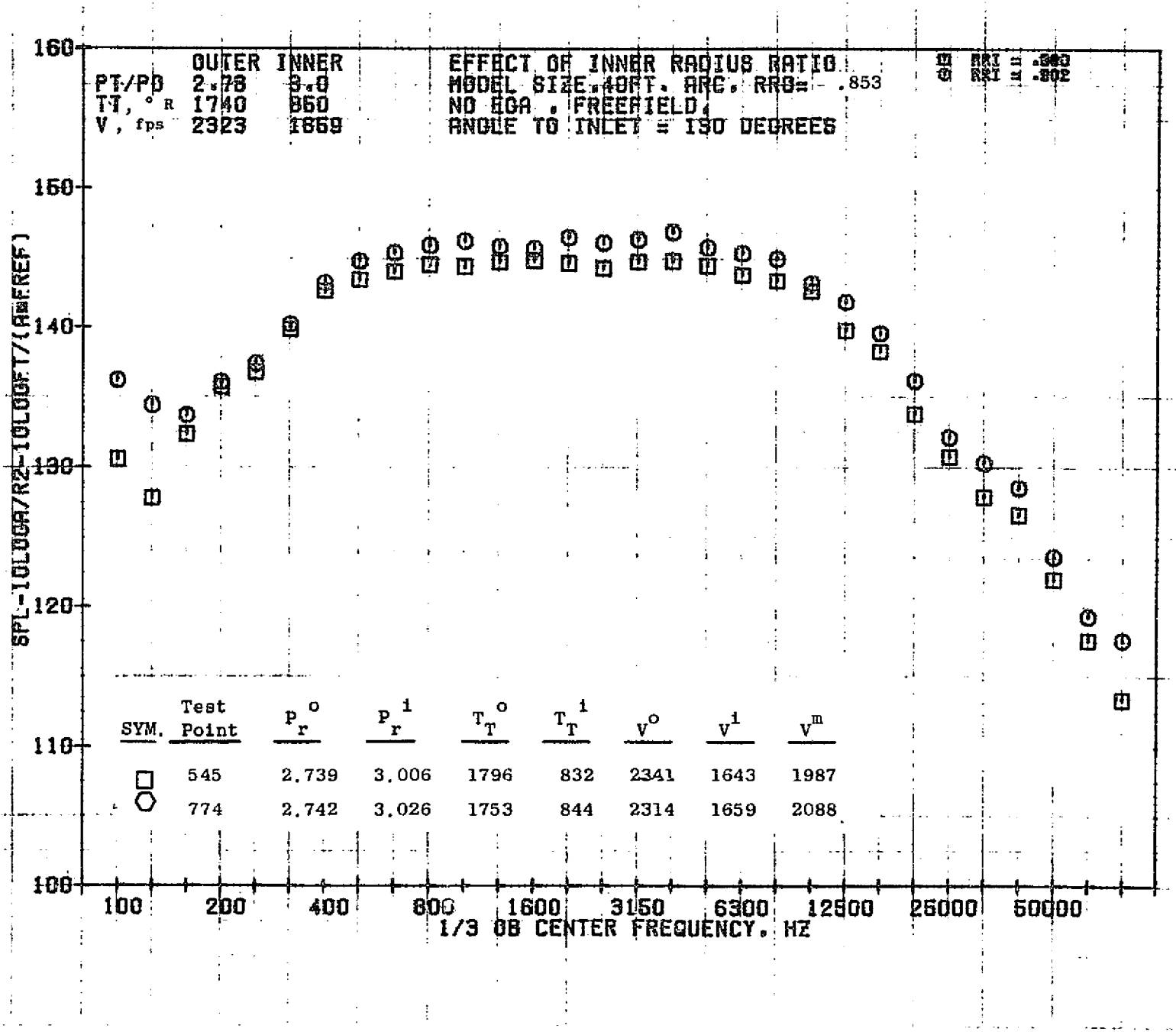

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18181-001

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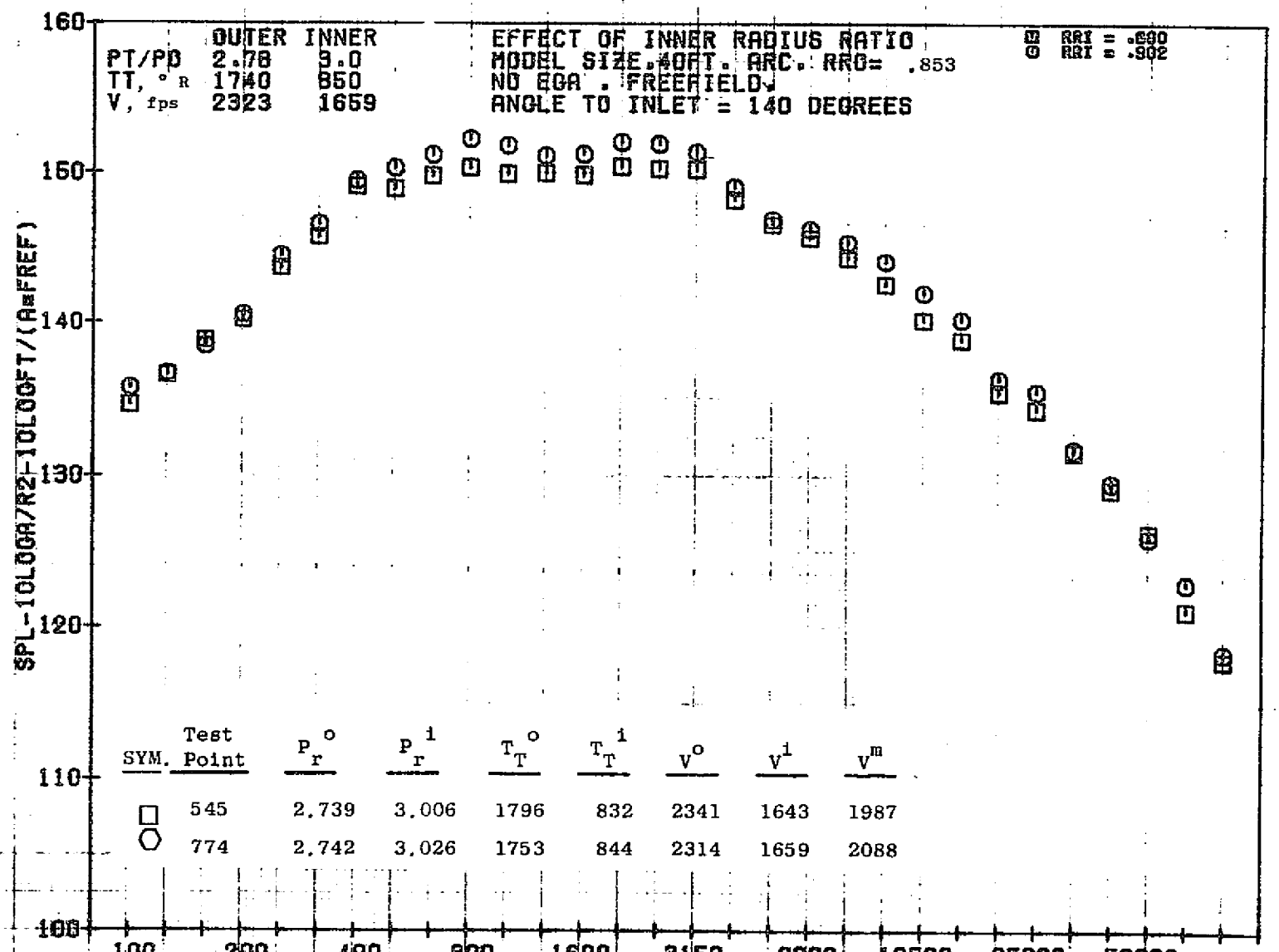

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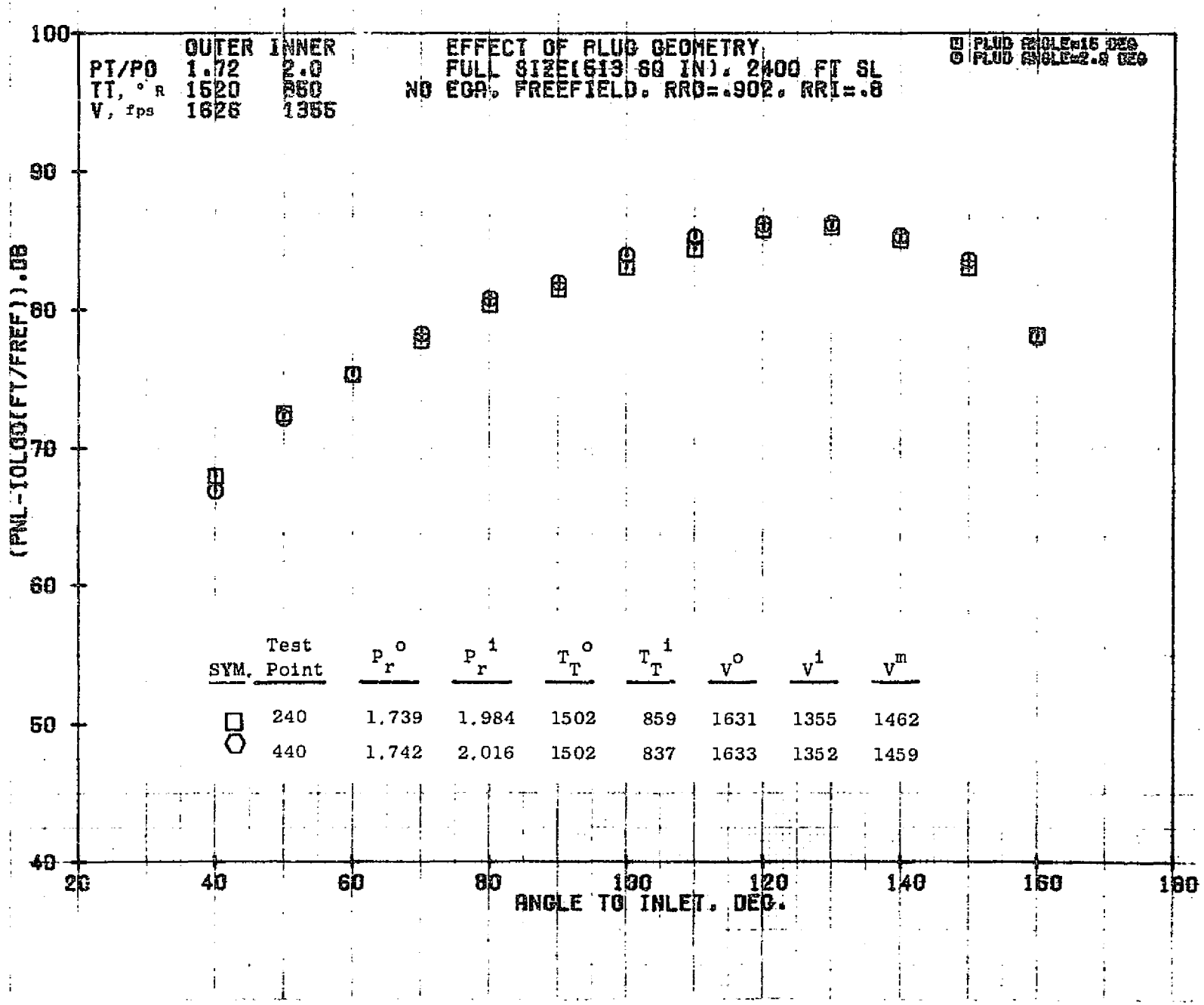
18161-001

79 BURCH A.

7.4.3 Effect of Plug Geometry

The effect of plug geometry is examined in this section. Configurations 2 and 4 have the same inner and outer radius ratios but different plug geometries. Configuration 2 has a smooth plug contour while Configuration 4 has a somewhat flat plug crown.



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18130-001

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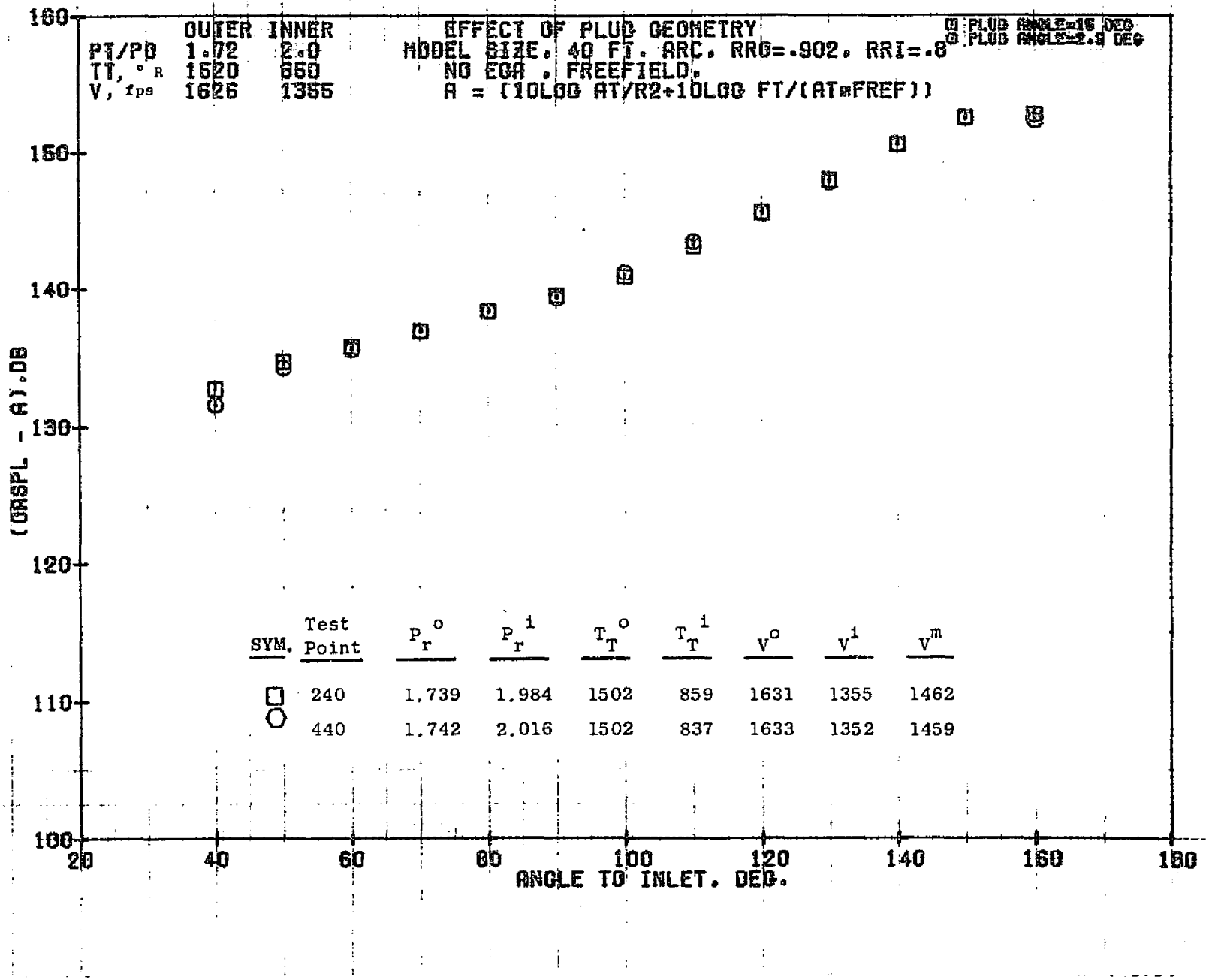

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18159-001

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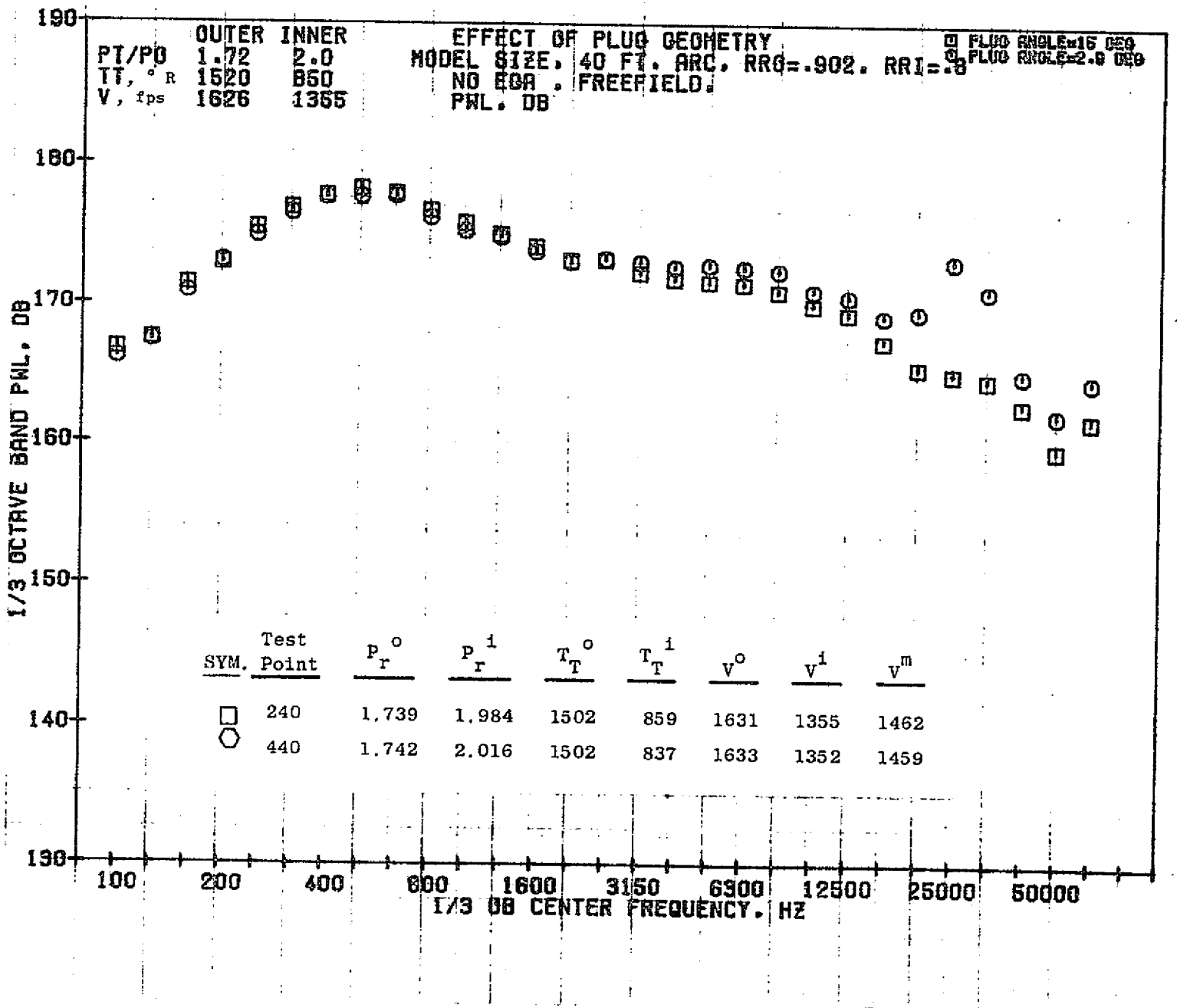

10/29/76
18159-001

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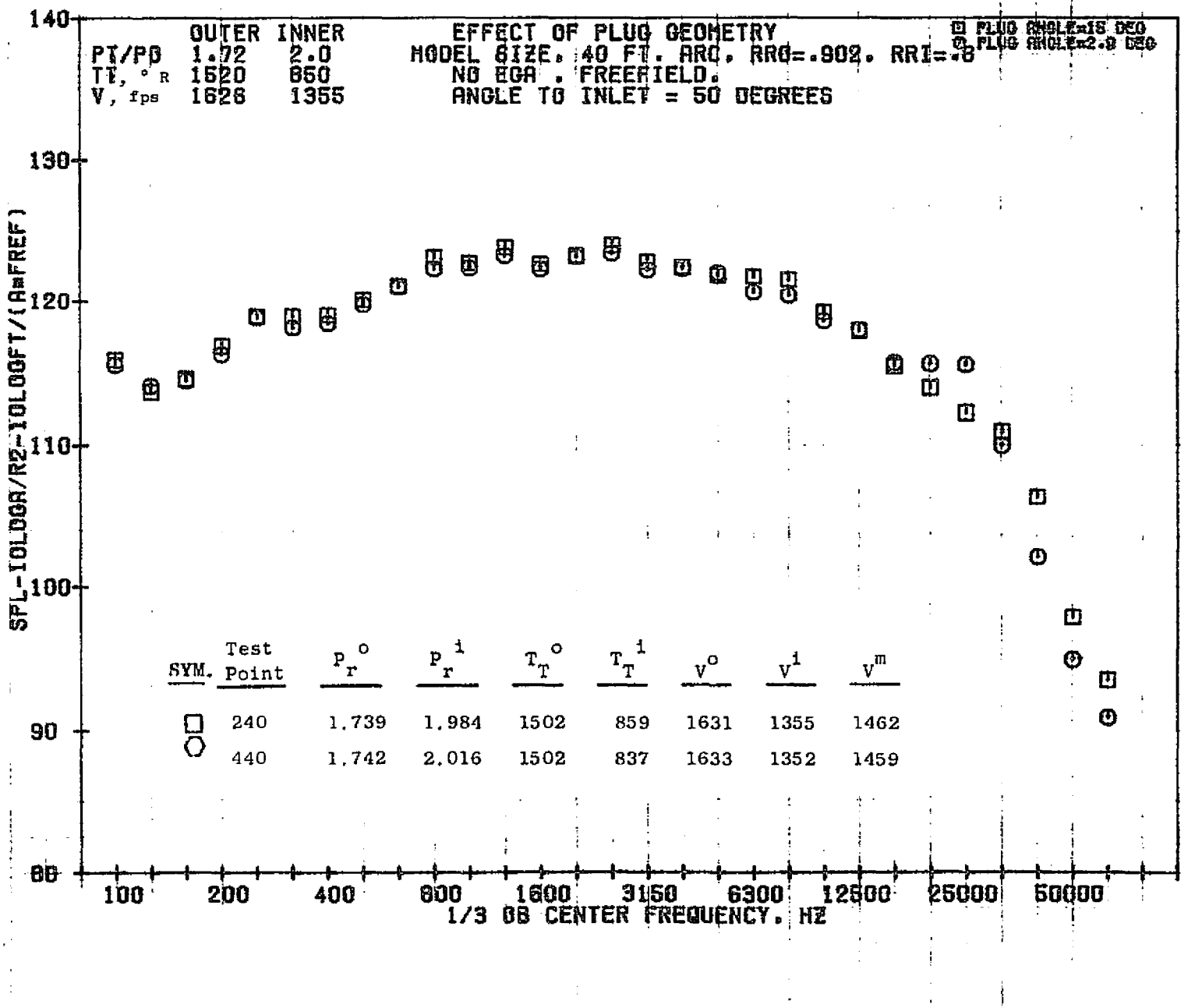

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18159-001

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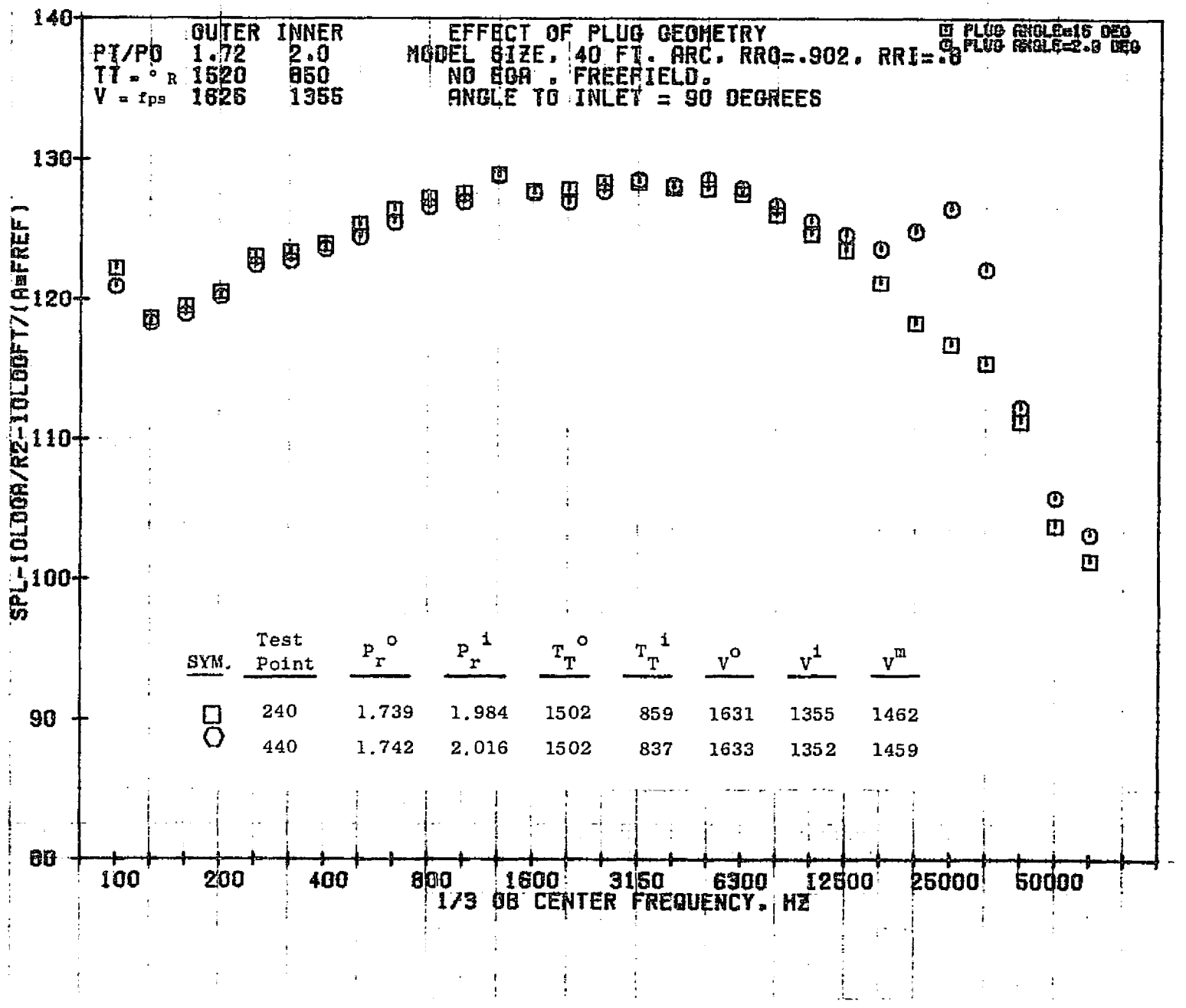

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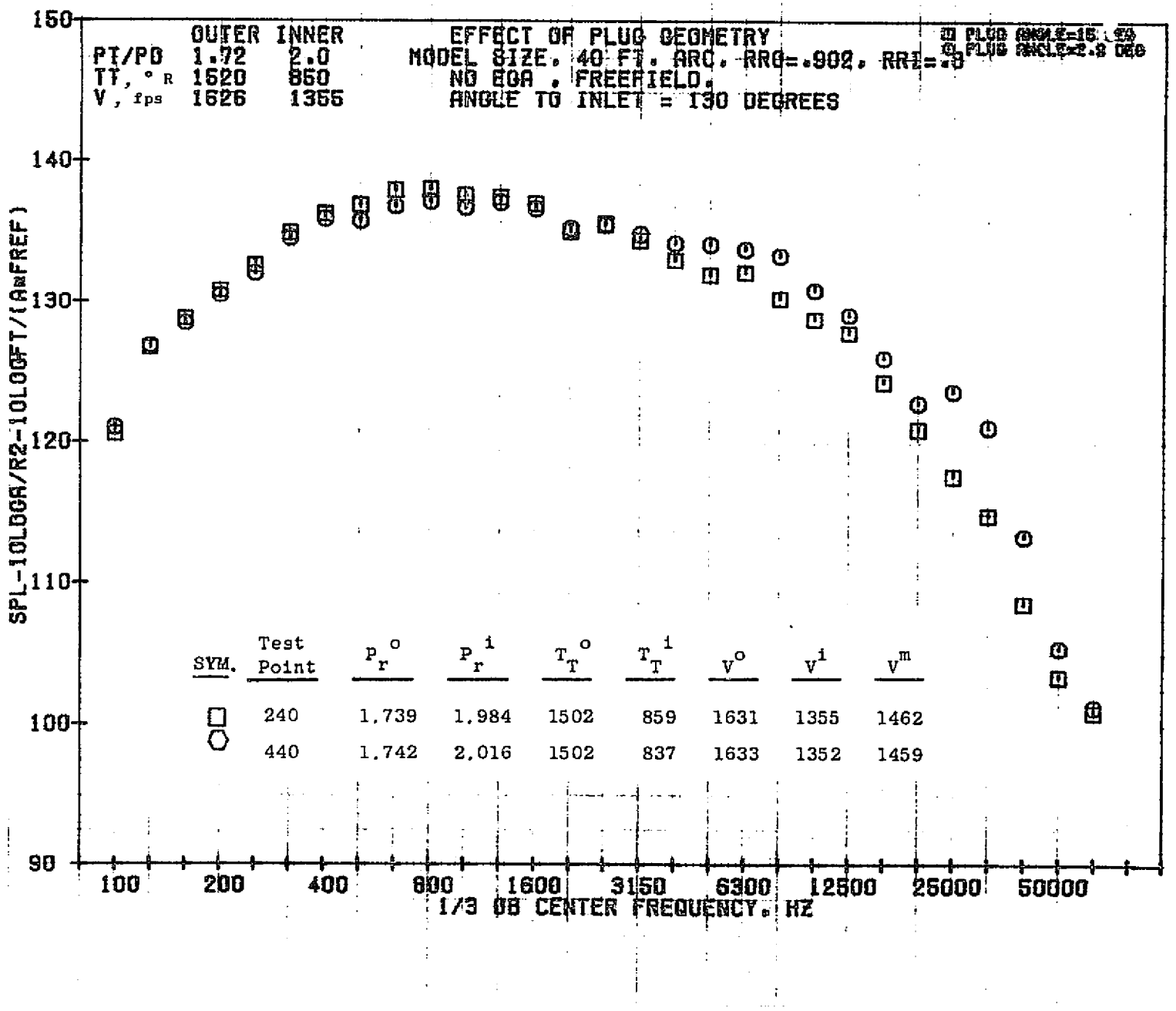

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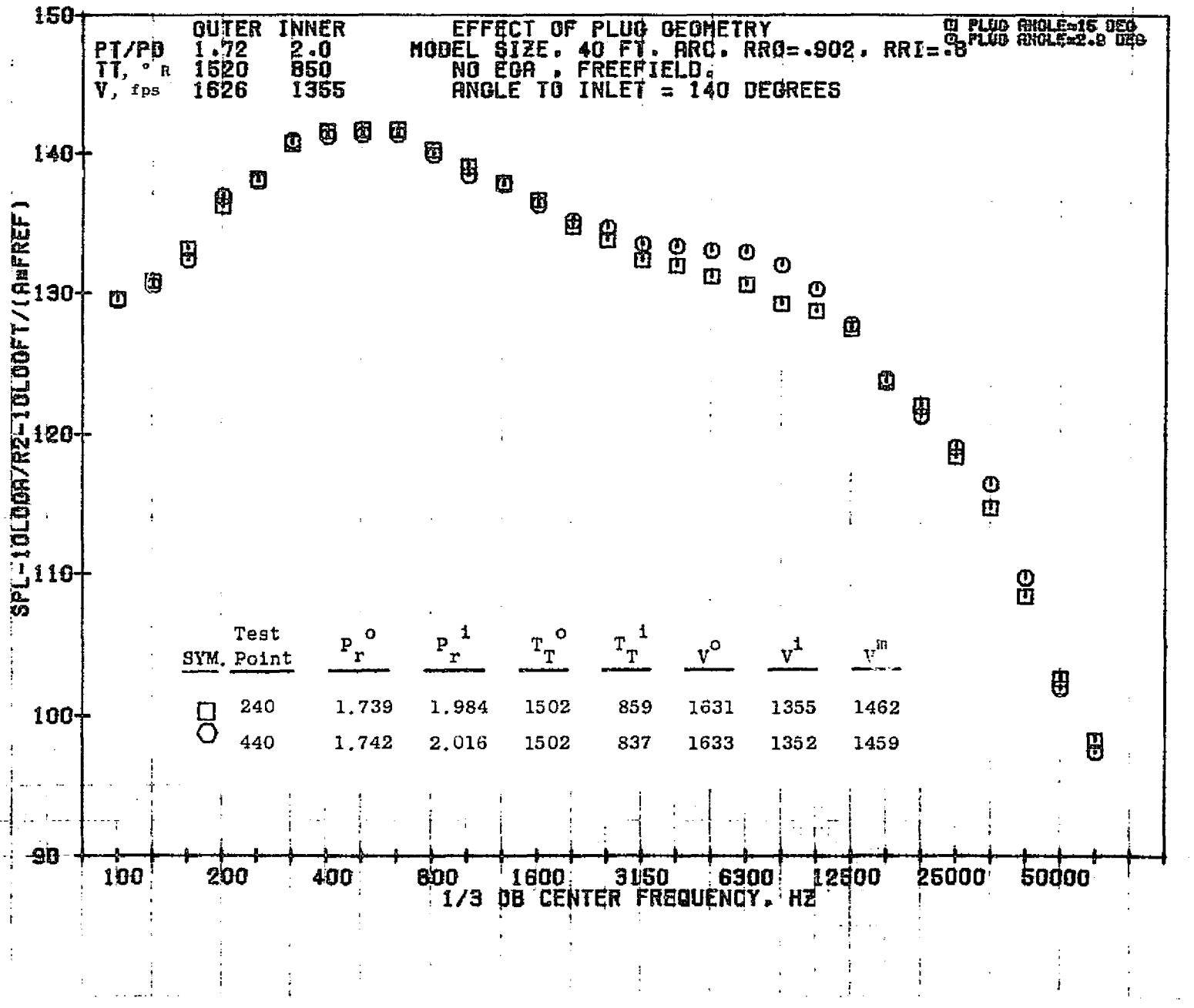

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1B159-001

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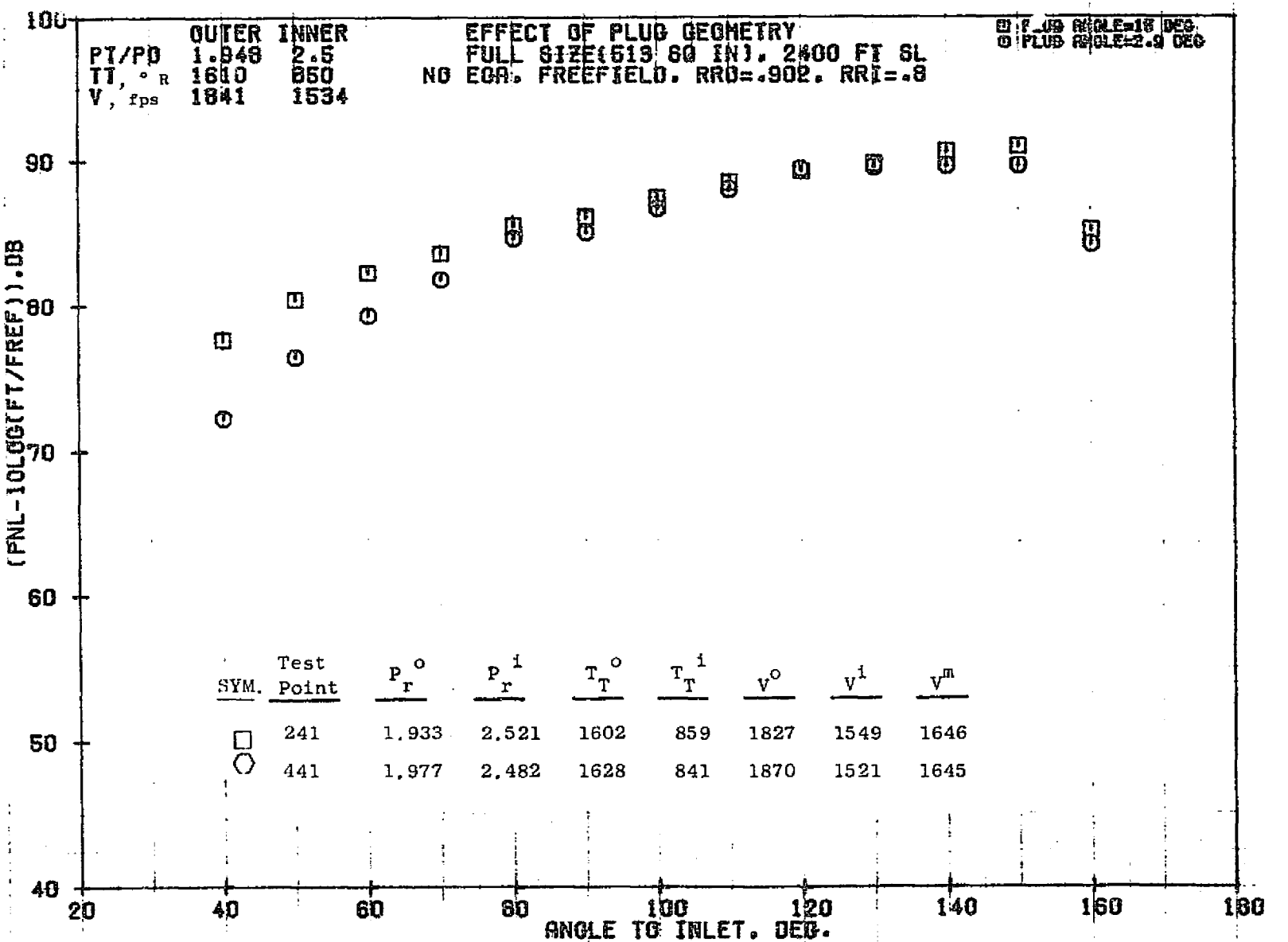

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18130-001

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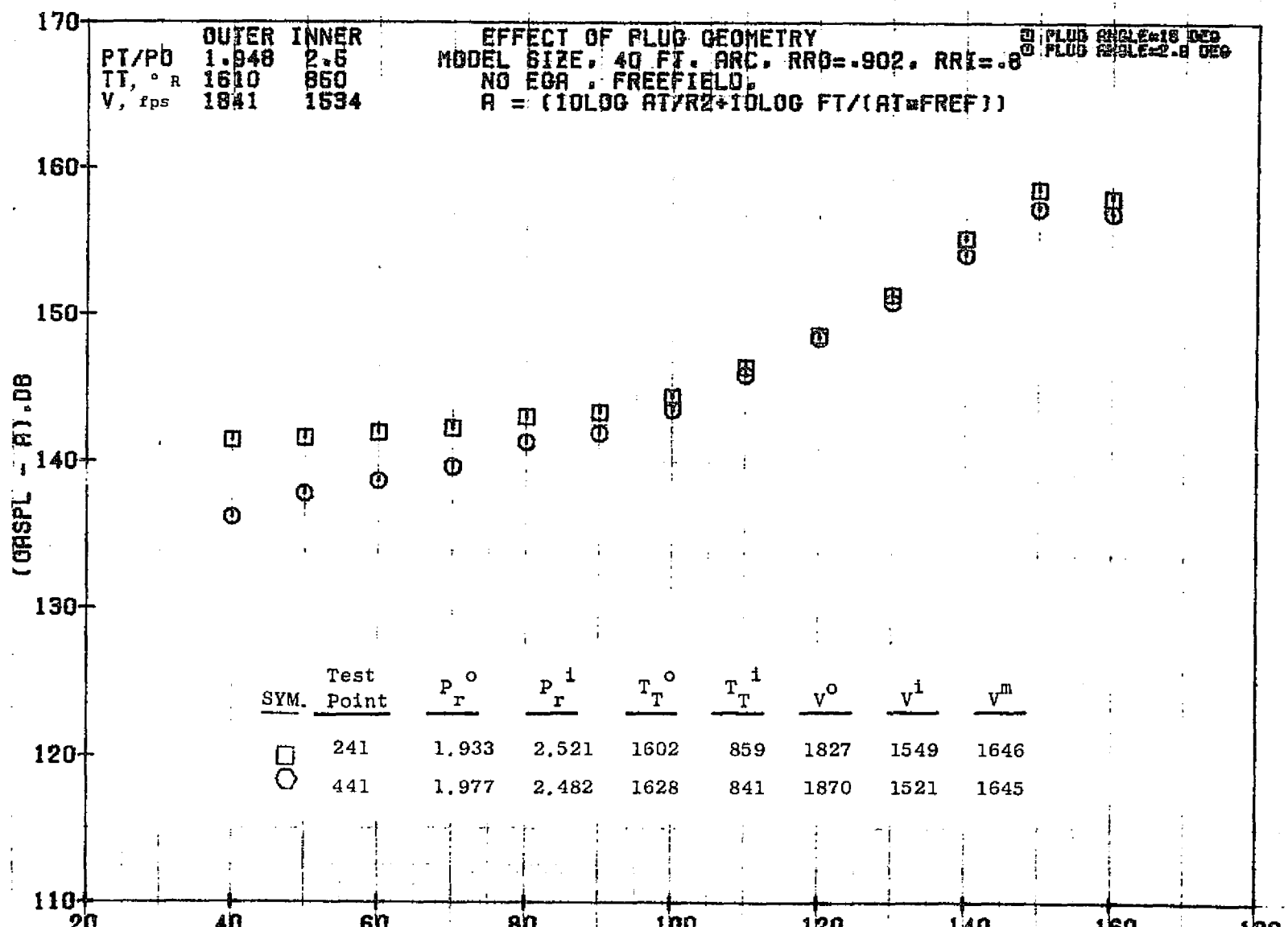

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18159-001

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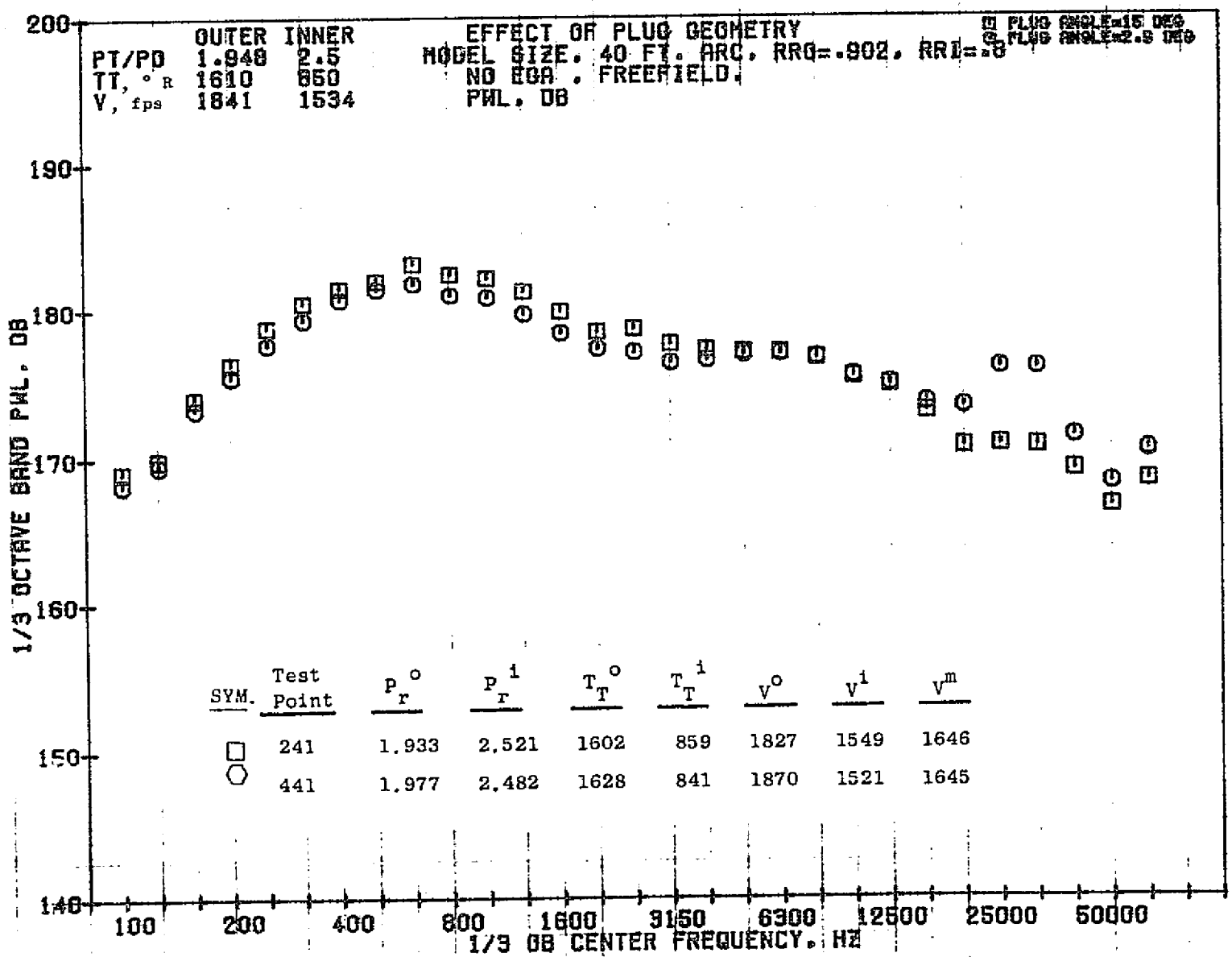

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18159-001

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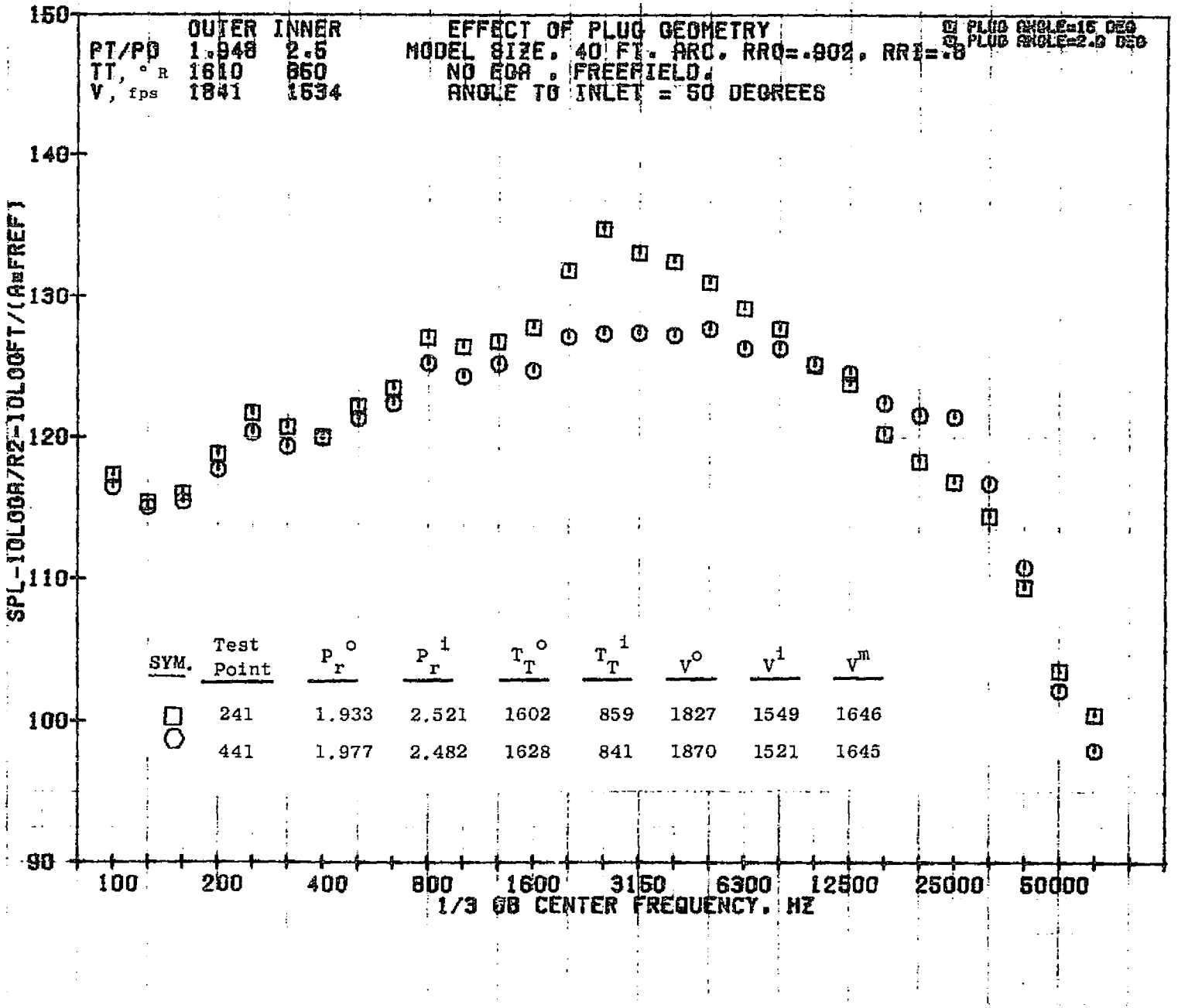

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18159-001

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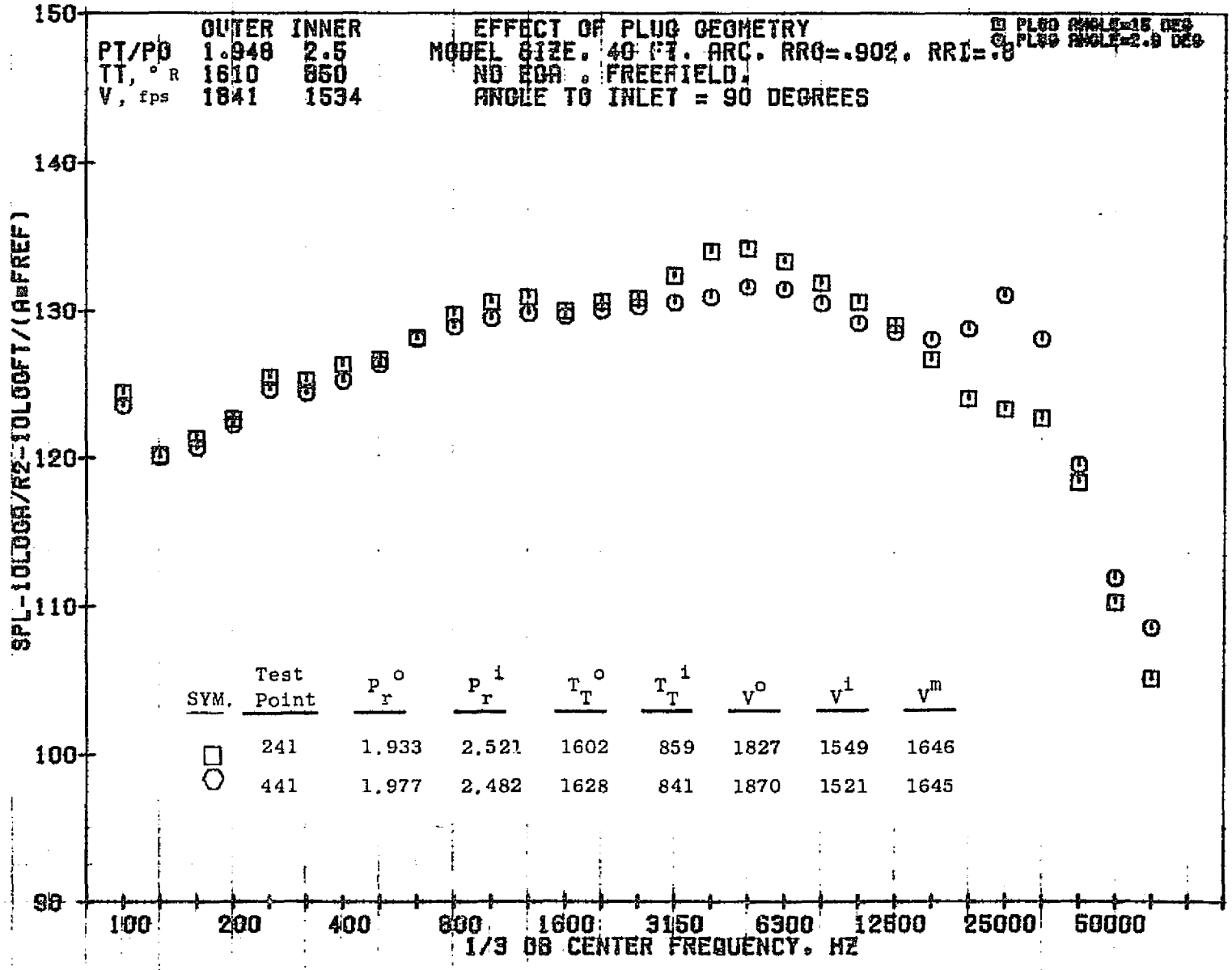

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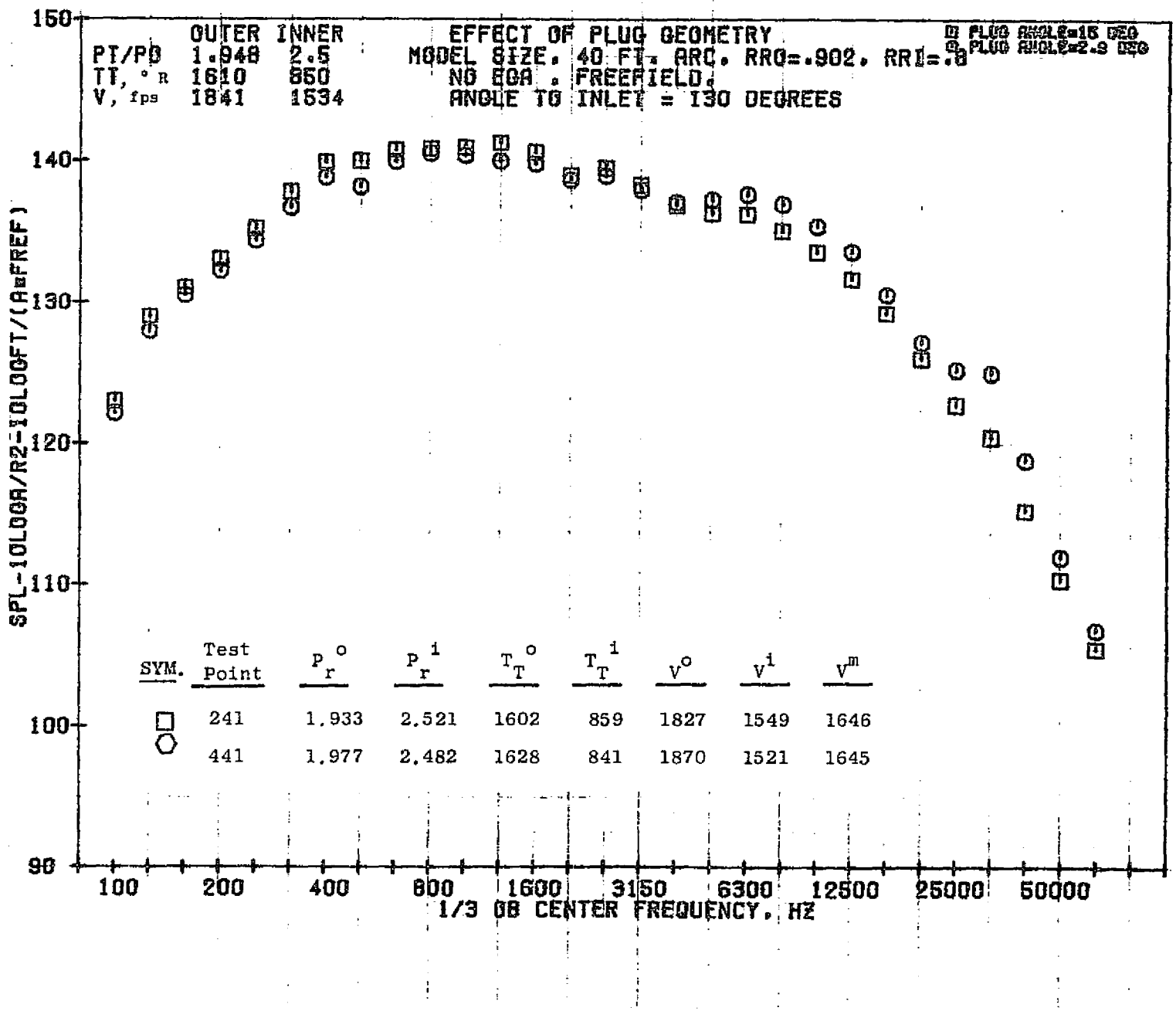

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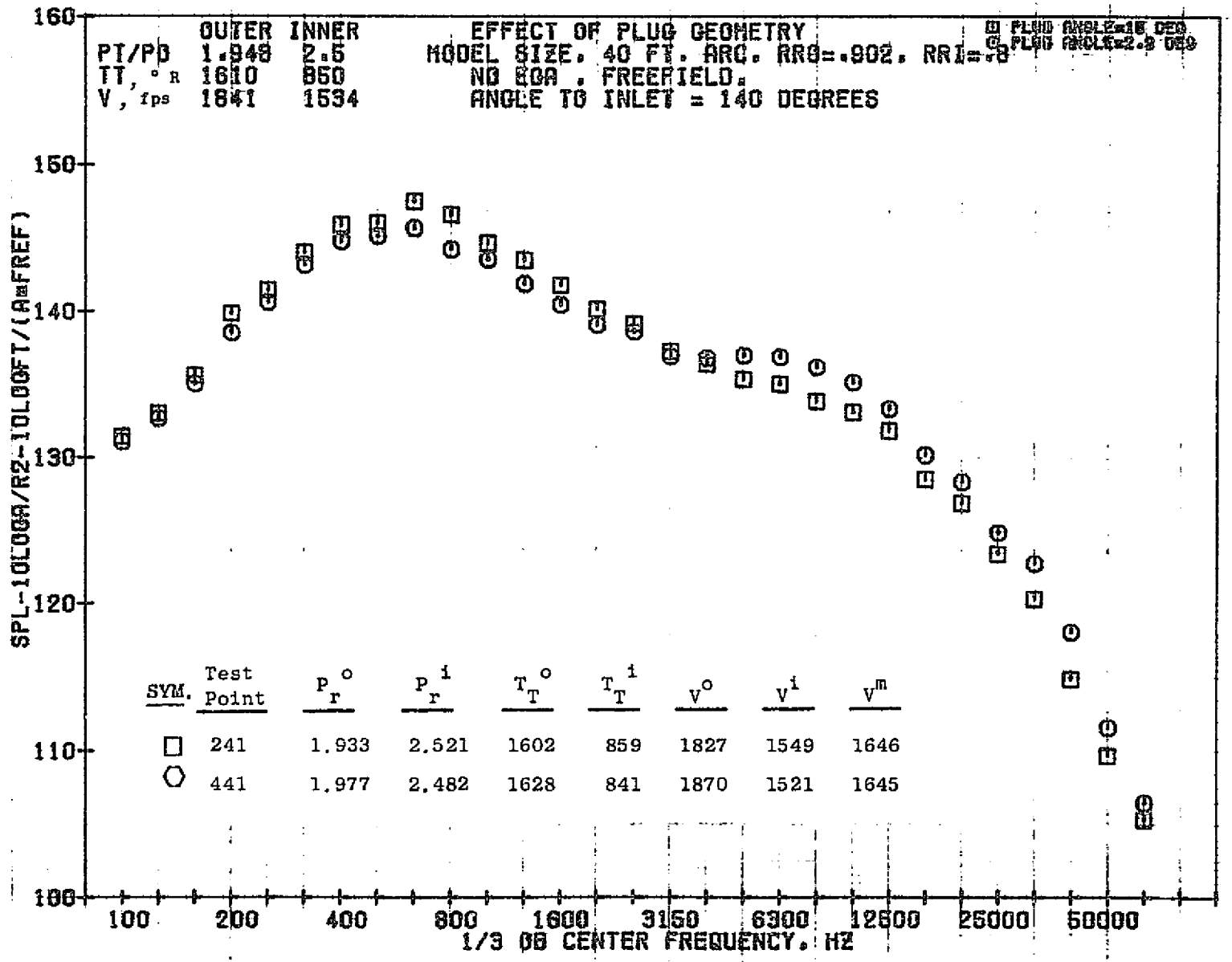

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18159-001

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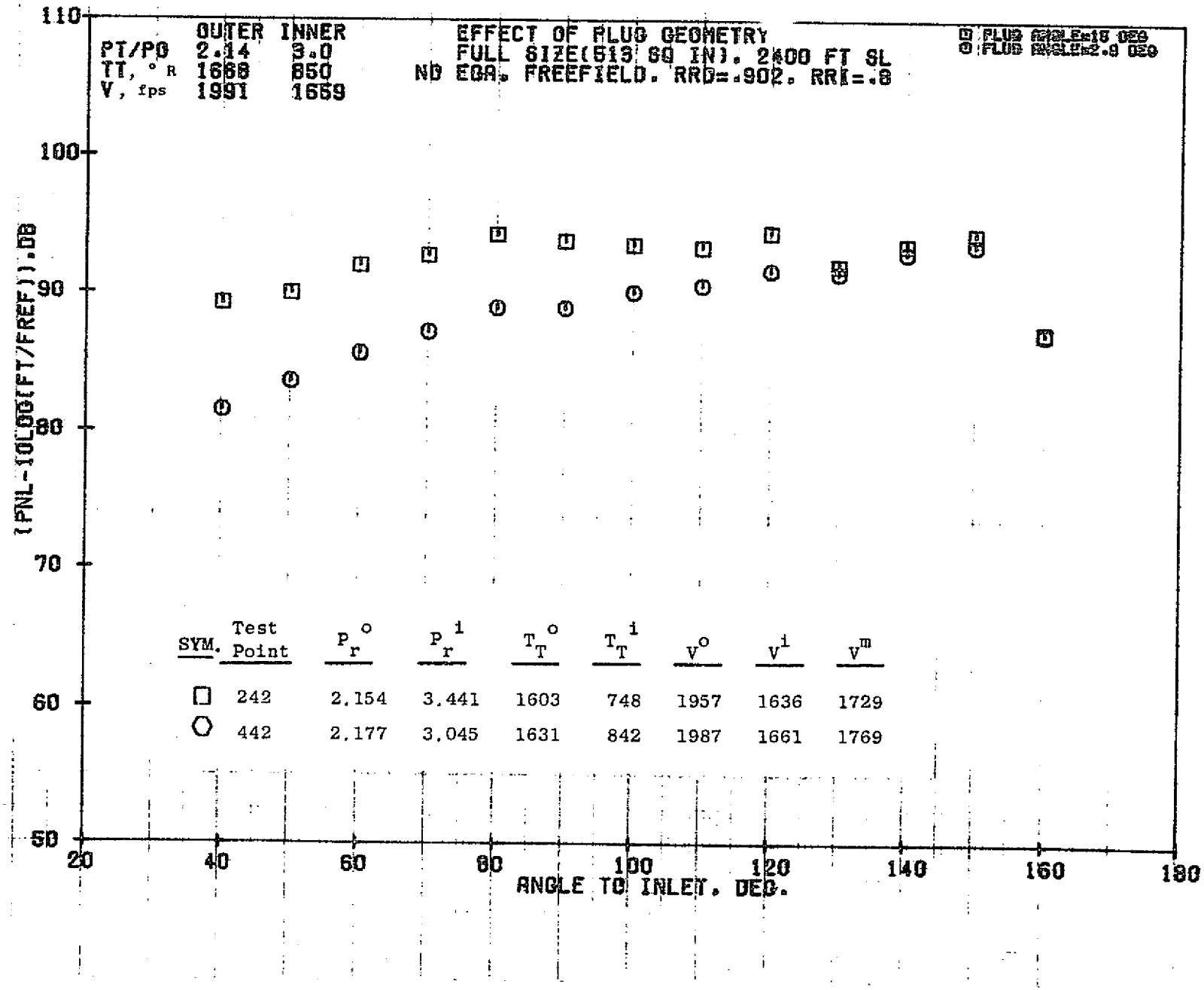

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18130-001

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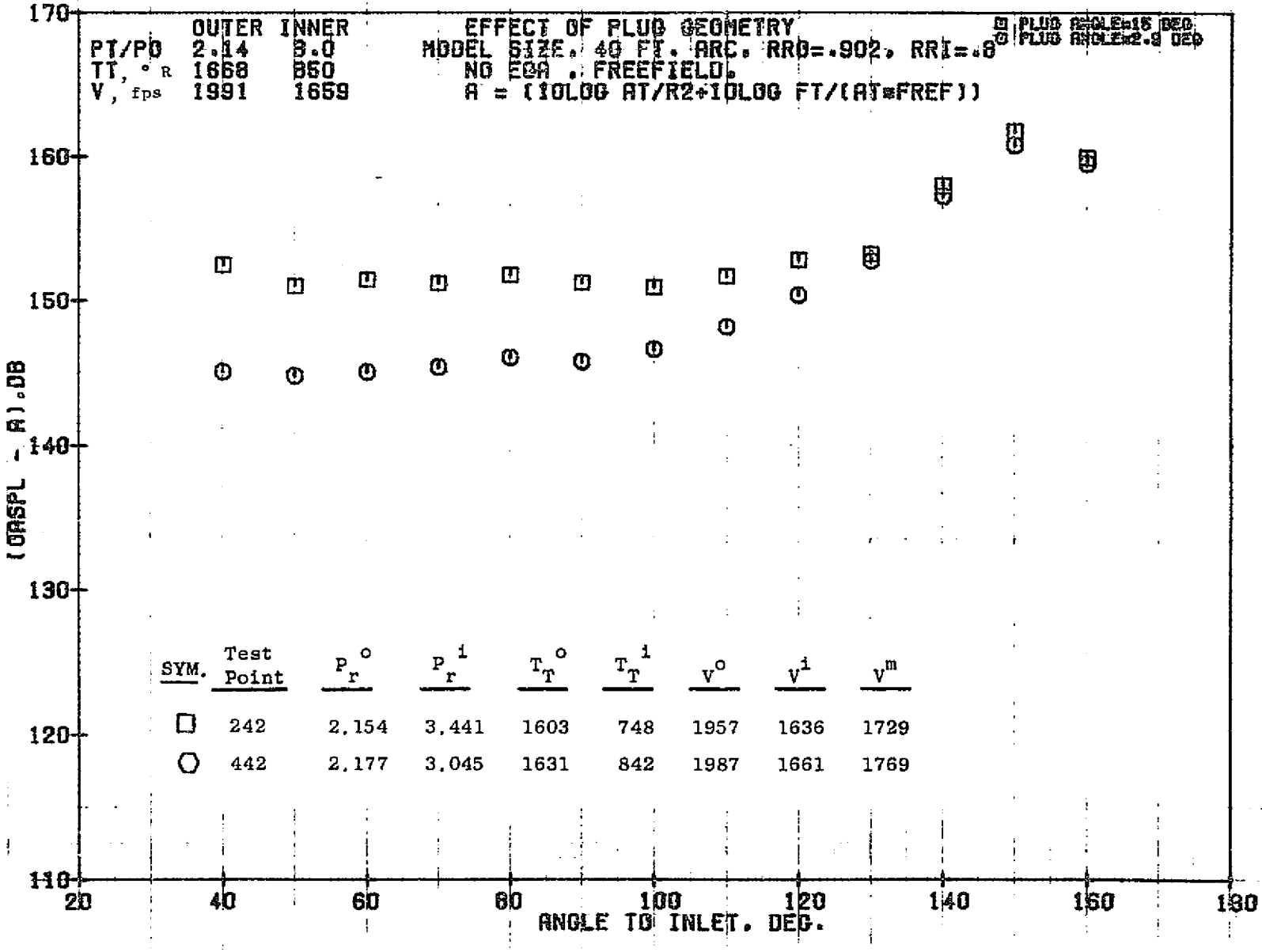

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18159-001

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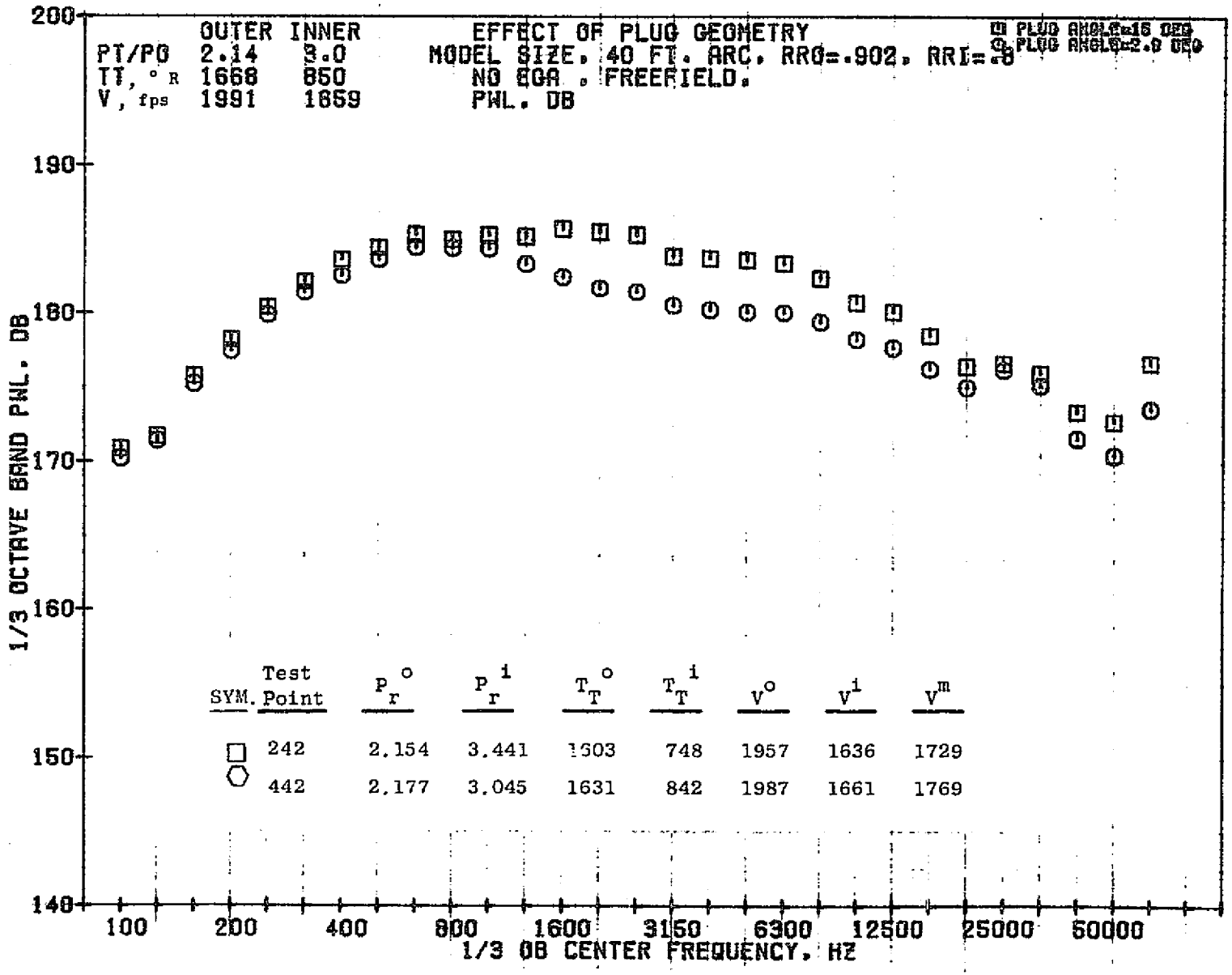

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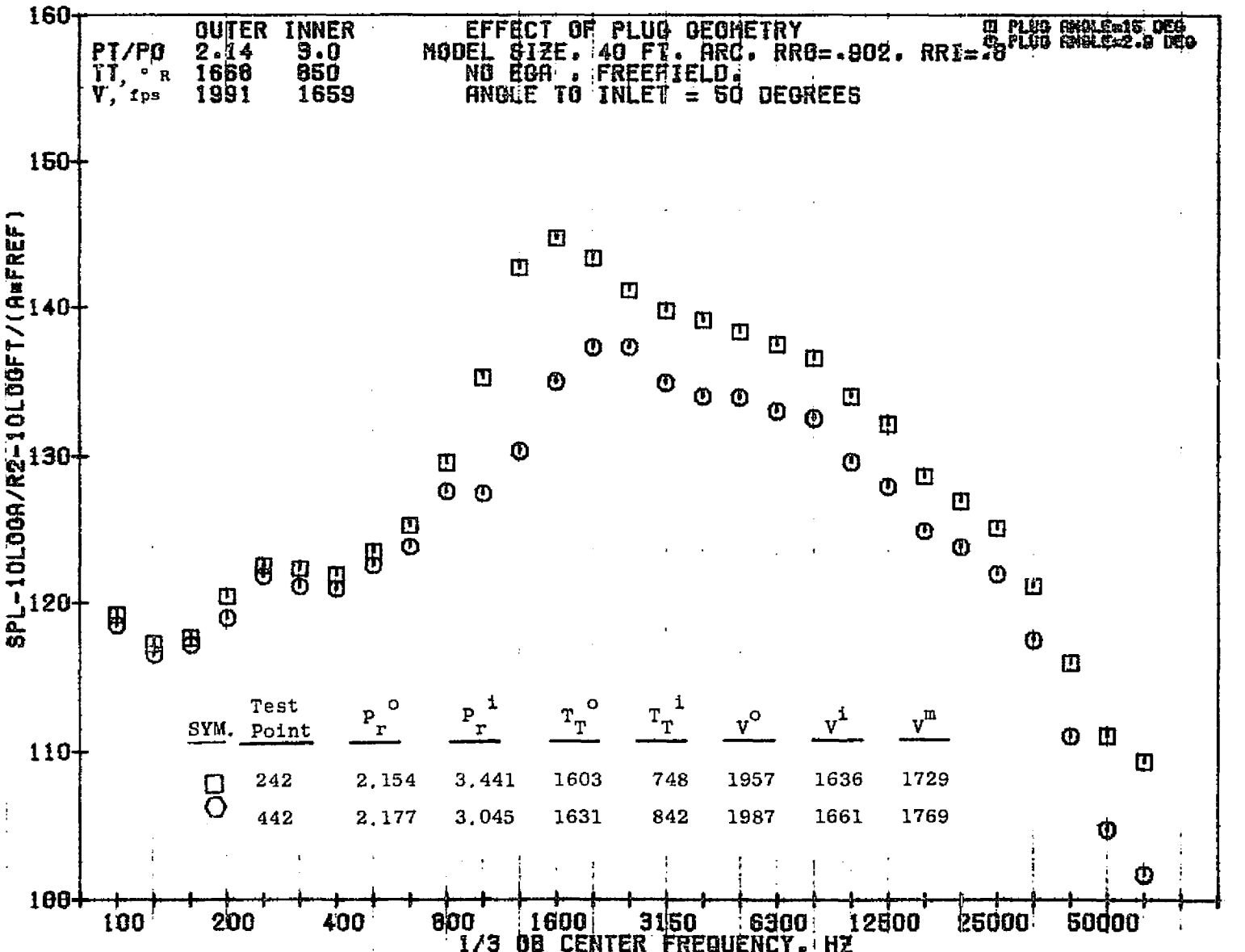

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18159-001

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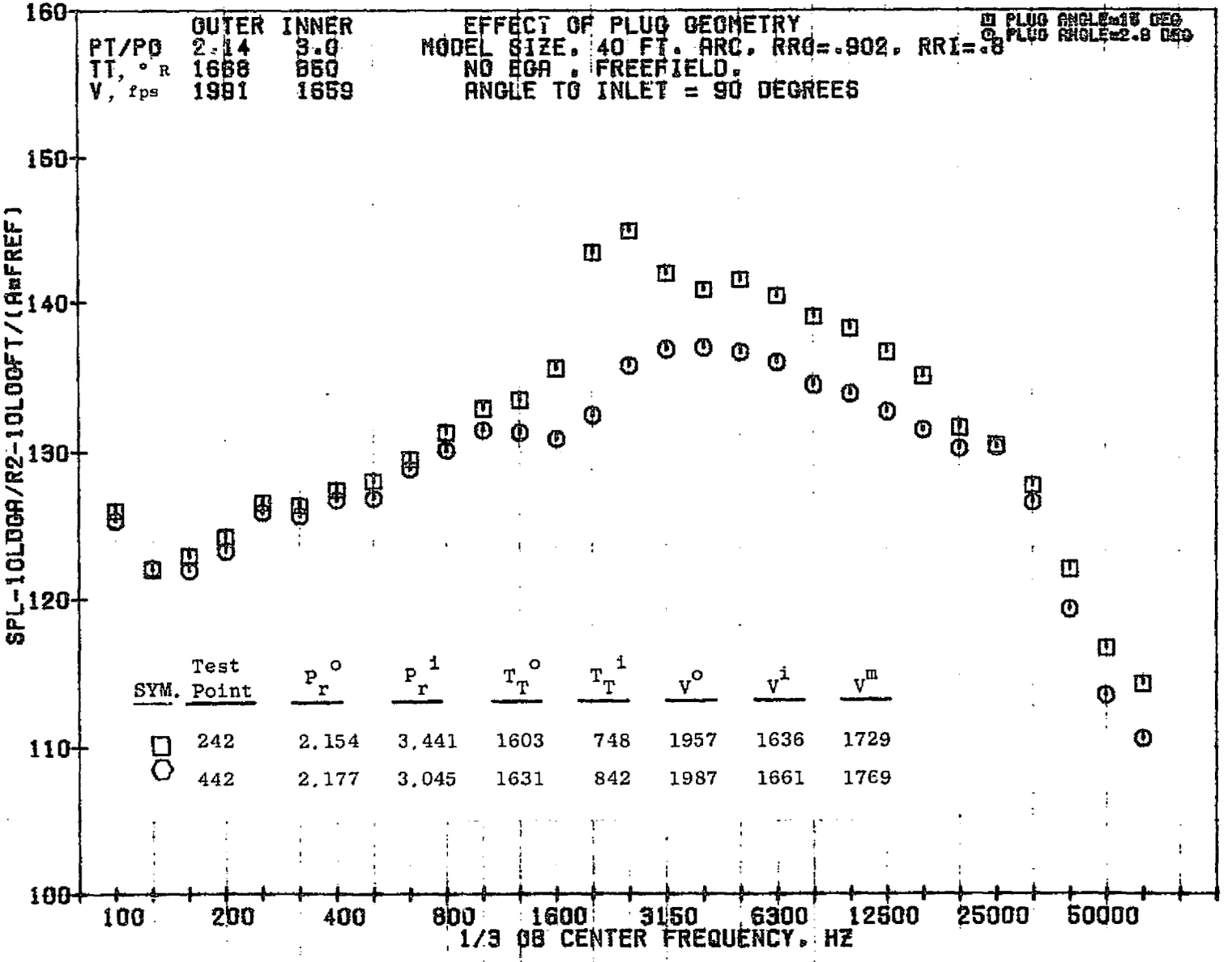

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1B159-001

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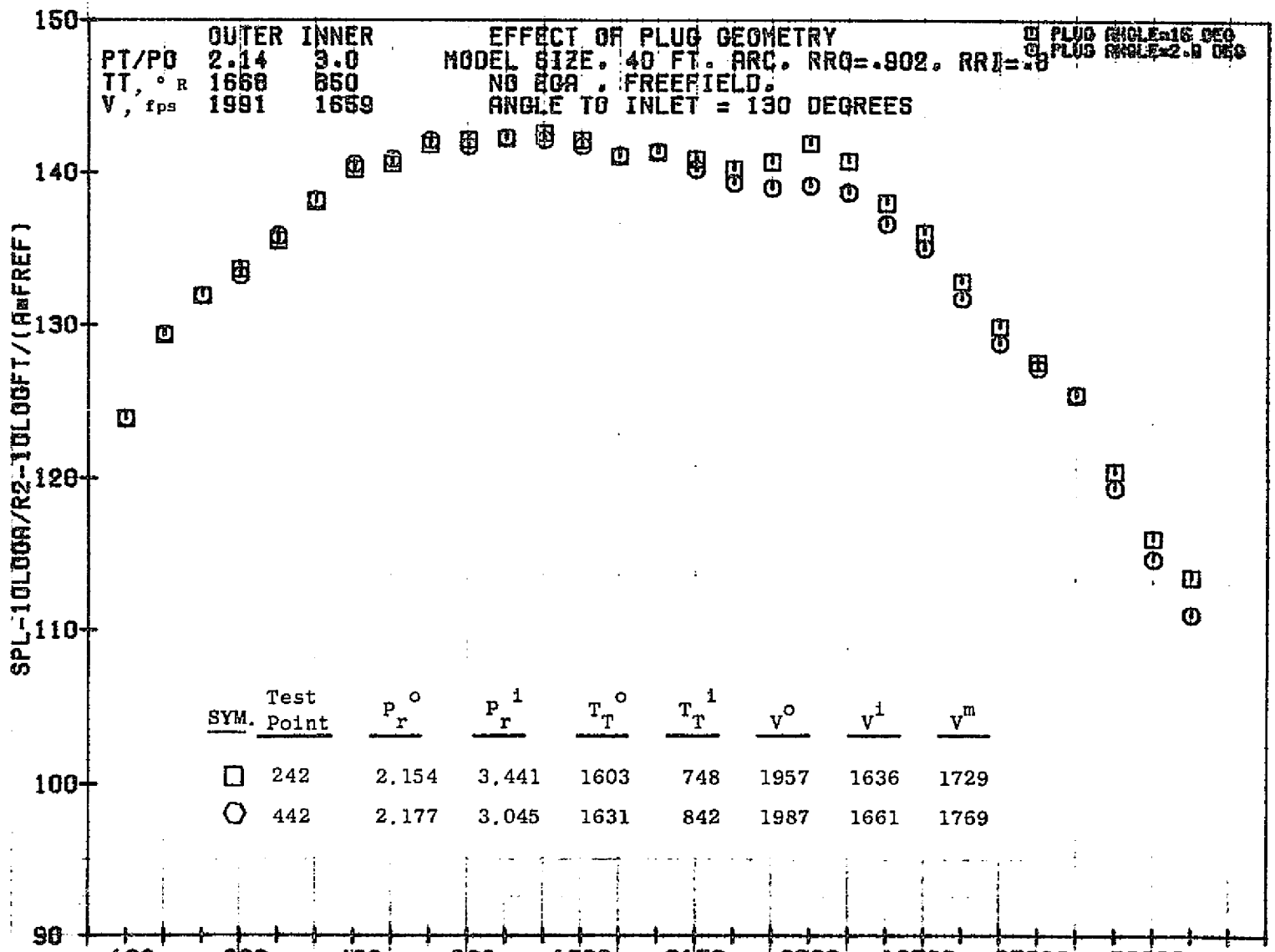

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18159-001

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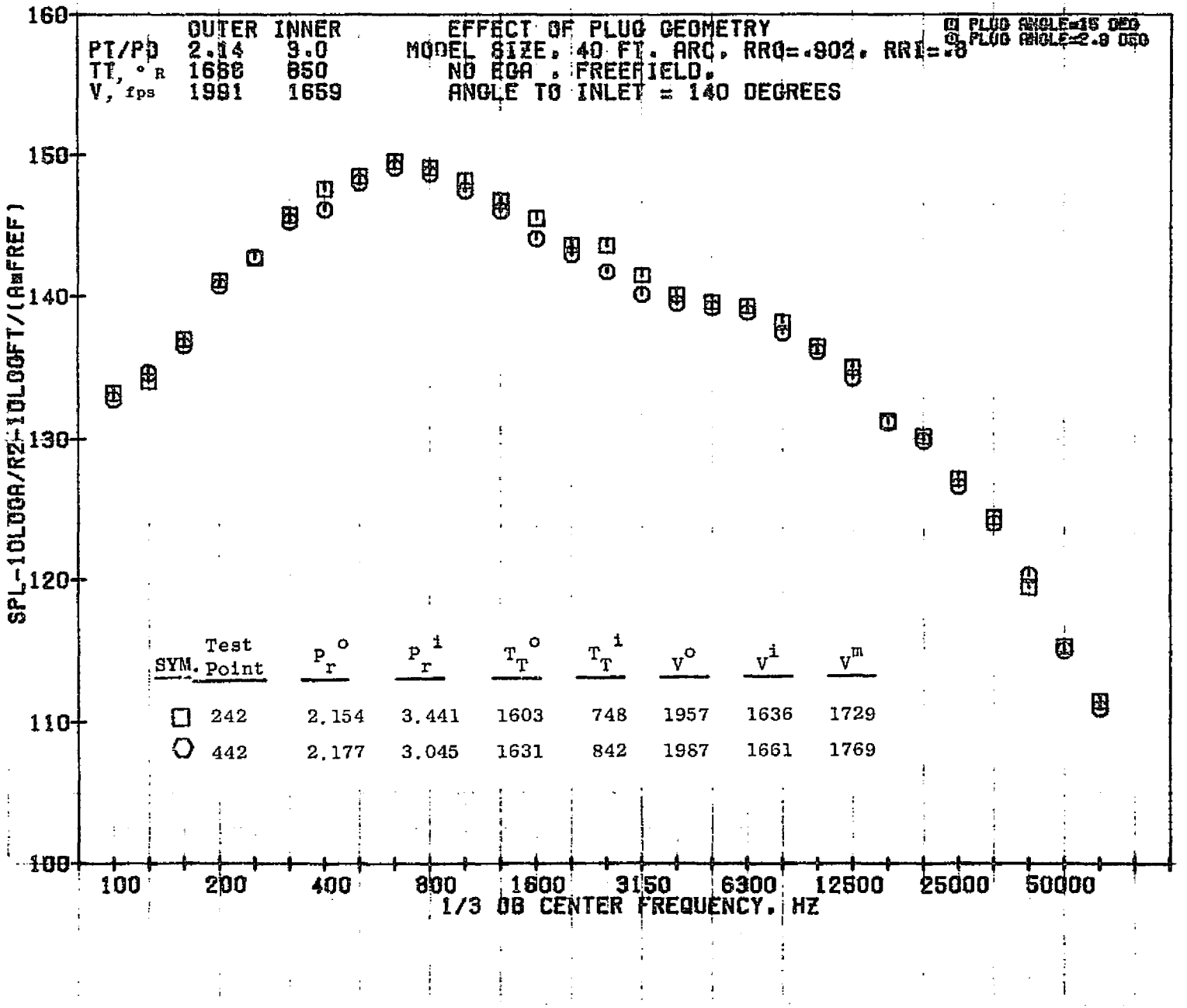

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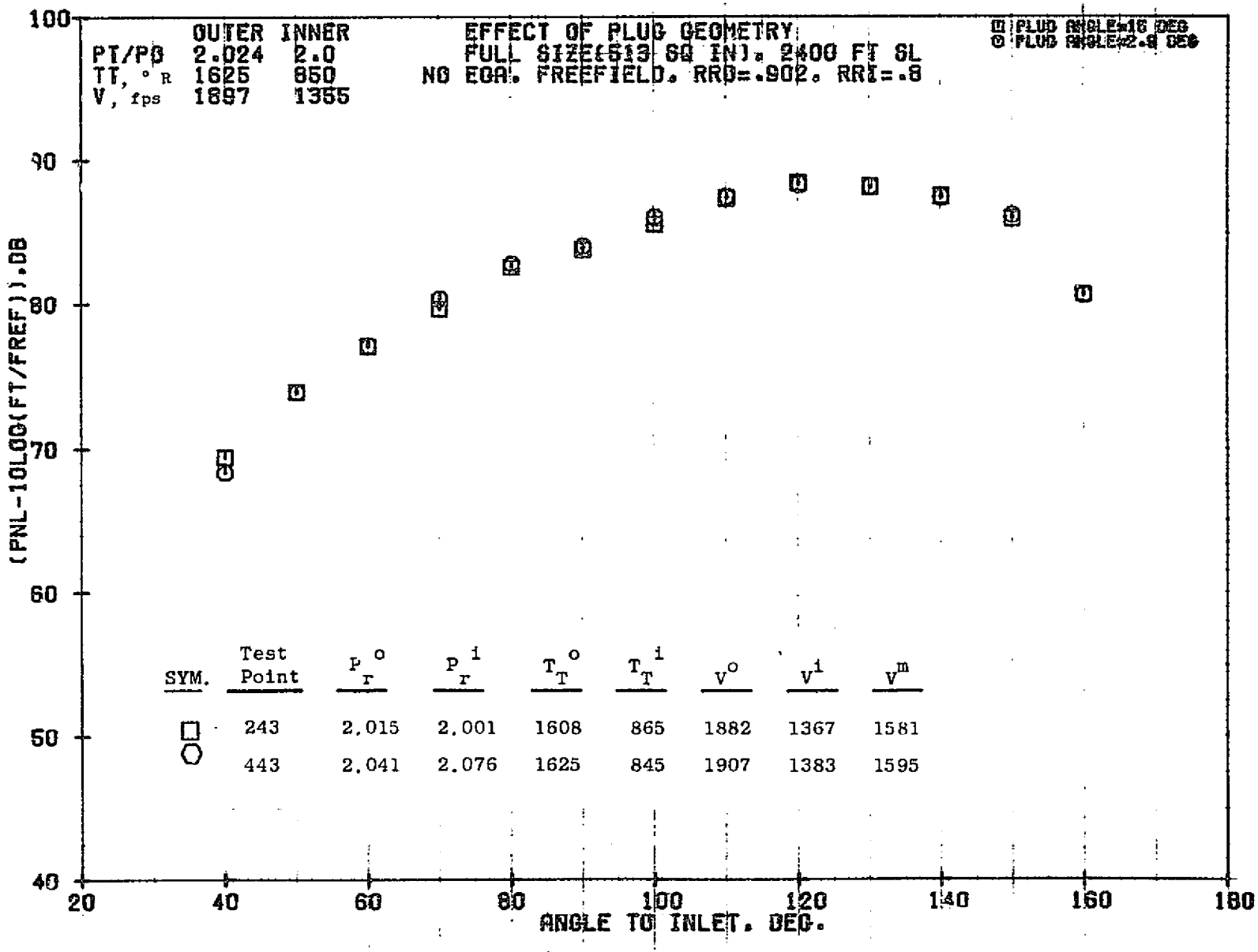

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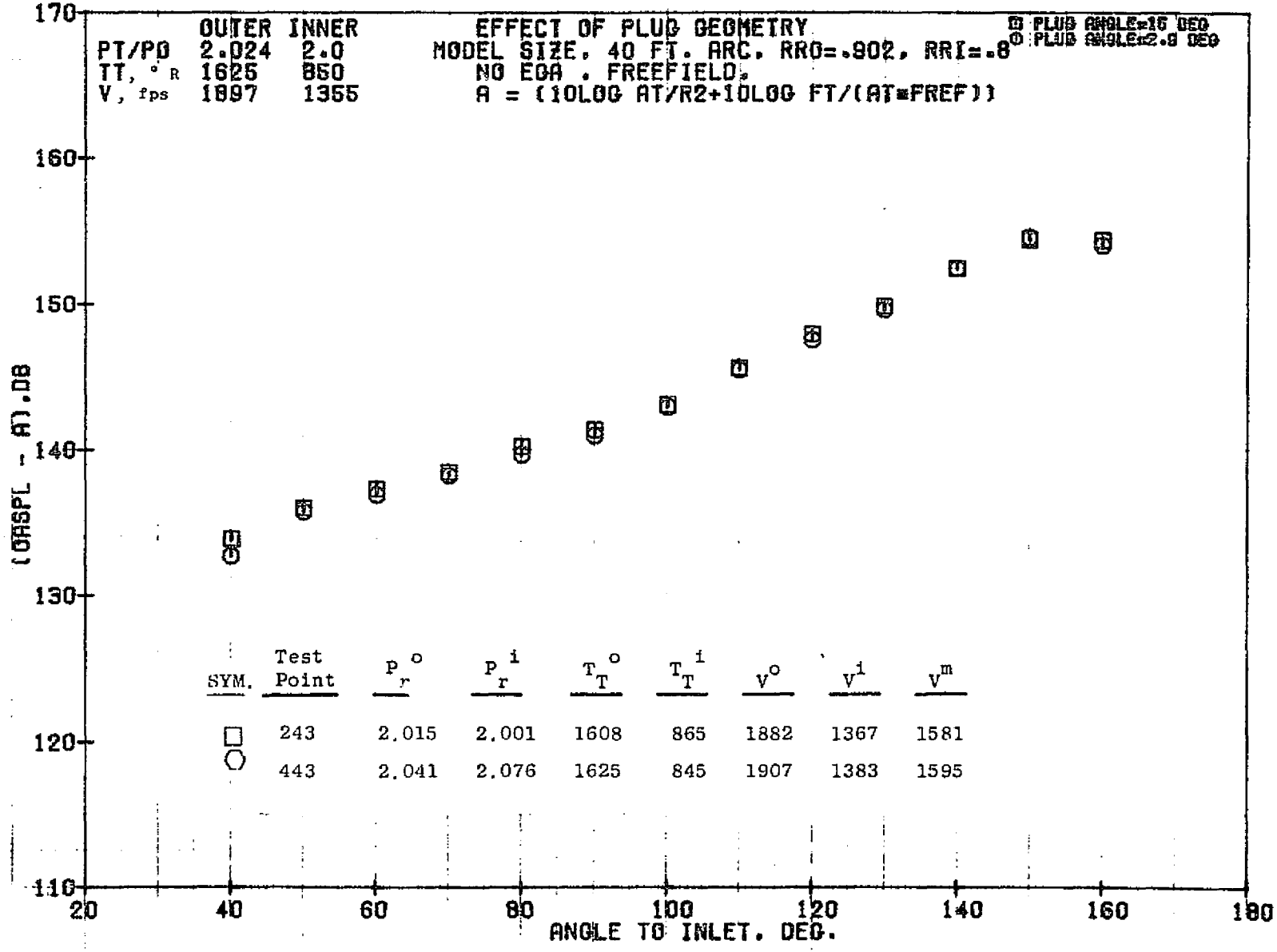

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18159-001

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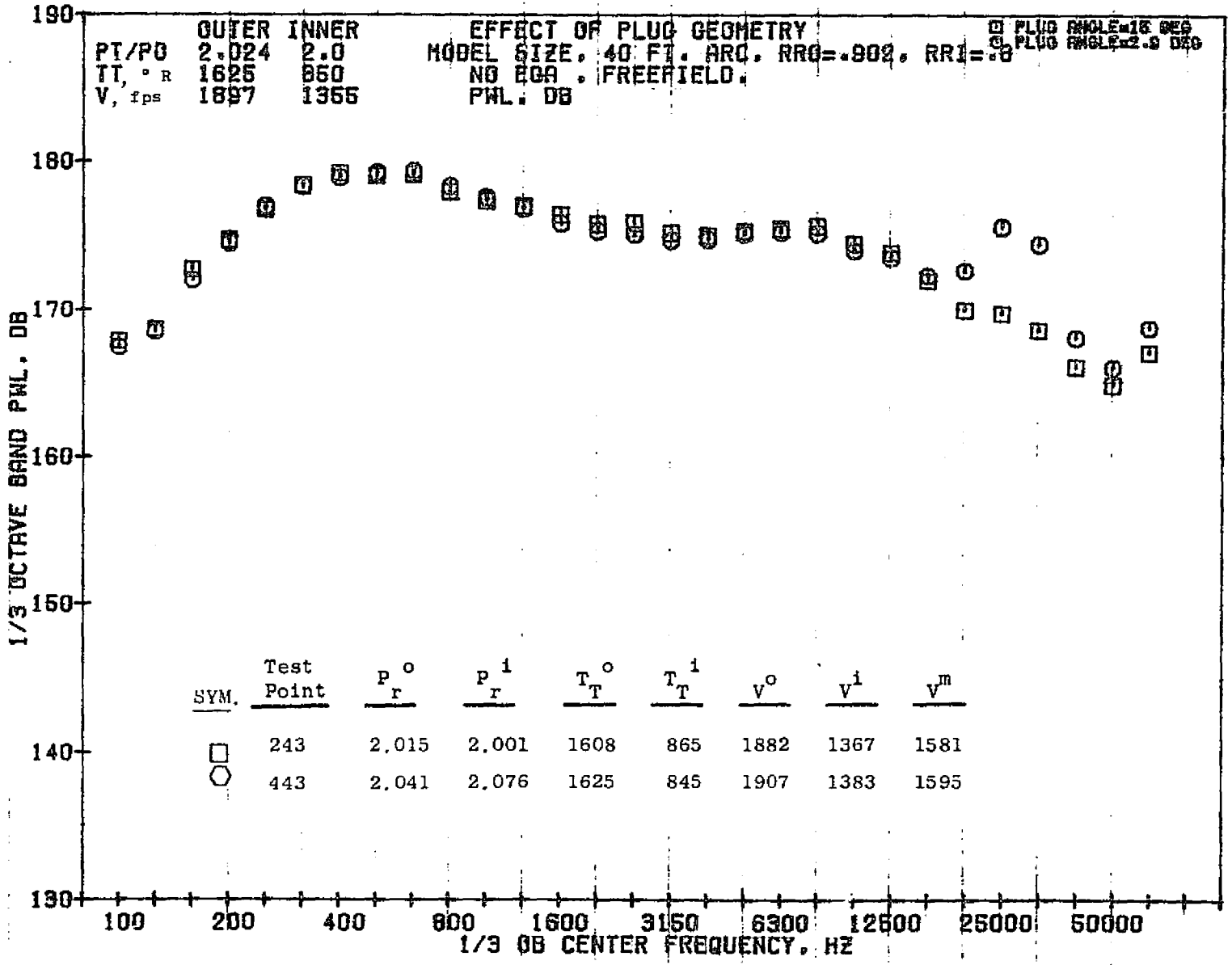

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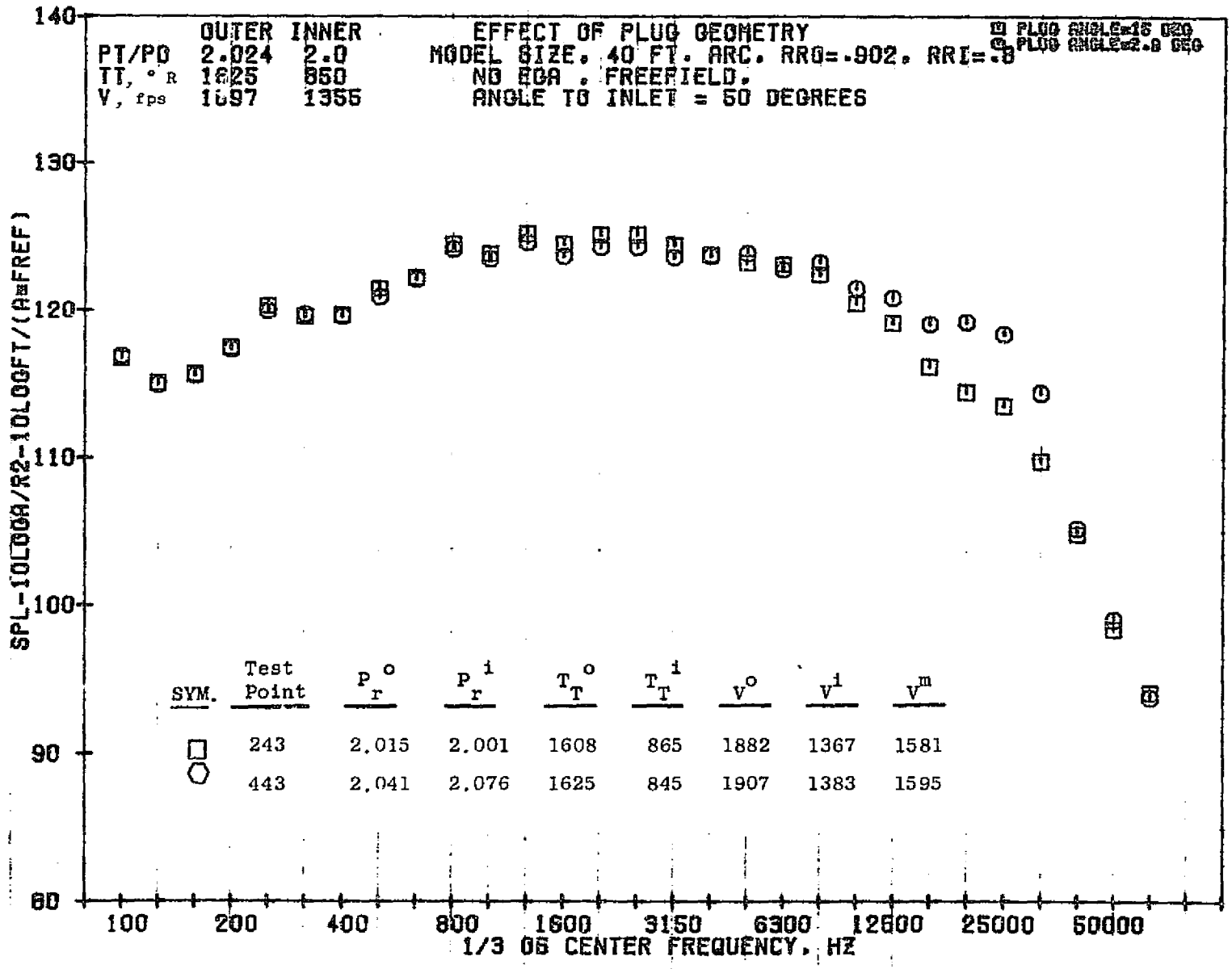

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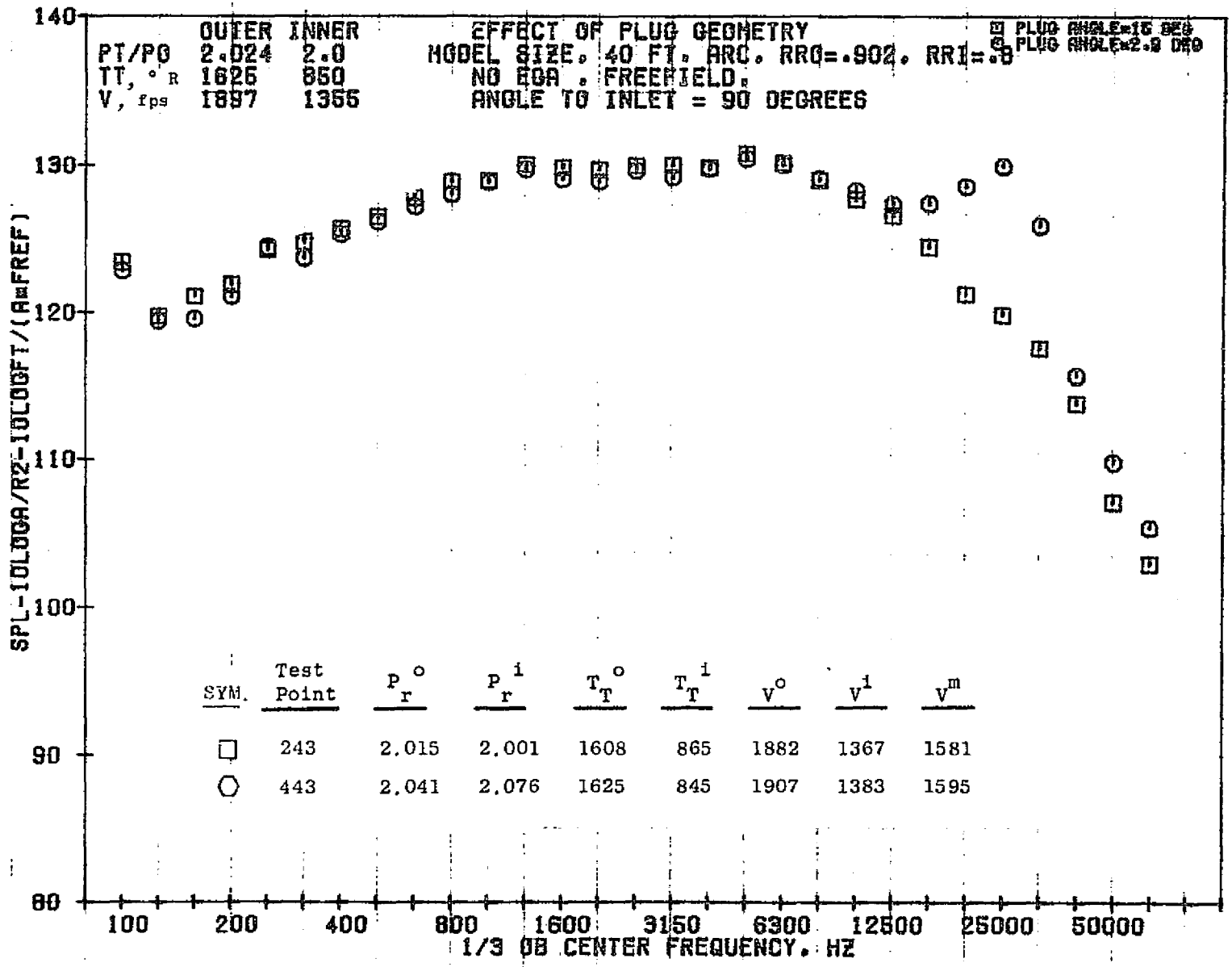

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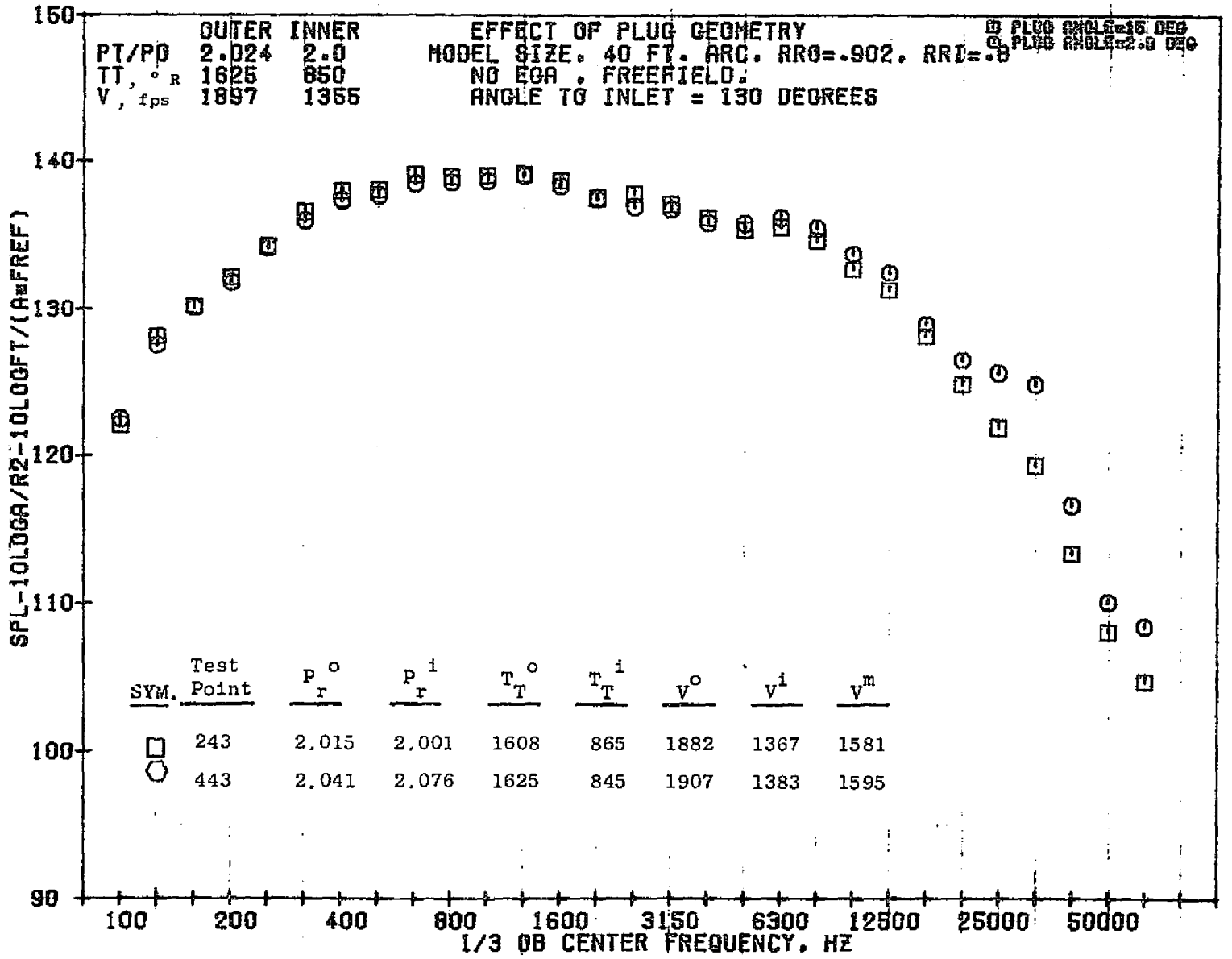

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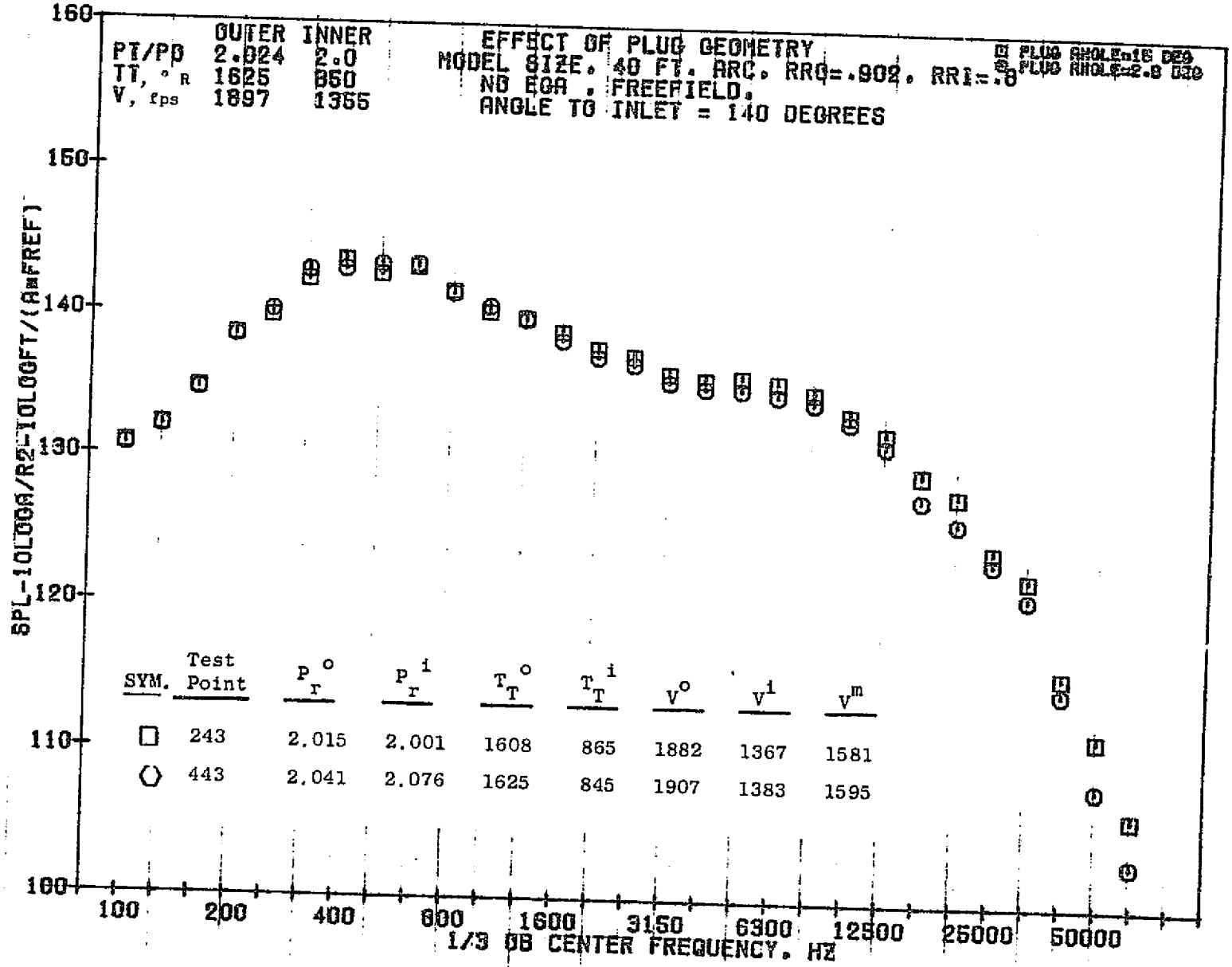

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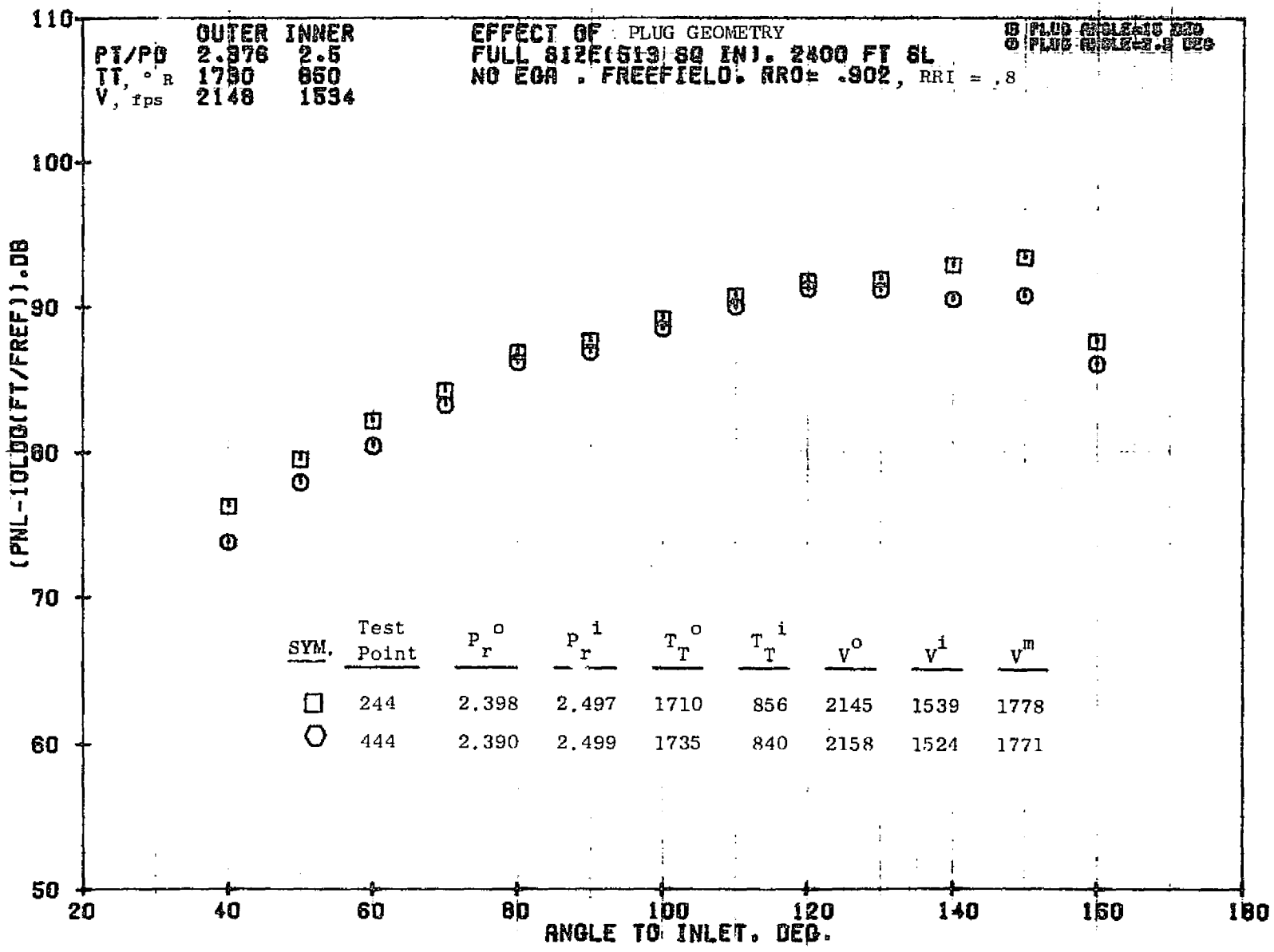

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18680-001

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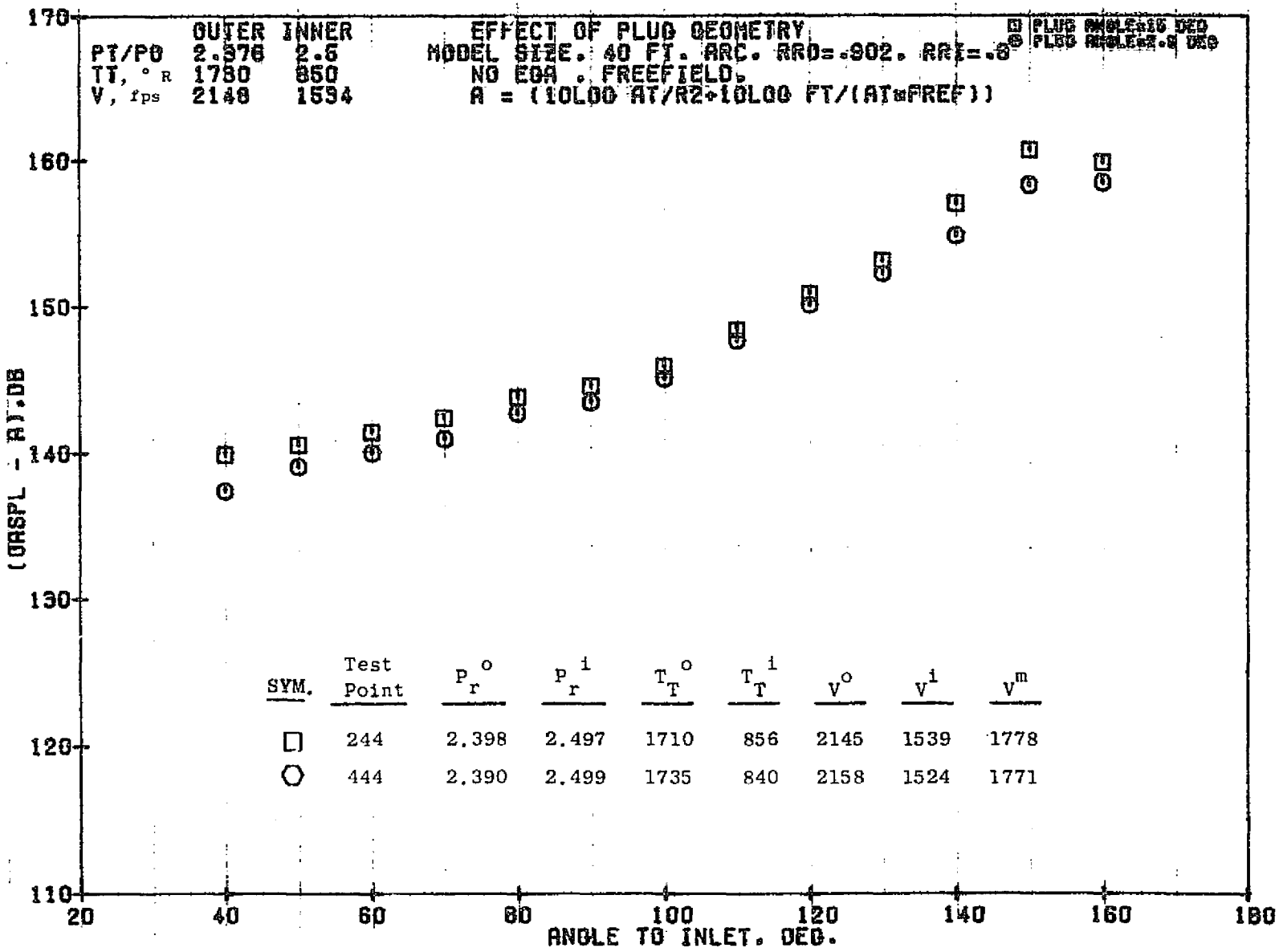

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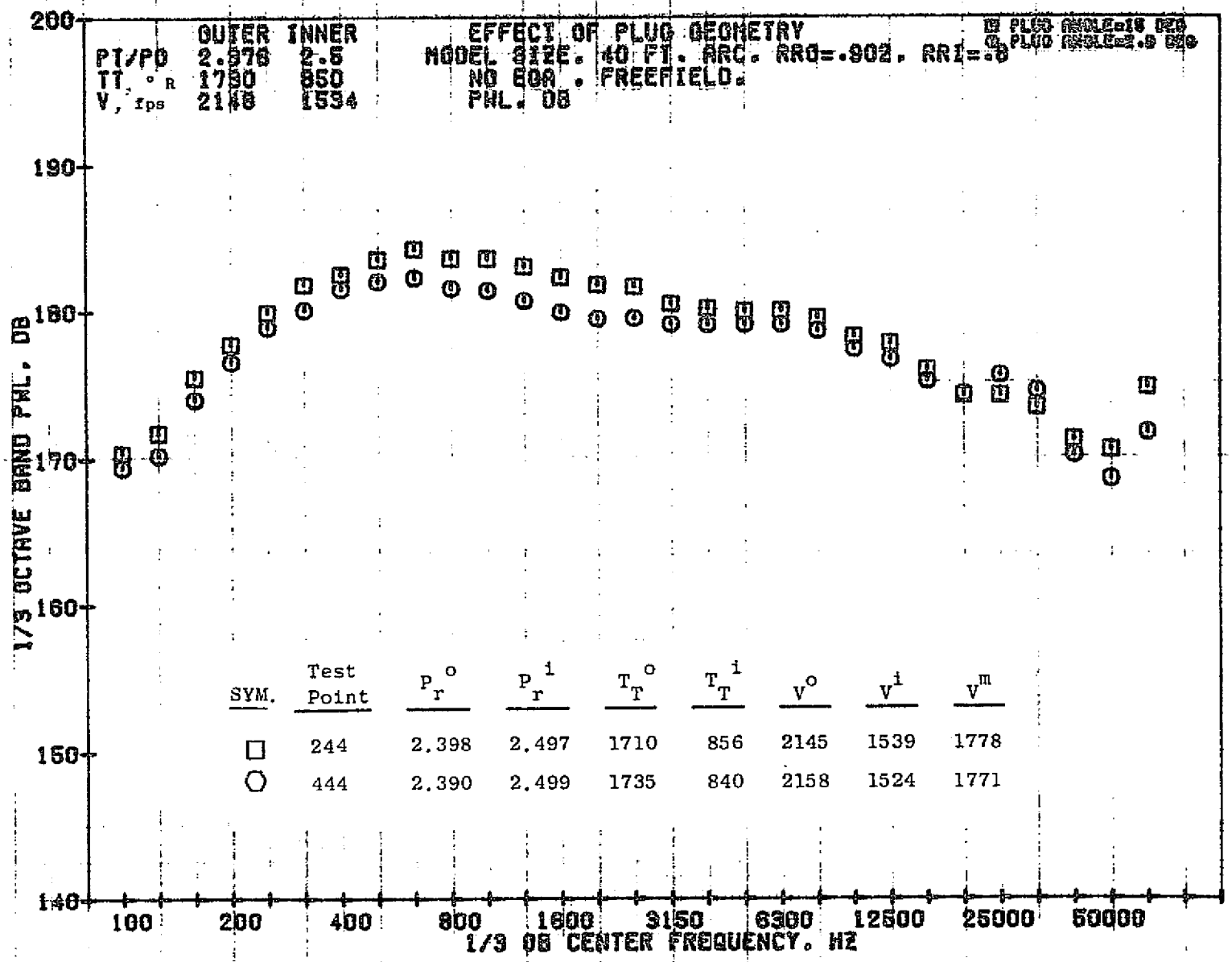

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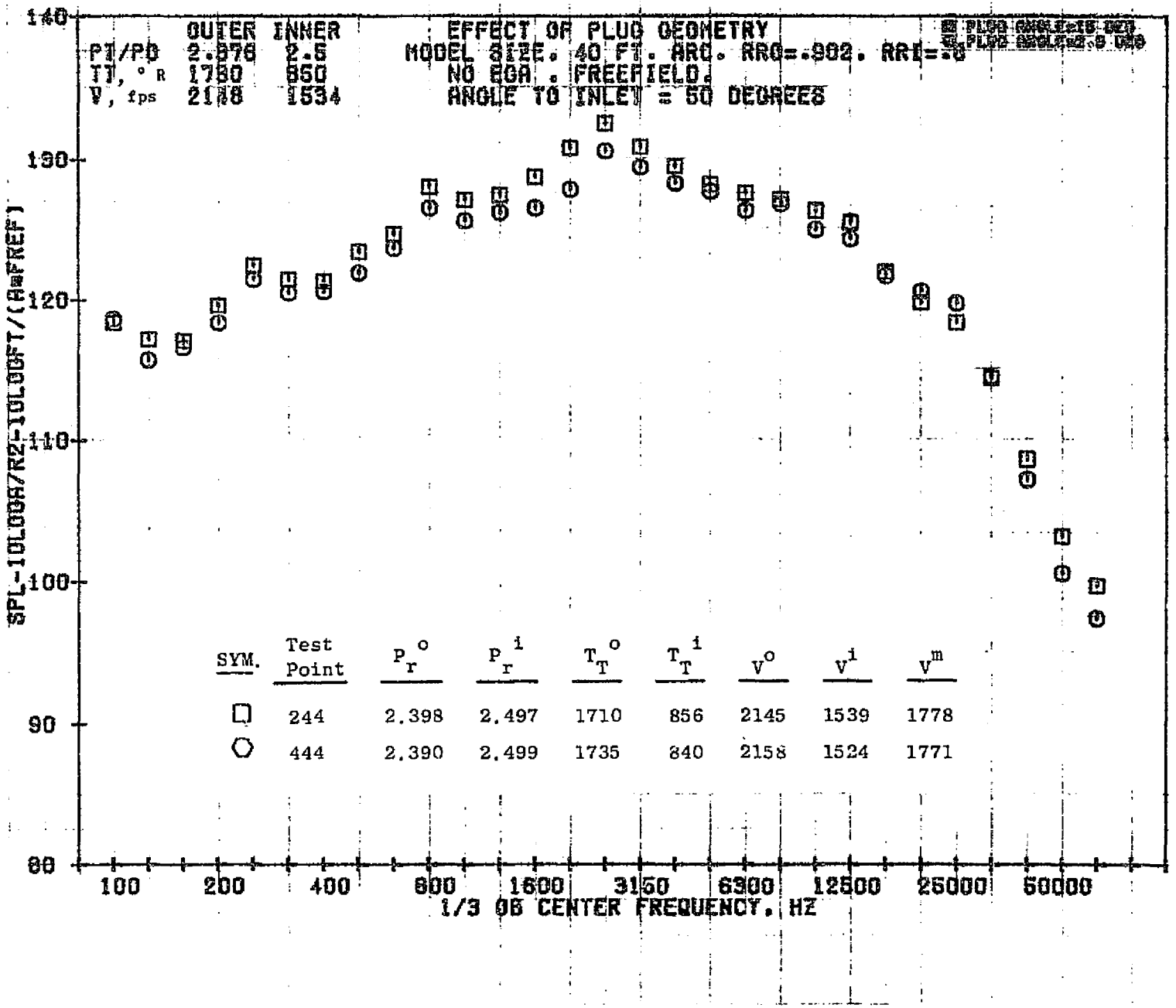

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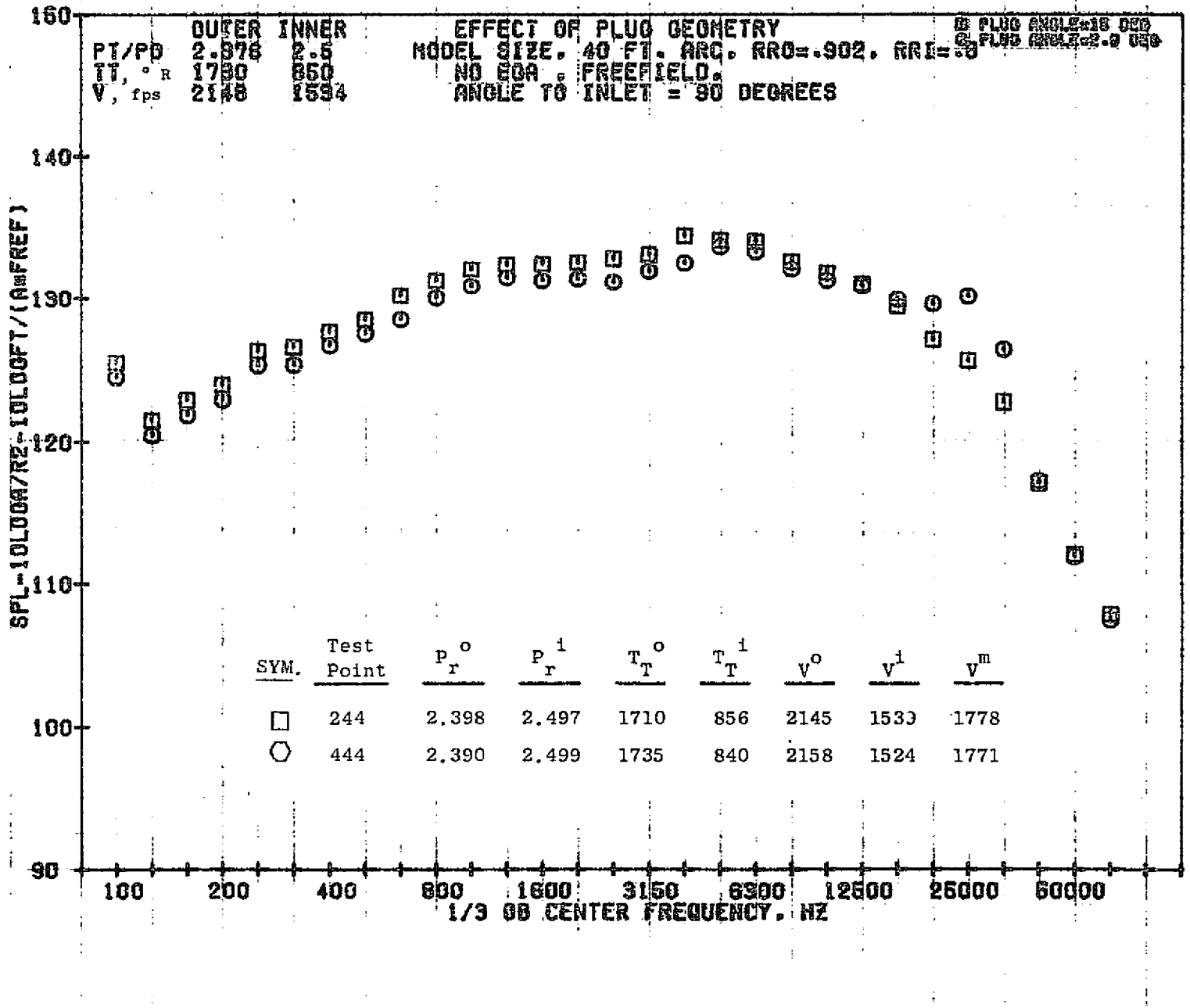

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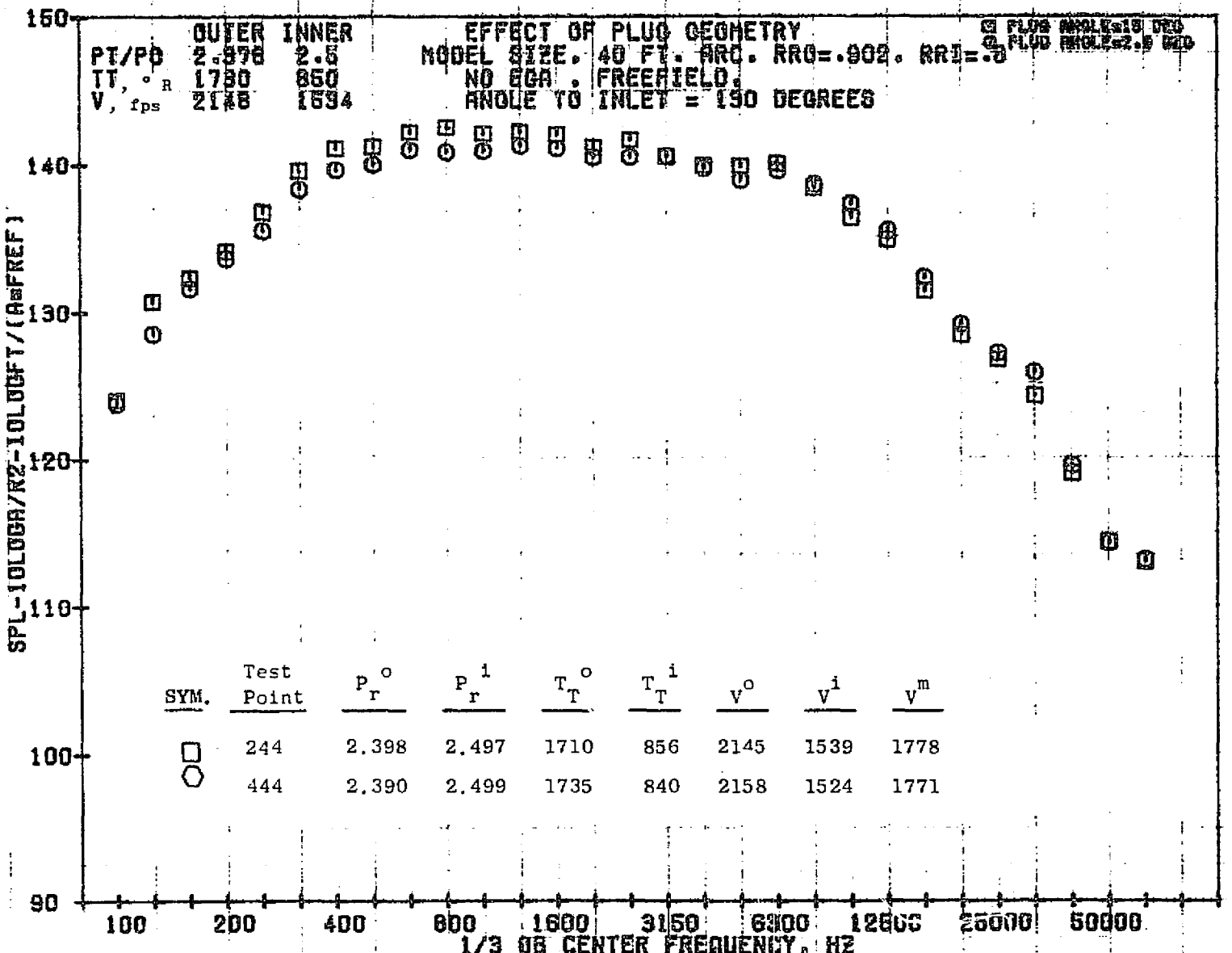

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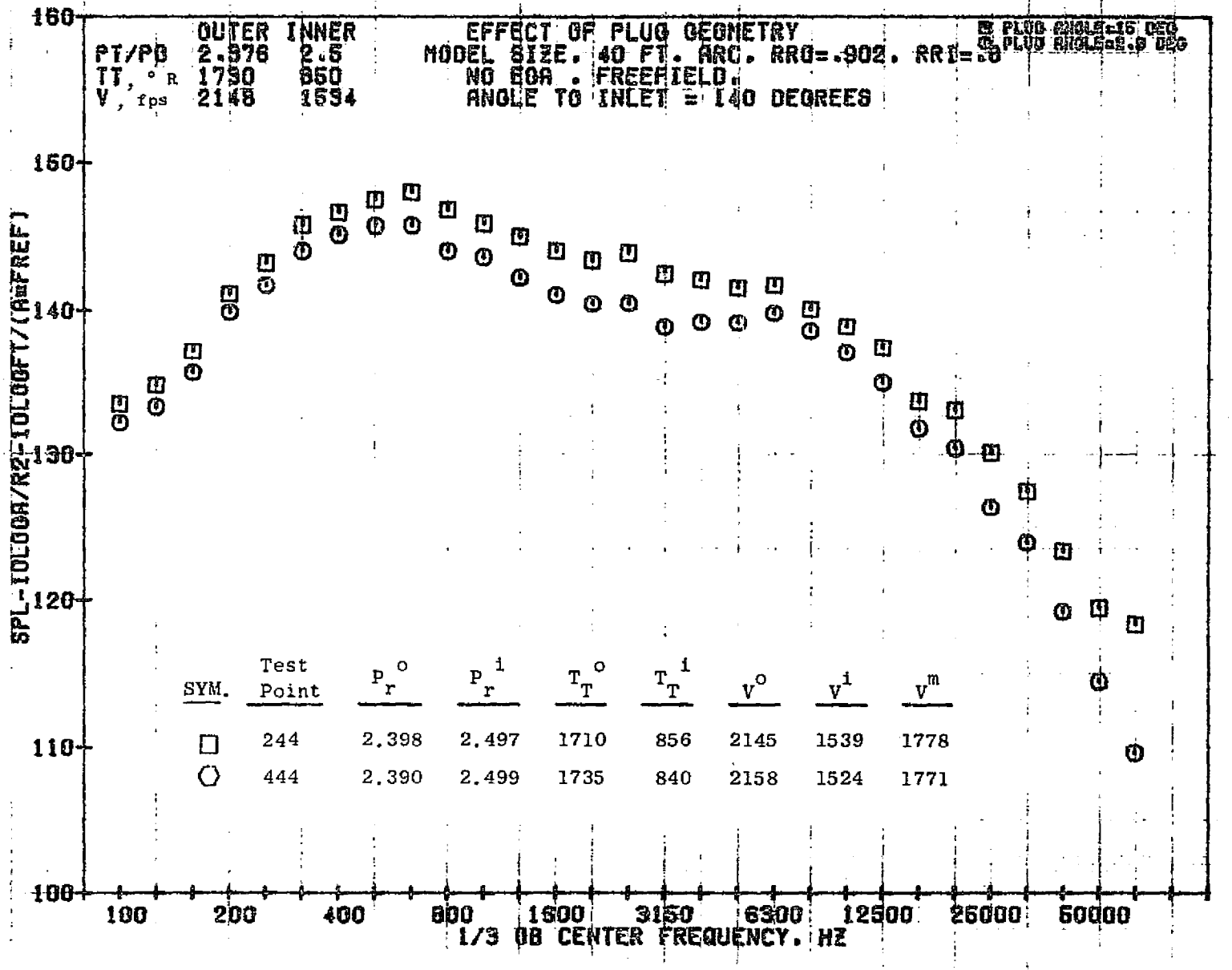

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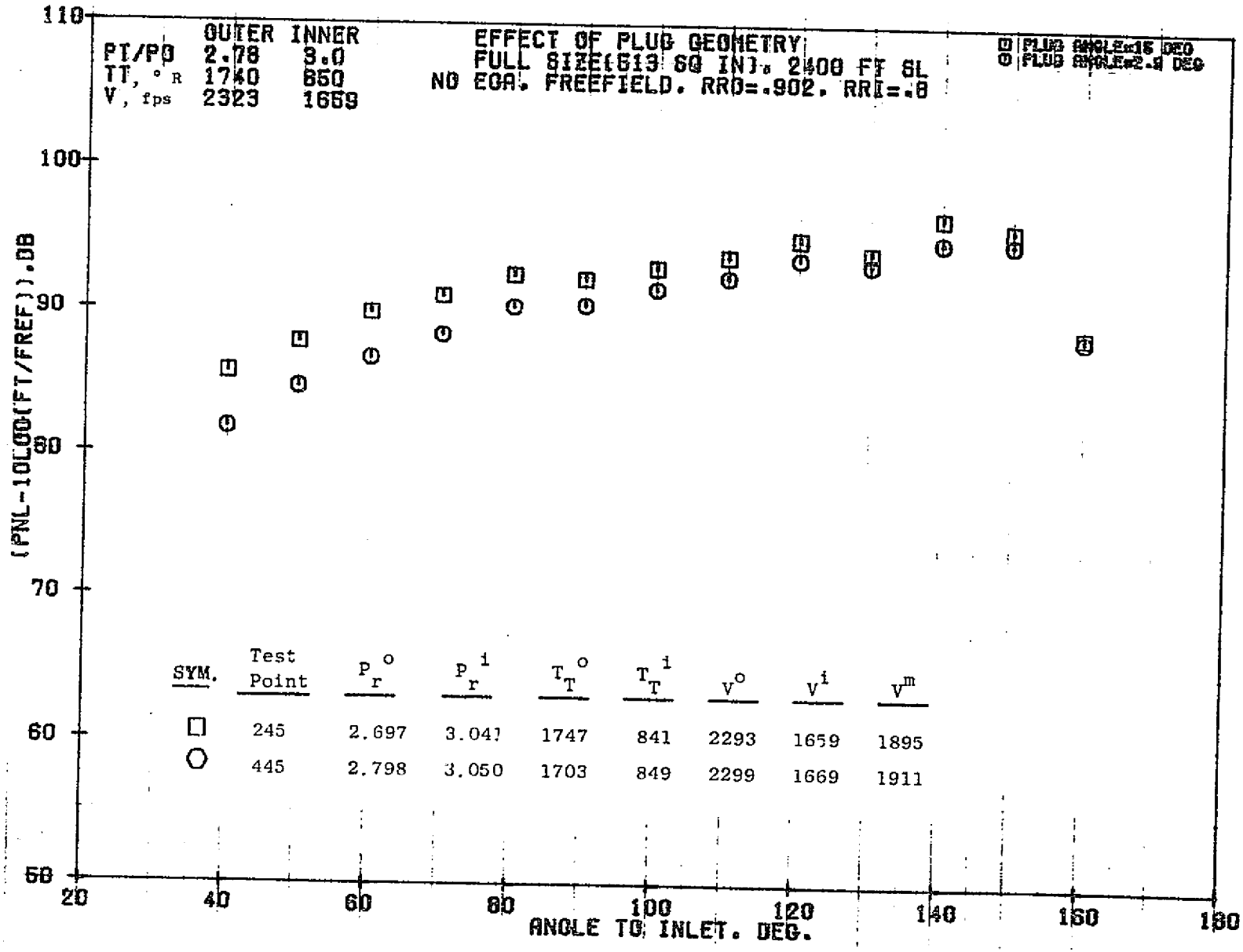

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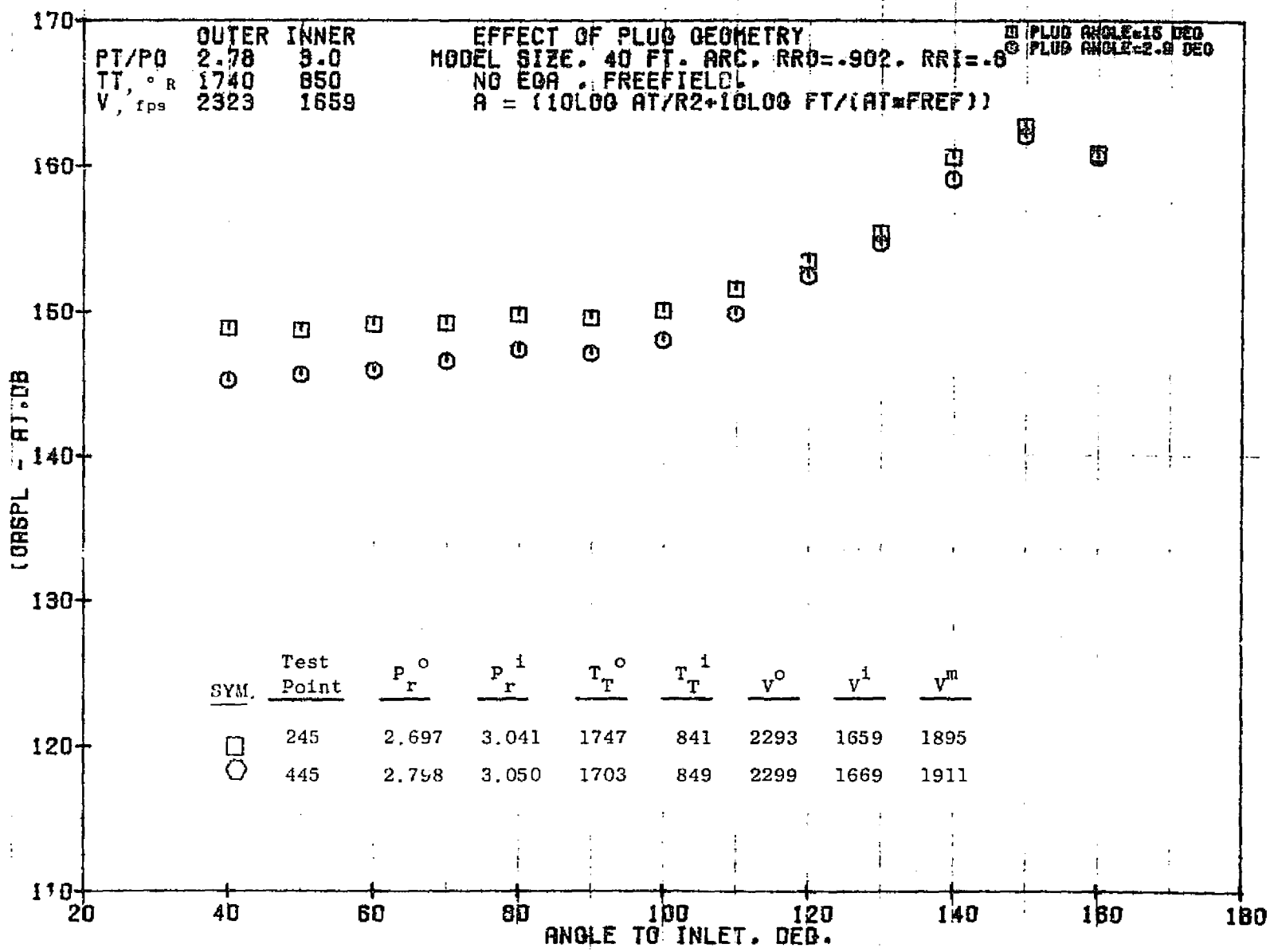

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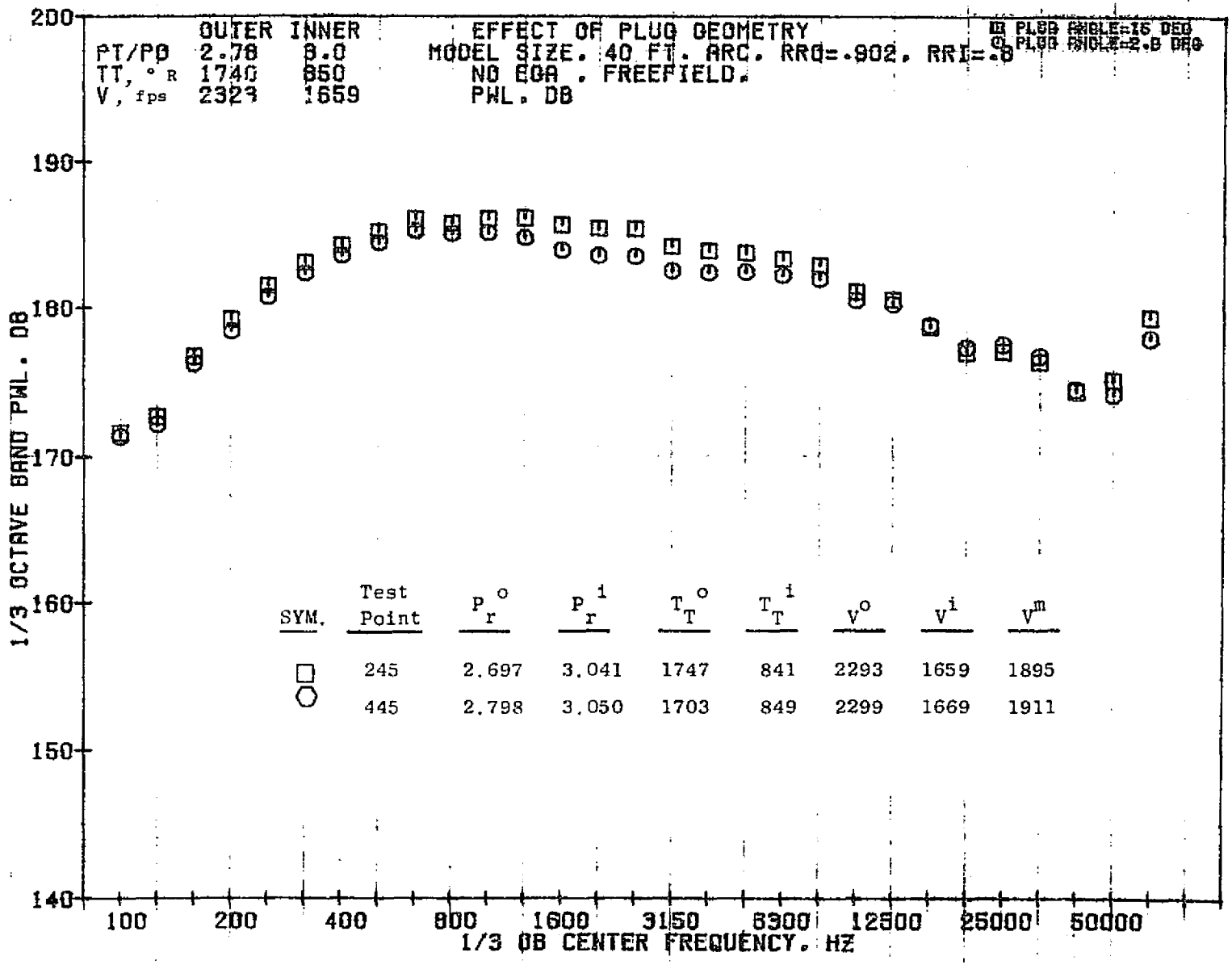

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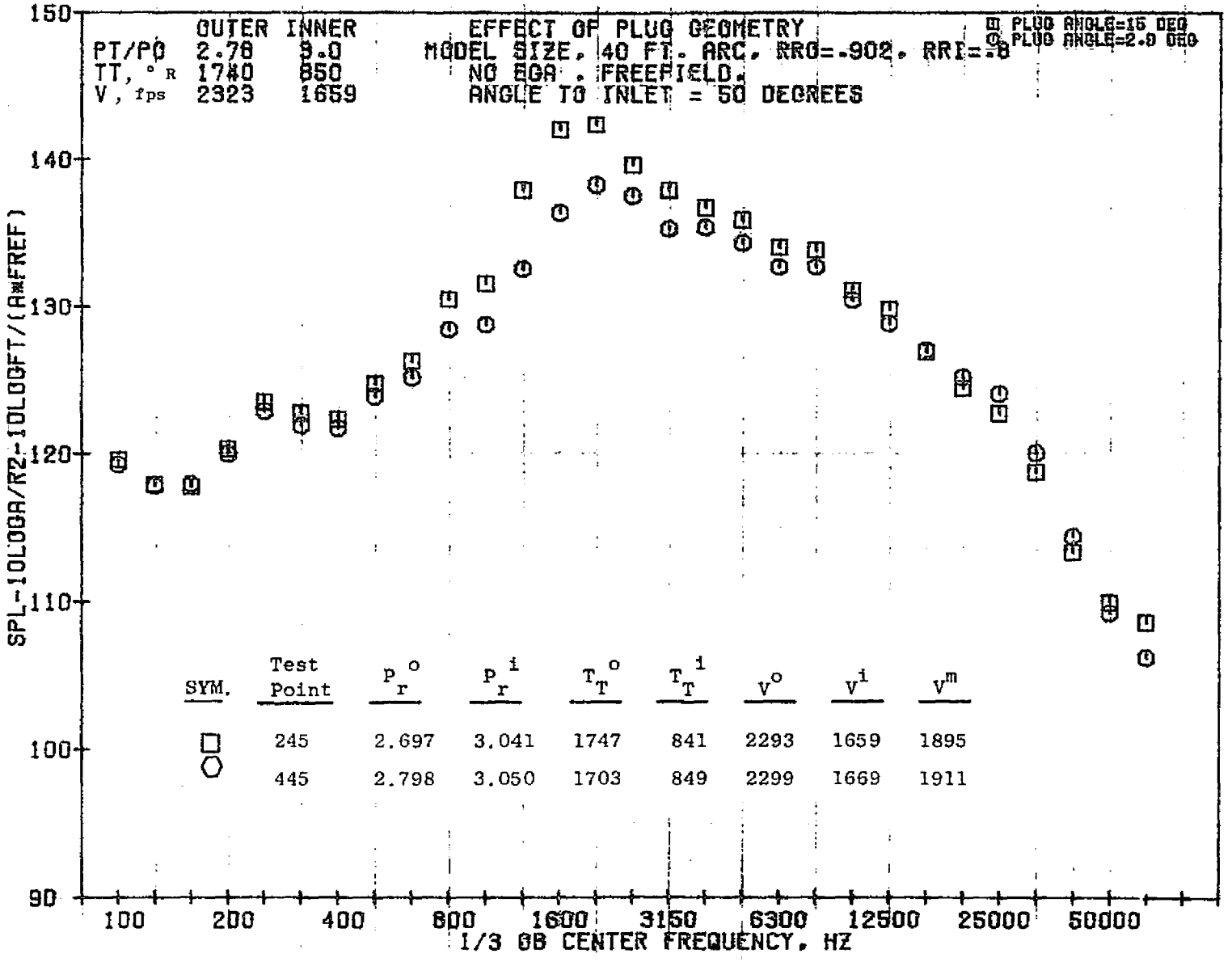

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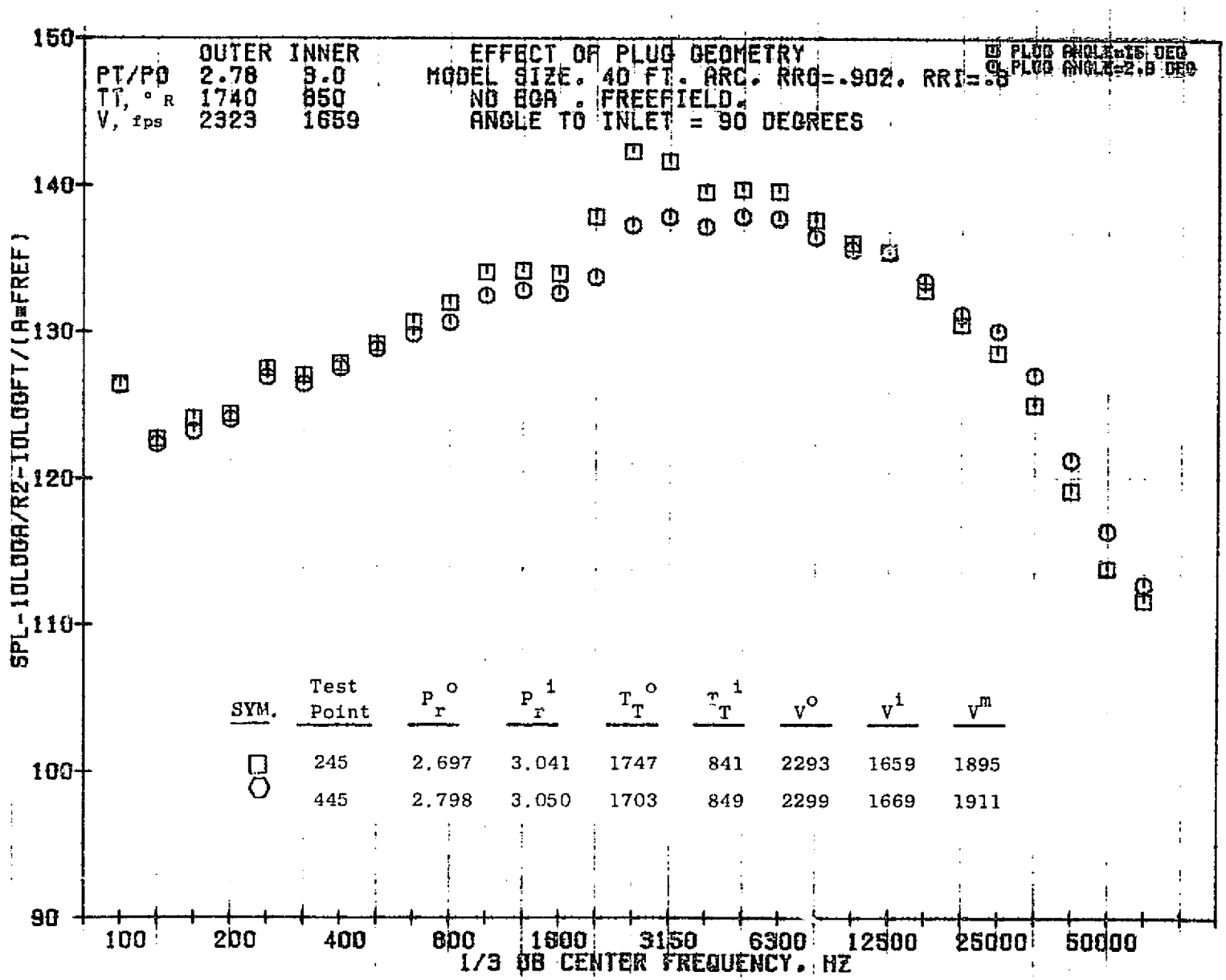

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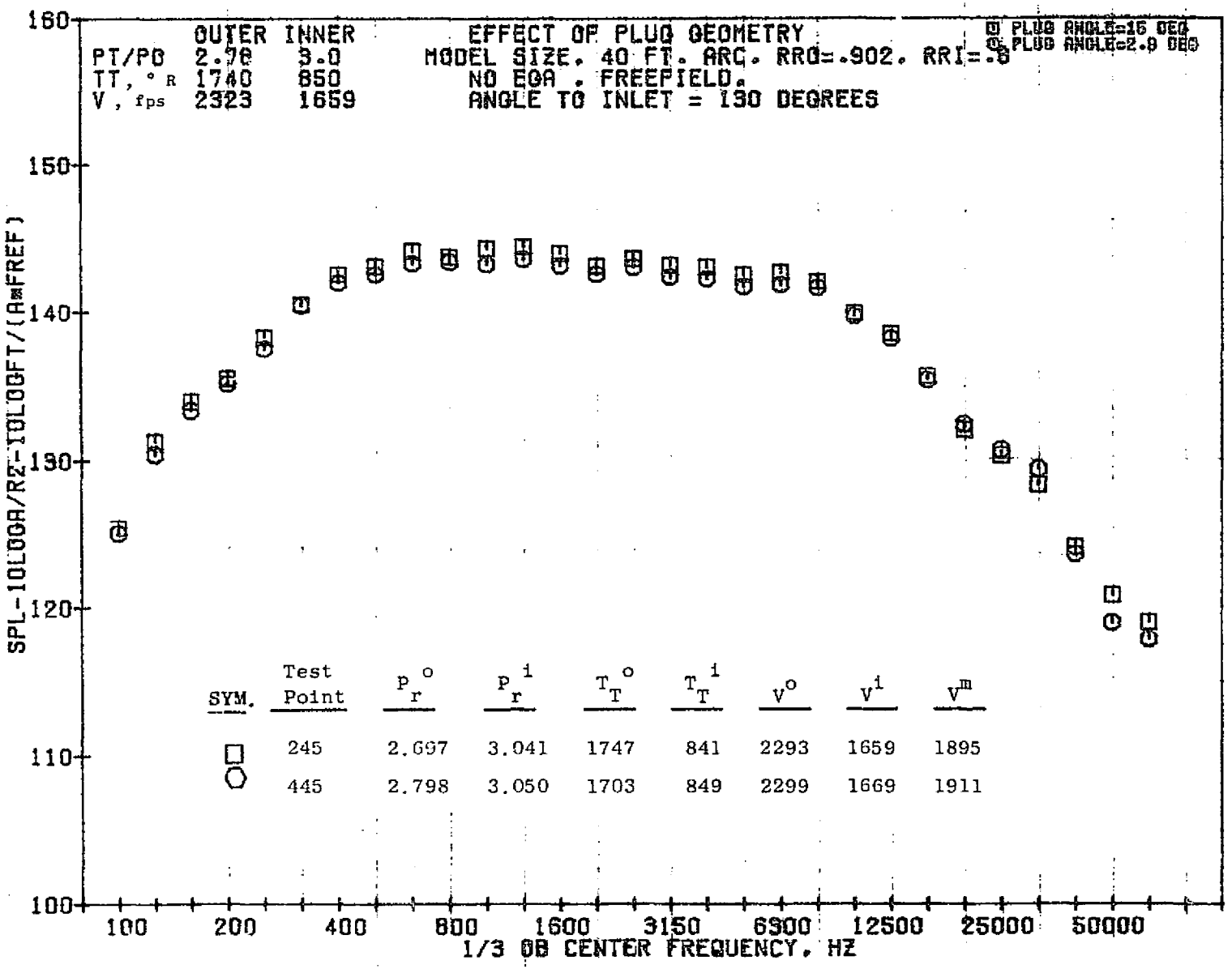

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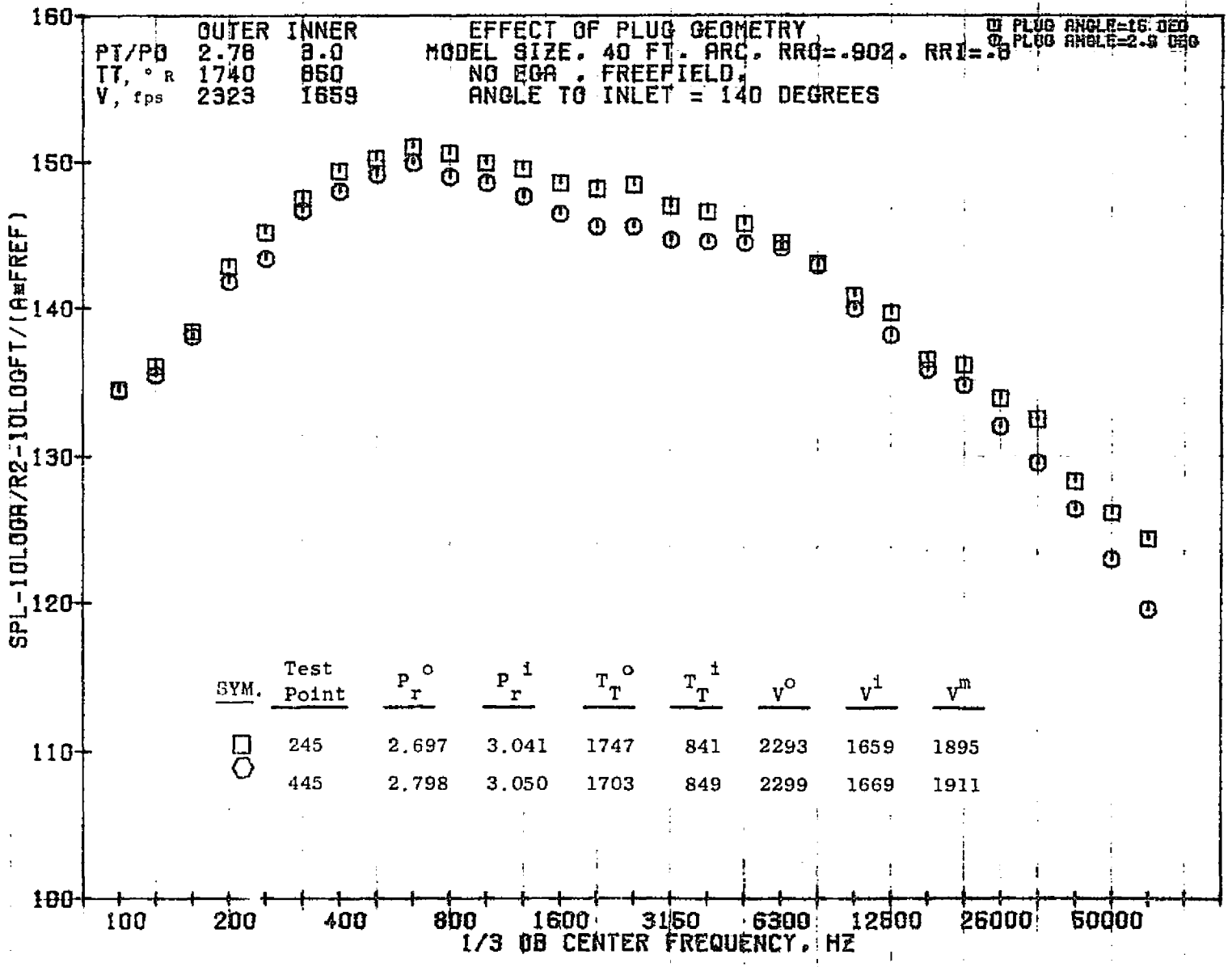

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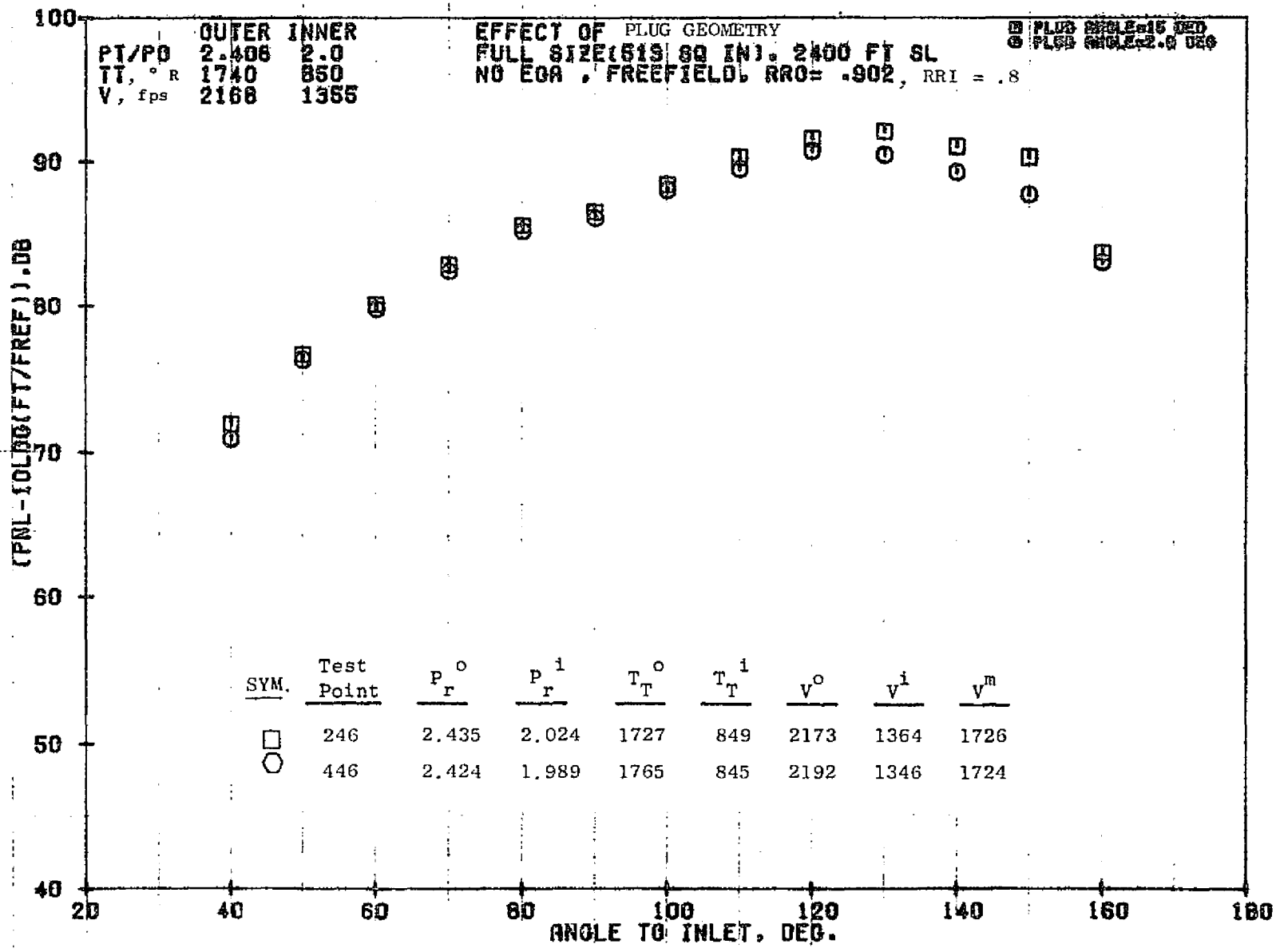

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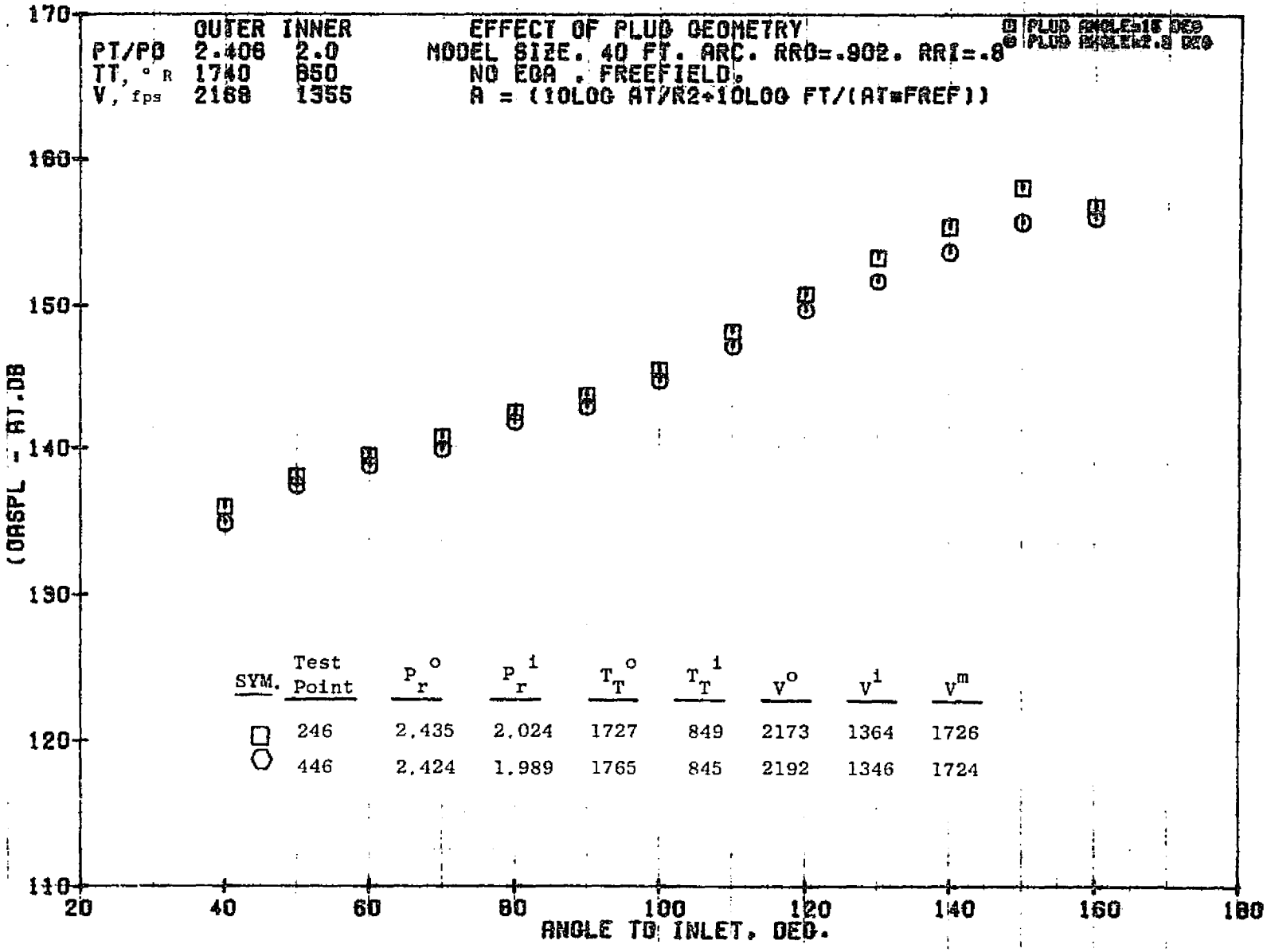

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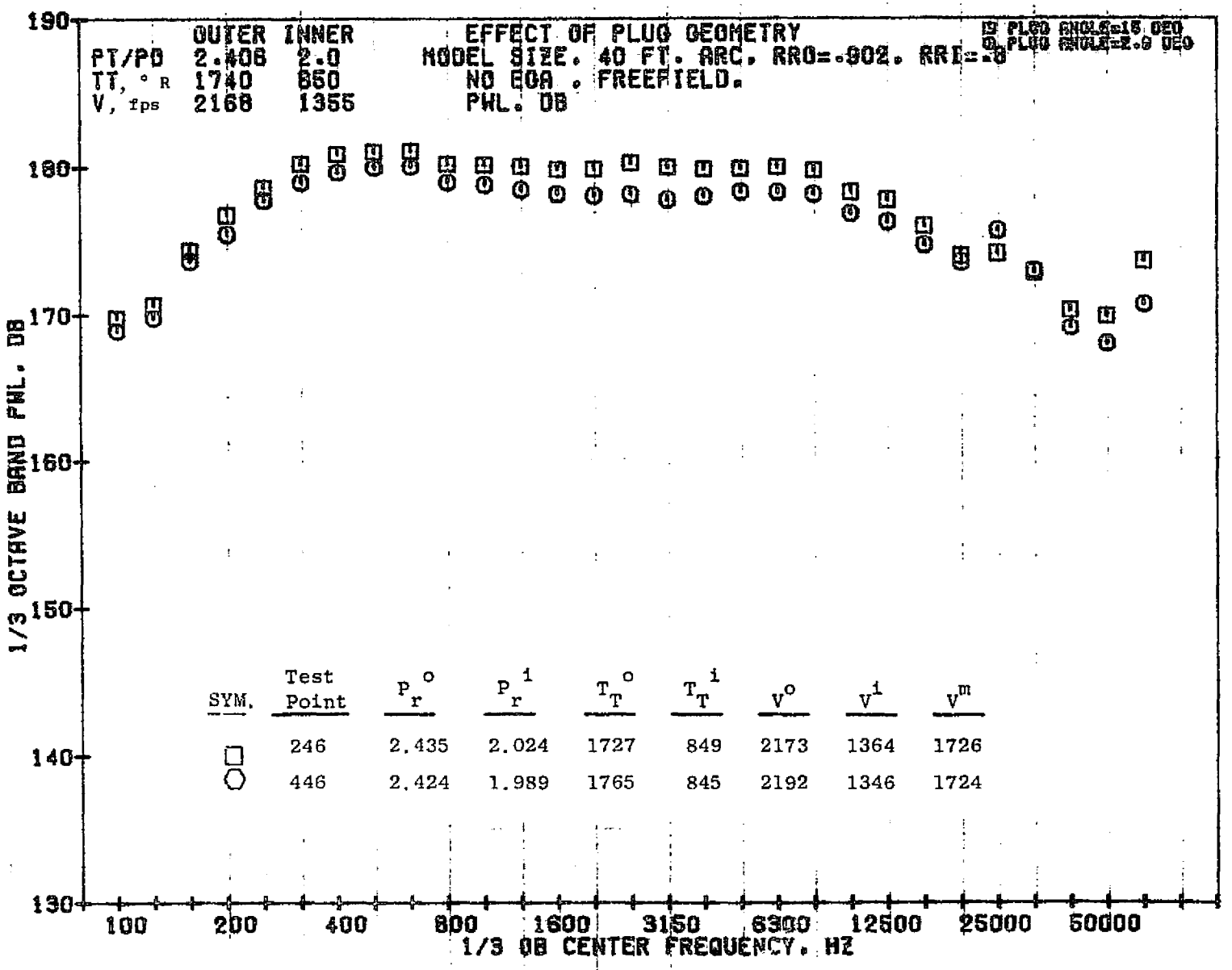

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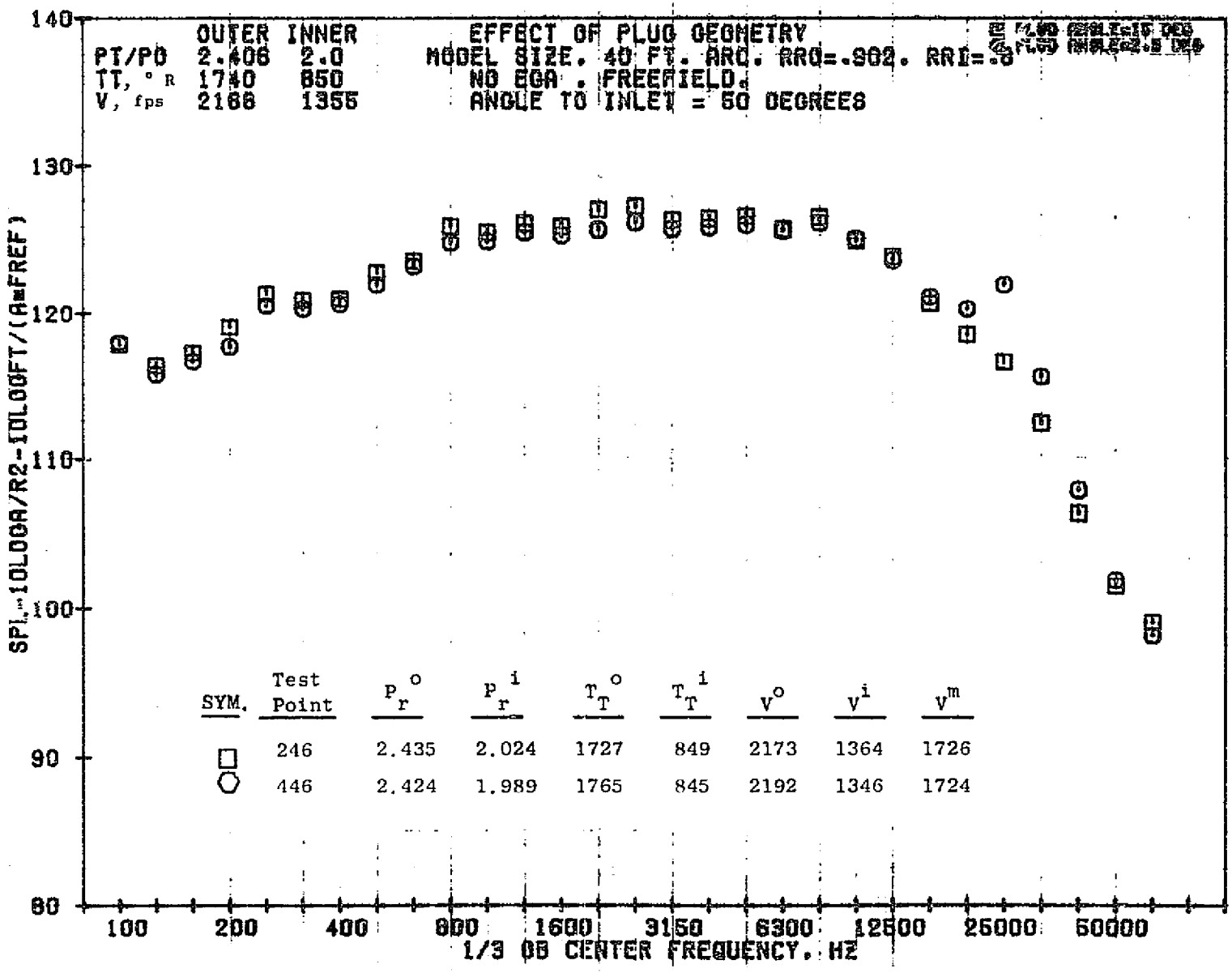

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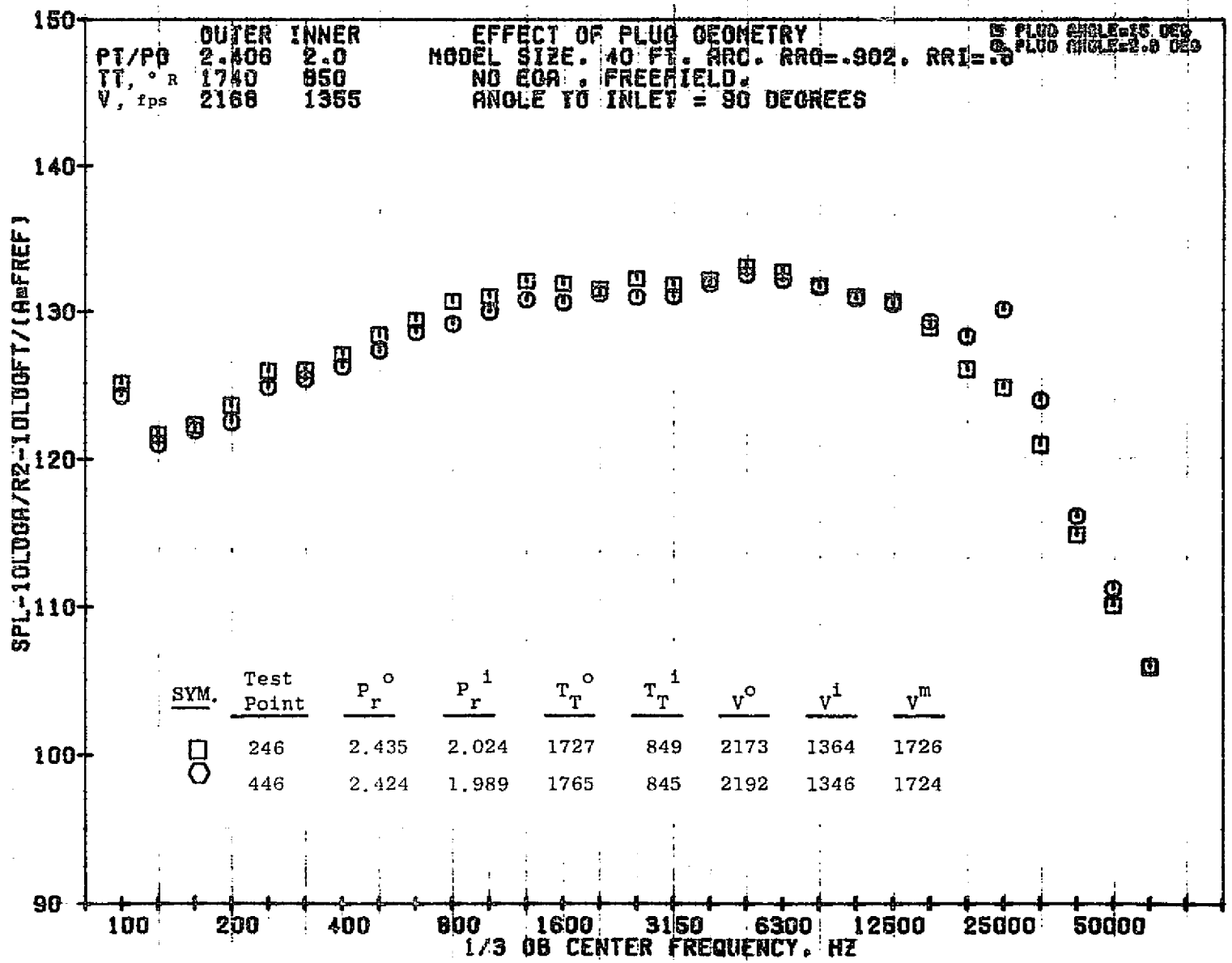

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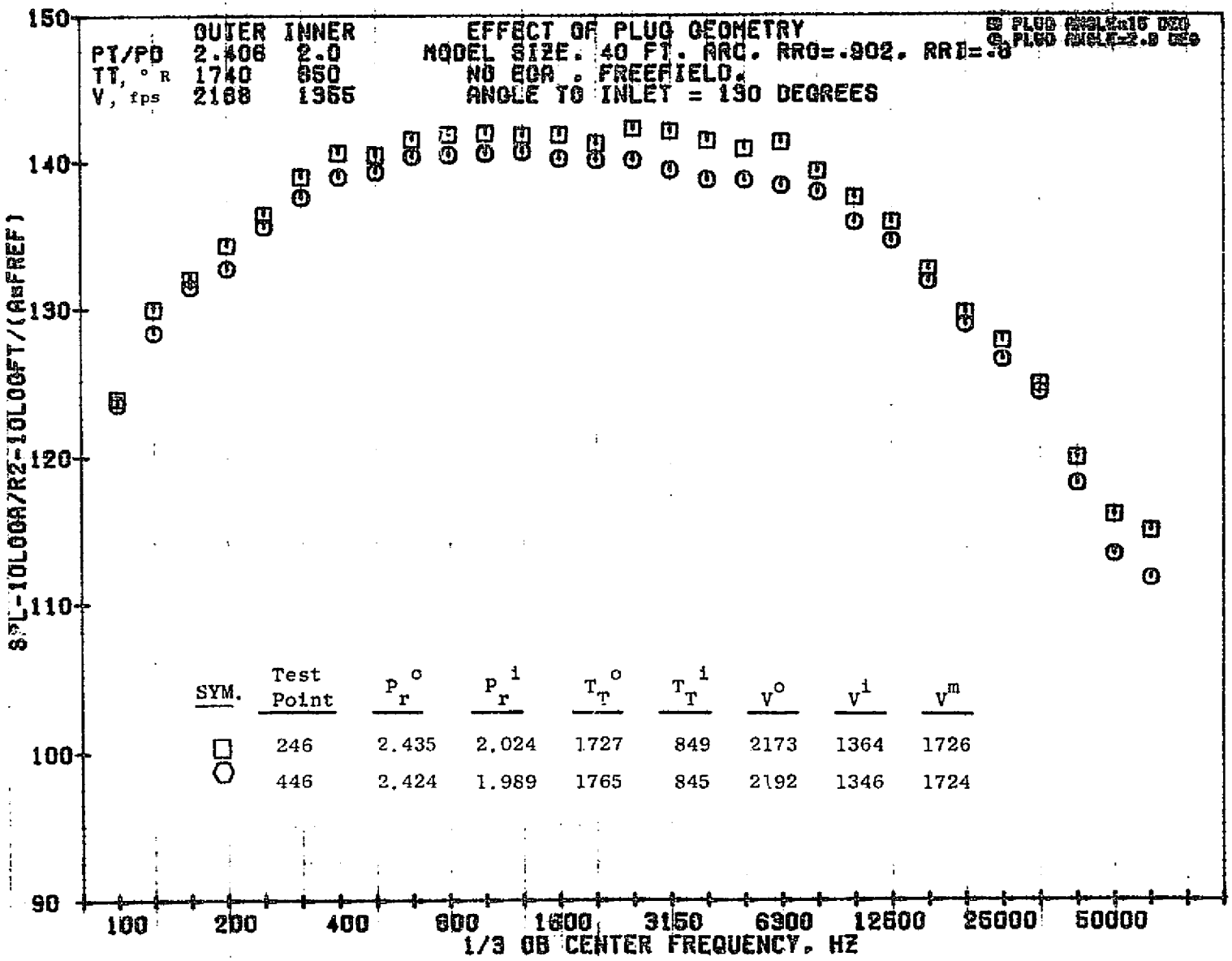

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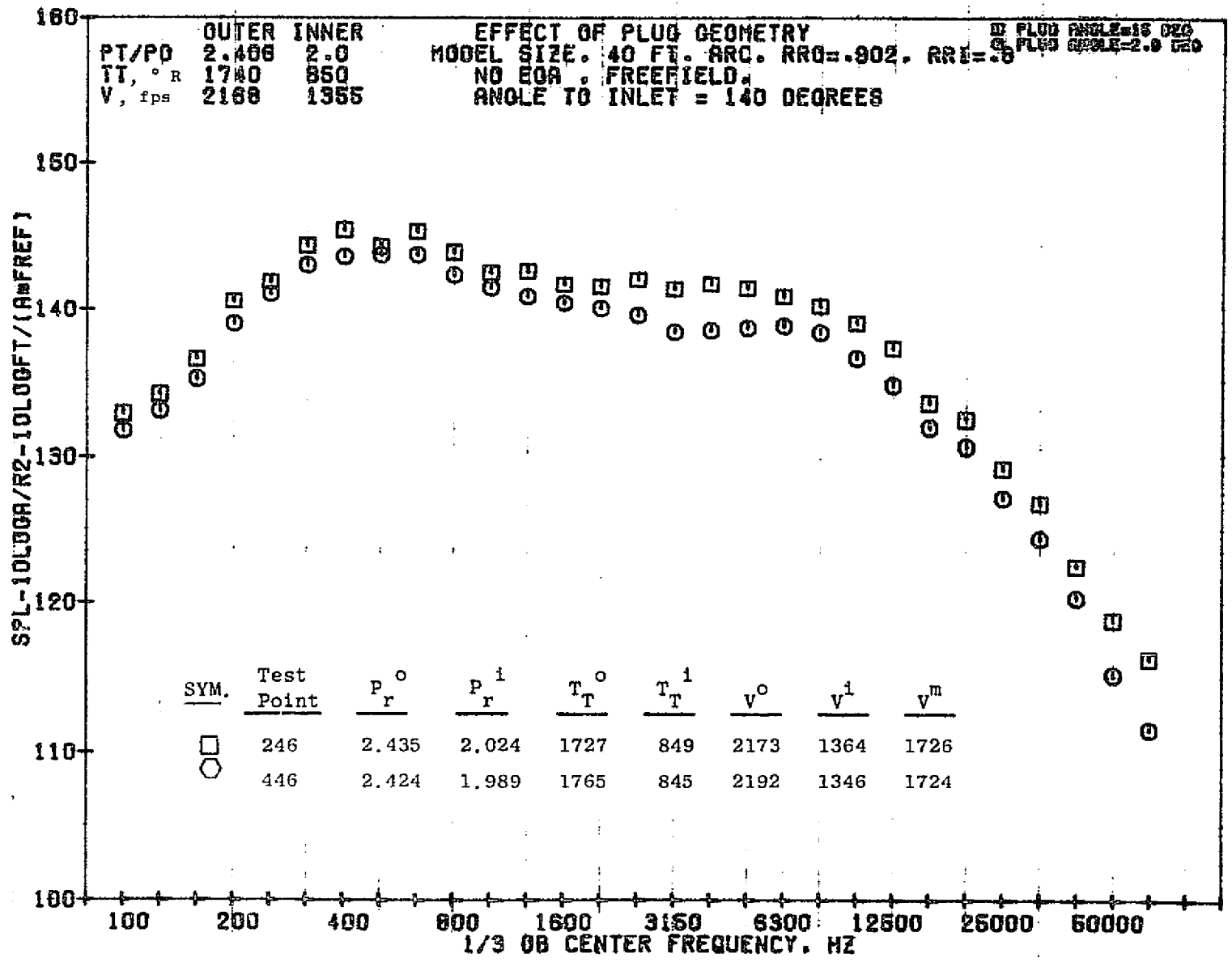

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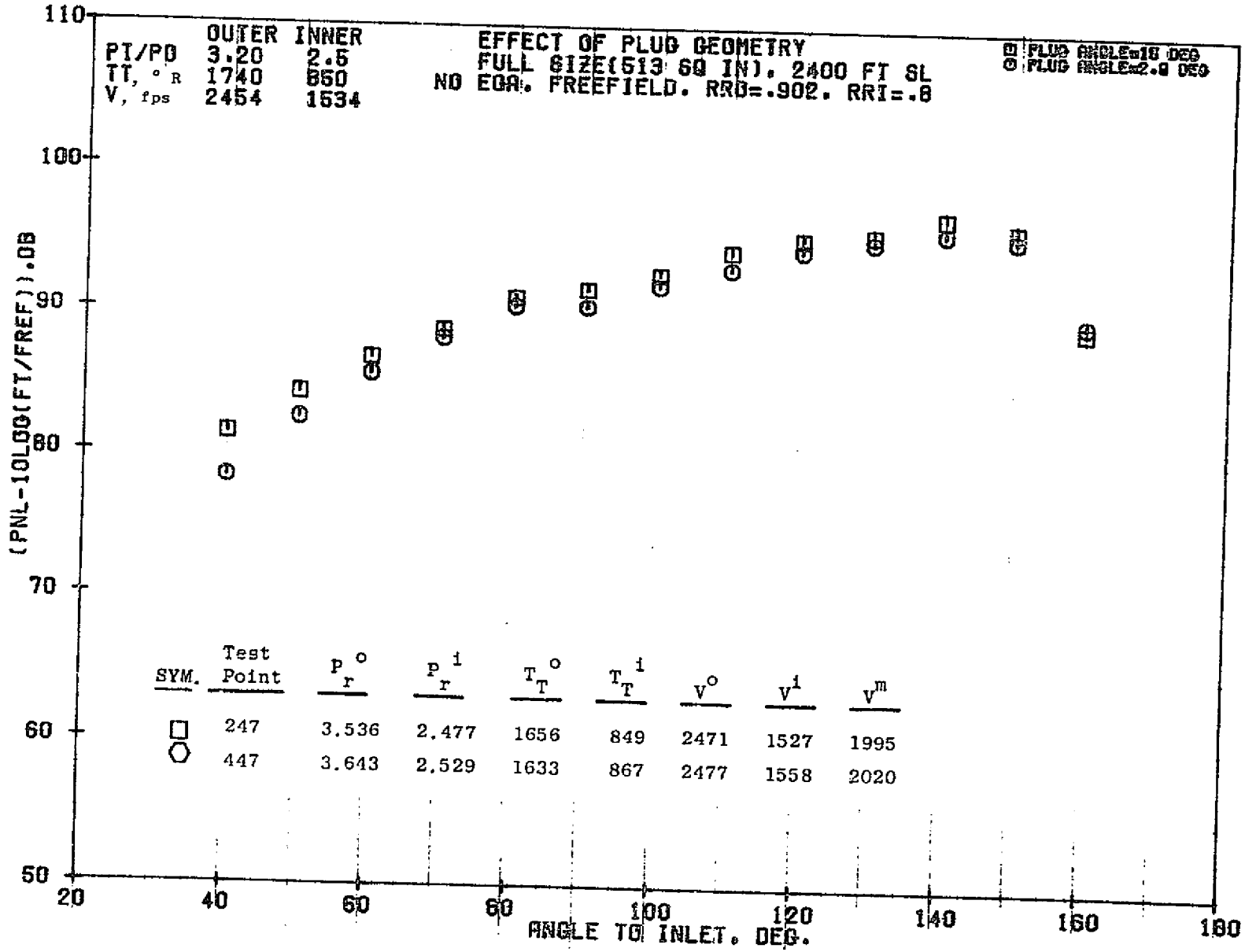

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10/29/76
18190-001

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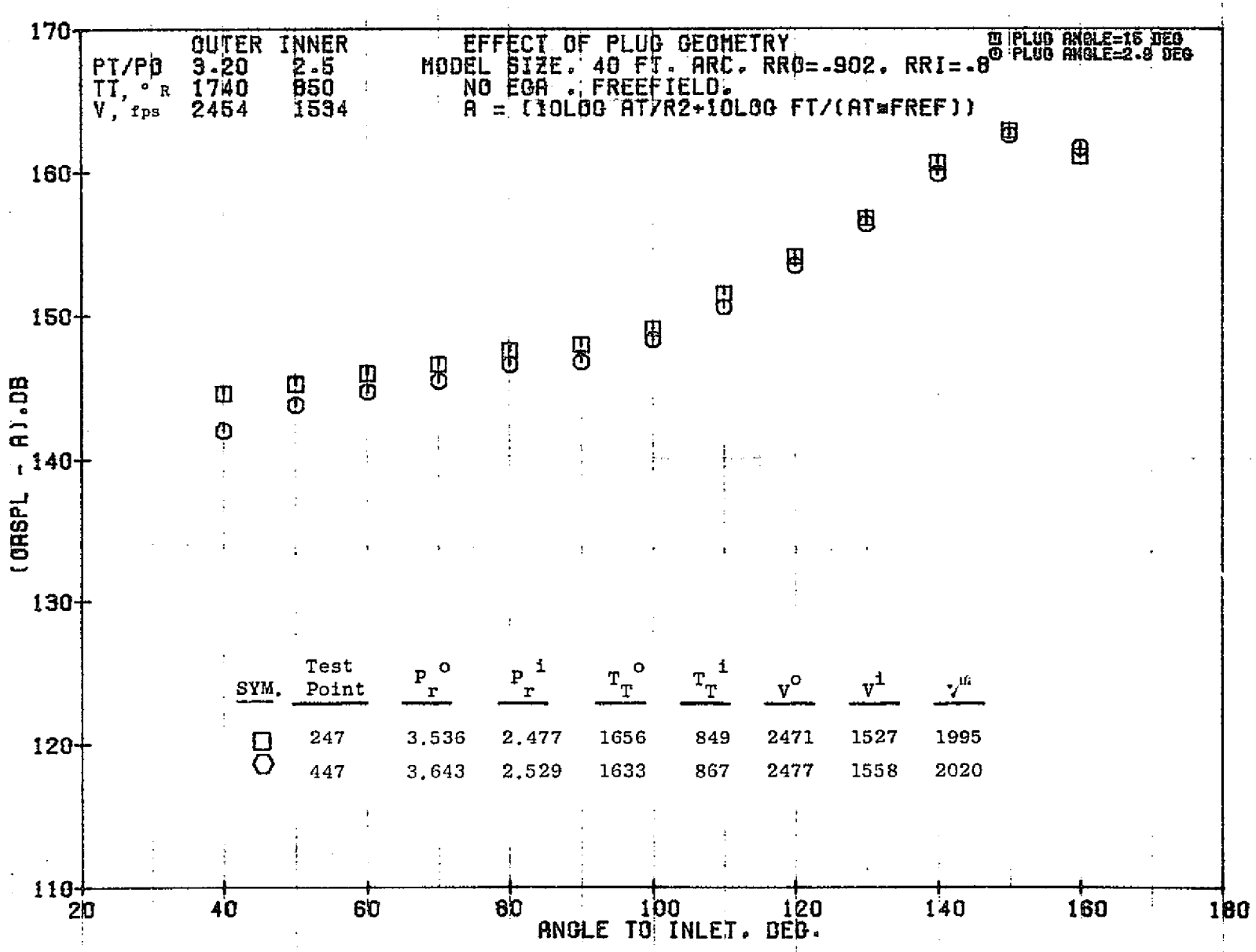

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1B360-001

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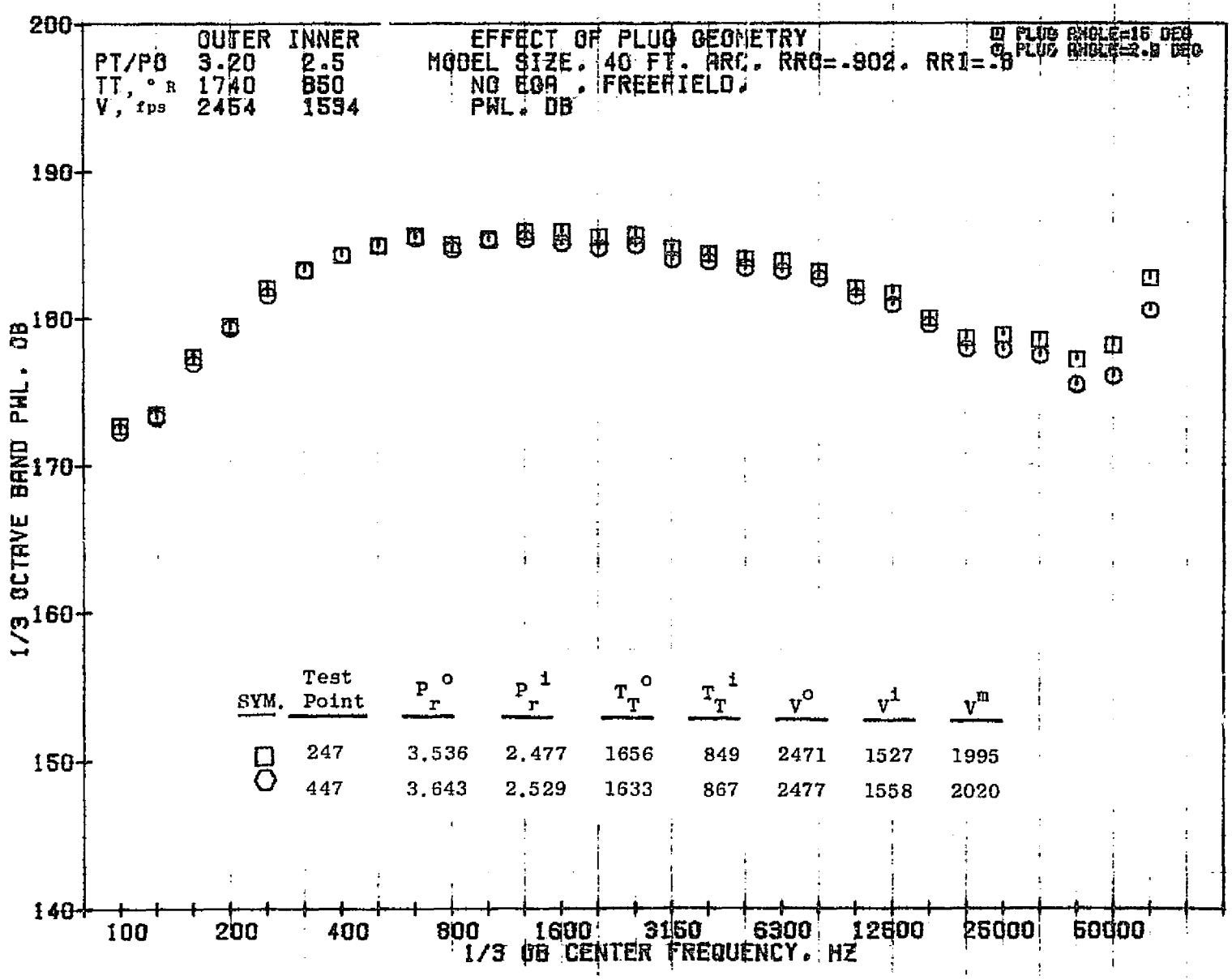

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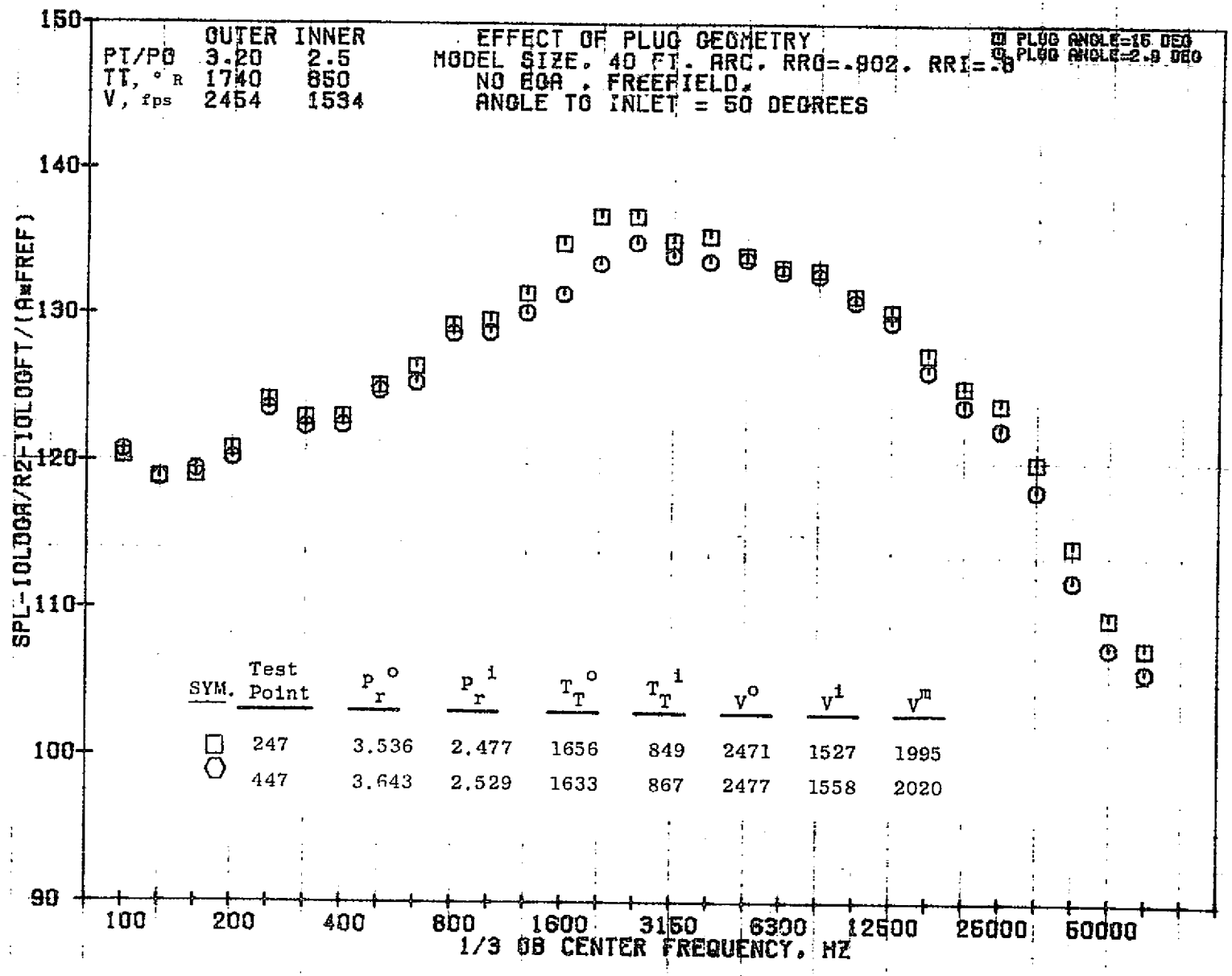

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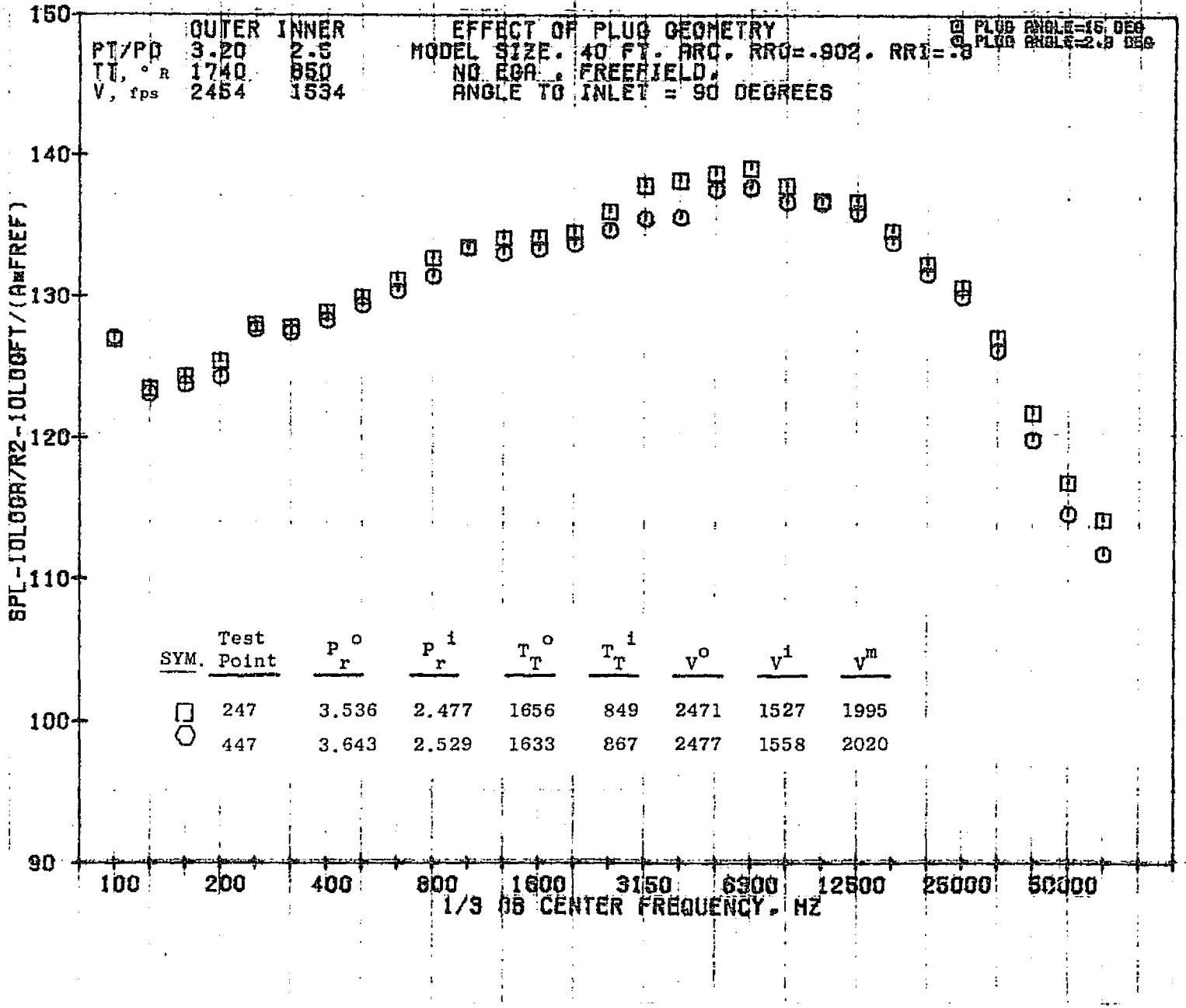

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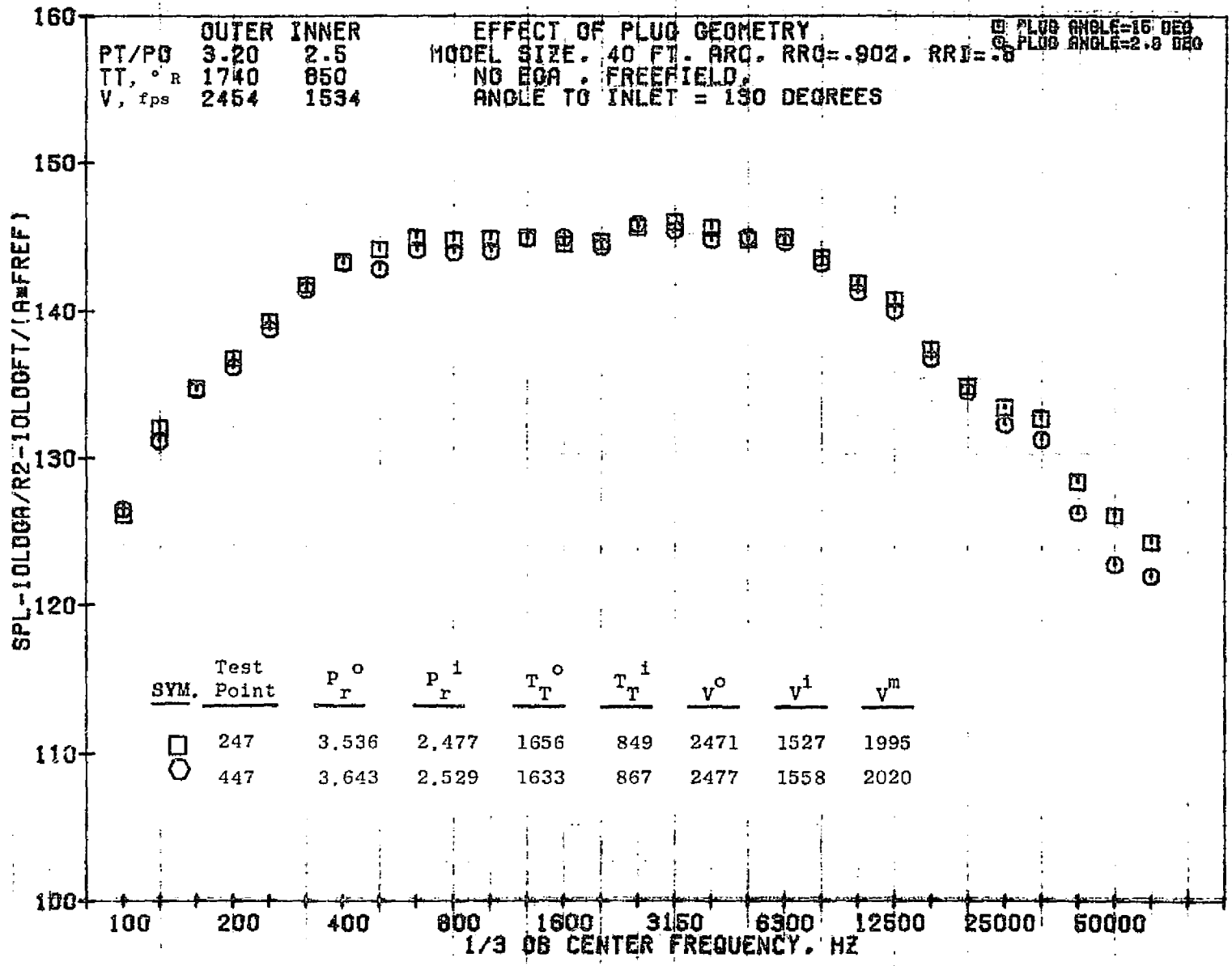

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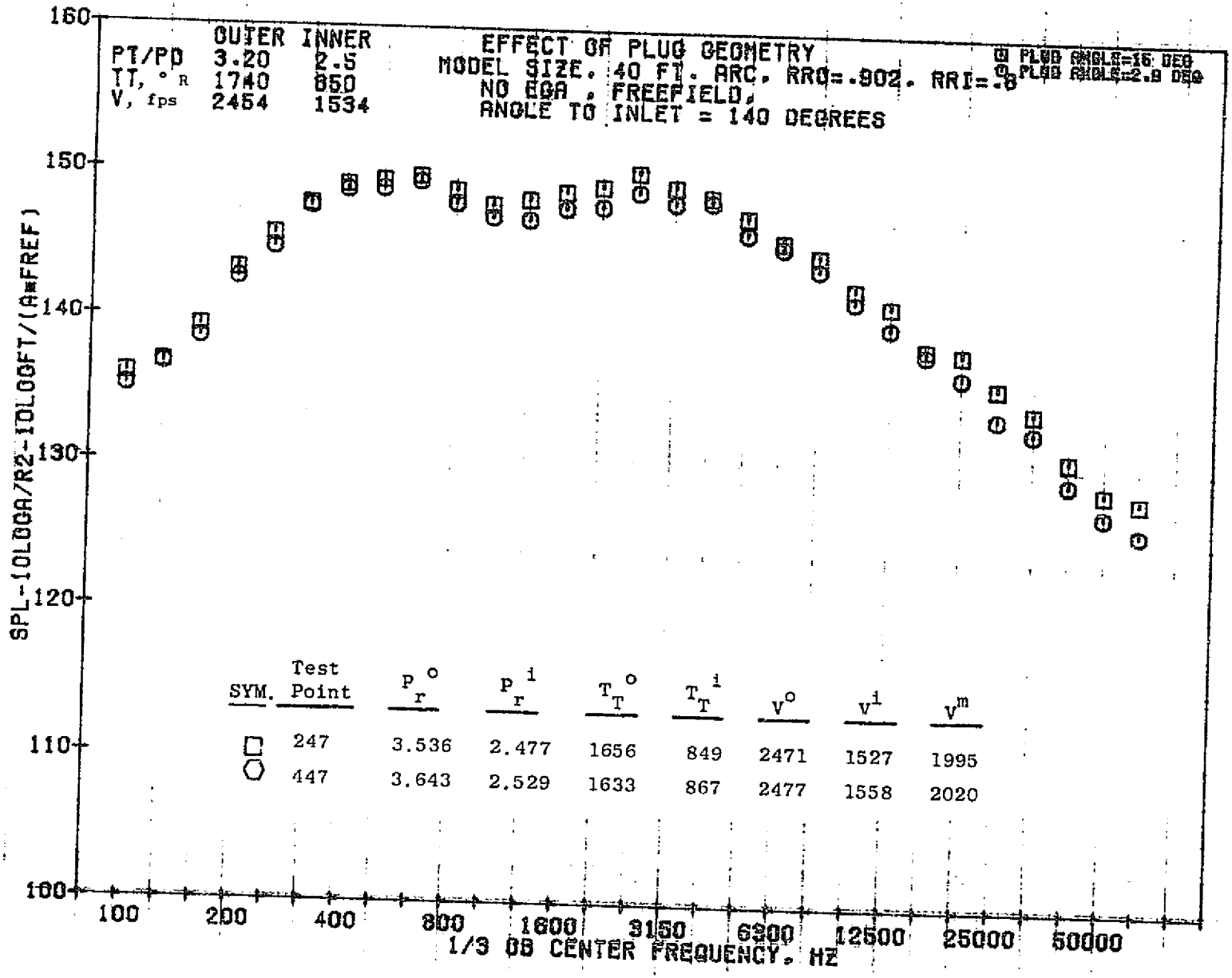

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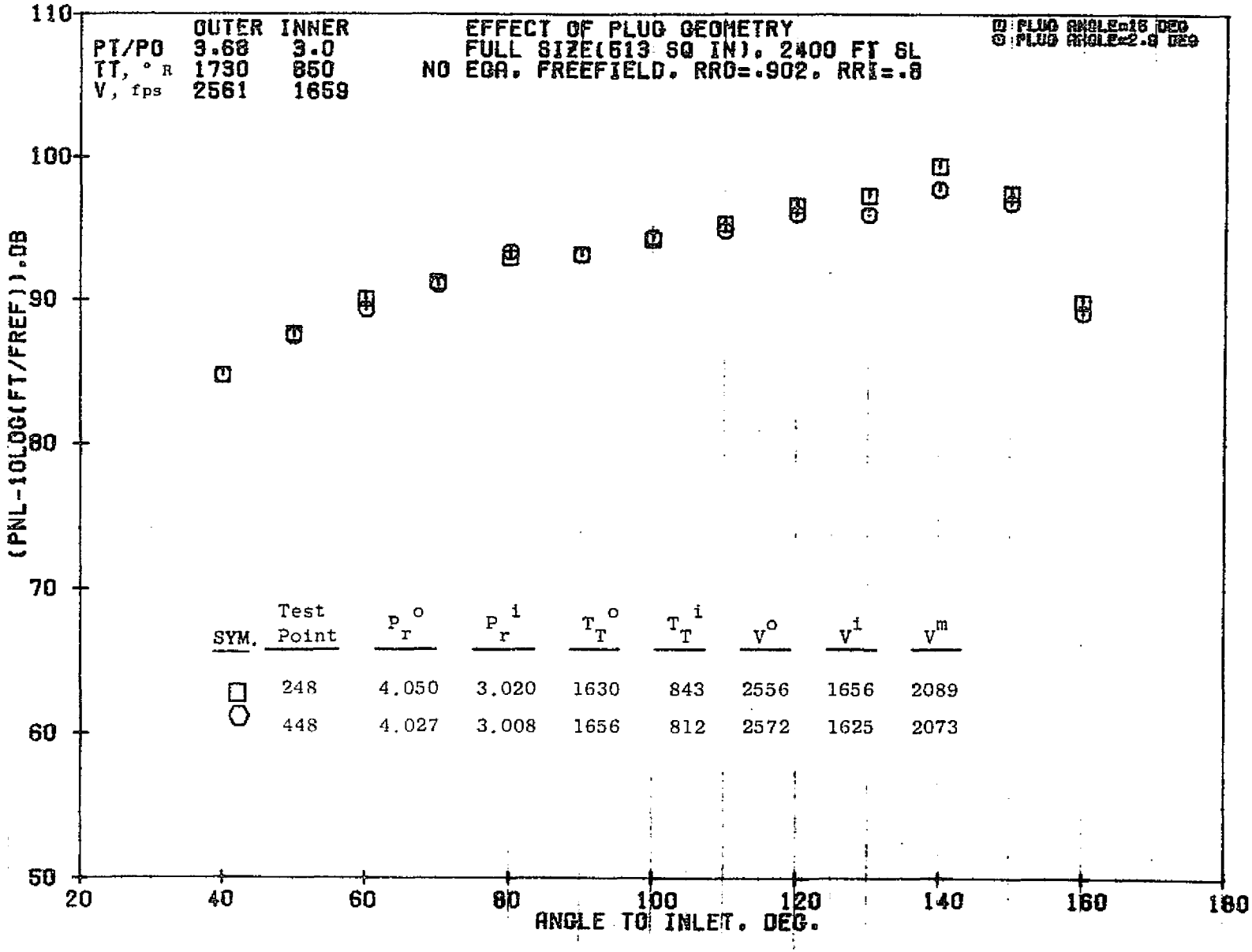

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1B130-021

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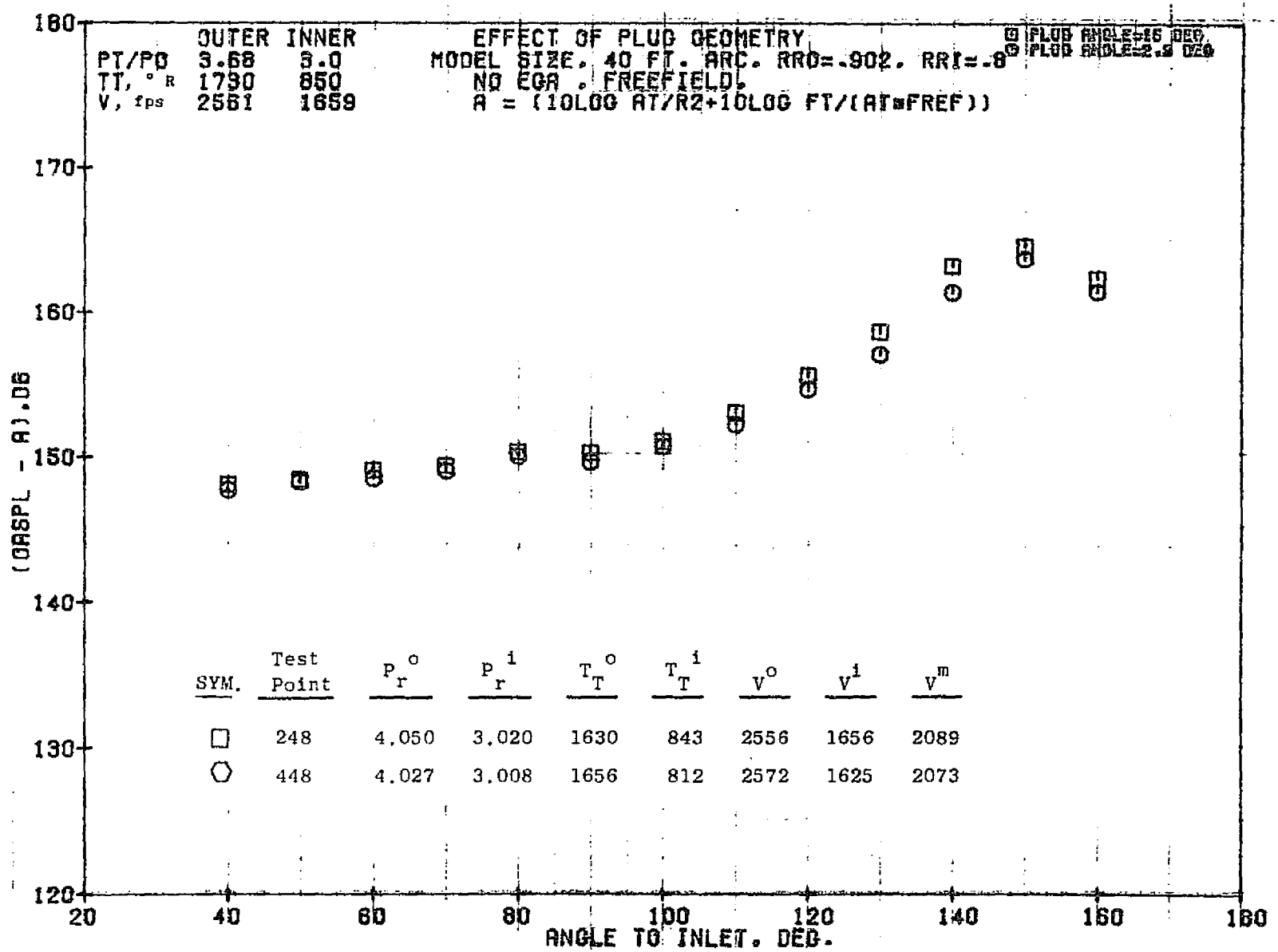

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18368-001

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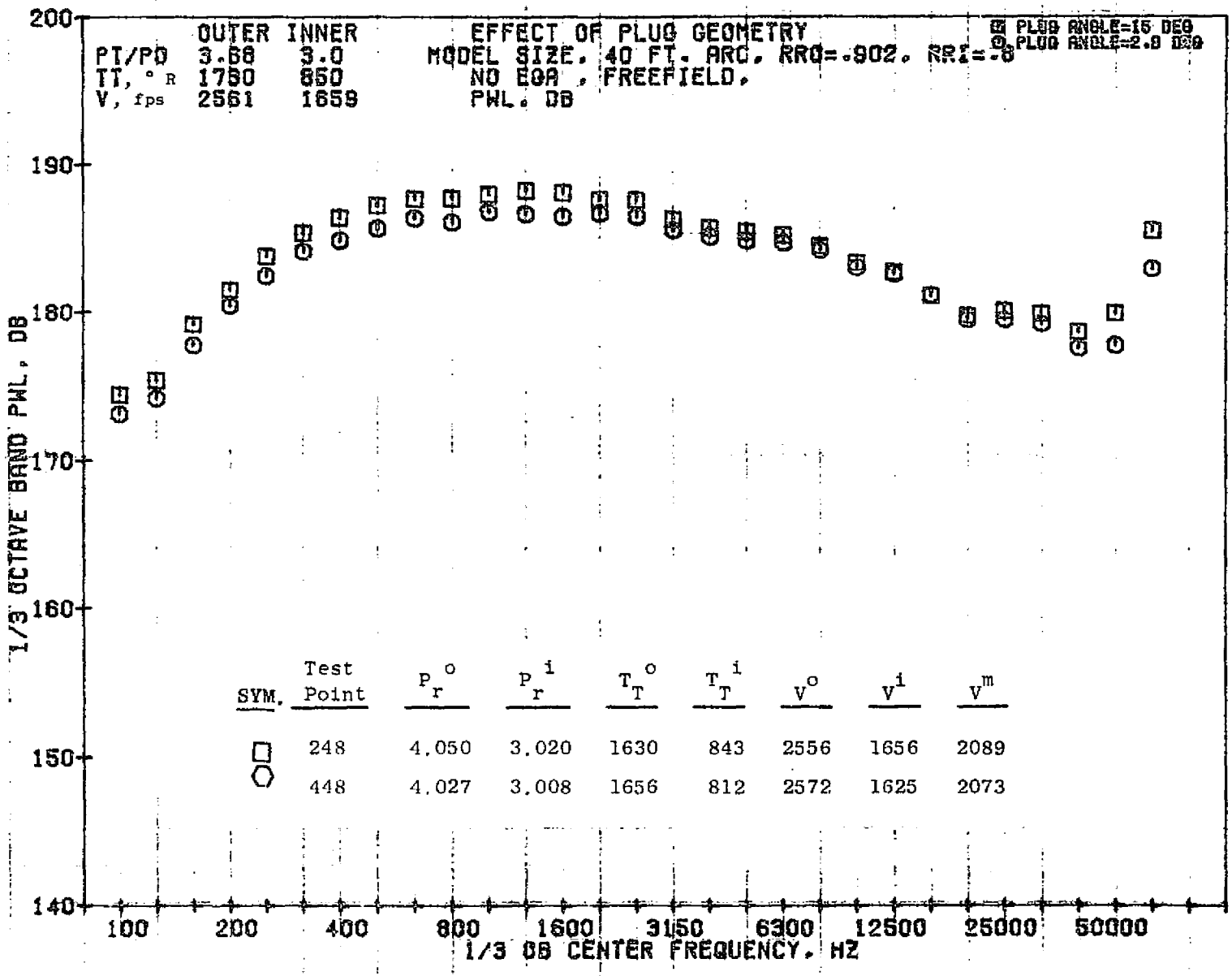

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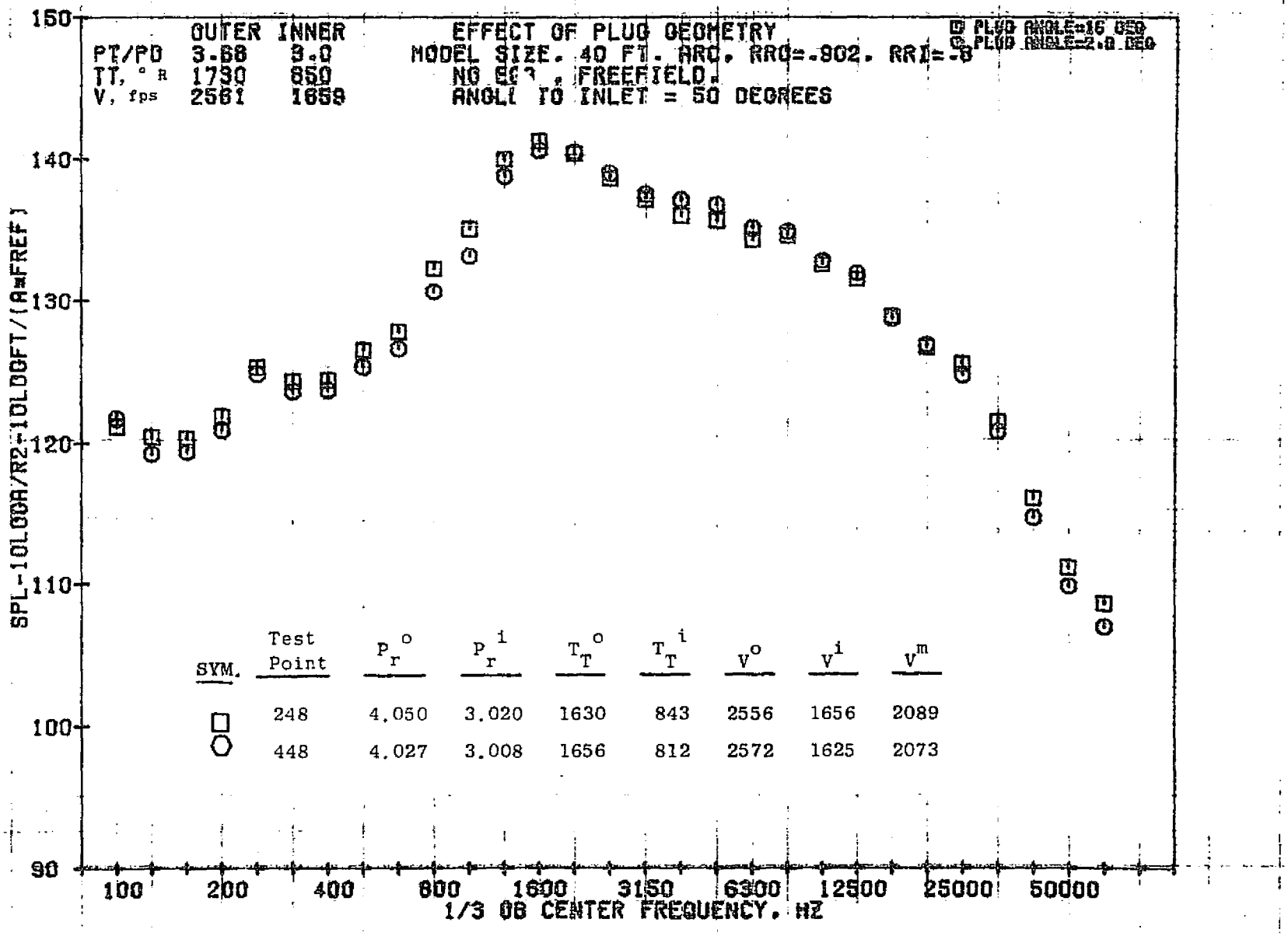

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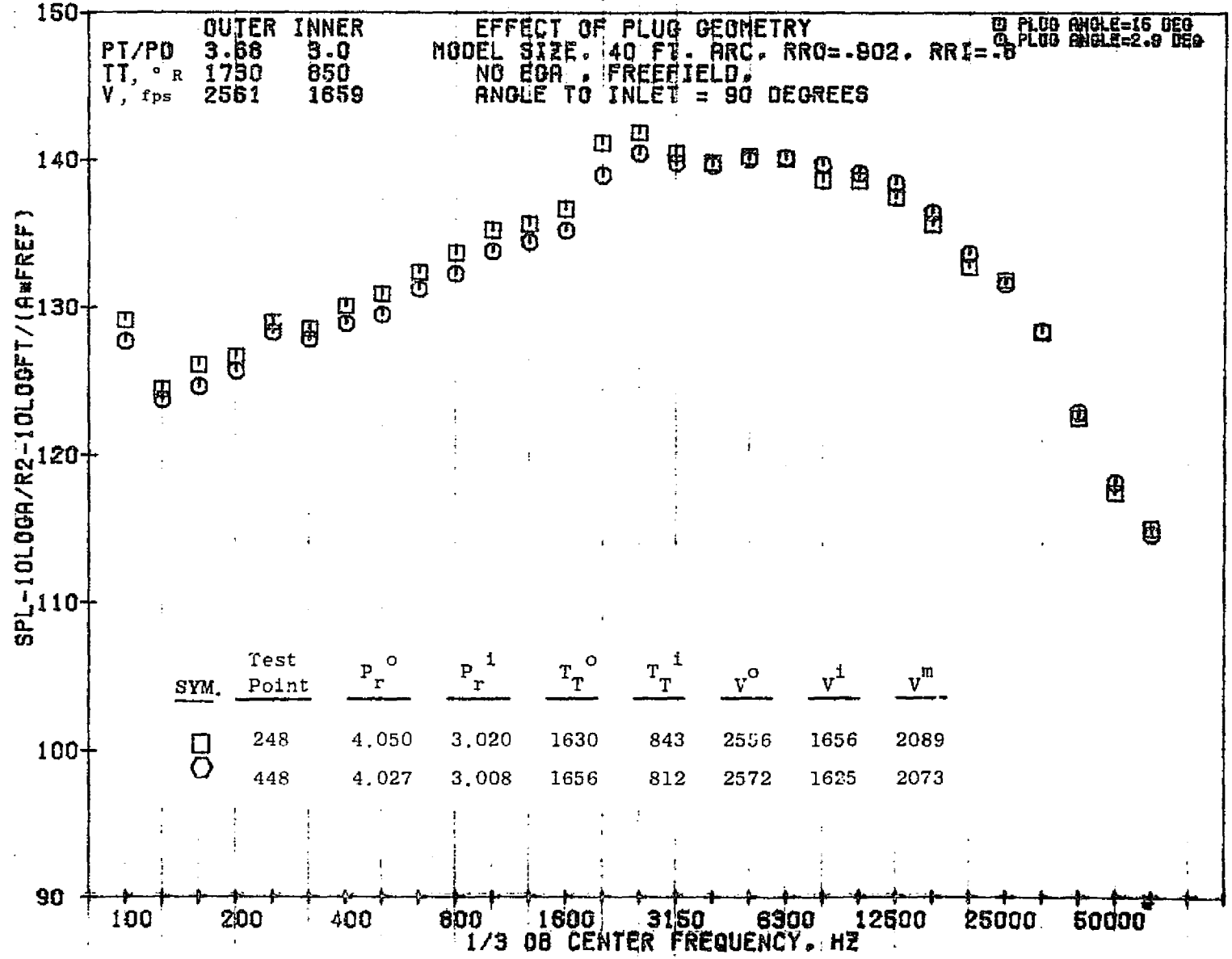

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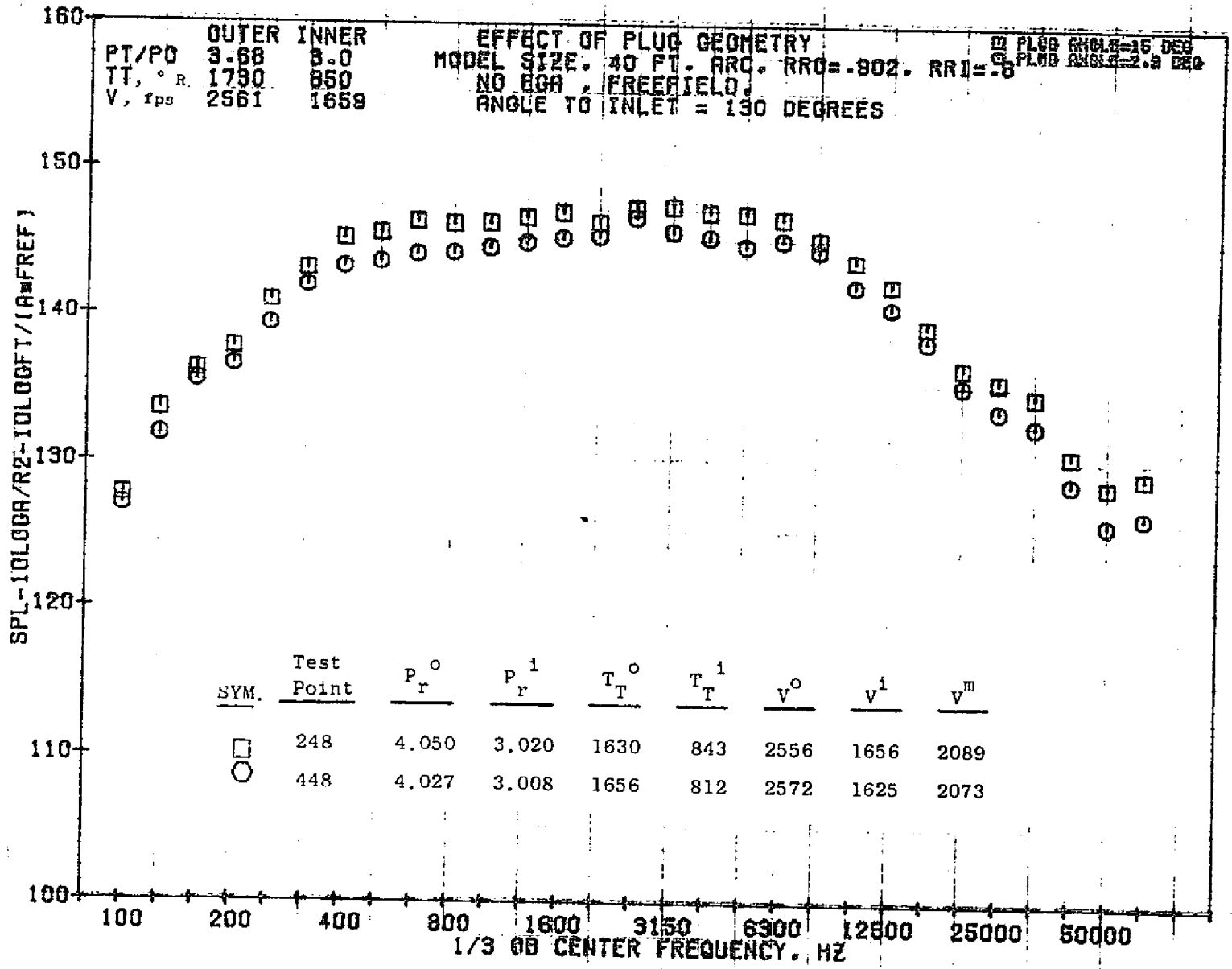

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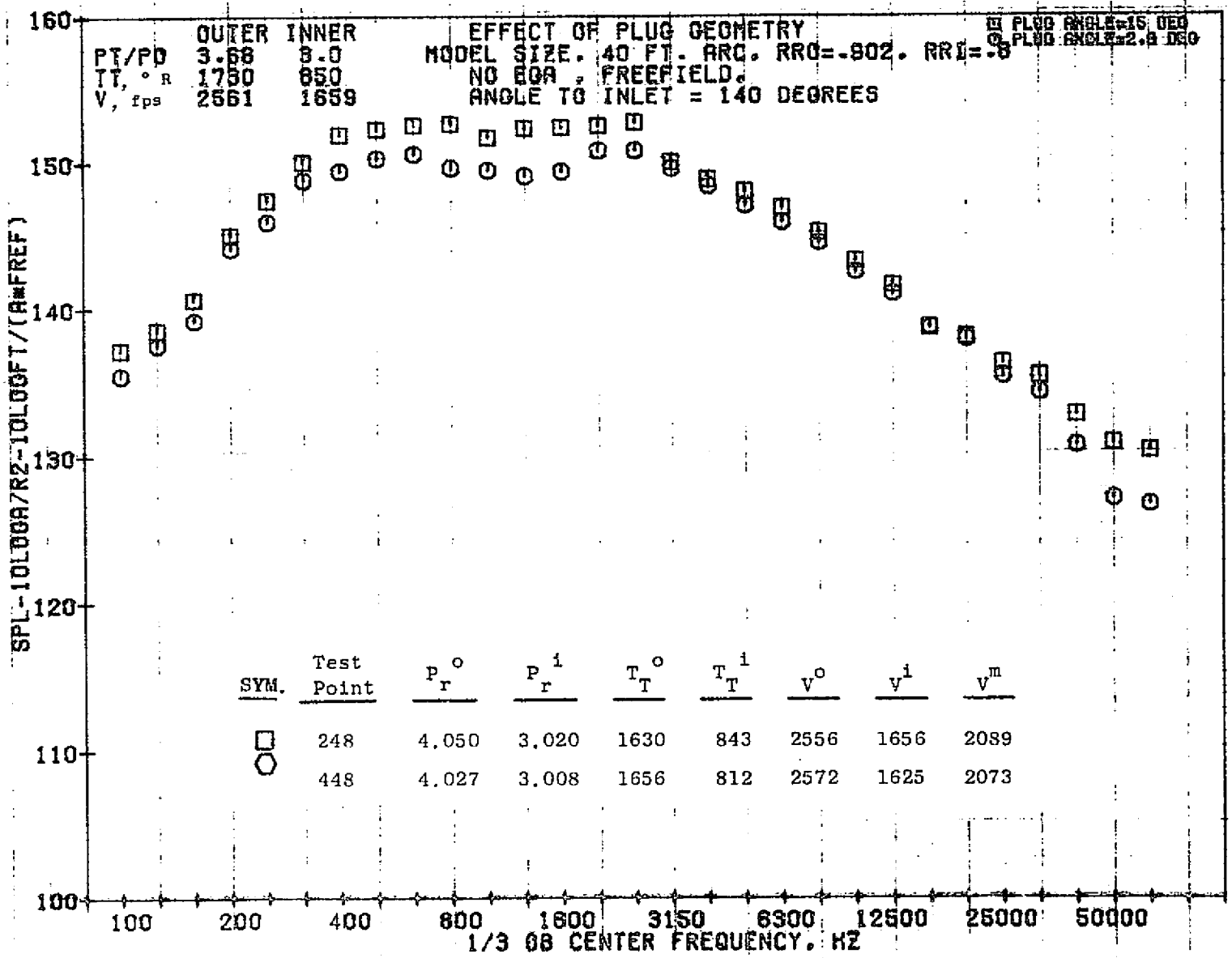
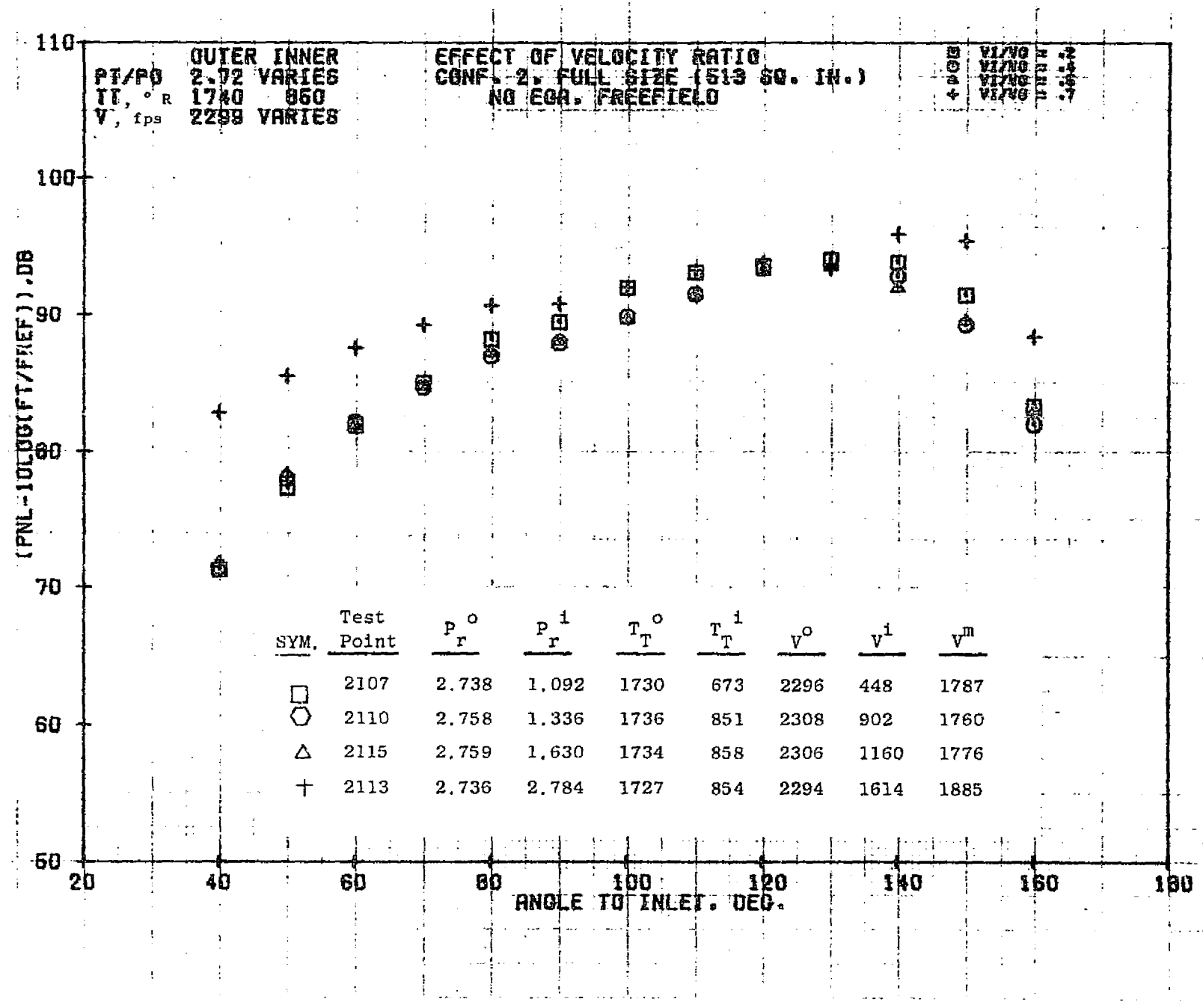


11/03/76
18360-001

79 BURCH A.

7.4.4. Effect of Velocity Ratio

For Configurations 2 through 7, test points were run with the outer stream aerodynamic parameters held constant while the inner stream velocity was varied to determine the effect of velocity ratio. The results are shown in this section.



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11/01/76
18421-001

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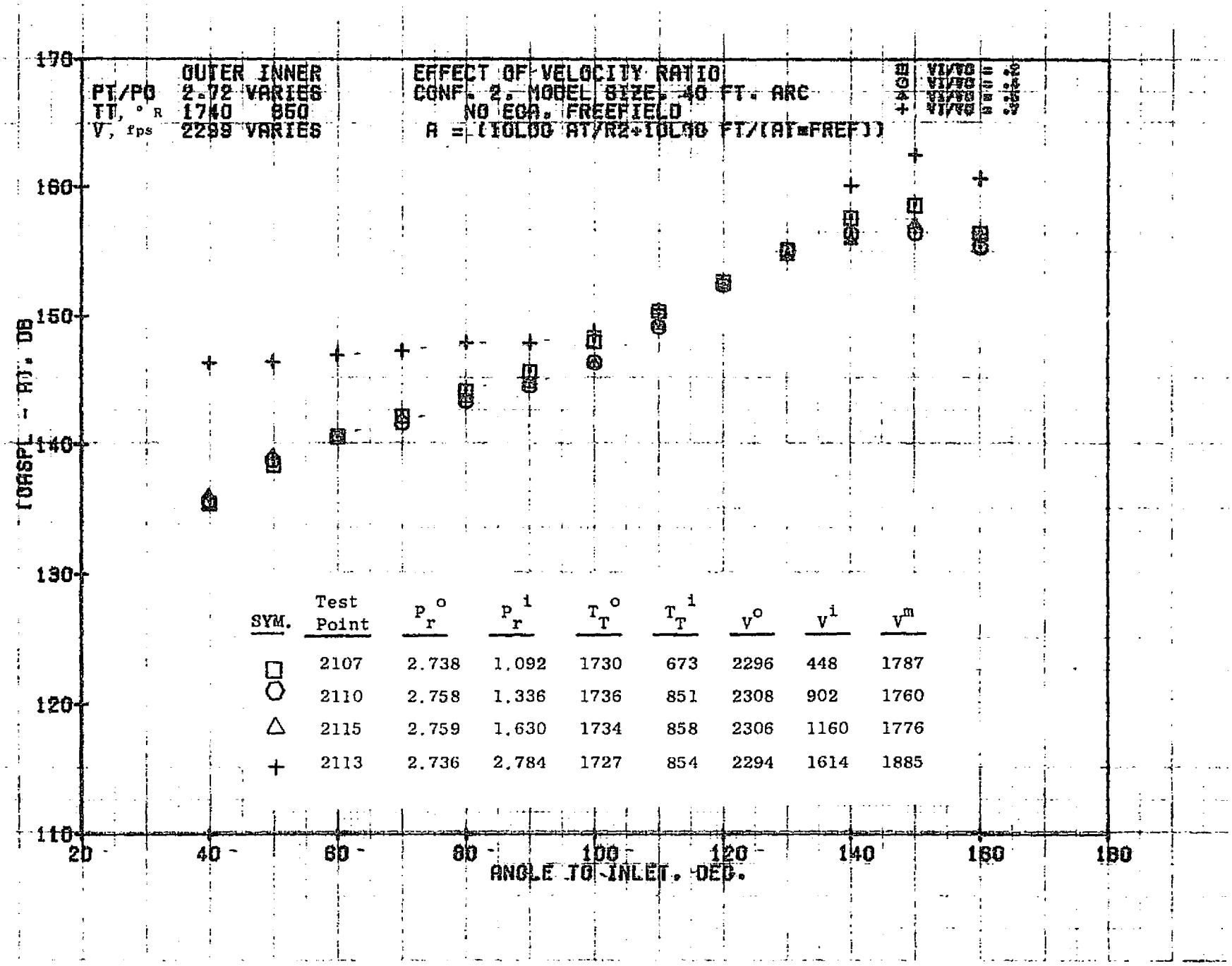
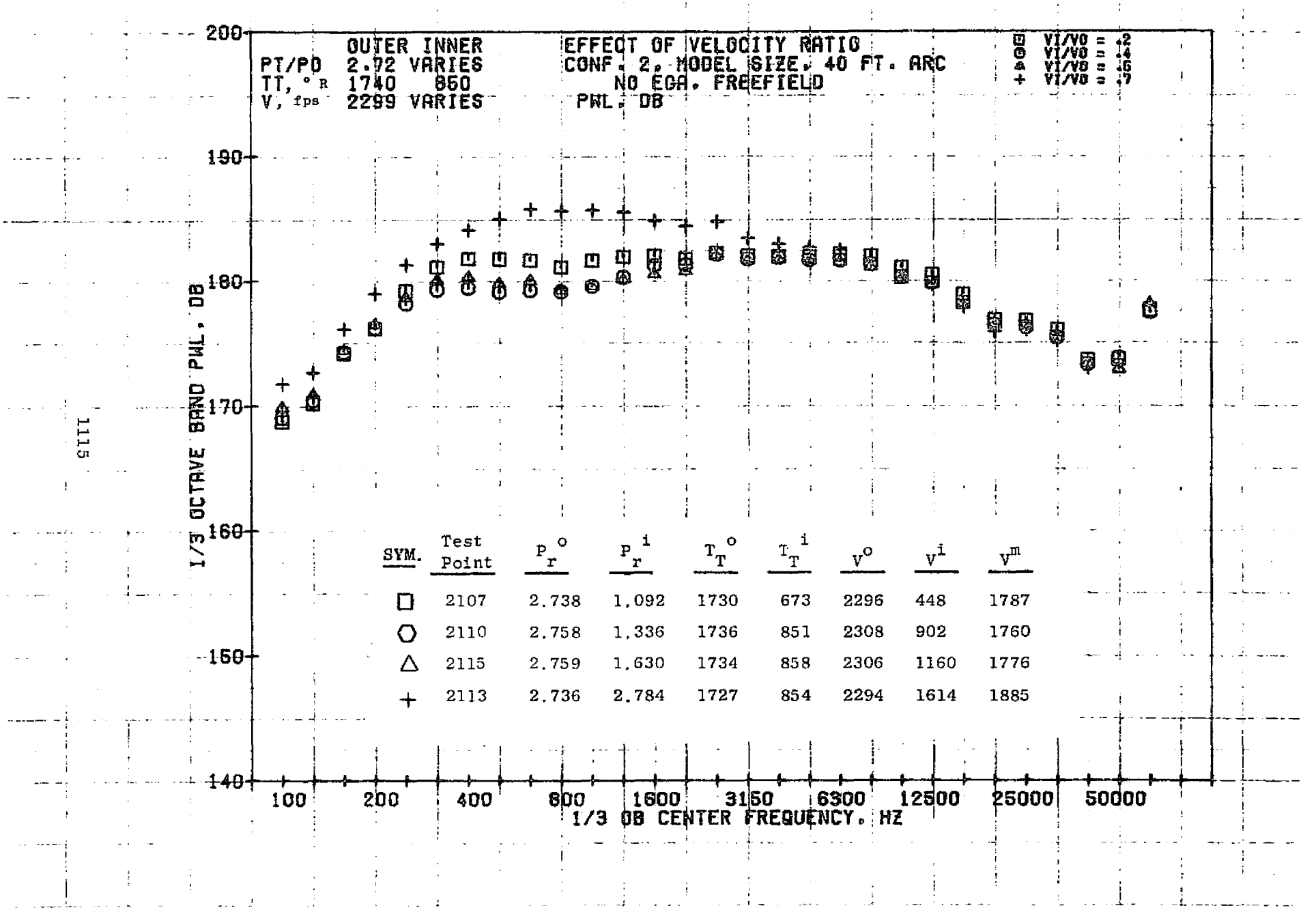


SYM.	Test Point	p_r^o	p_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	2107	2.738	1.092	1730	673	2296	448	1787
○	2110	2.758	1.336	1736	851	2308	902	1760
△	2115	2.759	1.630	1734	858	2306	1160	1776
+	2113	2.736	2.784	1727	854	2294	1614	1885

11/09/76
1R343-001

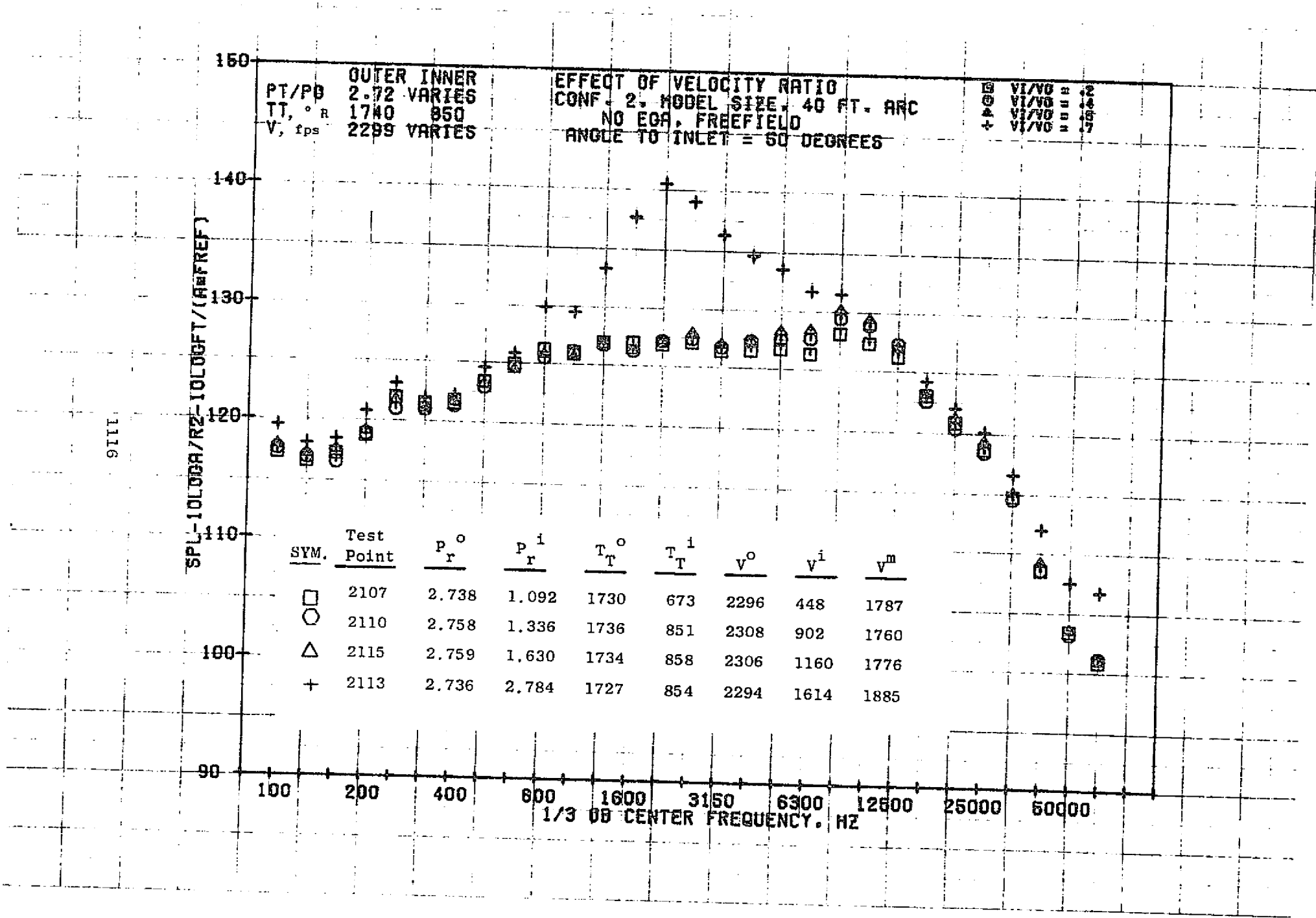
79 BIRCH A.



1115

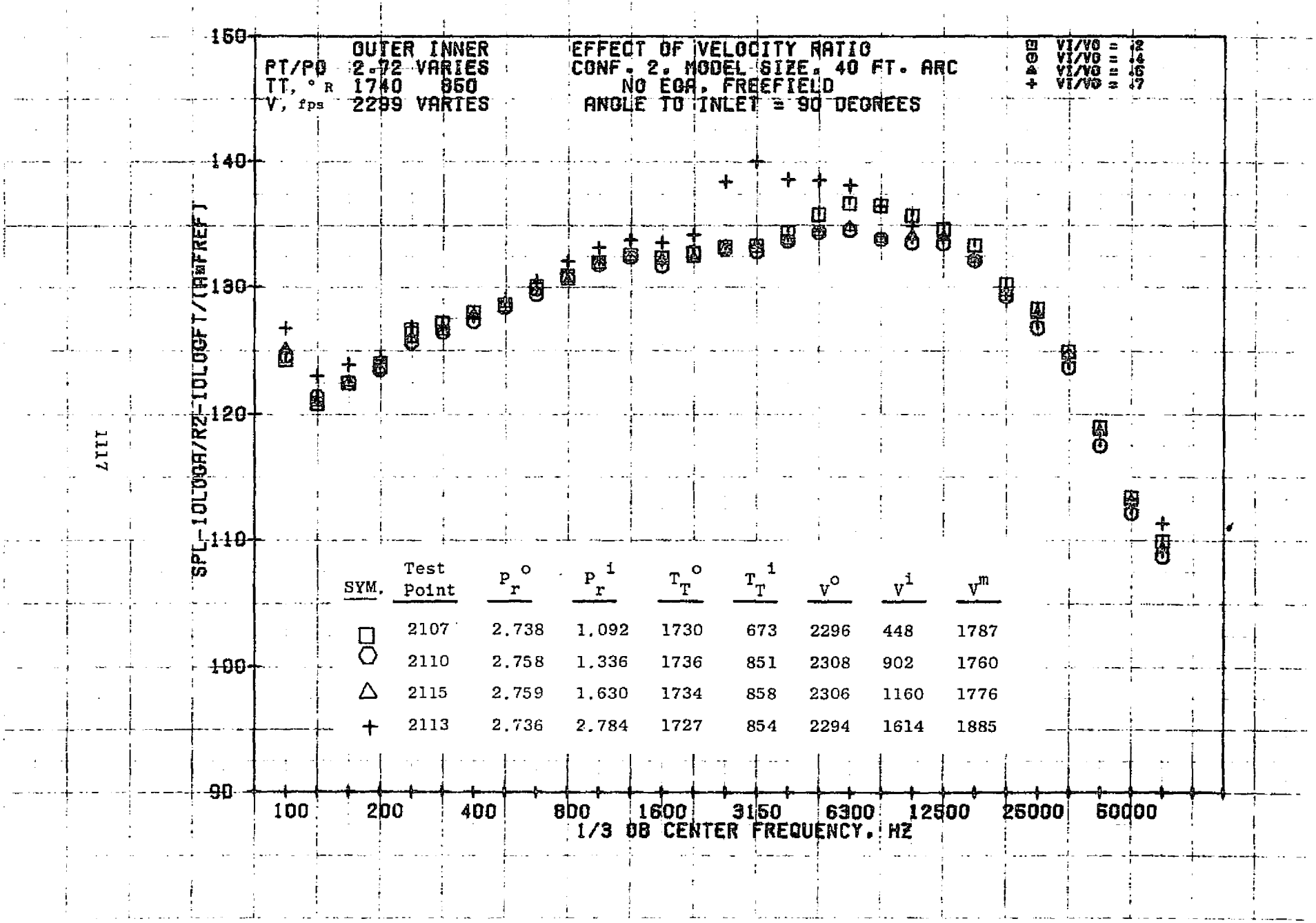
11/01/76
18391-001

79 BURCH A.



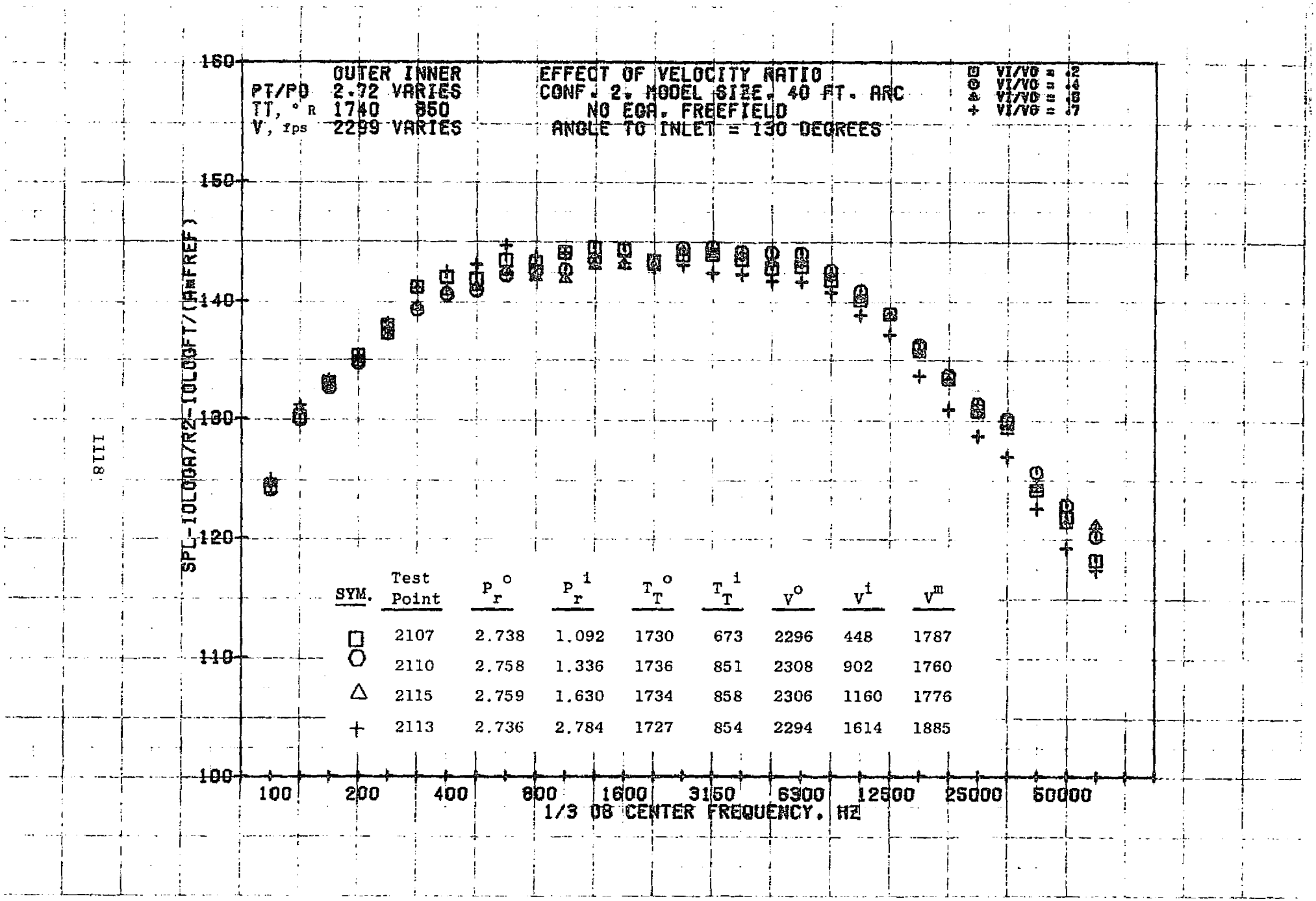
11/01/76
18391-001

79 BURCH A.



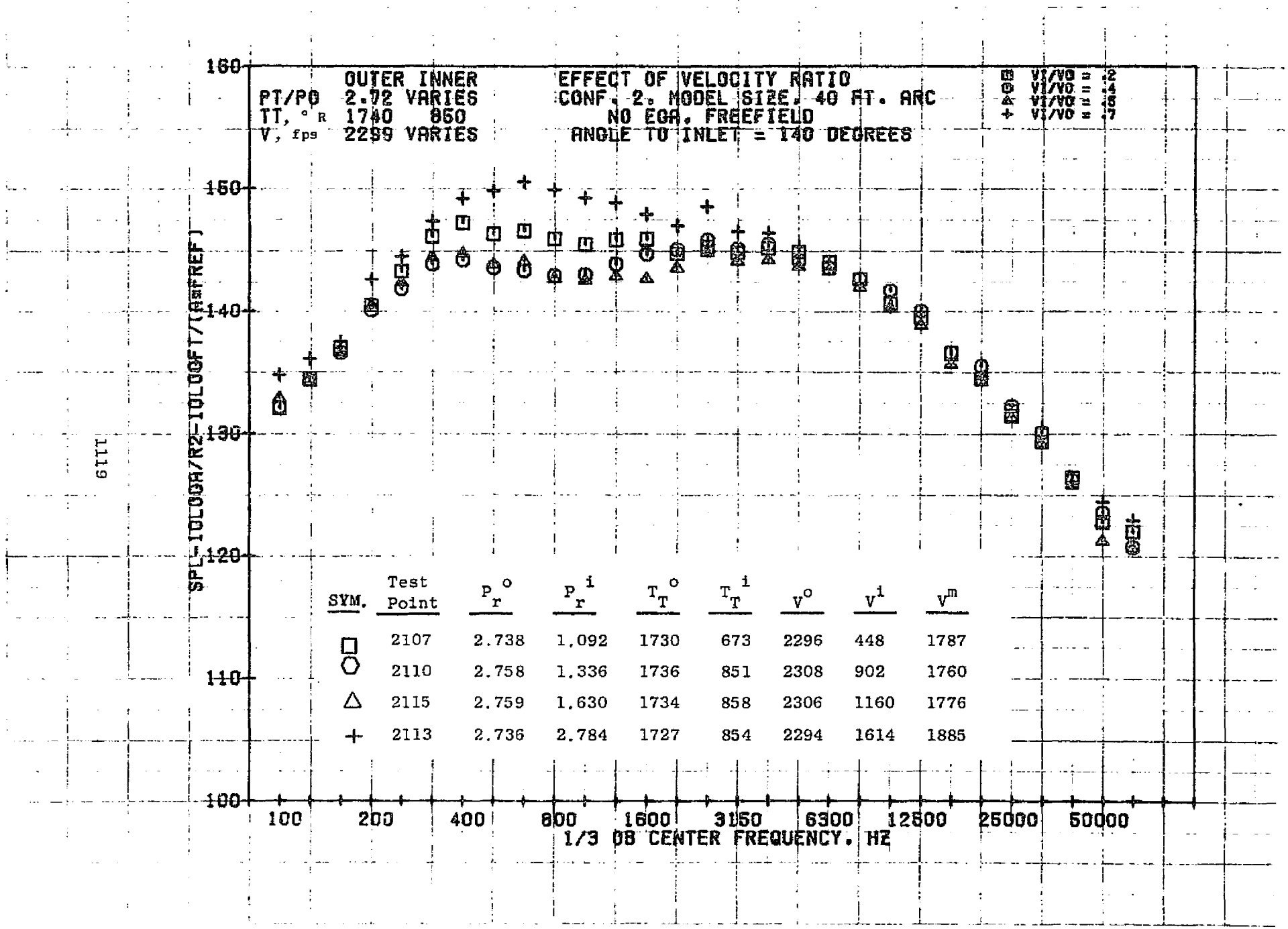
11/01/76
18391-001

79 BURCH A.



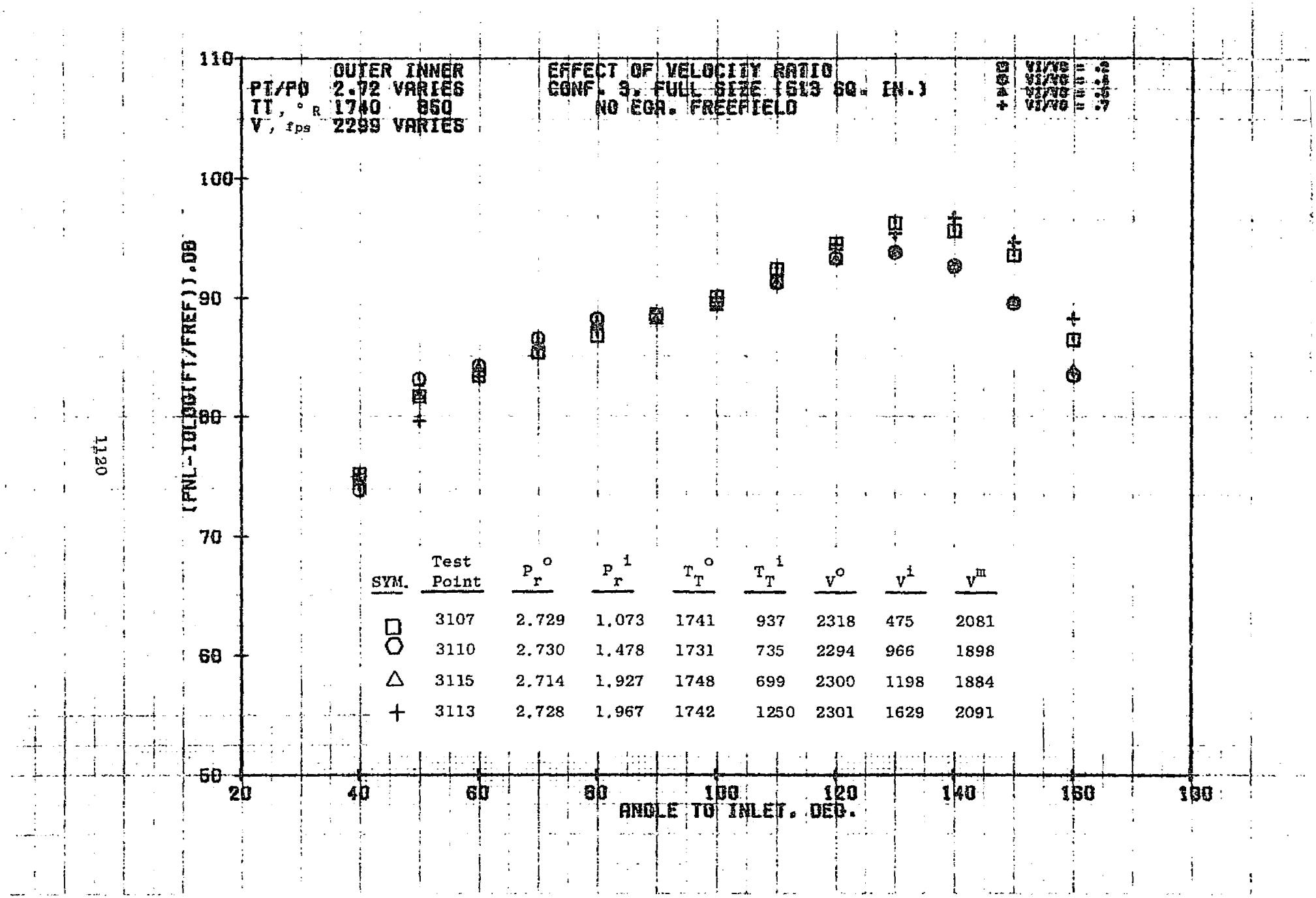
11/01/76
18391-001

79 BURCH A.



11/01/76
18391-001

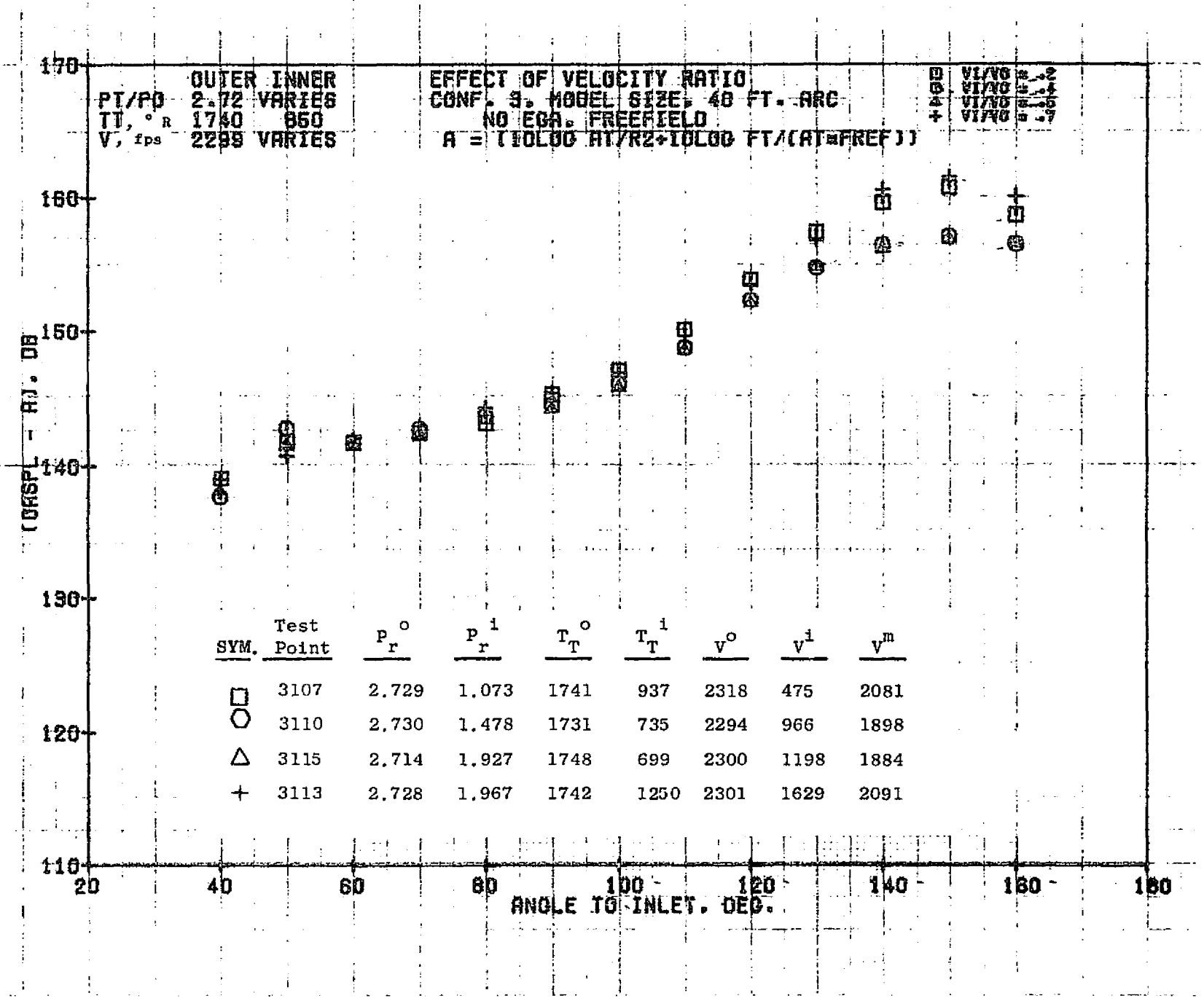
79 BURCH A.



1120

11/01/76
18421-001

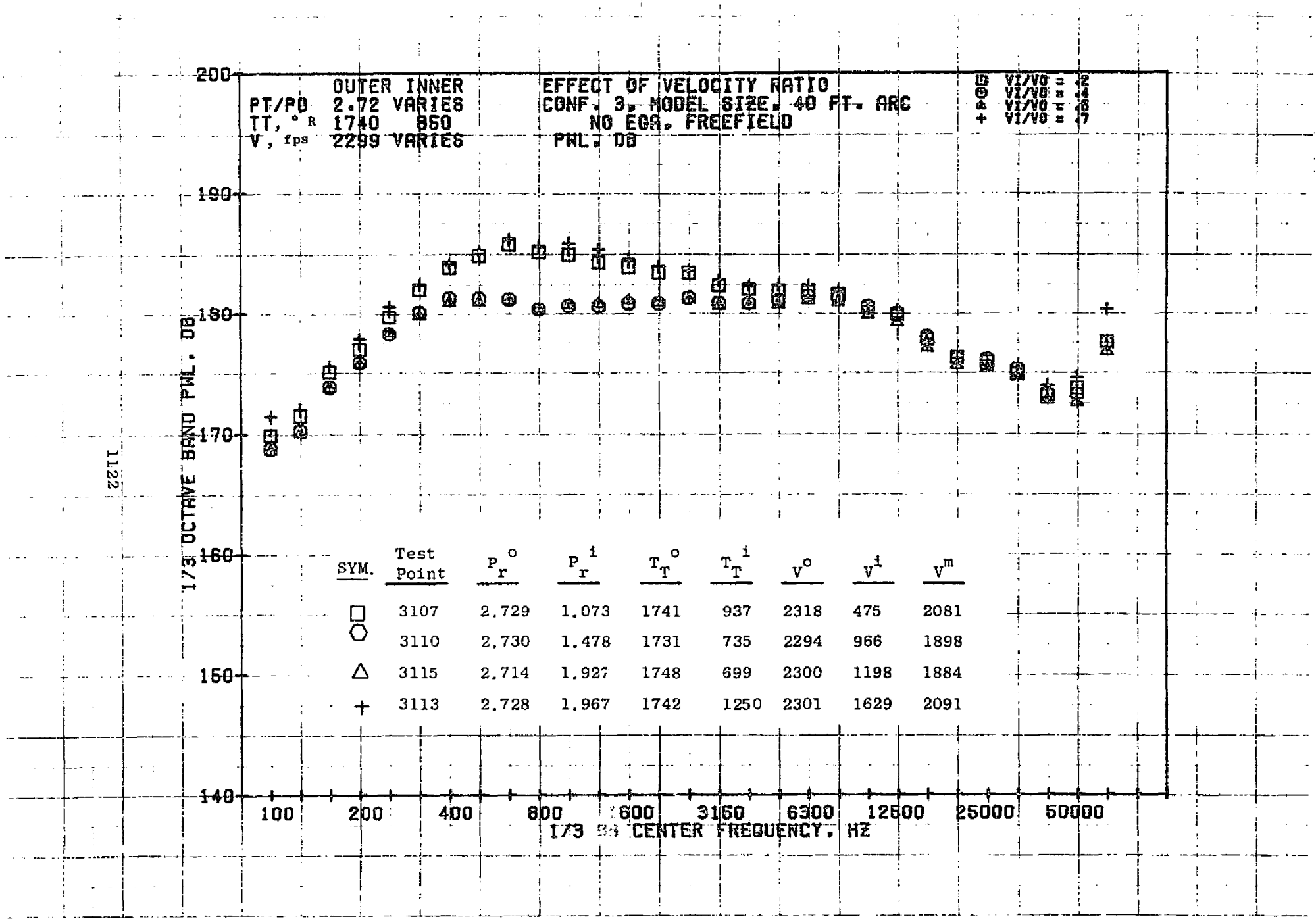
79 BURCH A.



1121

11/09/76
18943-001

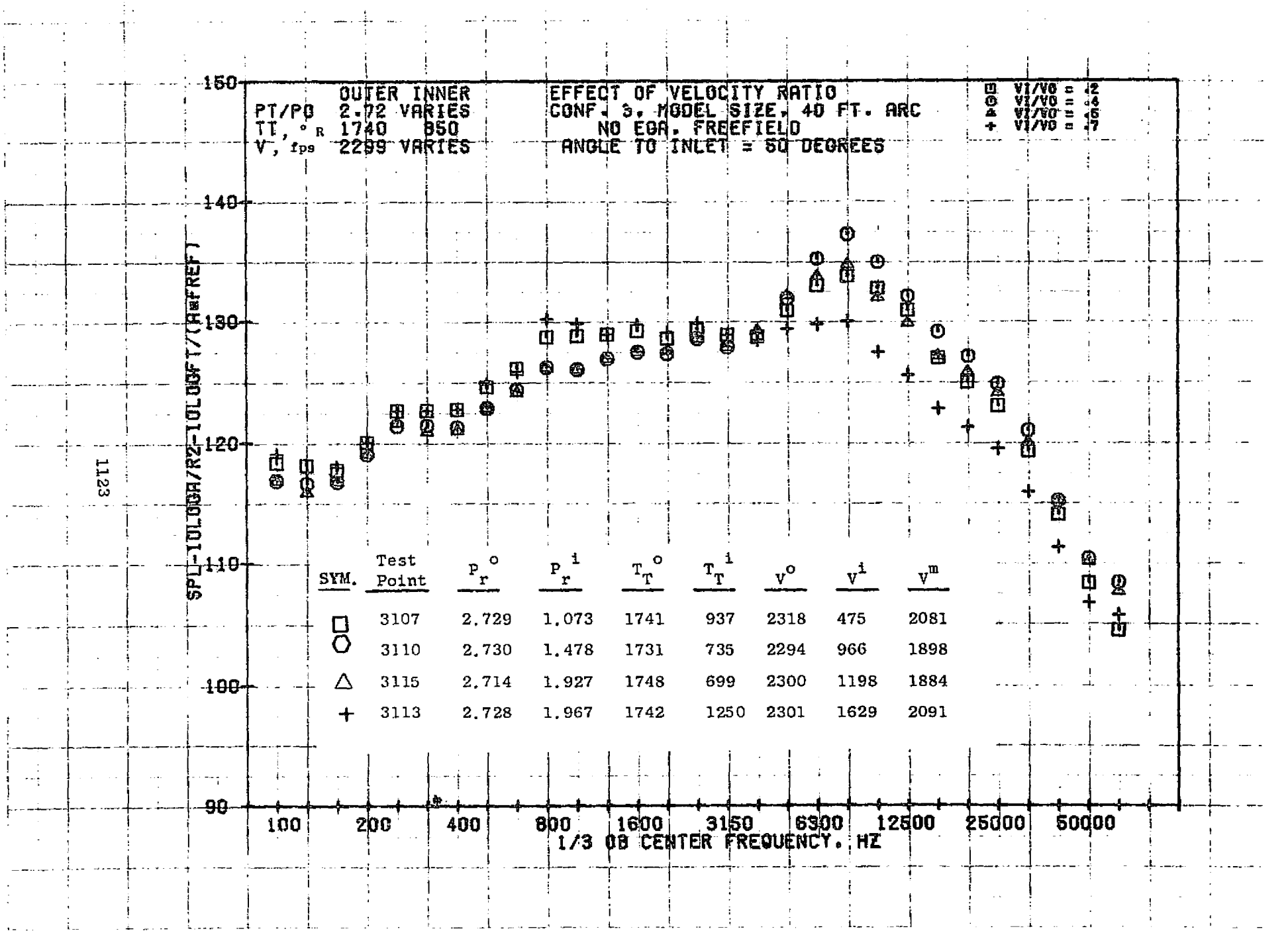
79 AIRCR A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3107	2.729	1.073	1741	937	2318	475	2081
⬡	3110	2.730	1.478	1731	735	2294	966	1898
△	3115	2.714	1.927	1748	699	2300	1198	1884
+	3113	2.728	1.967	1742	1250	2301	1629	2091

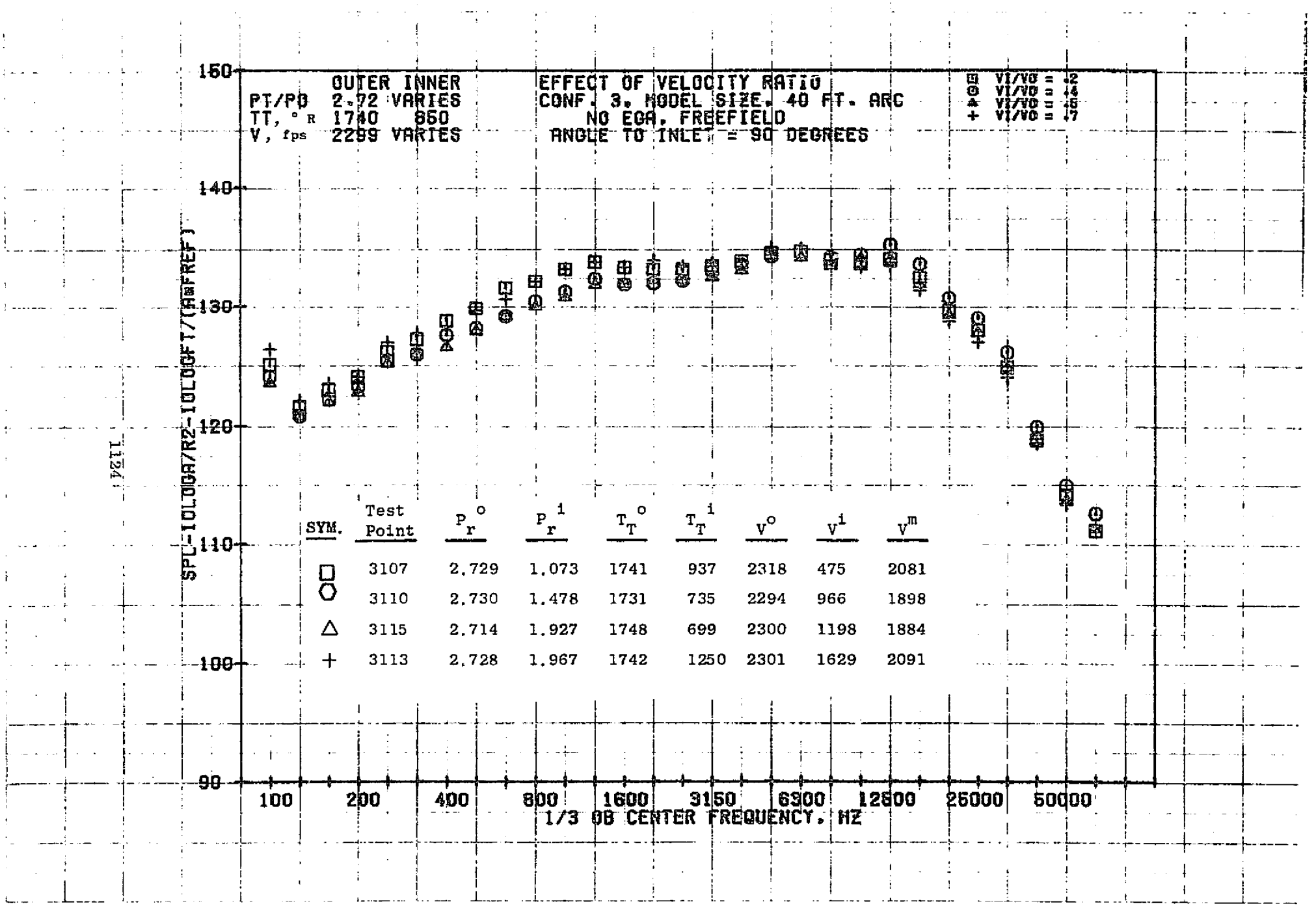
11/01/76
18391-001

79 BURCH A.



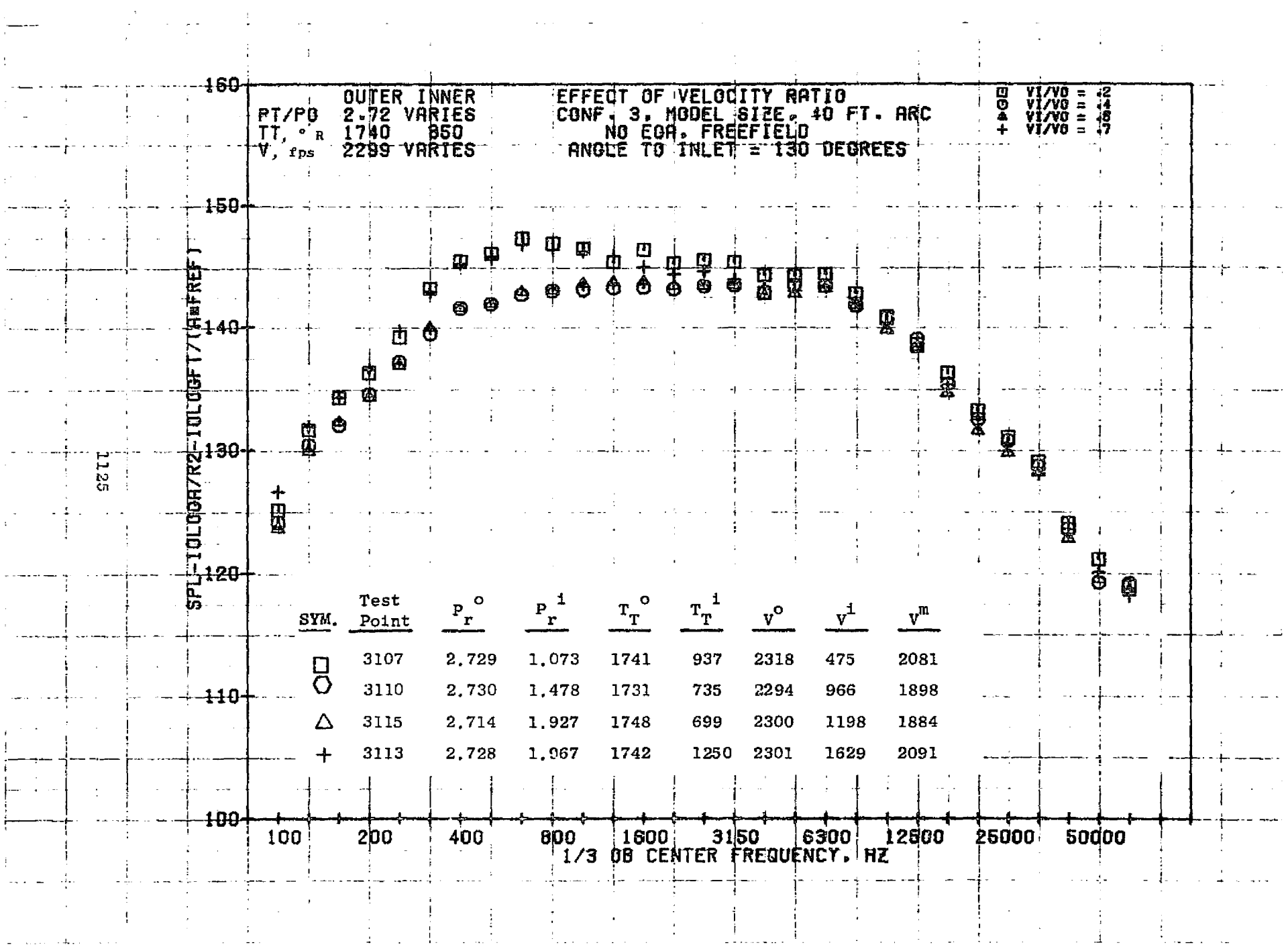
11/01/76
18391-001

79 BURCH A.



11/01/76
18391-001

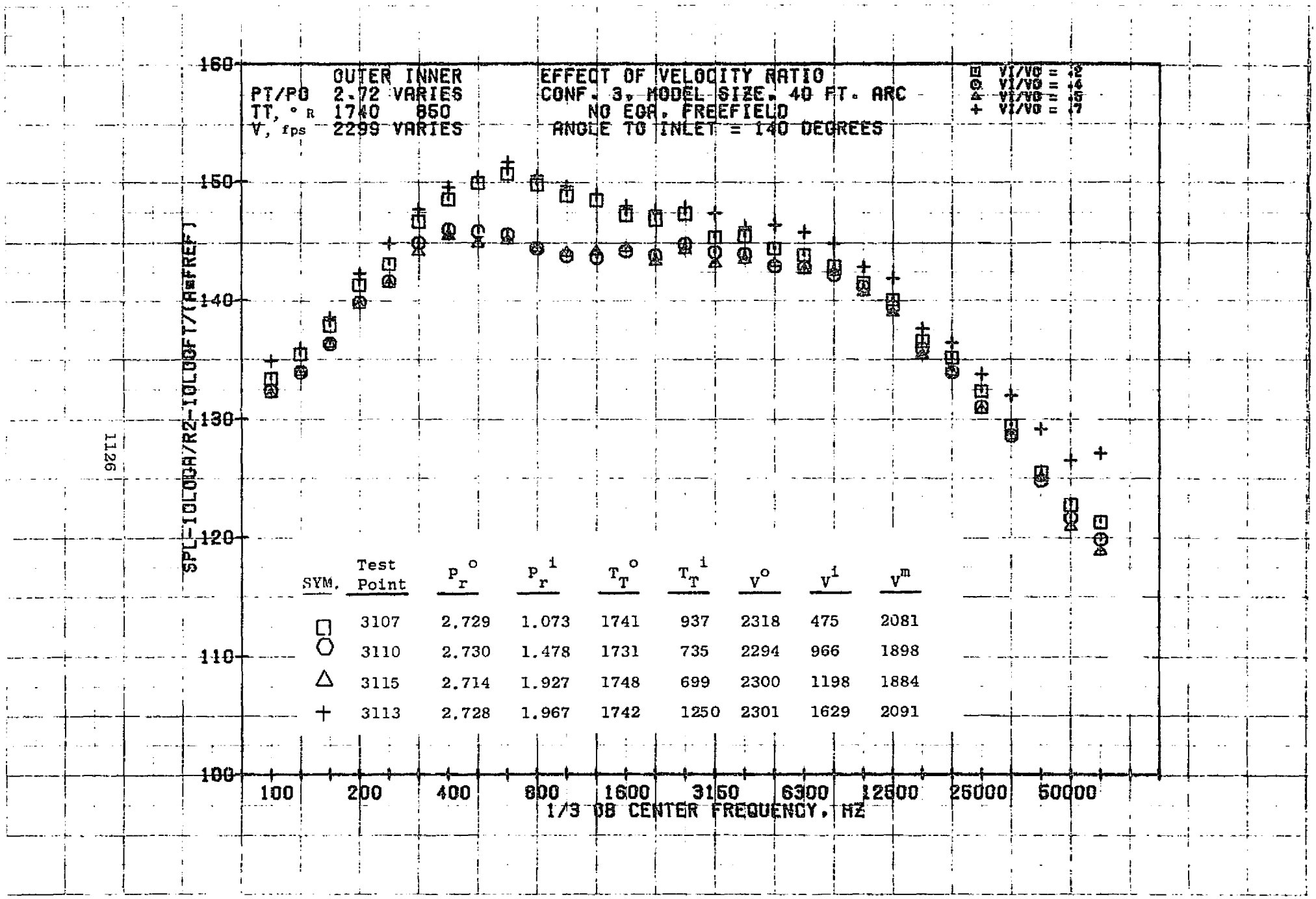
79 BURCH A.



1125

11/01/76
1B391-001

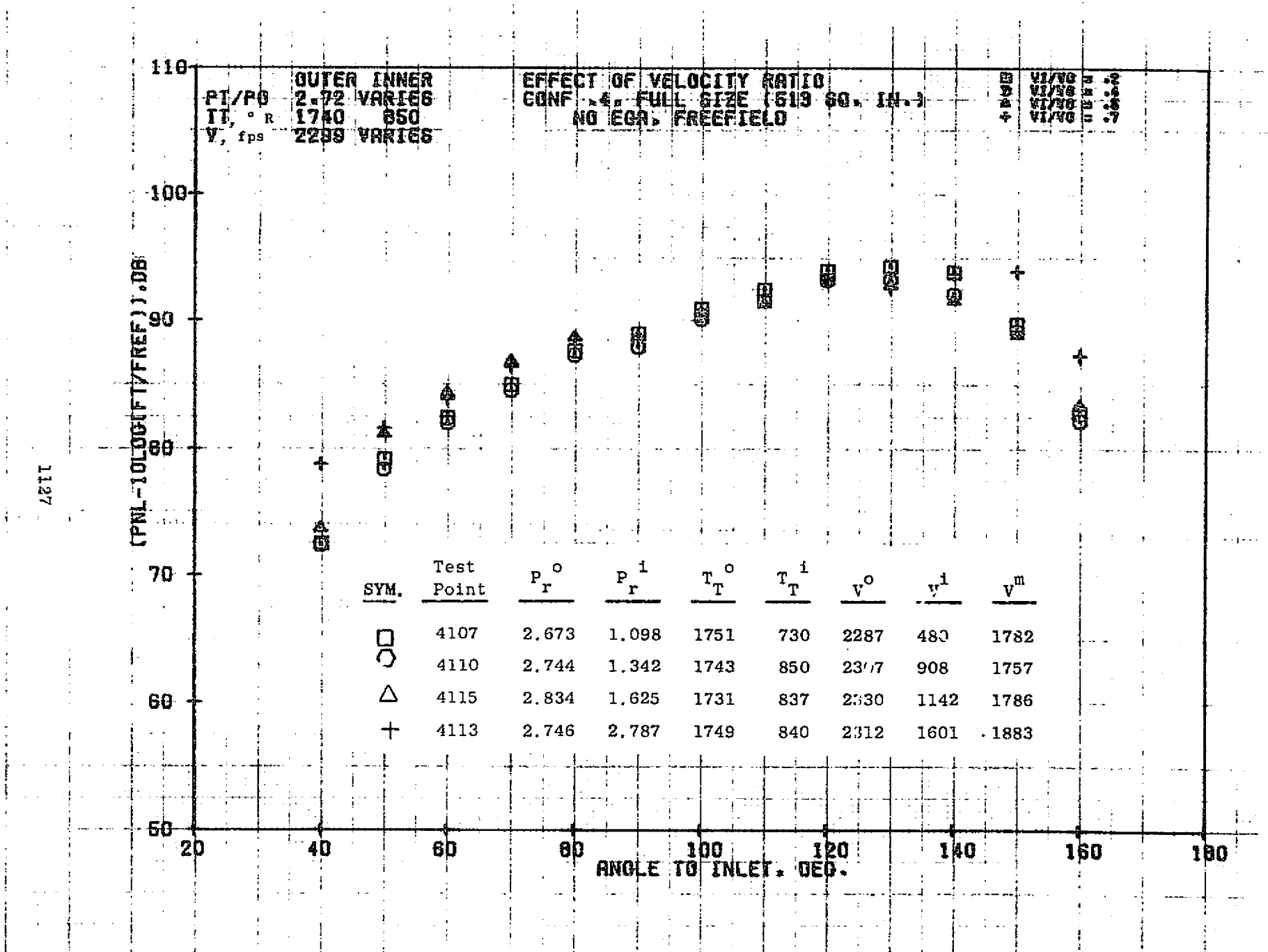
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	3107	2.729	1.073	1741	937	2318	475	2081
○	3110	2.730	1.478	1731	735	2294	966	1898
△	3115	2.714	1.927	1748	699	2300	1198	1884
+	3113	2.728	1.967	1742	1250	2301	1629	2091

11/01/76
18391-001

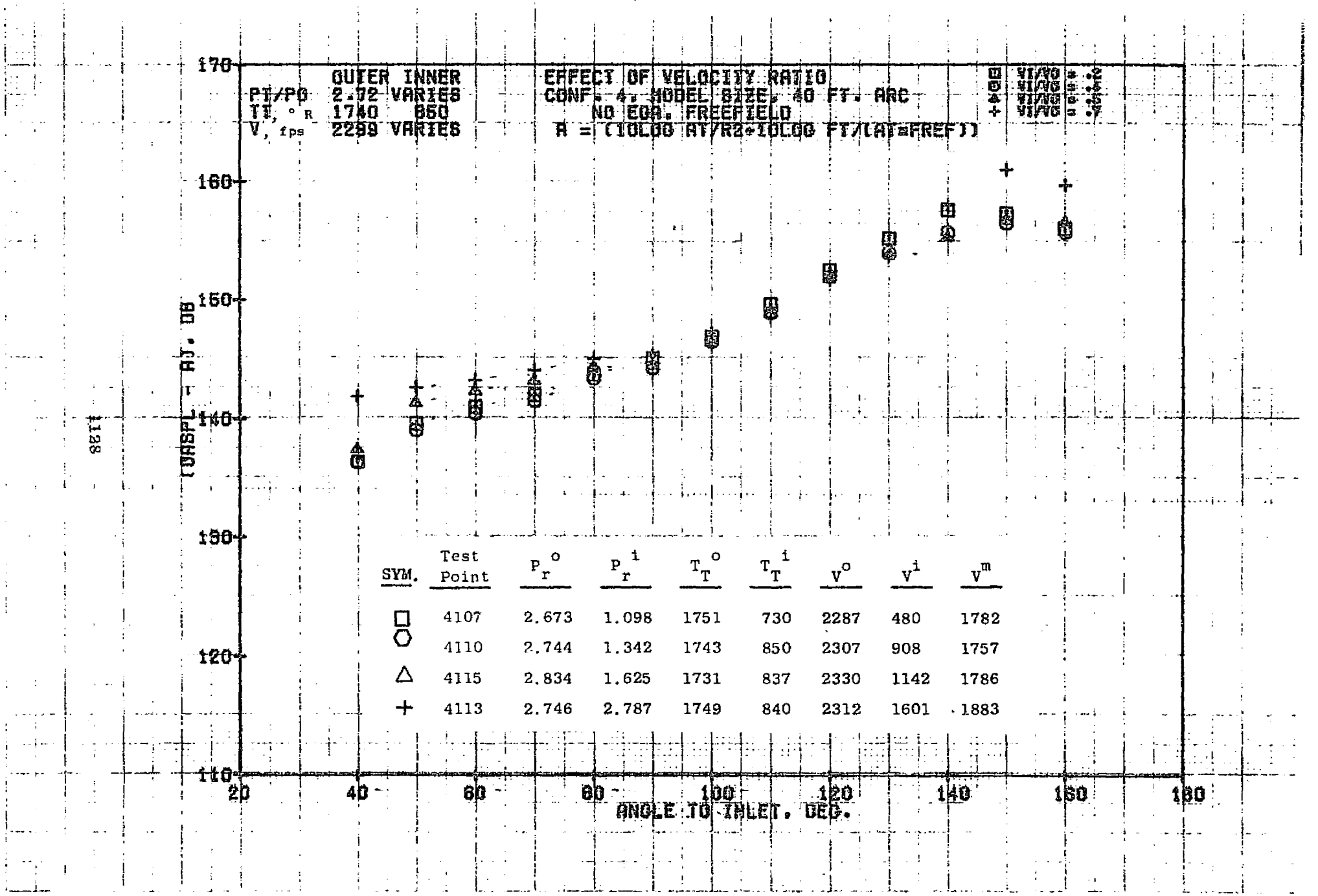
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	4107	2.673	1.098	1751	730	2287	480	1782
○	4110	2.744	1.342	1743	850	2307	908	1757
△	4115	2.834	1.625	1731	837	2330	1142	1786
+	4113	2.746	2.787	1749	840	2312	1601	1883

11/01/76
18421-001

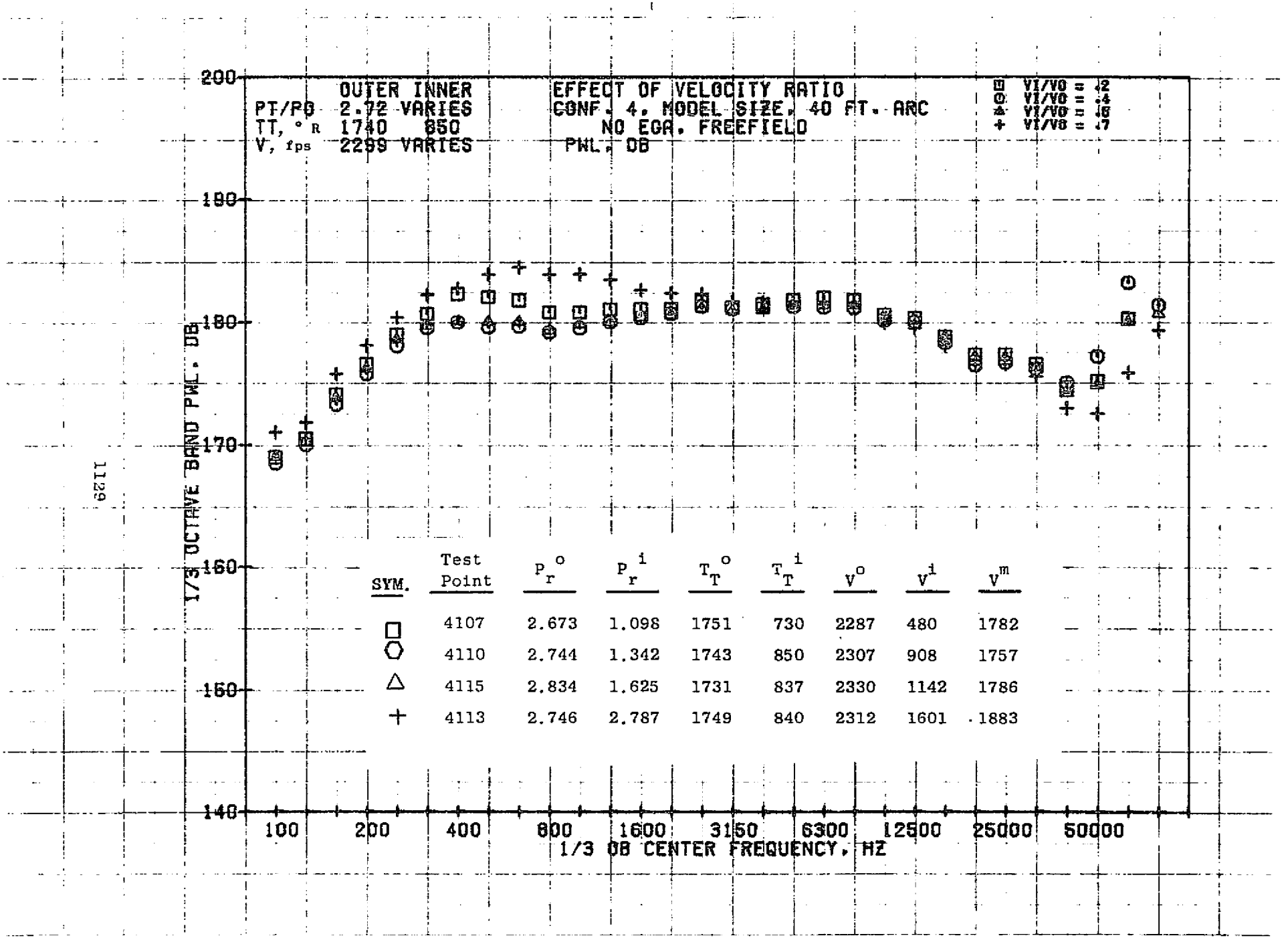
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	4107	2.673	1.098	1751	730	2287	480	1782
⬡	4110	2.744	1.342	1743	850	2307	908	1757
△	4115	2.834	1.625	1731	837	2330	1142	1786
+	4113	2.746	2.787	1749	840	2312	1601	1883

11/09/76
18343-001

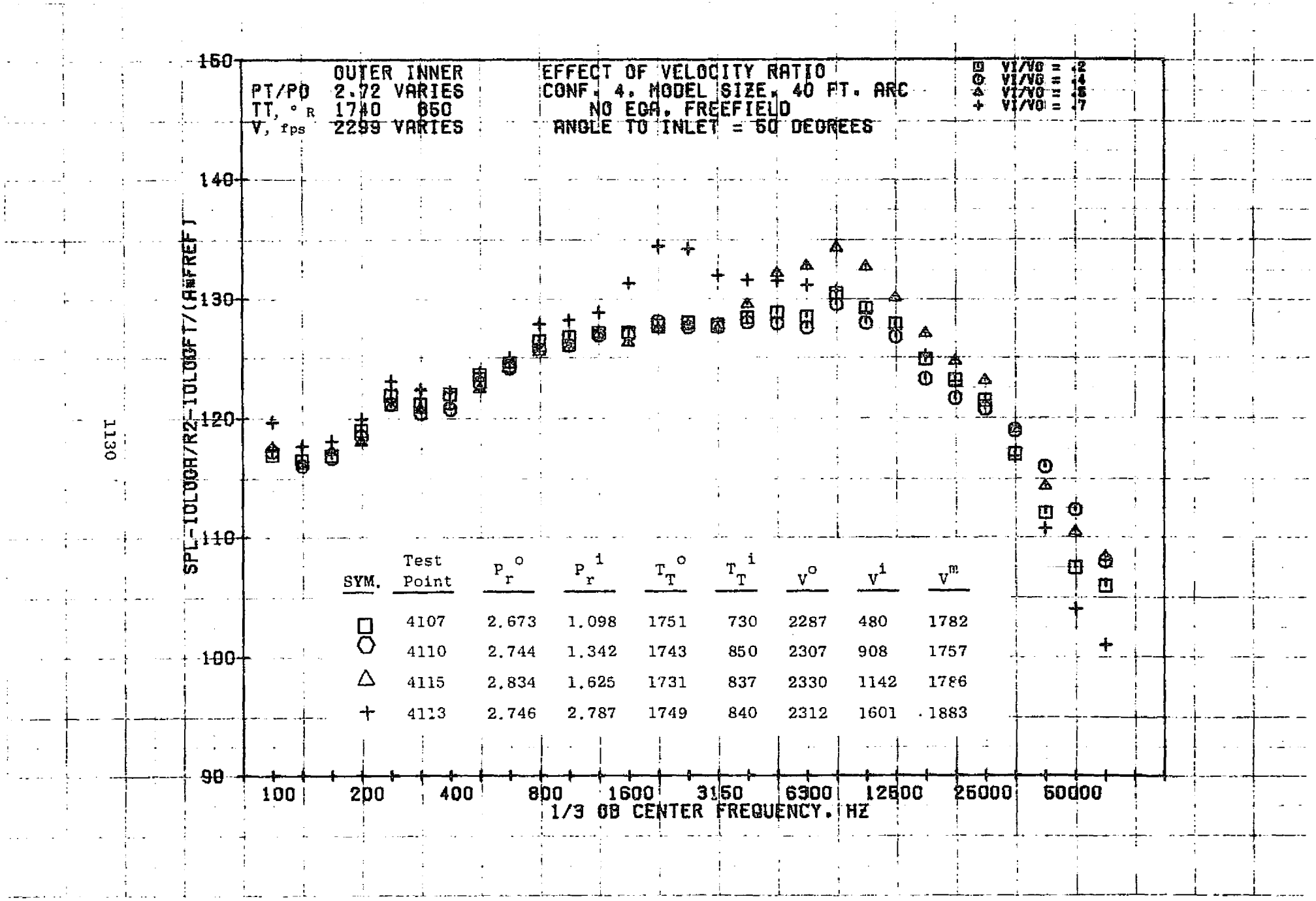
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	4107	2.673	1.098	1751	730	2287	480	1782
⬡	4110	2.744	1.342	1743	850	2307	908	1757
△	4115	2.834	1.625	1731	837	2330	1142	1786
+	4113	2.746	2.787	1749	840	2312	1601	1883

11/01/76
1B391-001

79 BURCH A.



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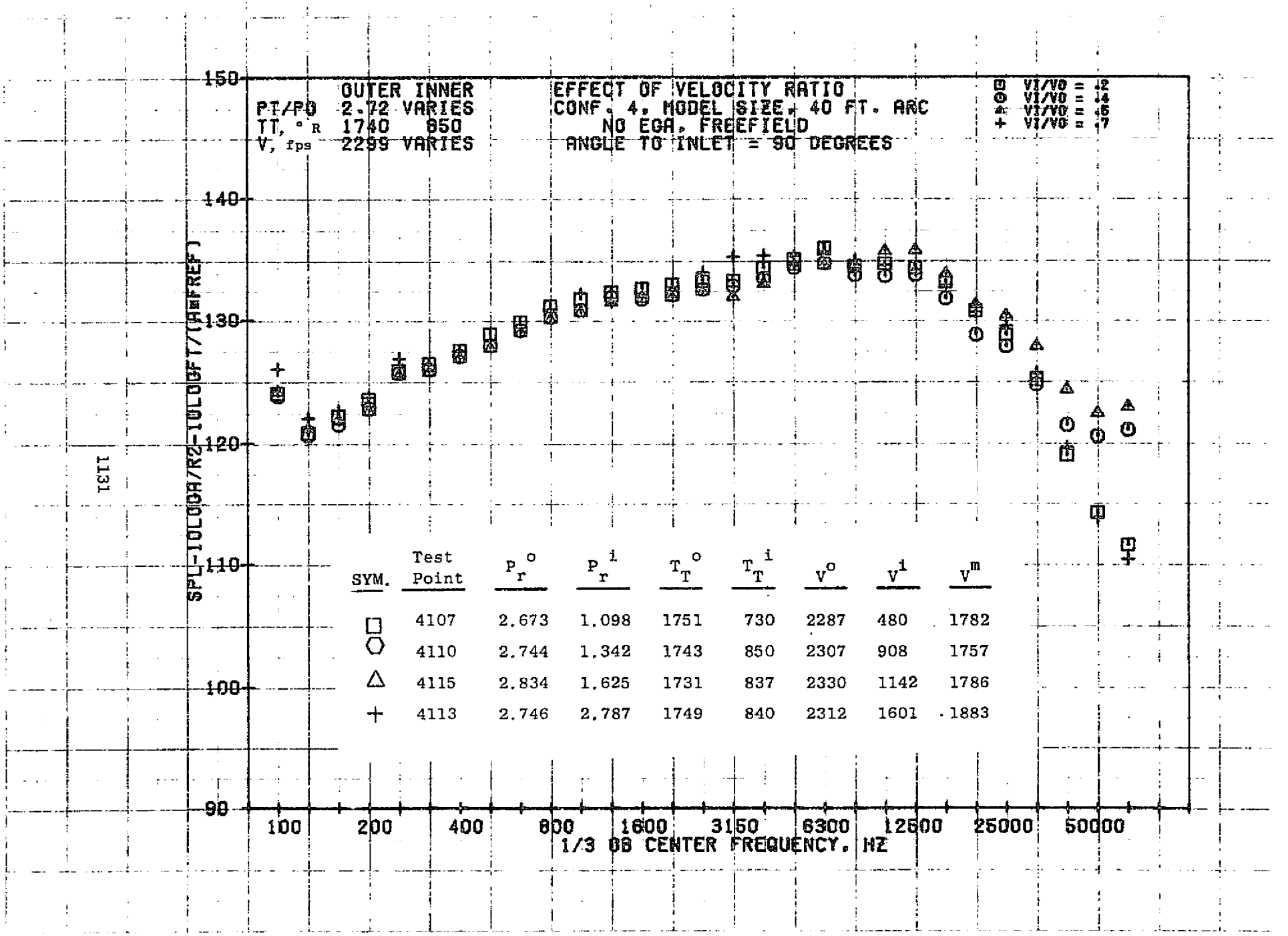
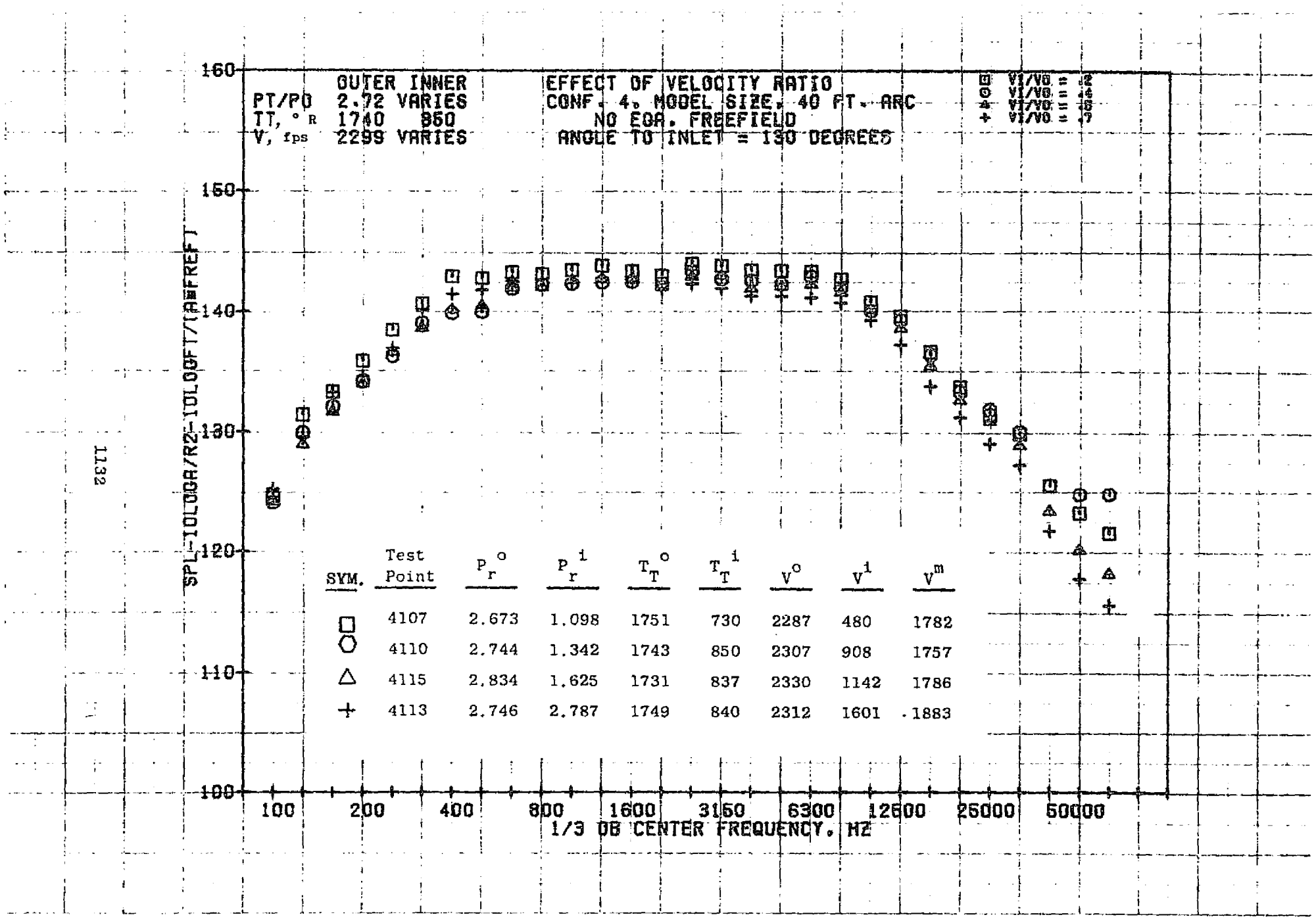
11/01/76
1B391-001

79 BURCH A.



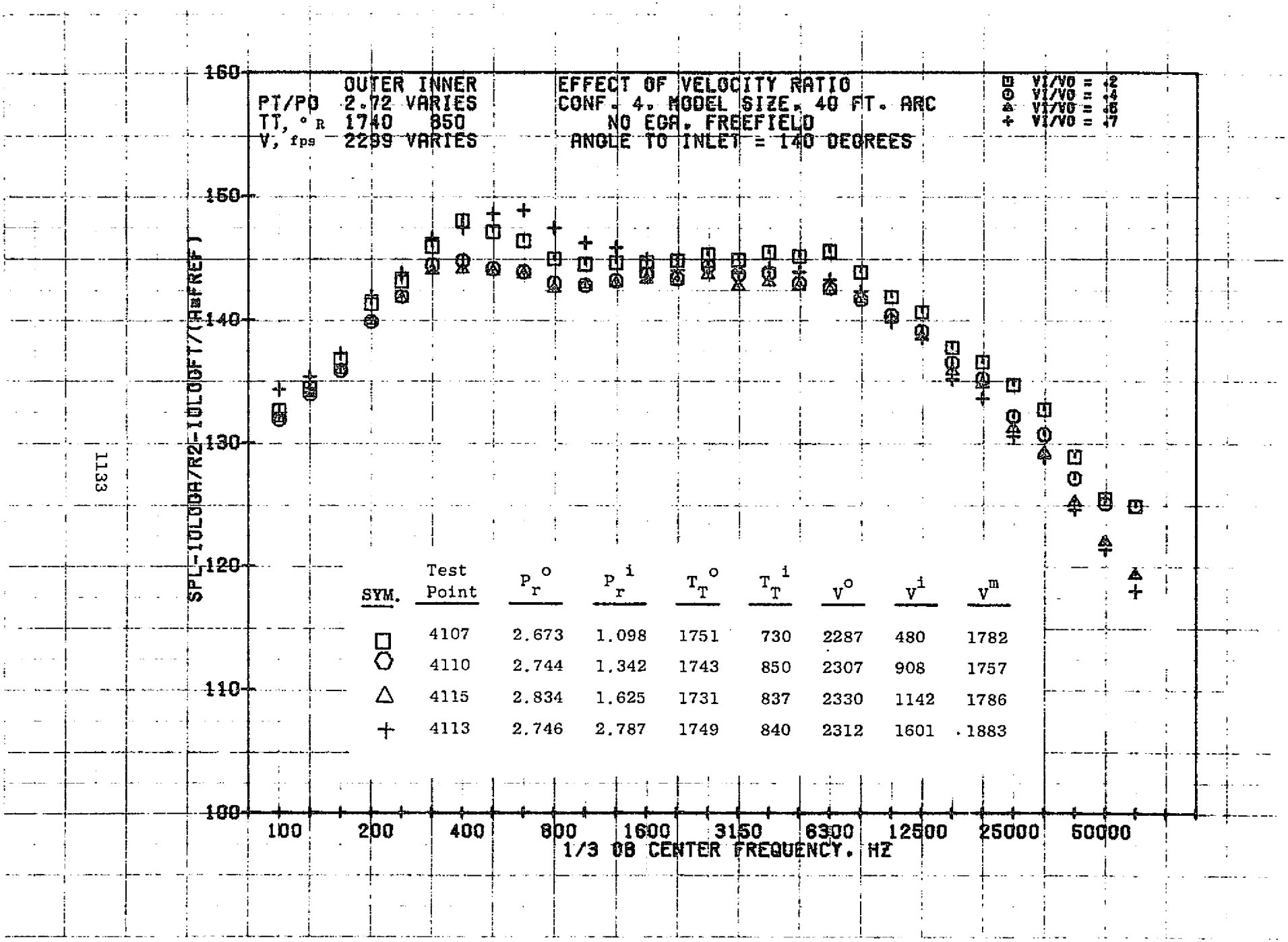
11/01/76
!B391-001

79 BURCH A.



11/01/76
1B391-001

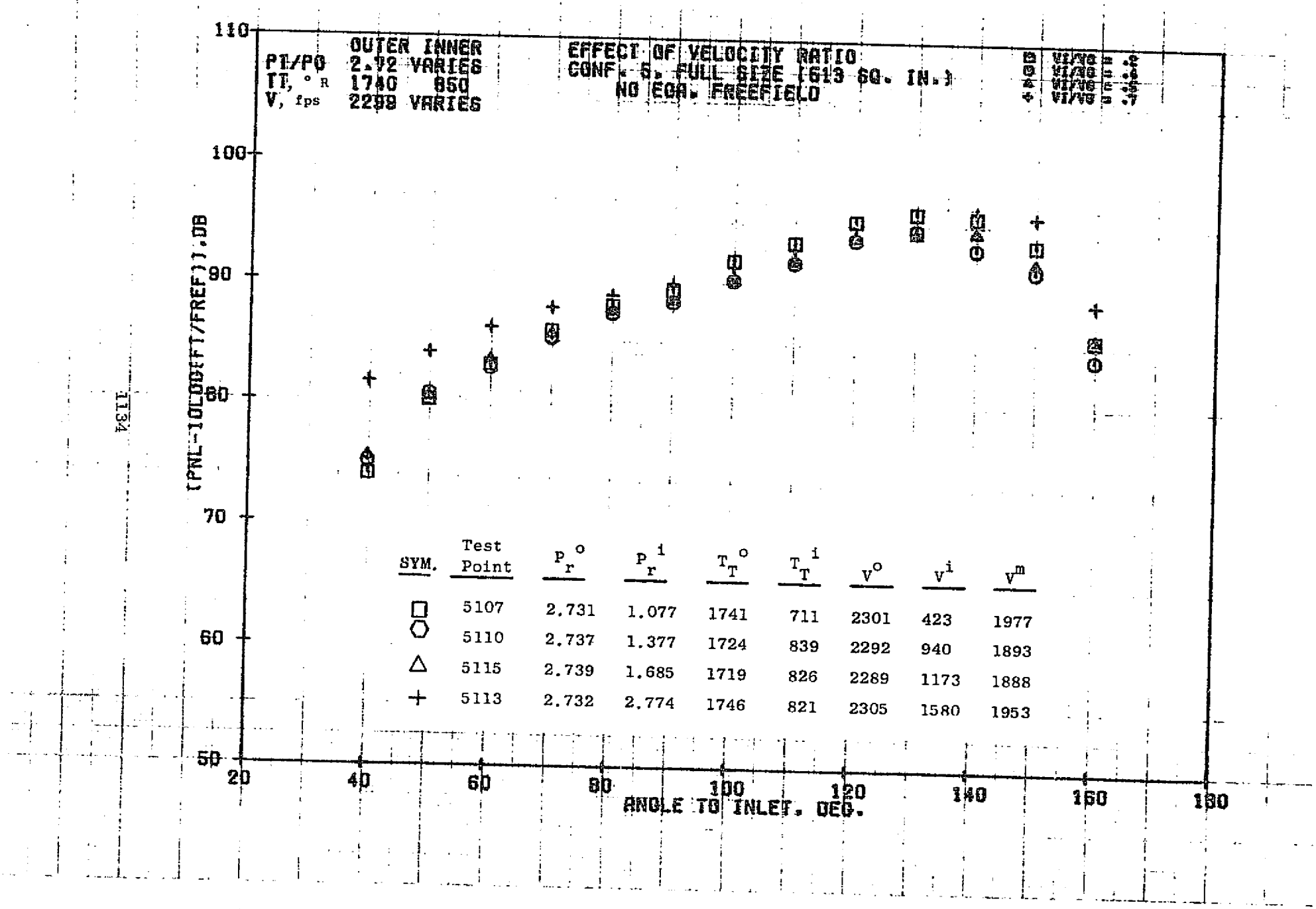
79 BURCH A.



1133

11/01/76
1B391-001

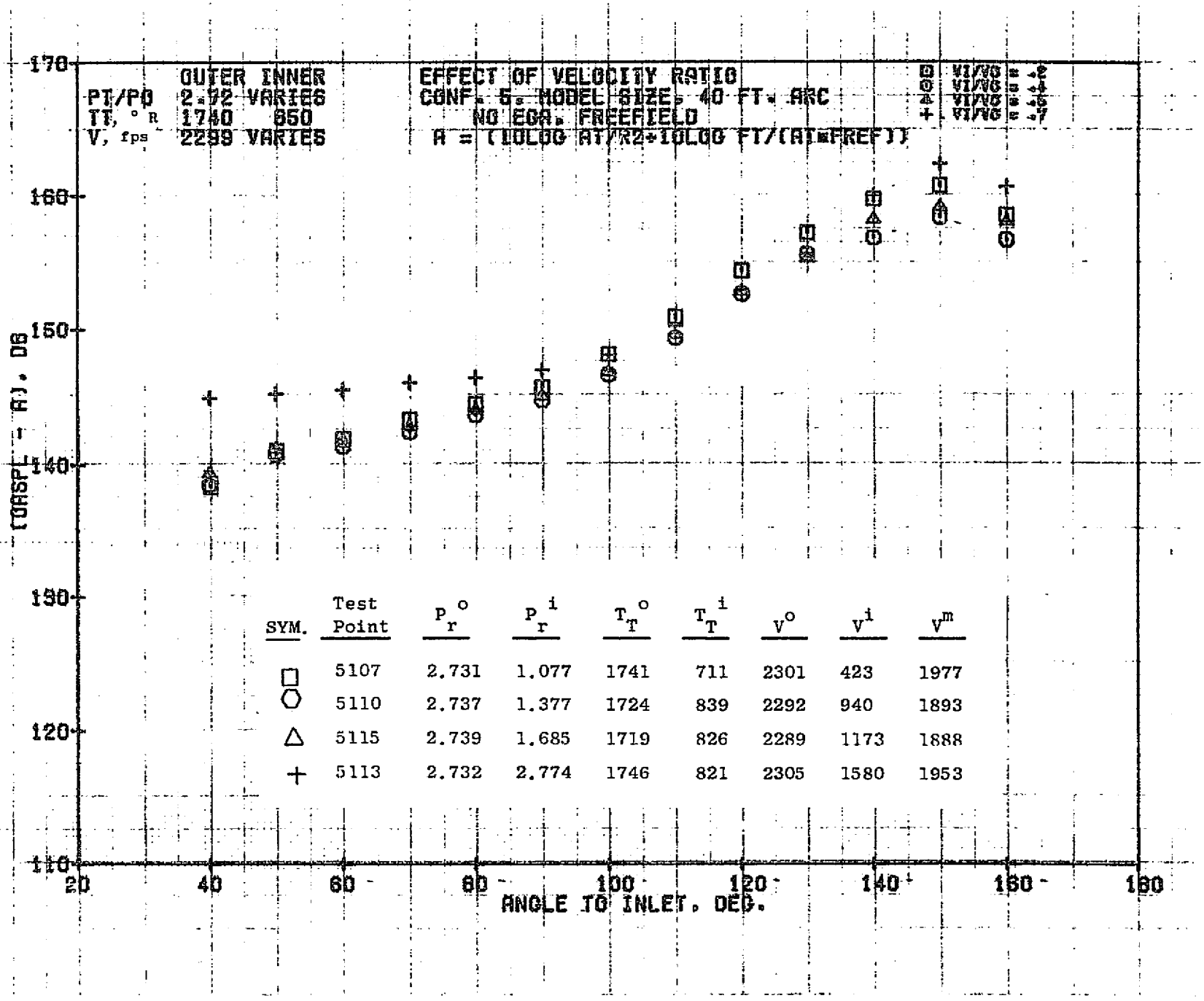
79 BURCH A.



1134

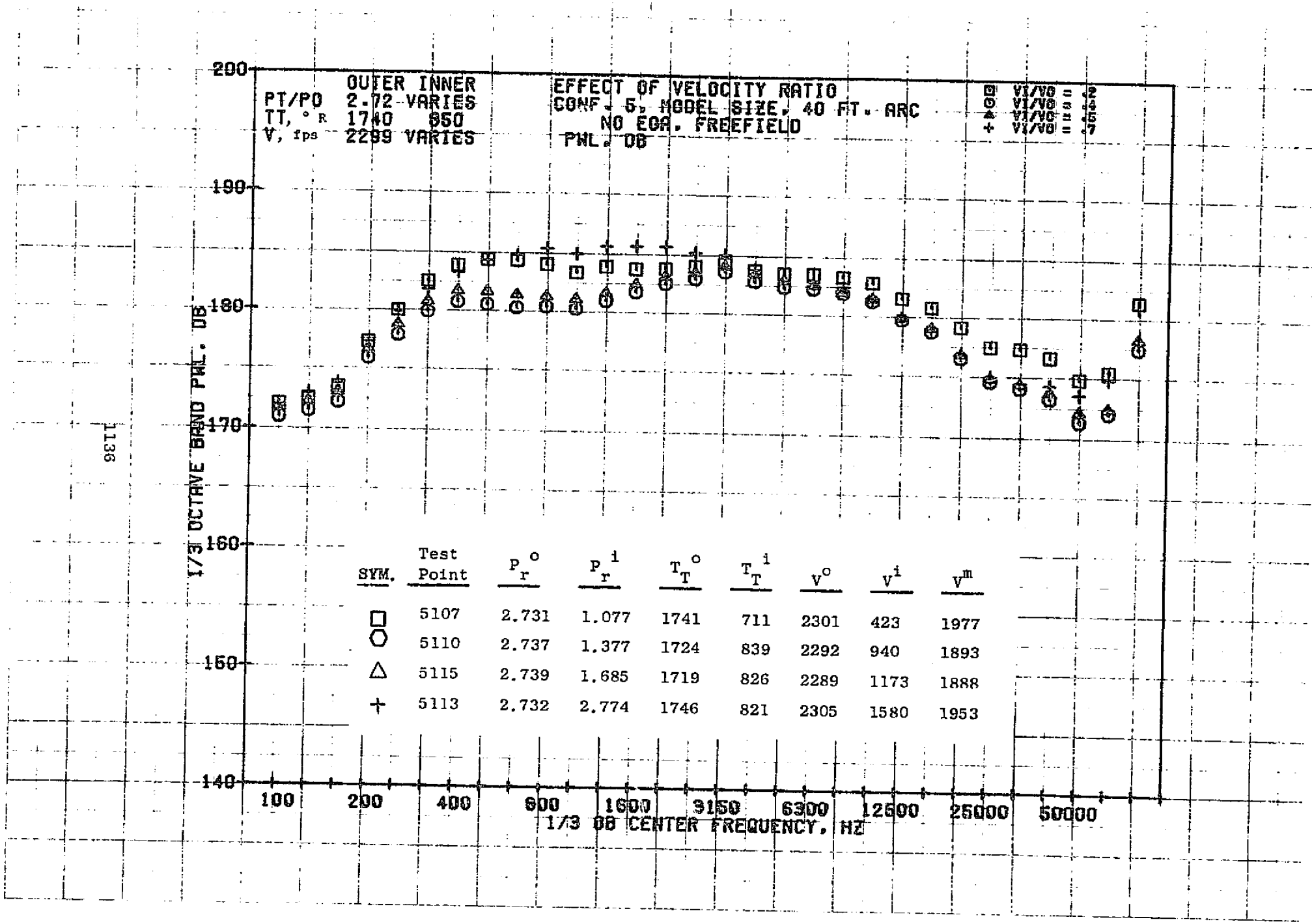
11/01/76
18421-001

79 BURCH A.



11/09/78
18943-001

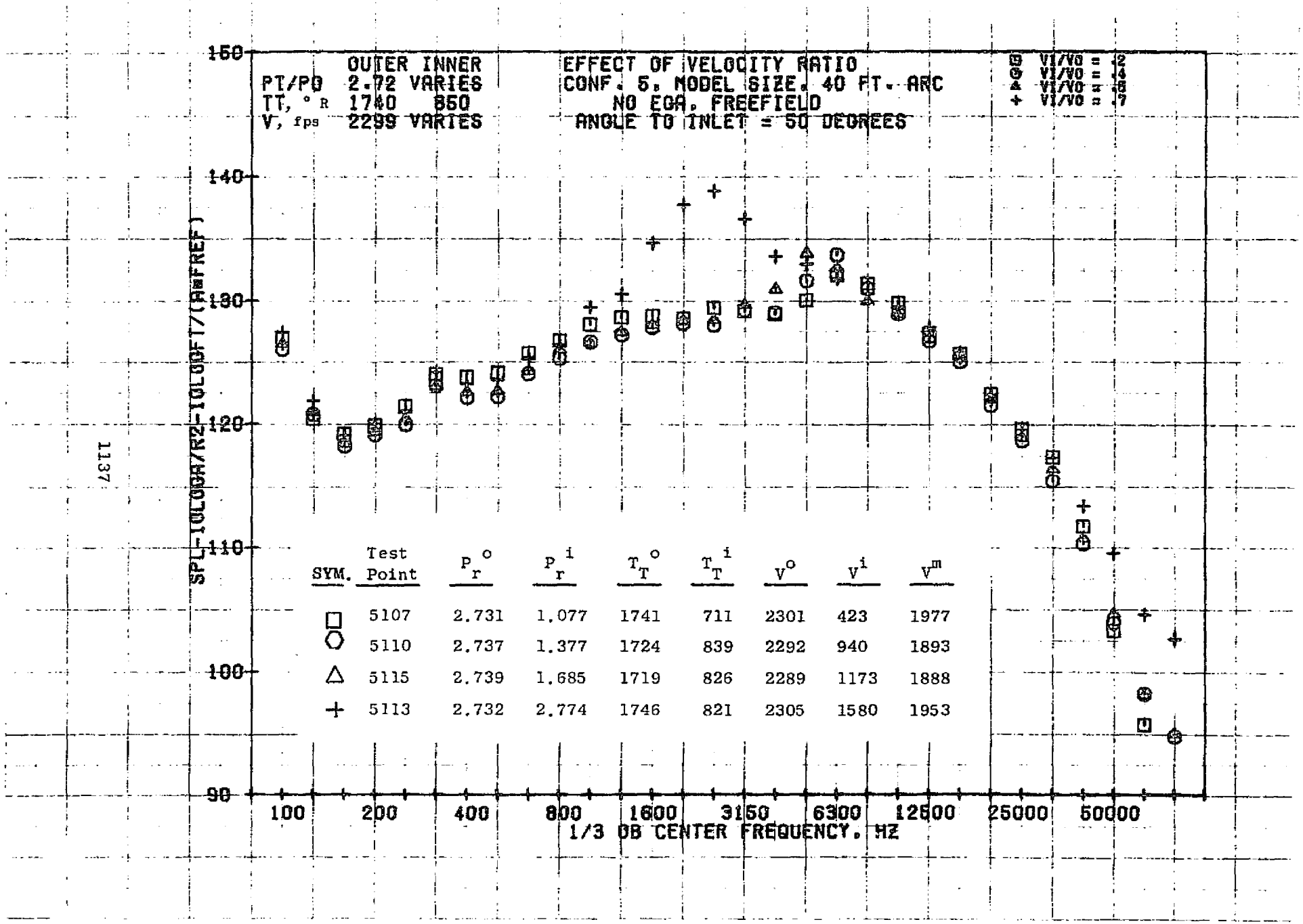
79 AIRCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	5107	2.731	1.077	1741	711	2301	423	1977
○	5110	2.737	1.377	1724	839	2292	940	1893
△	5115	2.739	1.685	1719	826	2289	1173	1888
+	5113	2.732	2.774	1746	821	2305	1580	1953

11/01/76
18391-001

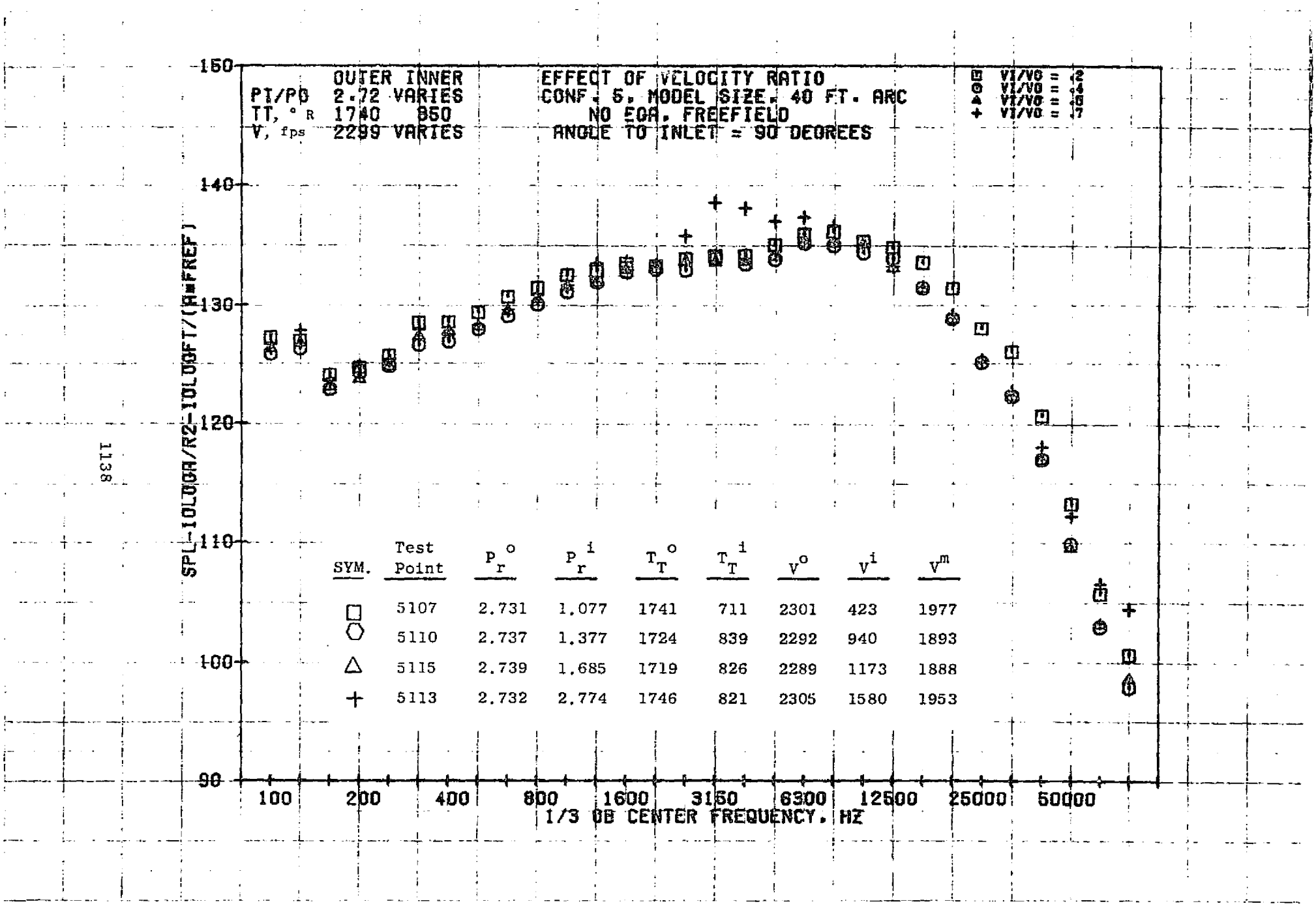
79 BURCH A.



1137

11/01/76
18391-001

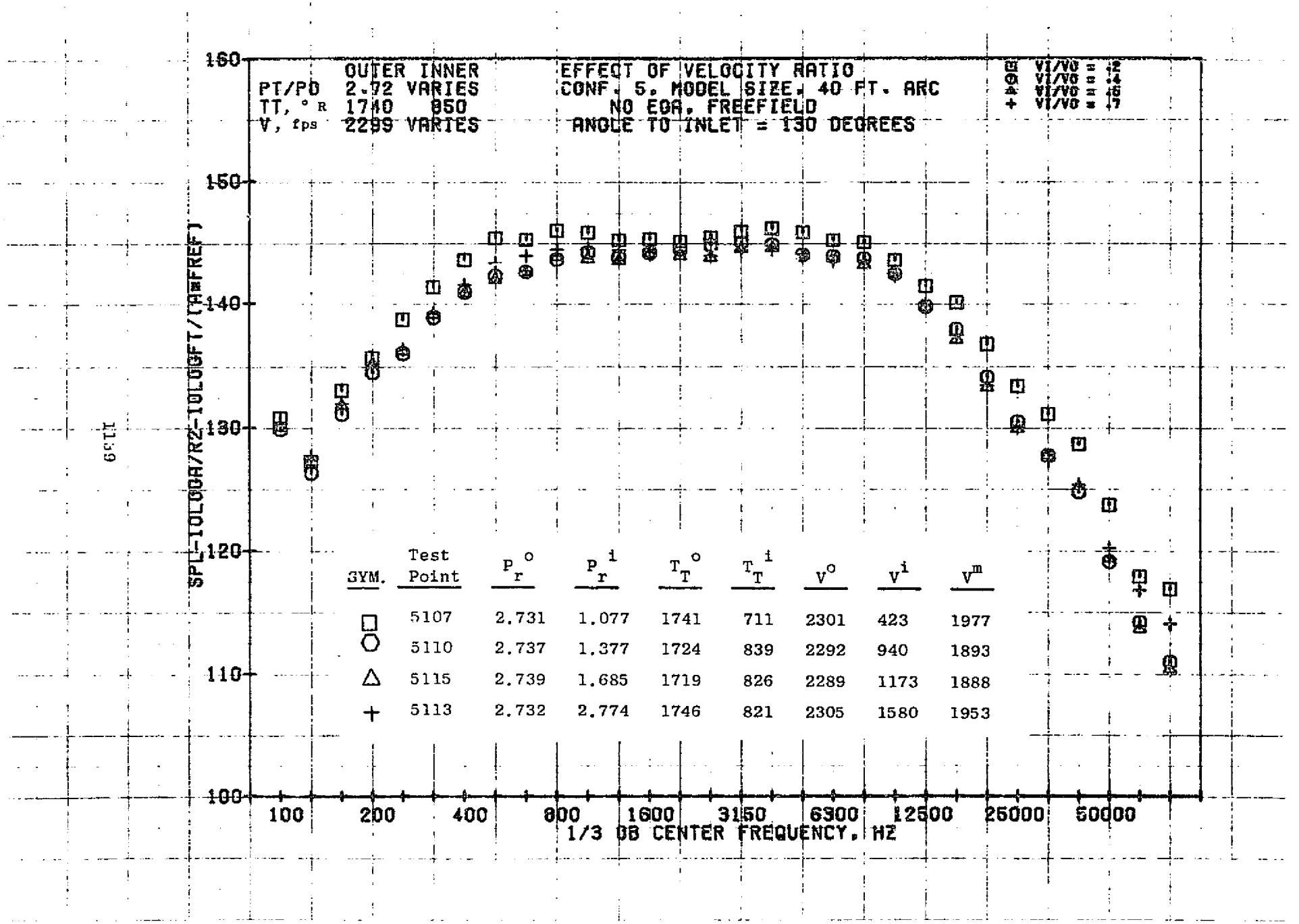
79 BURCH A.



1138

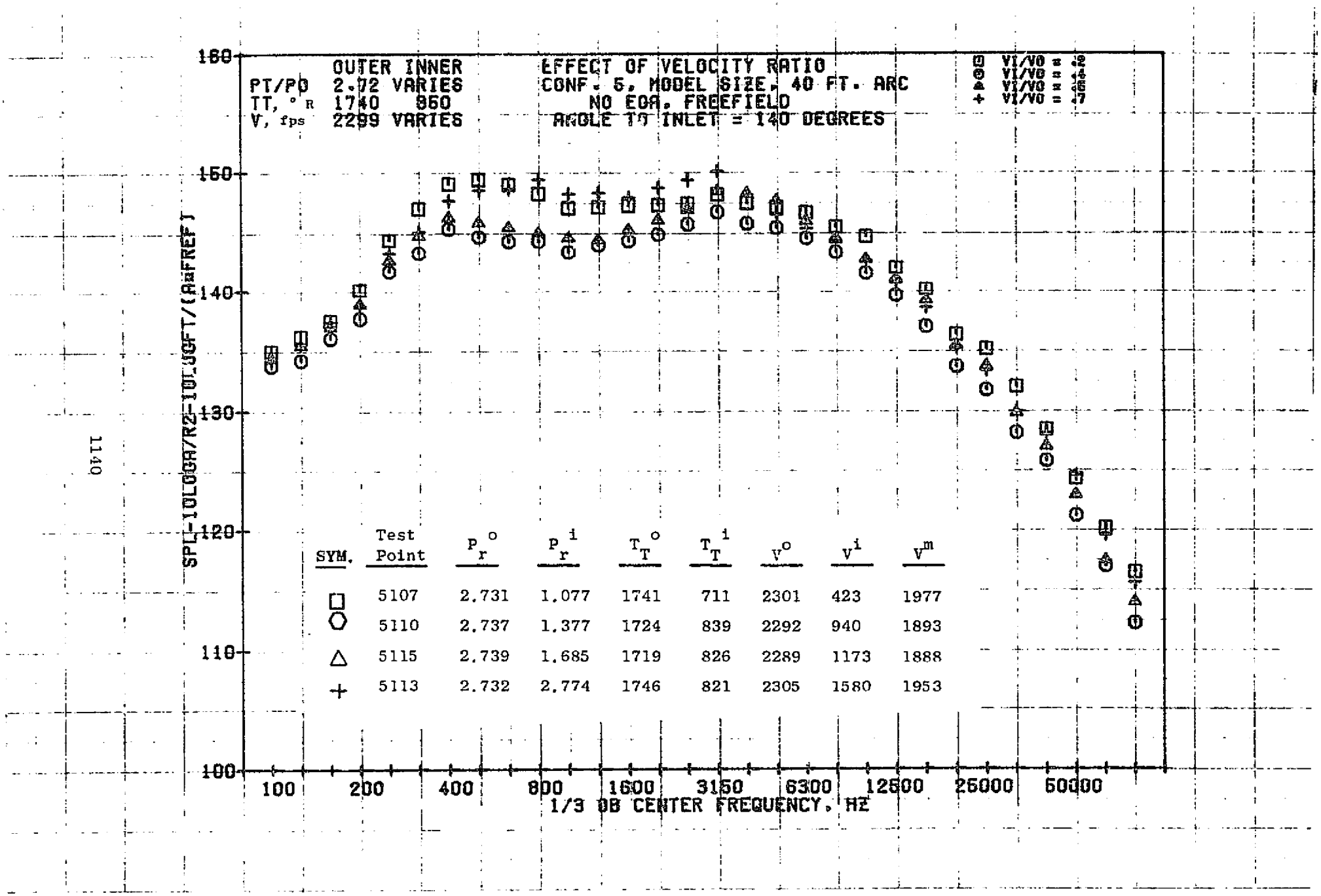
11/01/76
18391-001

79 BURCH A.



11/01/76
1B391-001

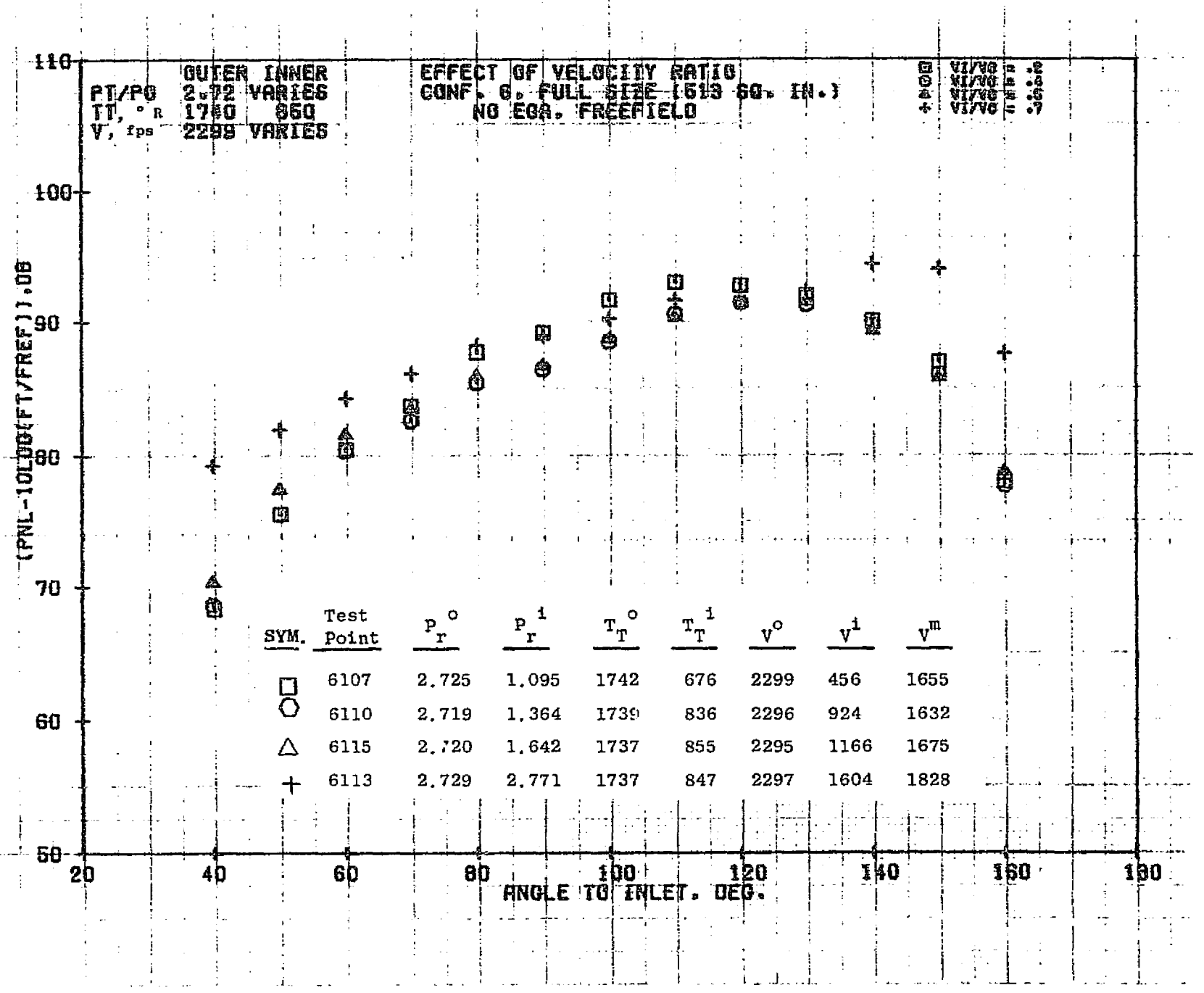
79 BURCH A.



1140

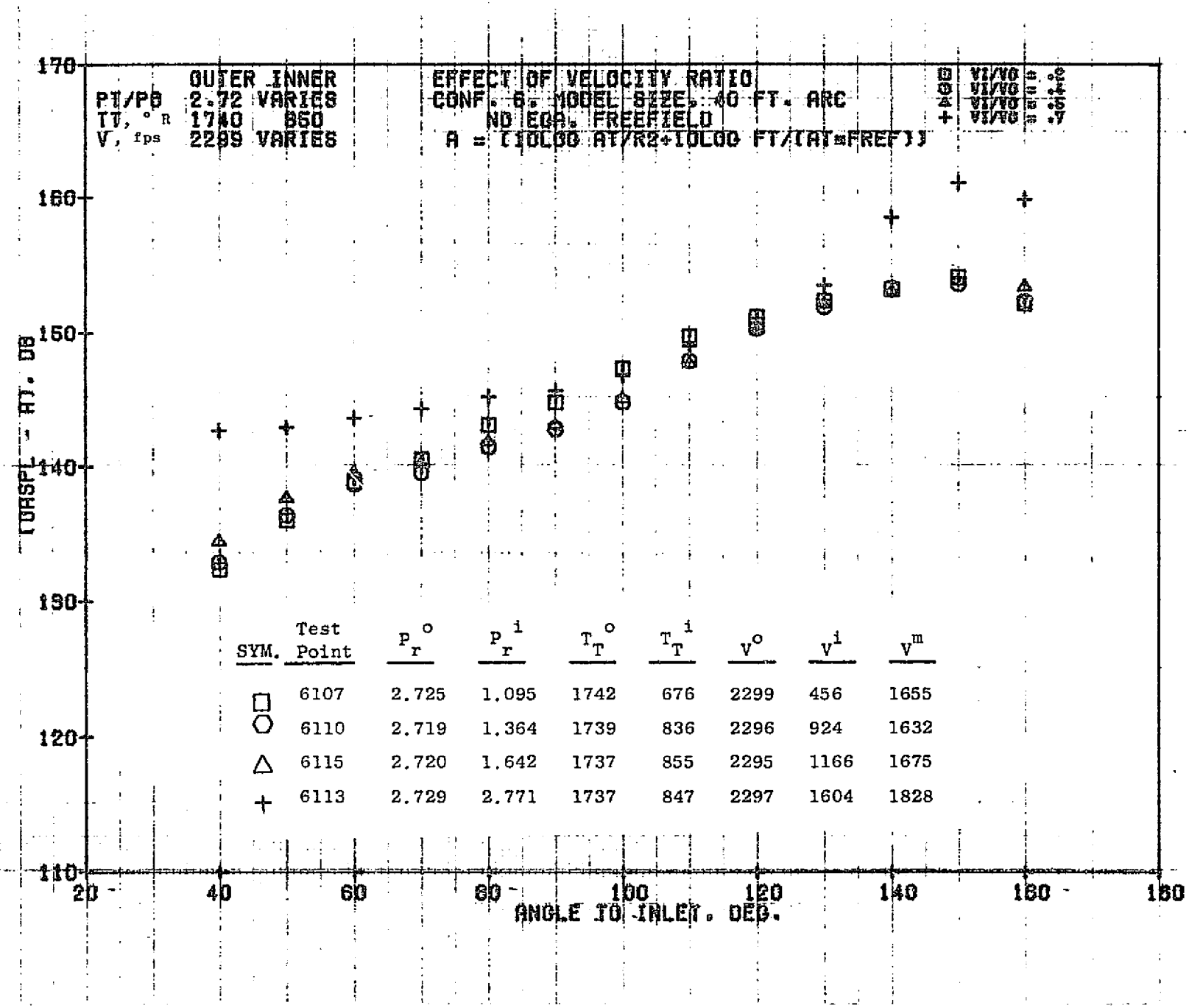
11/01/76
18391-001

79 BURCH A.



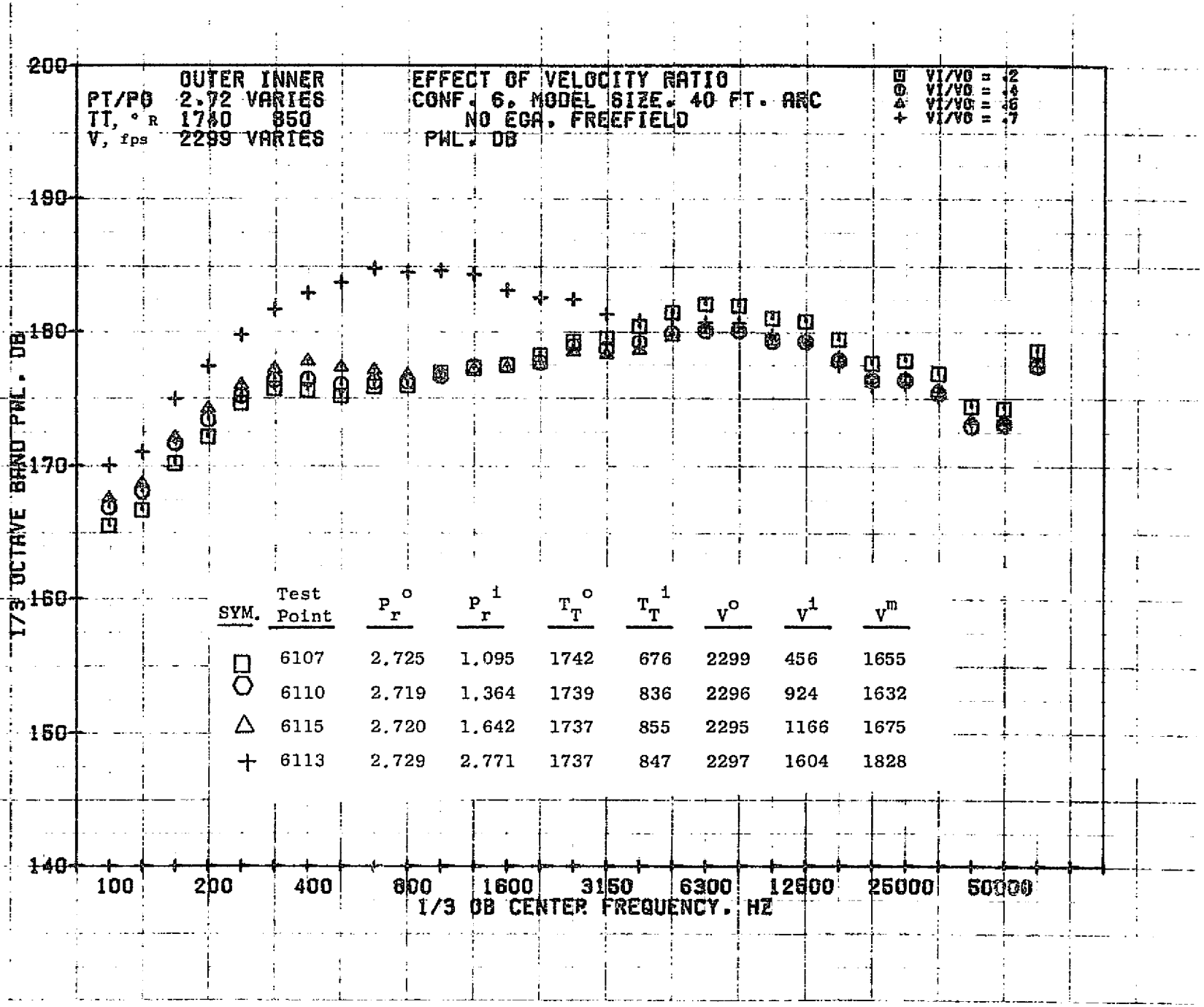
11/01/76
18421-001

79 BURCH A.



11/09/76
18343-001

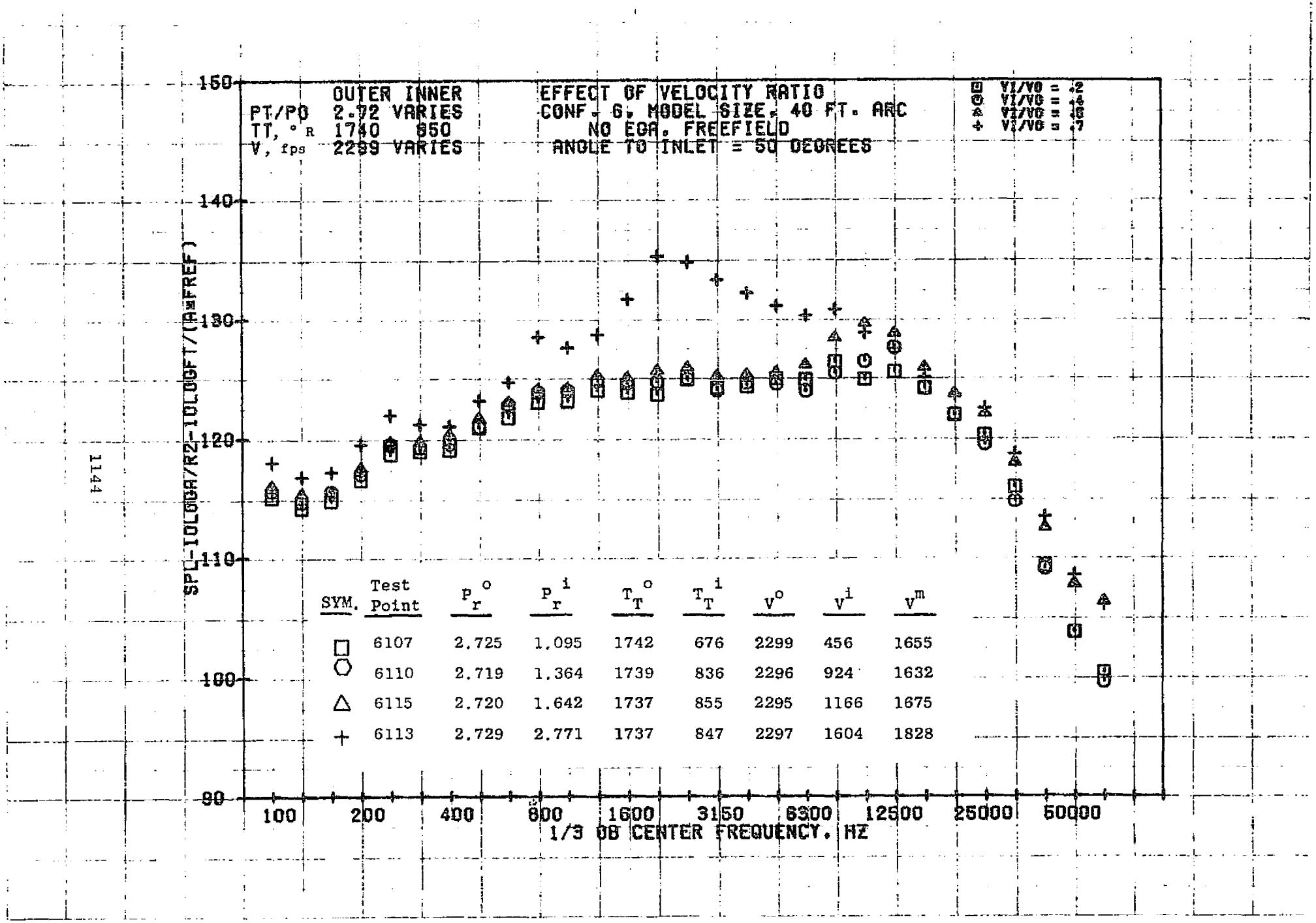
79 AIRCH A..



1143

11/01/76
18391-001

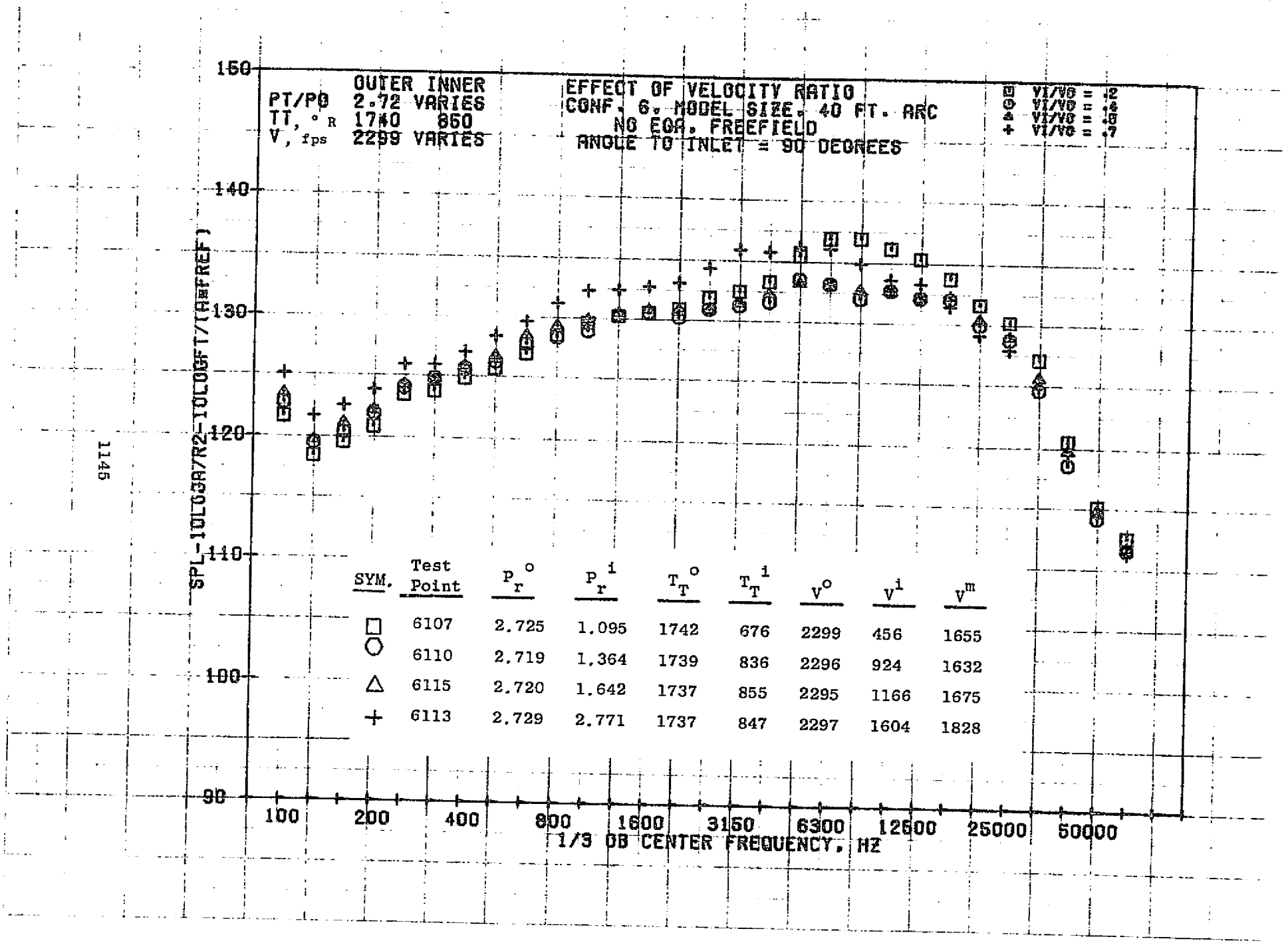
79 BURCH A.



1144

11/01/76
18391-001

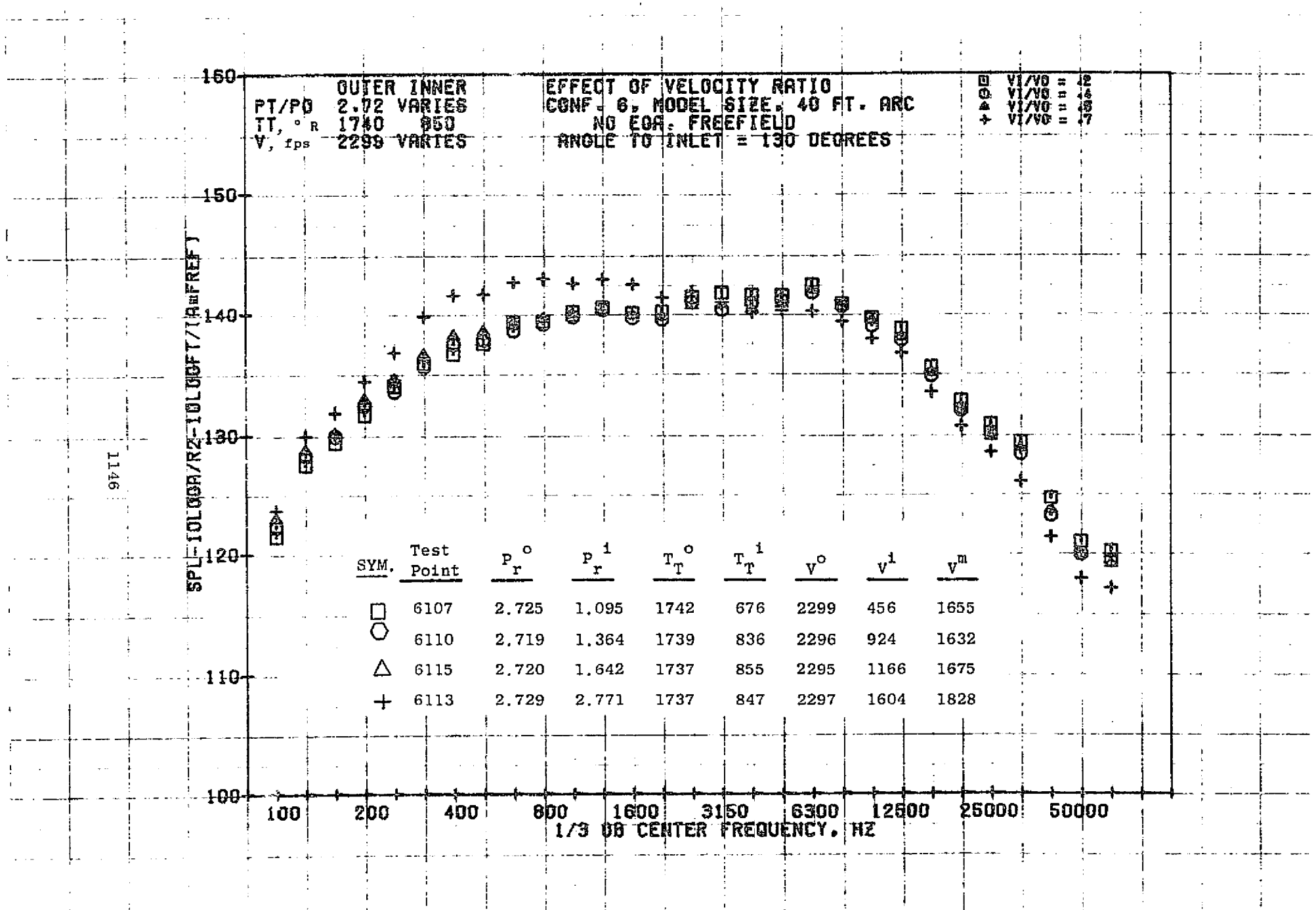
79 BURCH A.



1145

11/01/76
1B391-001

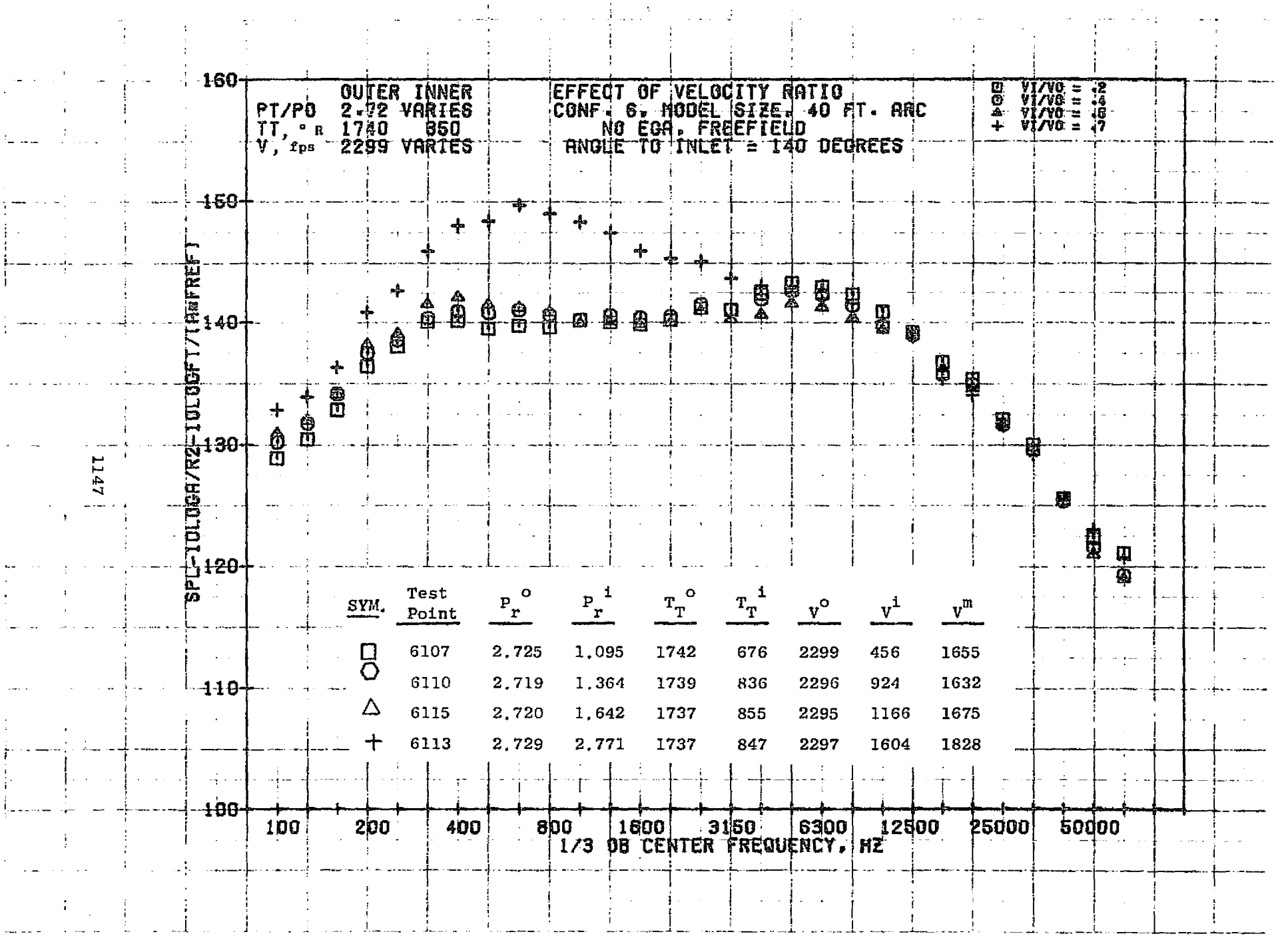
79 BURCH A.



1146

11/01/76
18391-001

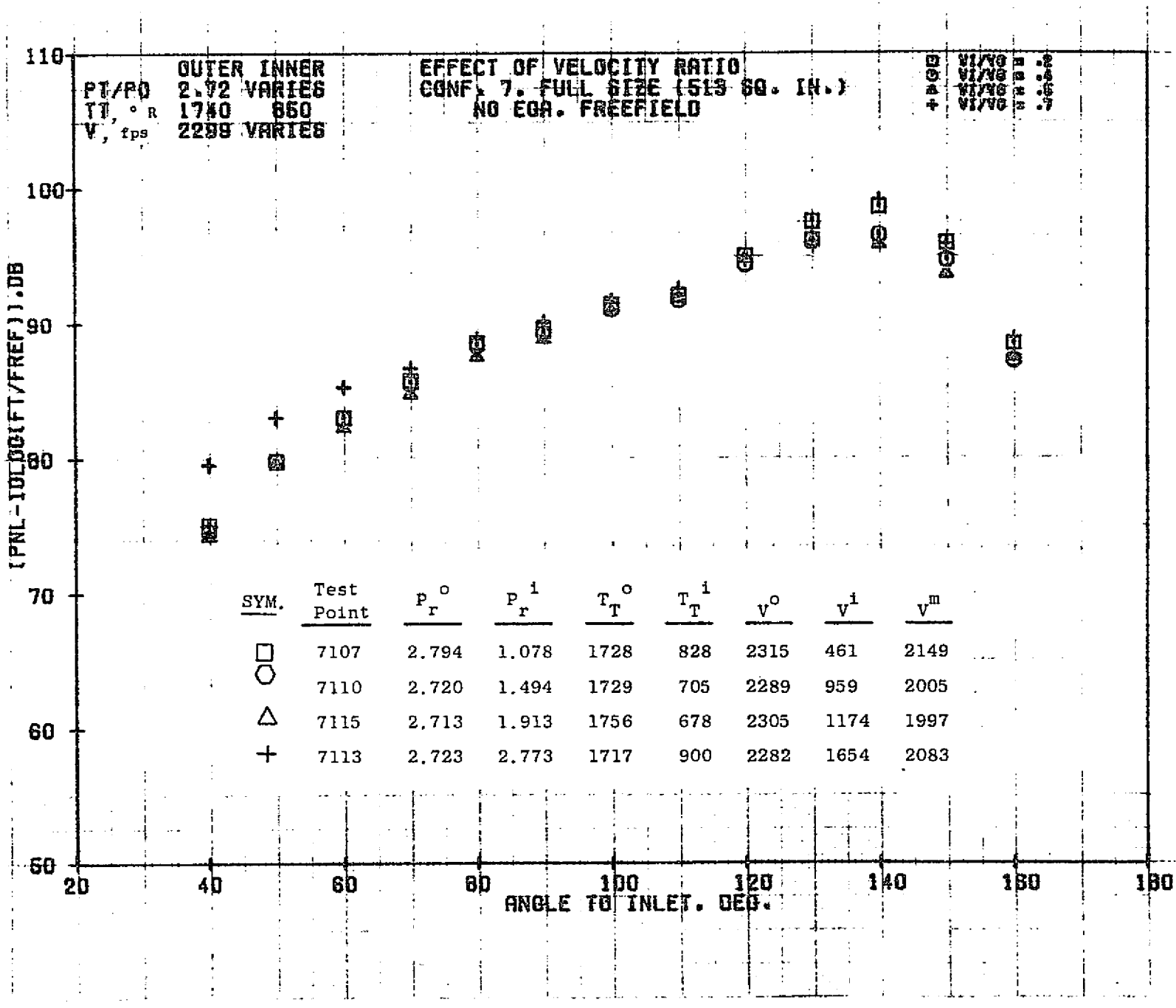
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	6107	2.725	1.095	1742	676	2299	456	1655
⬡	6110	2.719	1.364	1739	836	2296	924	1632
△	6115	2.720	1.642	1737	855	2295	1166	1675
+	6113	2.729	2.771	1737	847	2297	1604	1828

11/01/76
18391-001

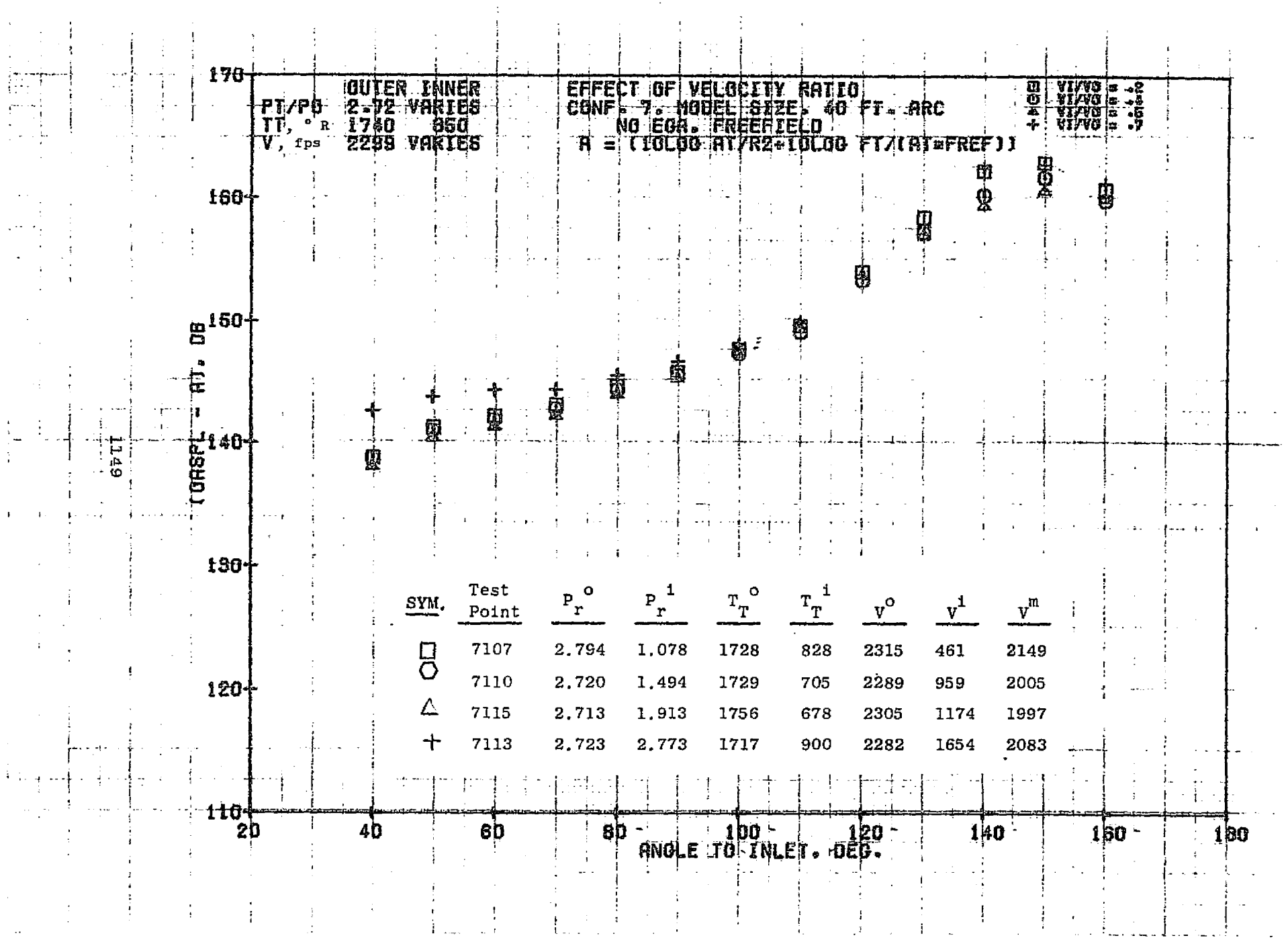
79 BURCH A.



1148

11/01/76
18421-001

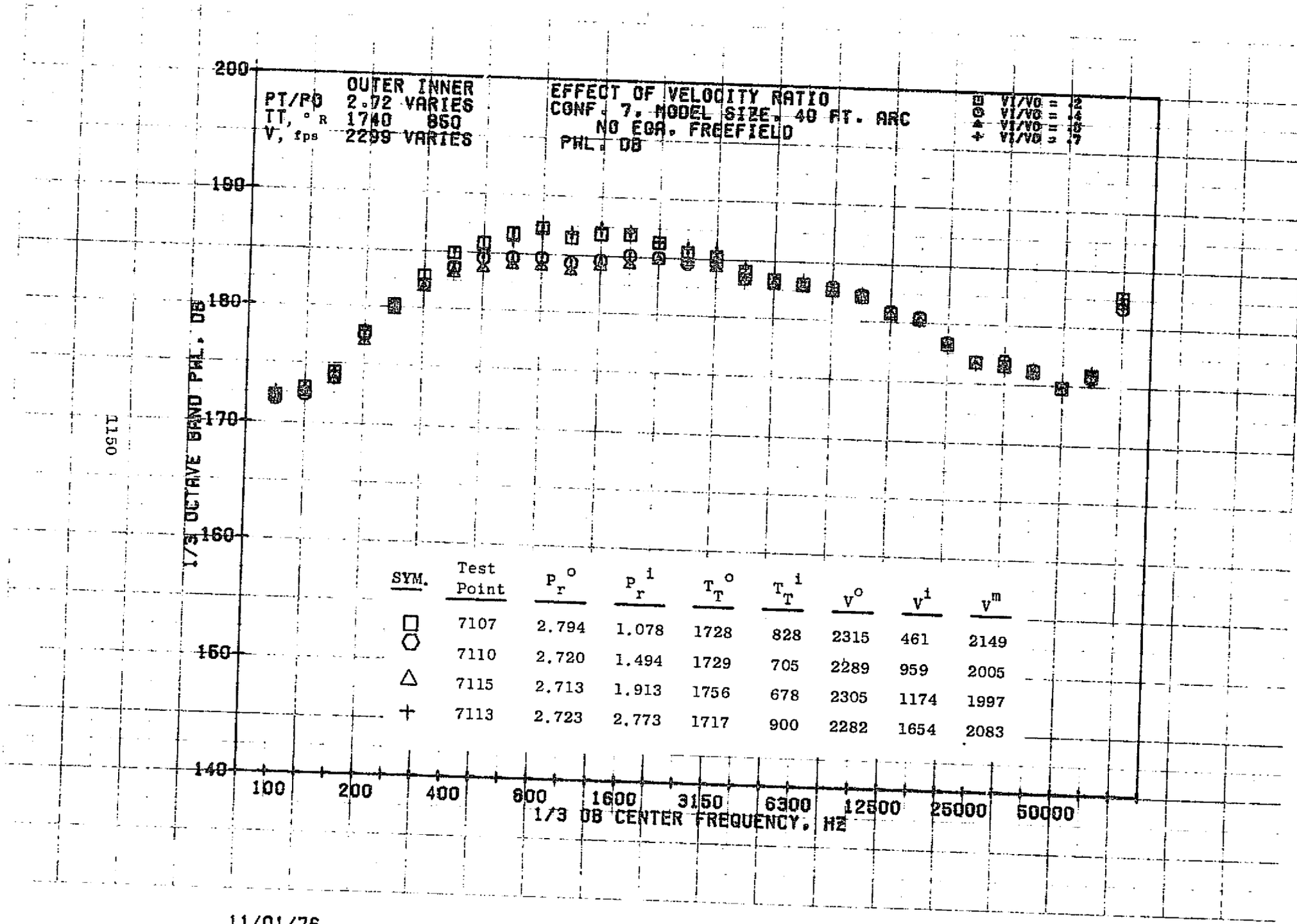
79 BURCH A.



1149

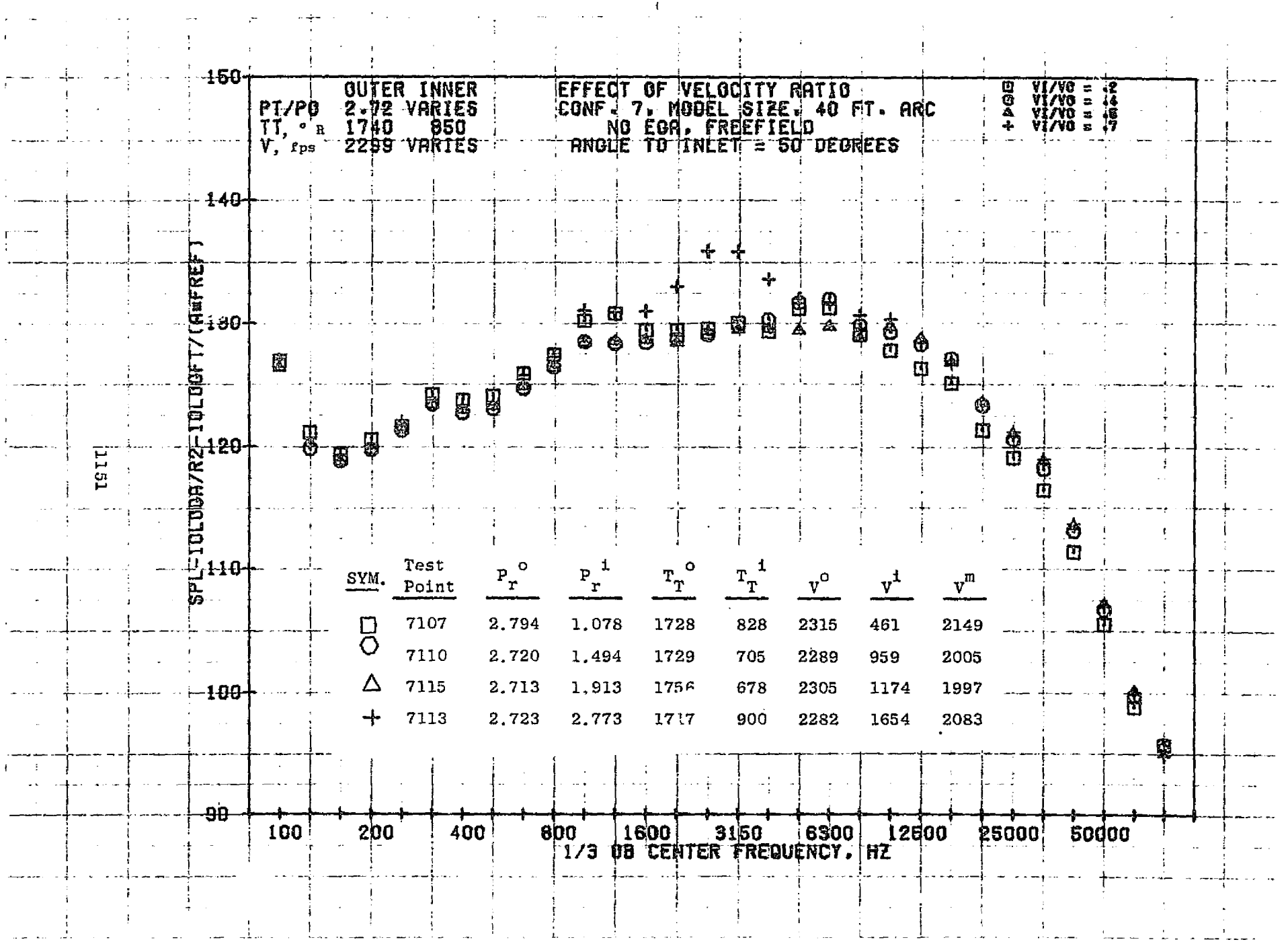
11/09/76
[illegible]

[illegible] BIRCH A.



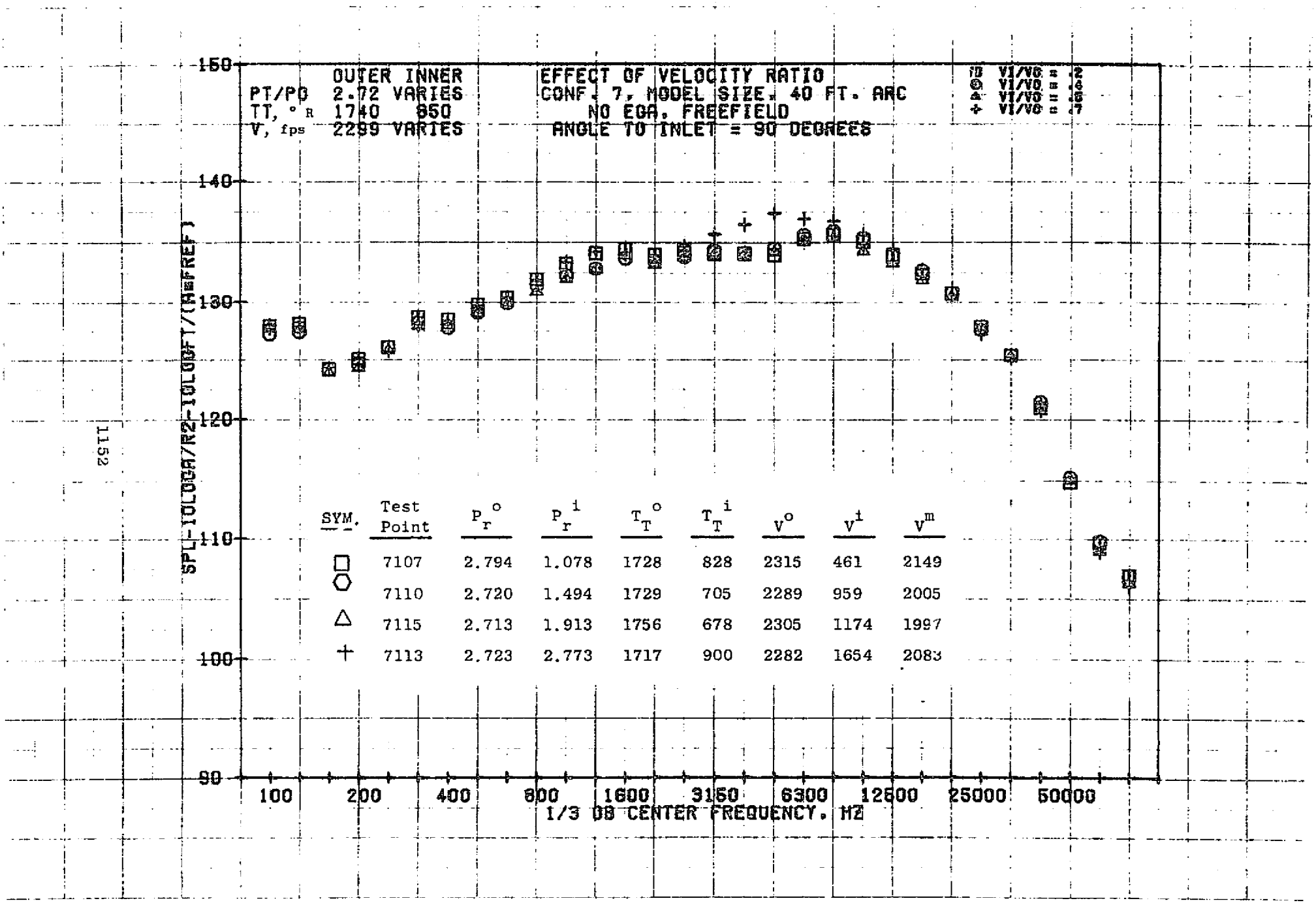
11/01/76
1B391-001

79 BURCH A.



11/01/76
18391-001

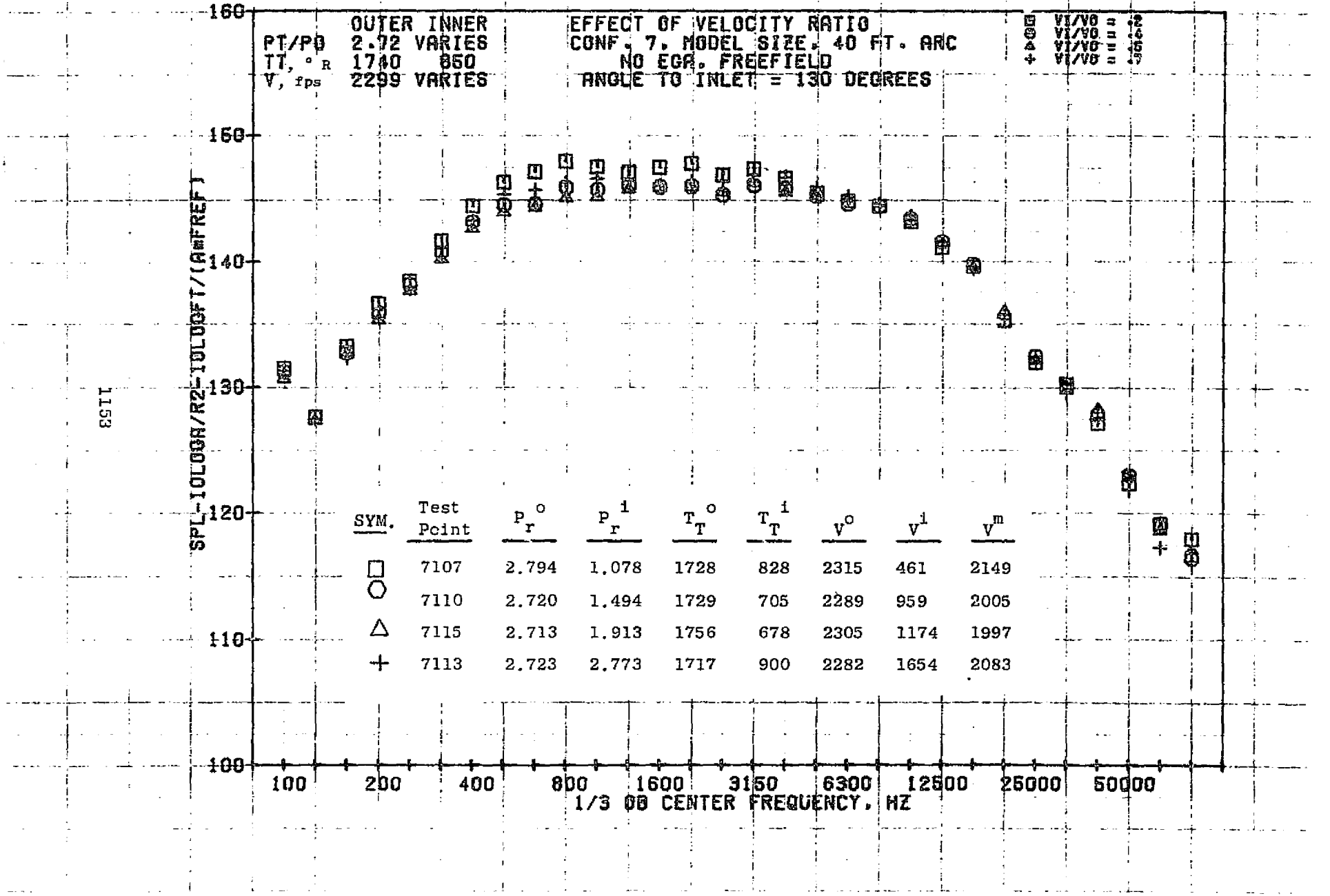
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	7107	2.794	1.078	1728	828	2315	461	2149
⬡	7110	2.720	1.494	1729	705	2289	959	2005
△	7115	2.713	1.913	1756	678	2305	1174	1997
+	7113	2.723	2.773	1717	900	2282	1654	2083

11/01/76
18391-001

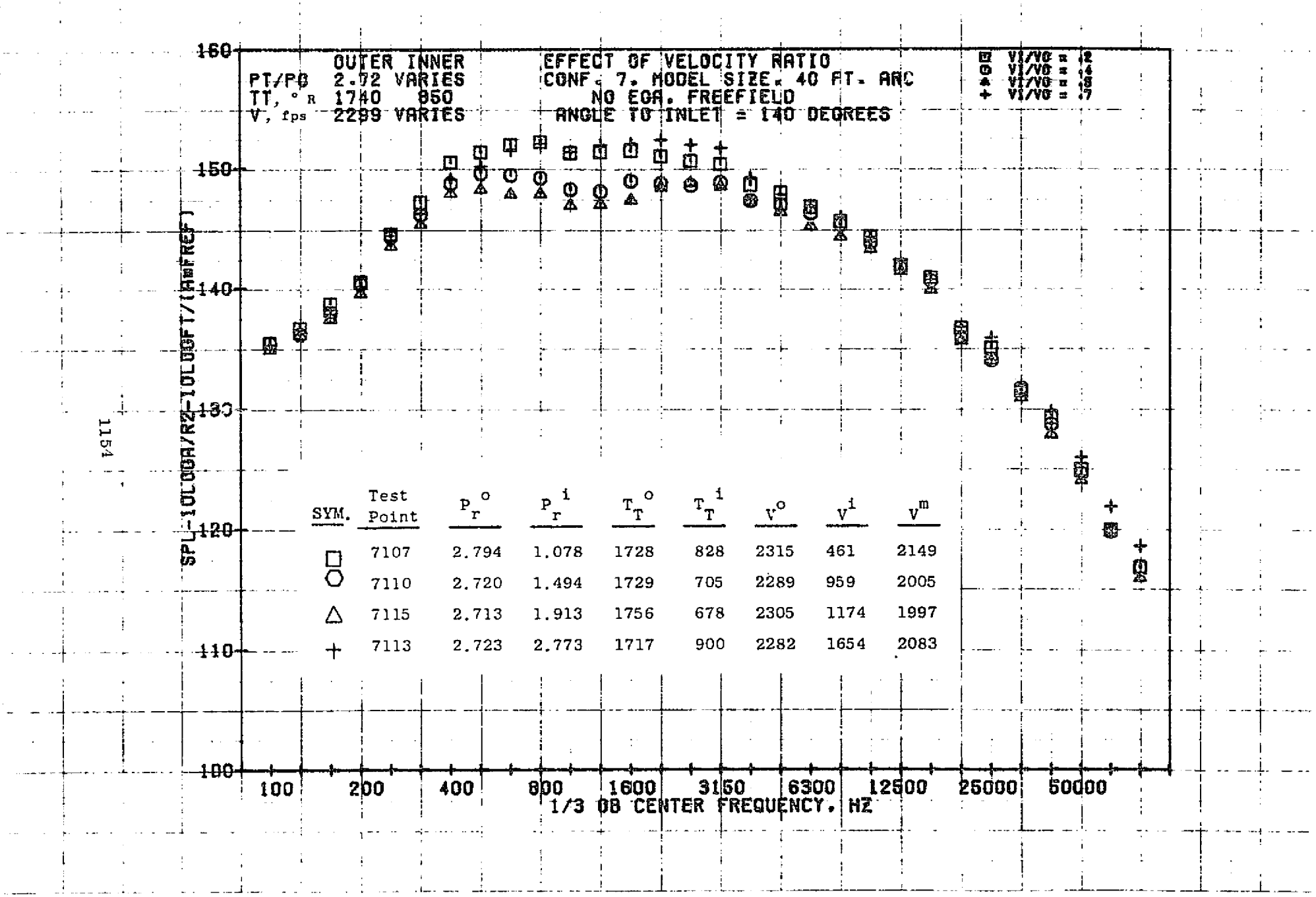
79 BURCH A.



1153

11/01/76
18391-001

79 BURCH A.

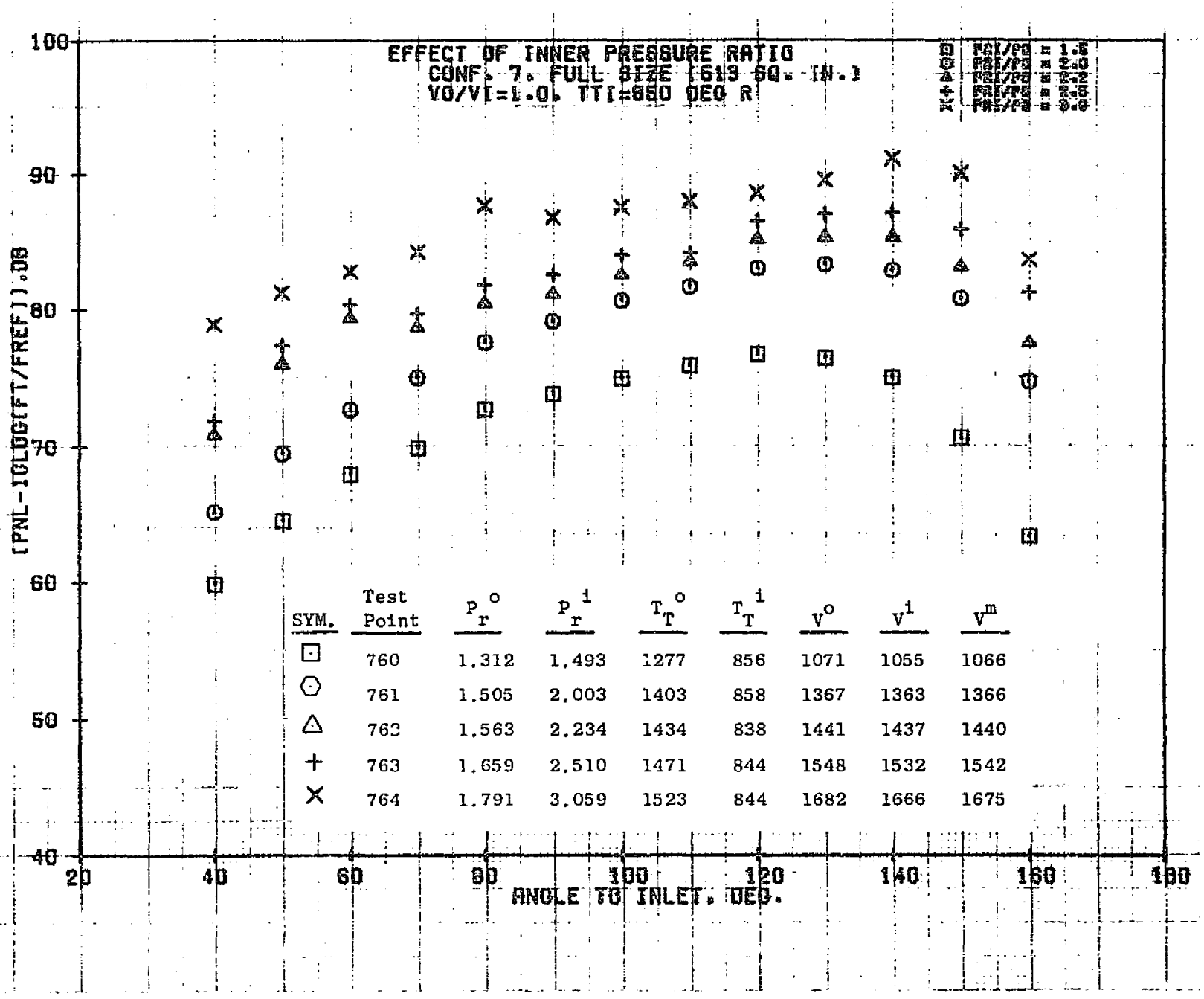


11/01/76
18391-001

79 BURCH A.

7.4.5 Effect of Inner Pressure Ratio at Constant Velocity Ratio

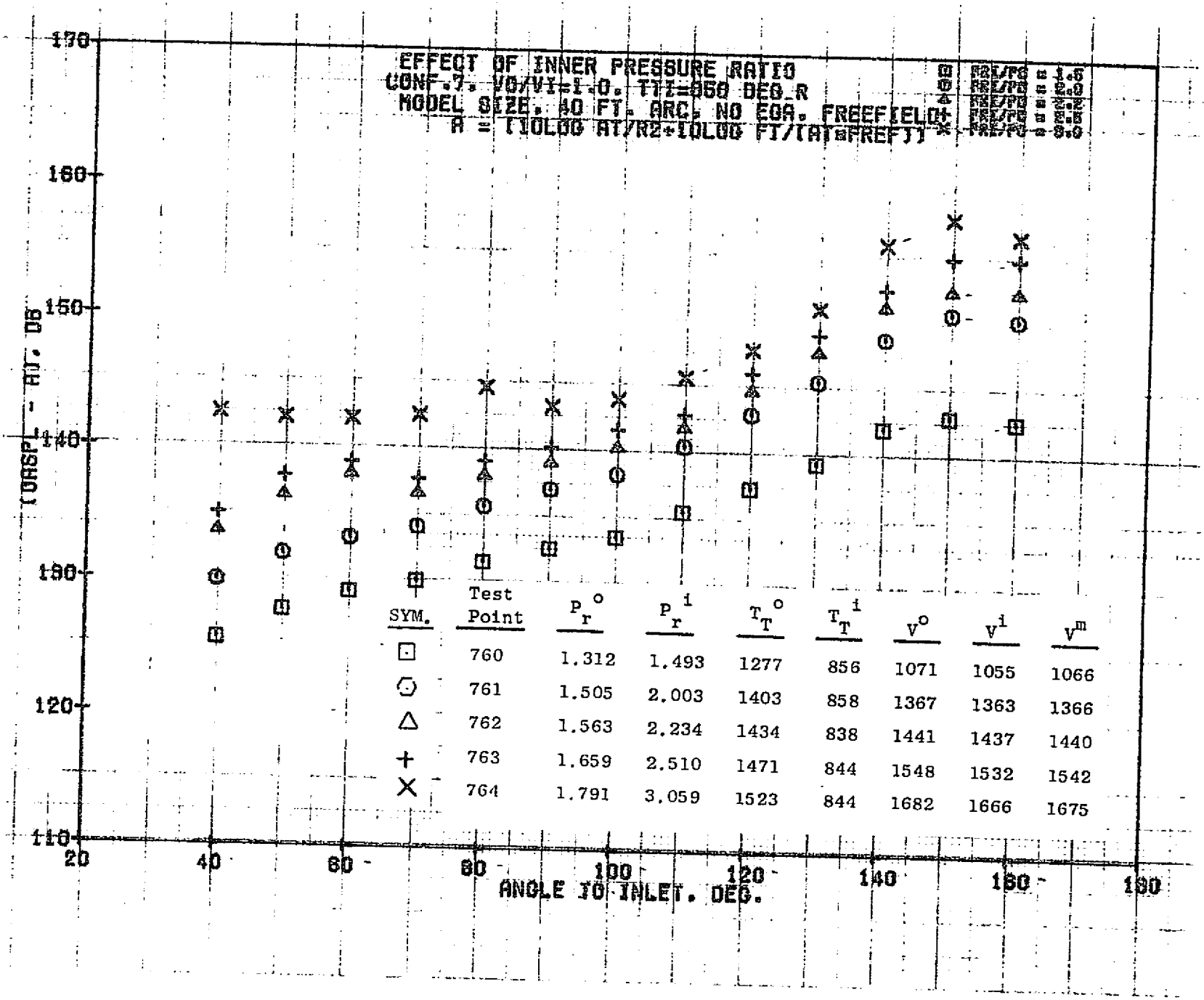
For Configuration 7, a test series was run in which the velocity ratio was held constant at different levels and the inner pressure ratio was varied. The results are shown in this section.



1156

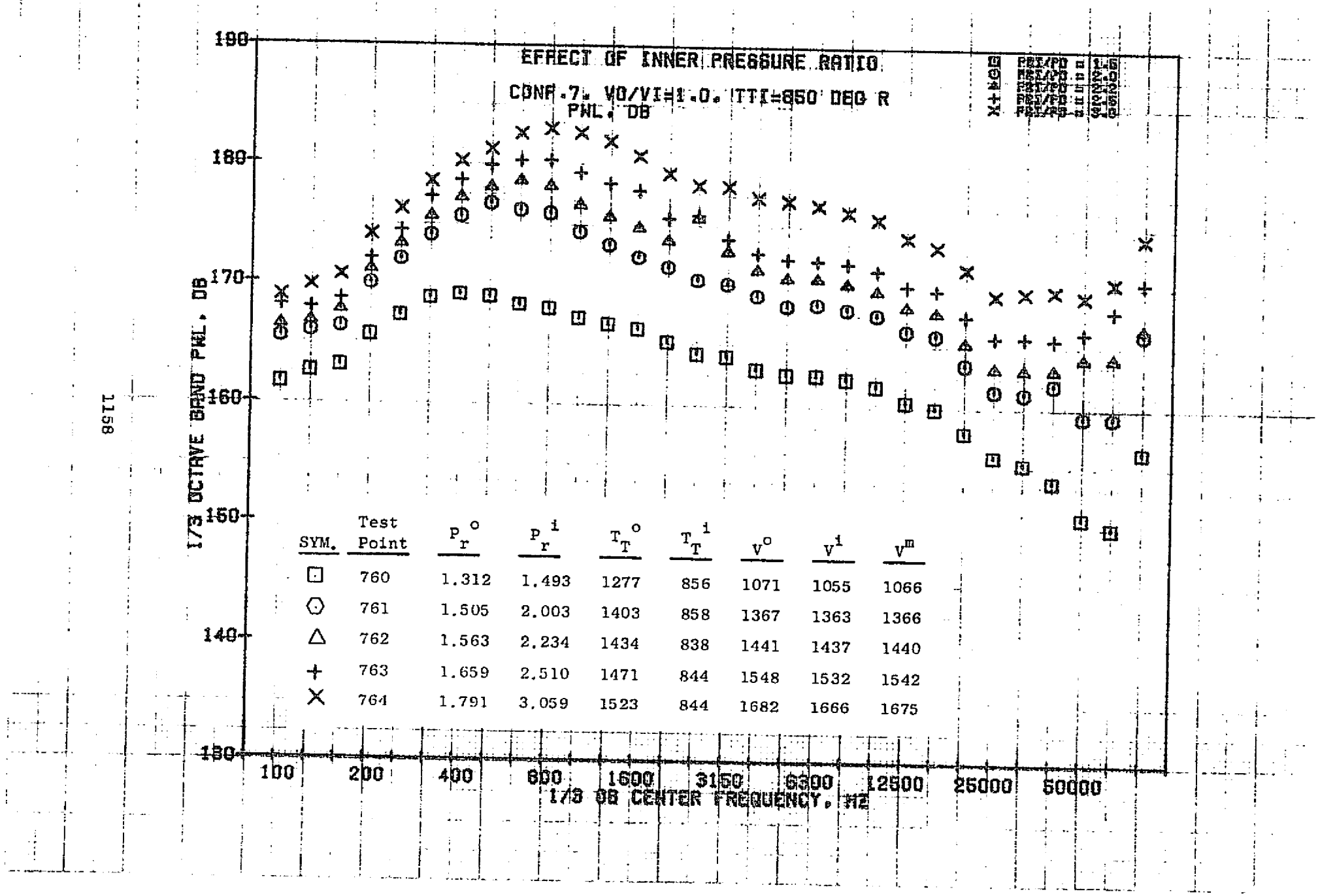
11/01/76
18421-001

79 BURCH A.



11/09/76
18336-001

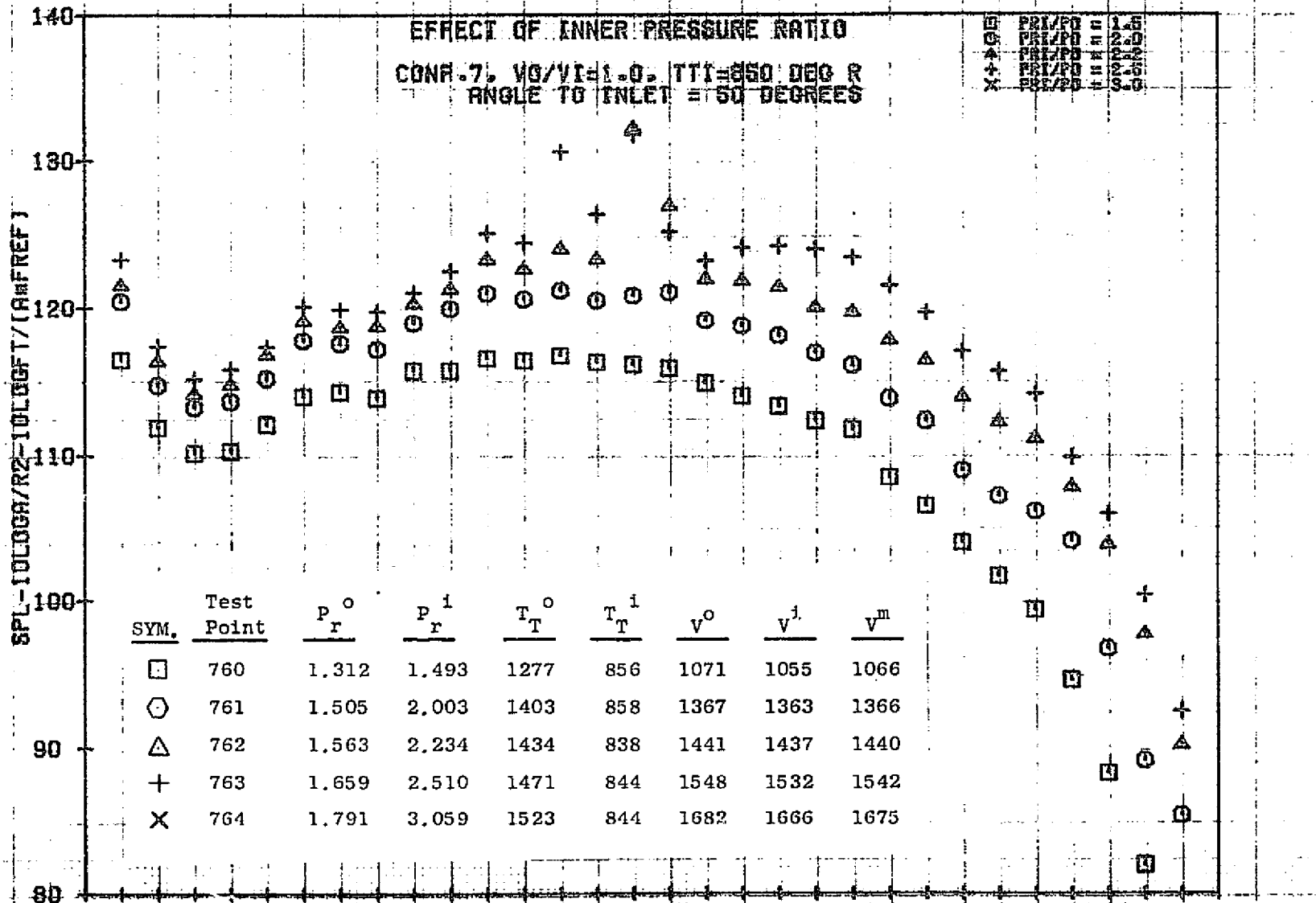
79 AUROH A.



1158

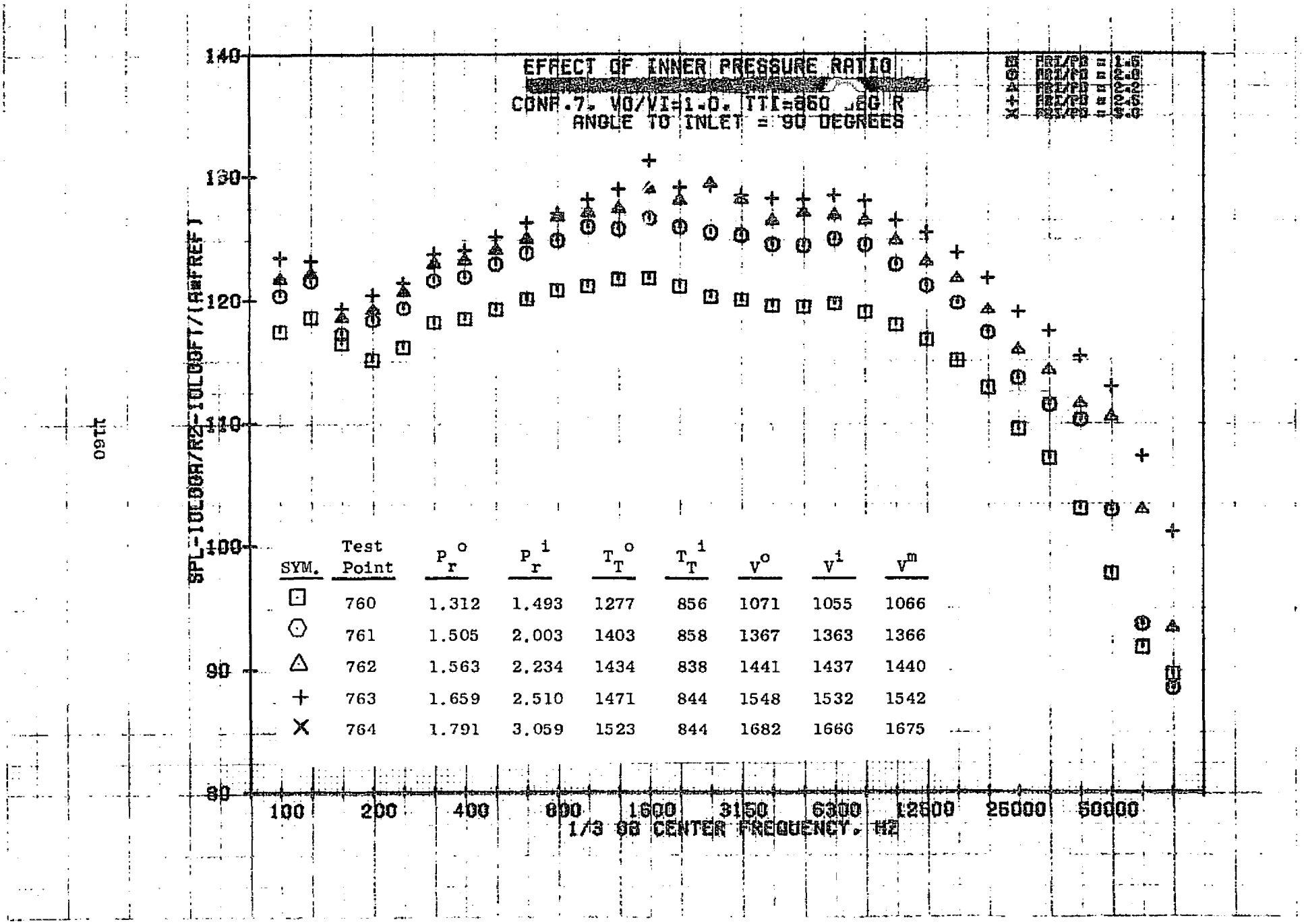
11/03/76
18575-001

79 BURCH A.



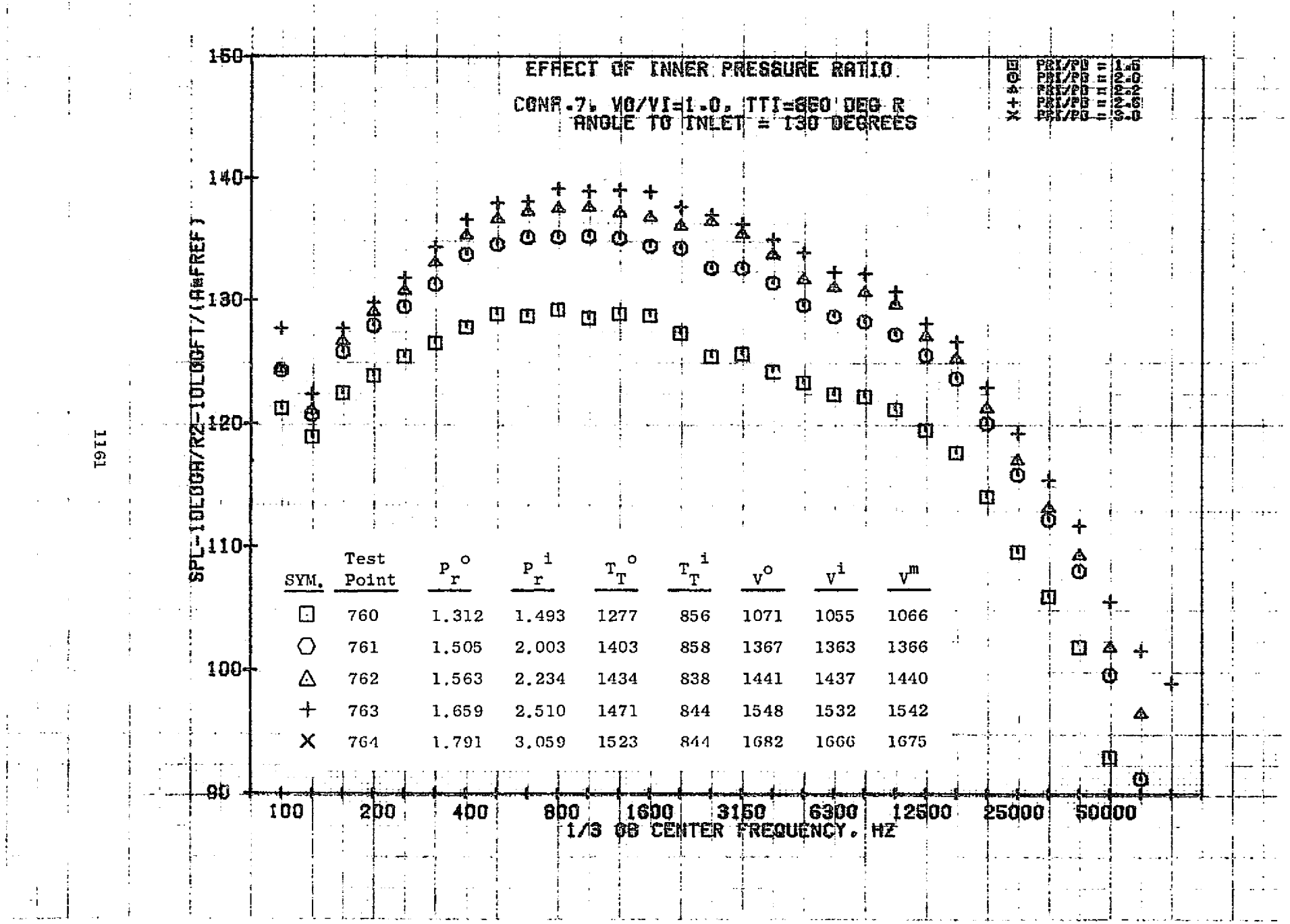
11/03/76
18575-001

79 BURCH A.



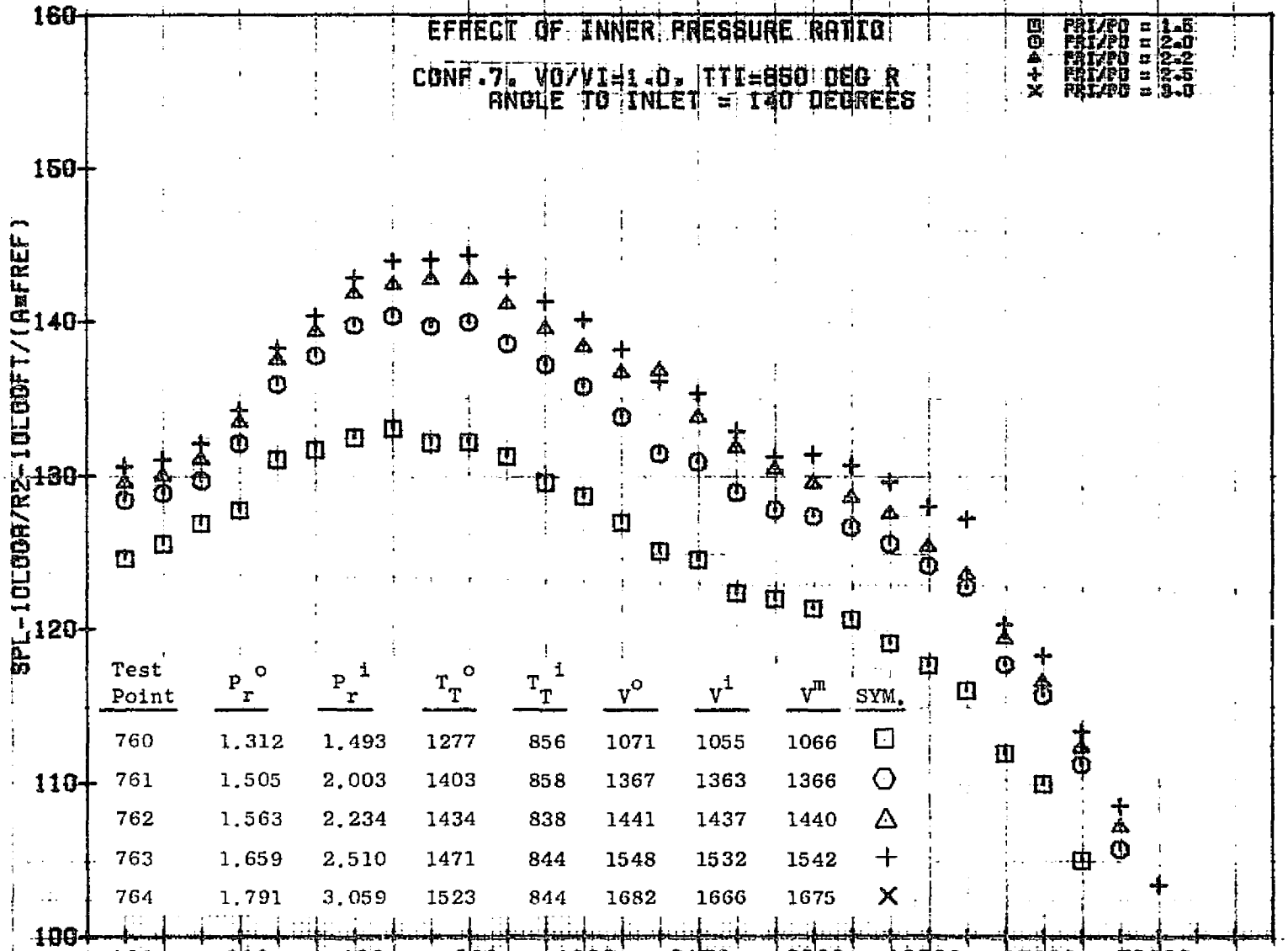
11/03/76
18675-001

79 BURCH A.



11/03/76
18575-001

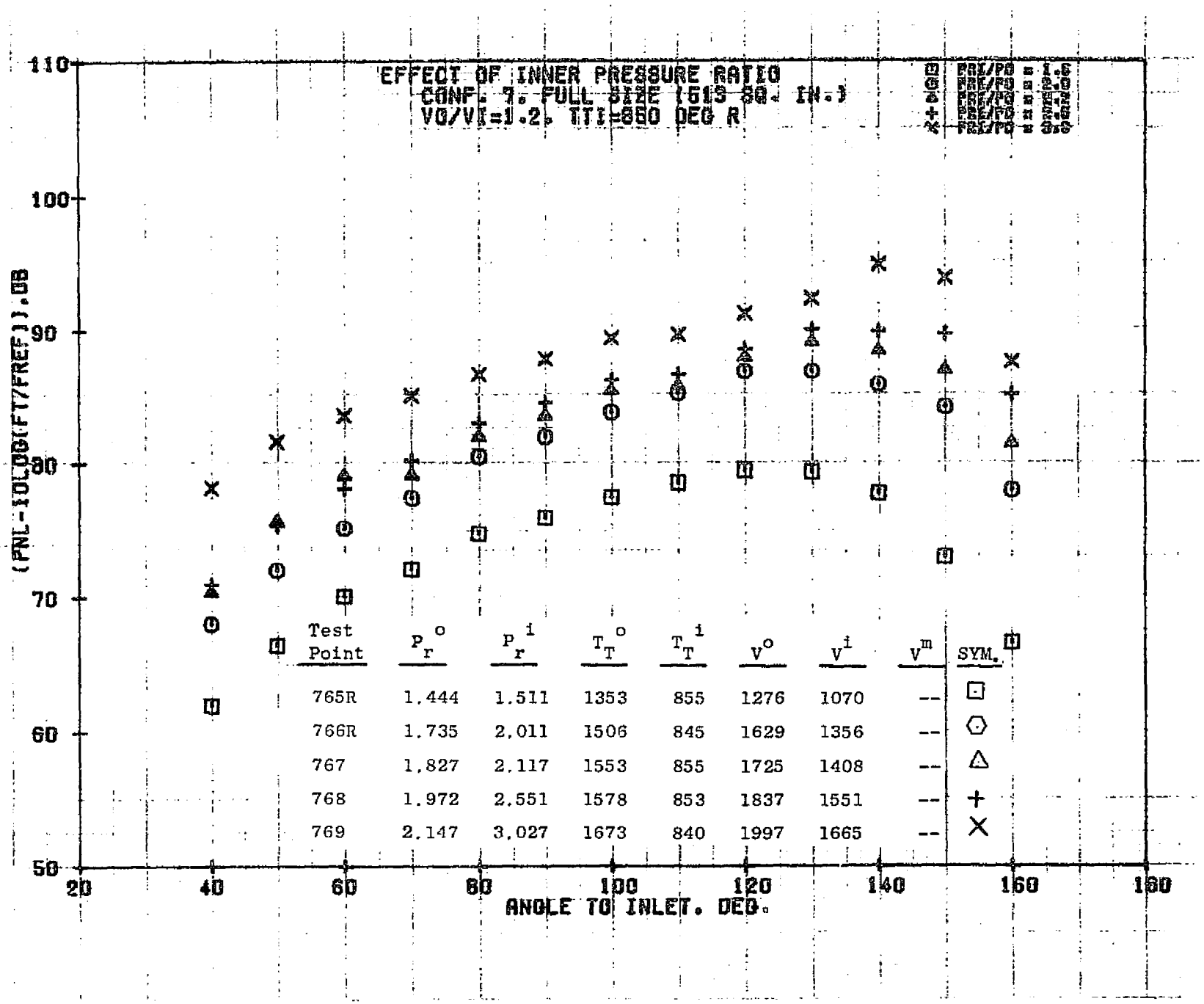
79 BURCH A.



1162

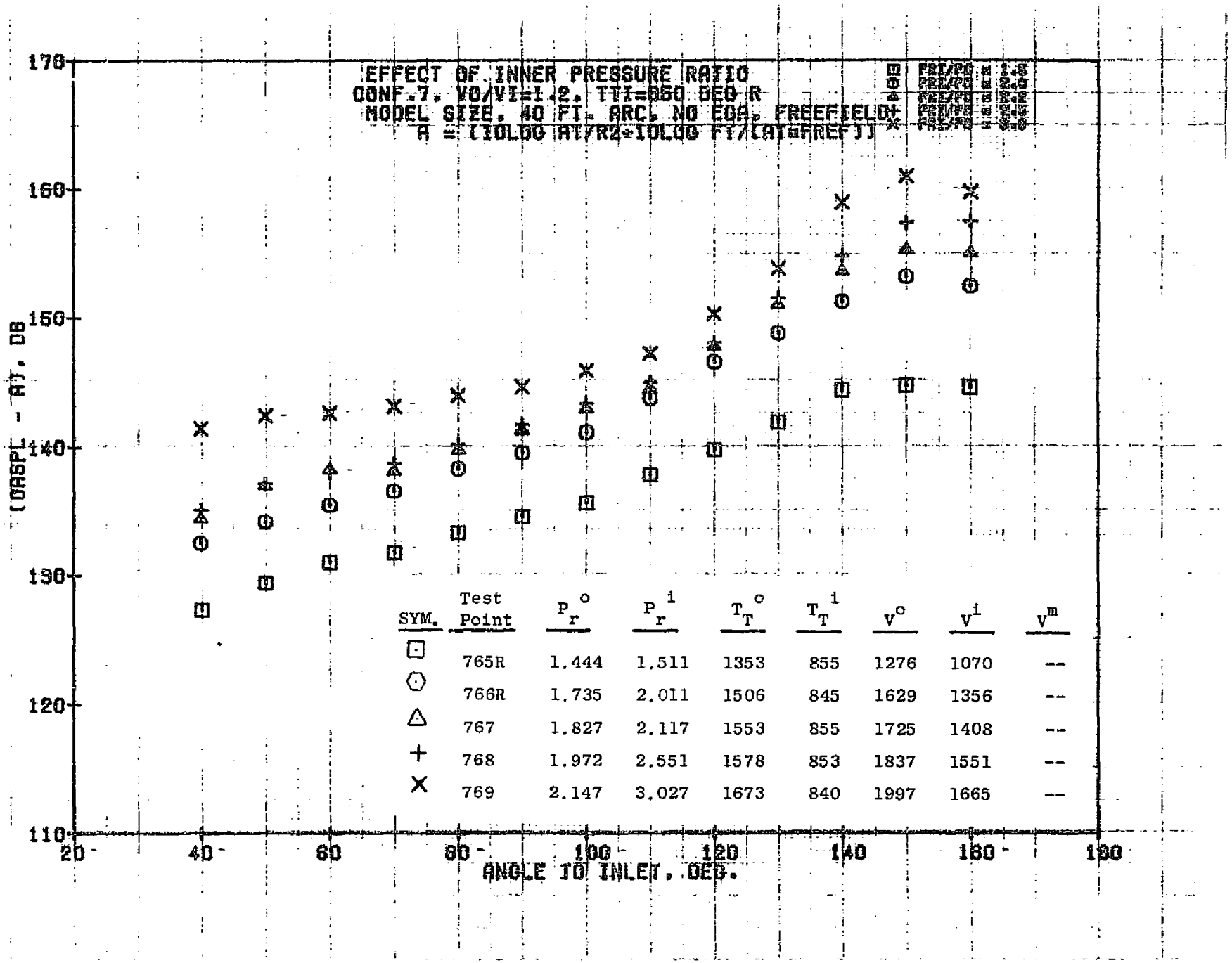
11/03/76
18575-001

79 BURCH A.



11/04/76
1R660-001

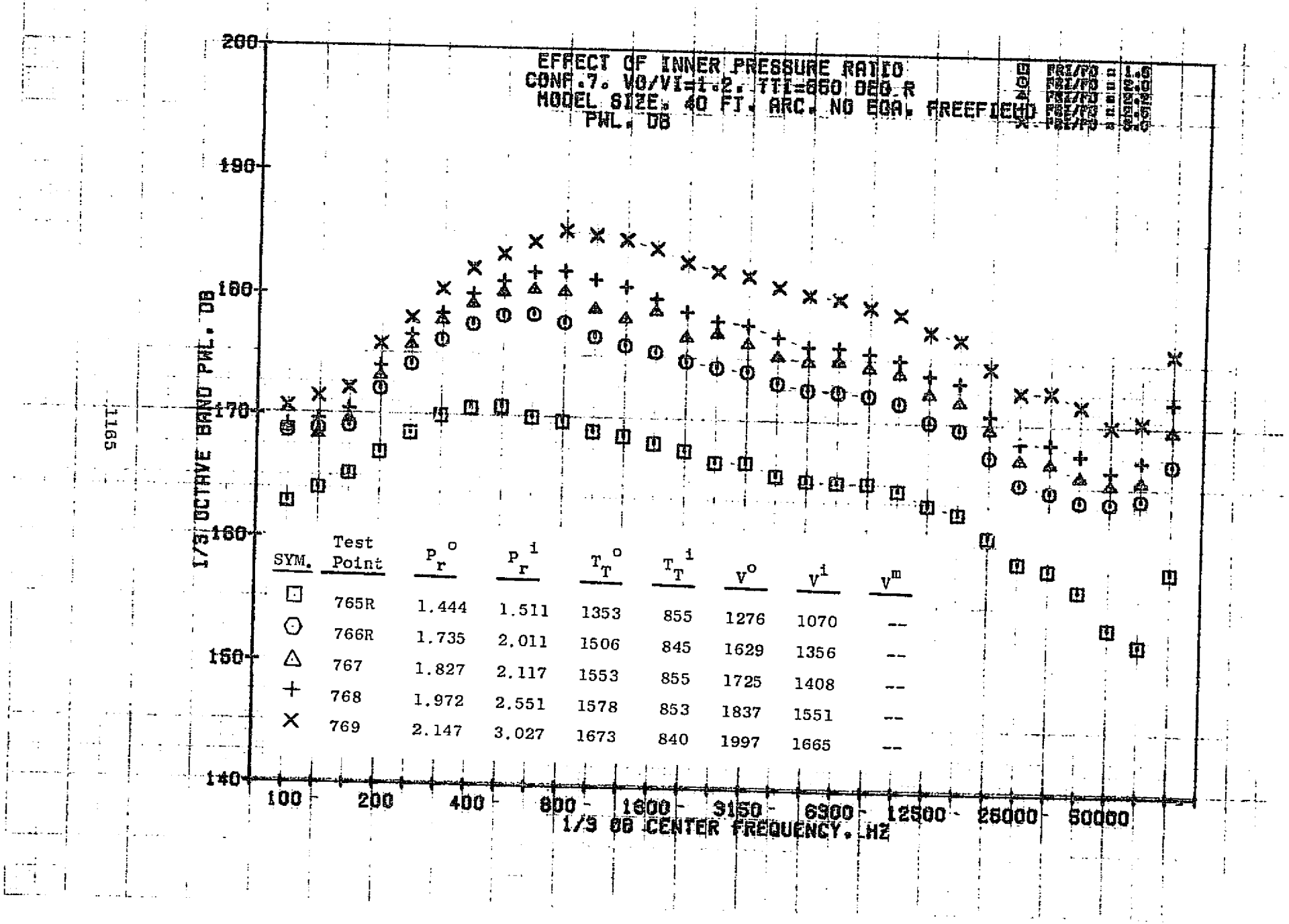
79 BURCH A.



1164

11/09/76
1A936-001

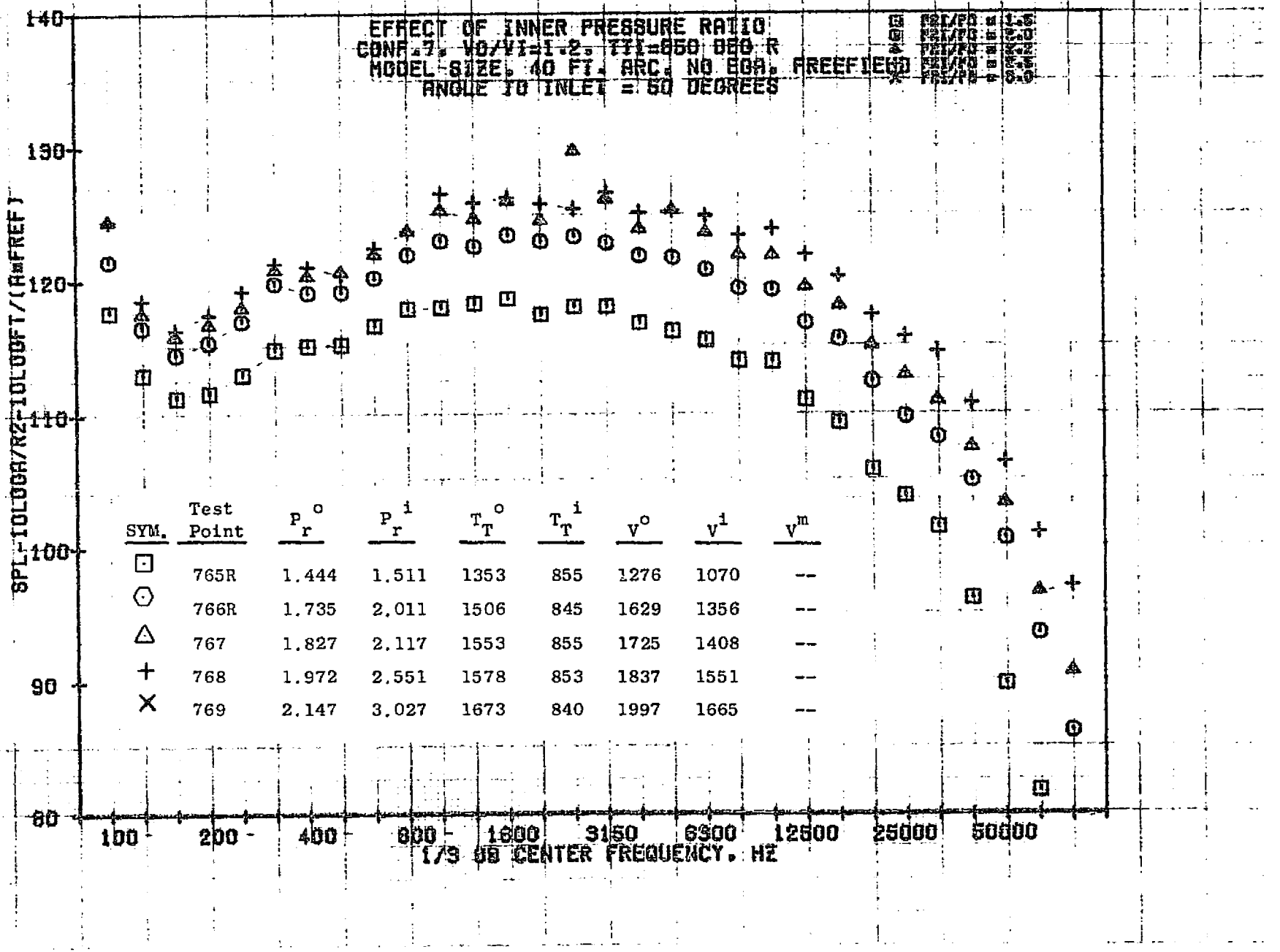
79 AIRCR A..



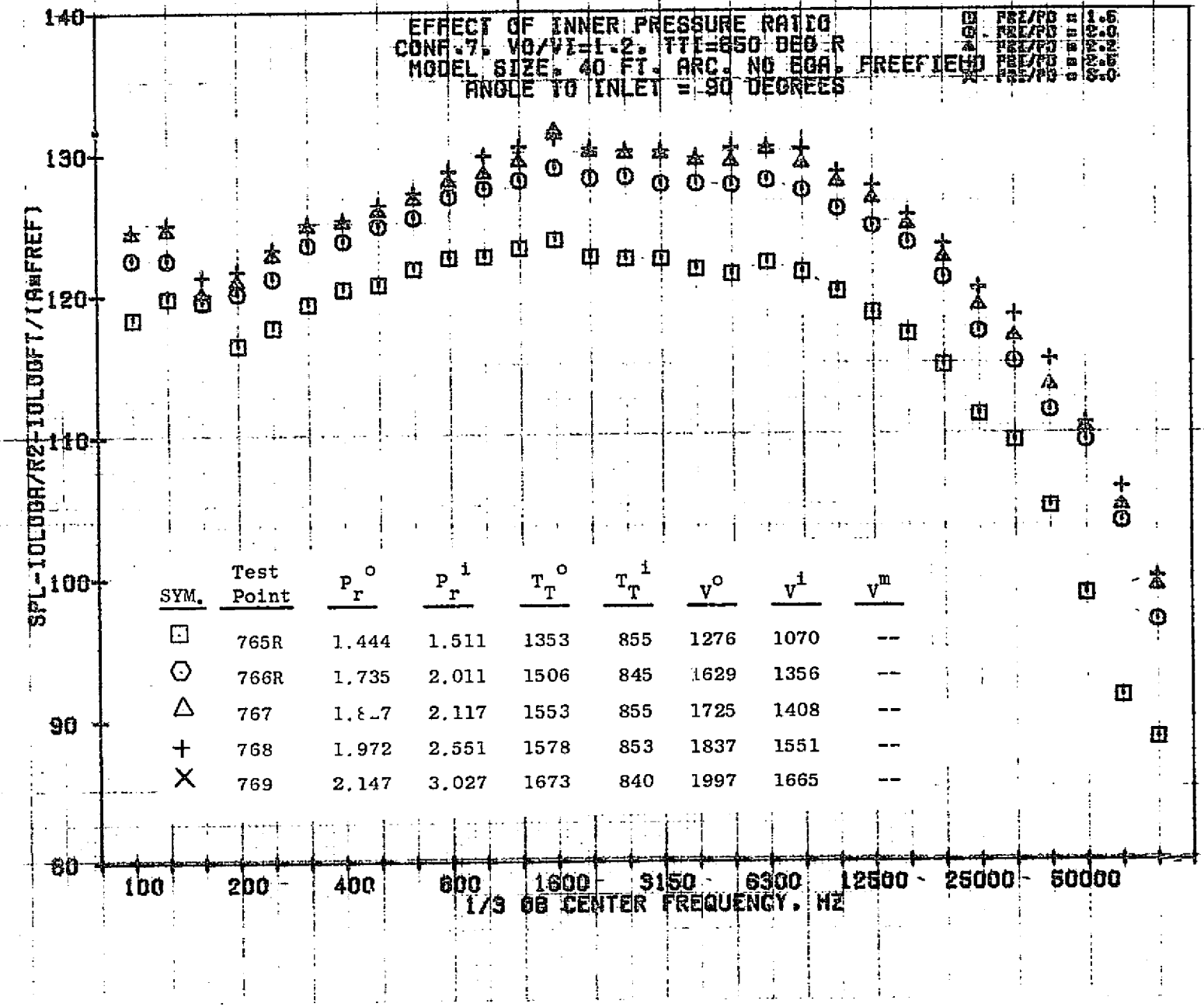
1165

11/09/76
1R33B-001

79 BURCH R.

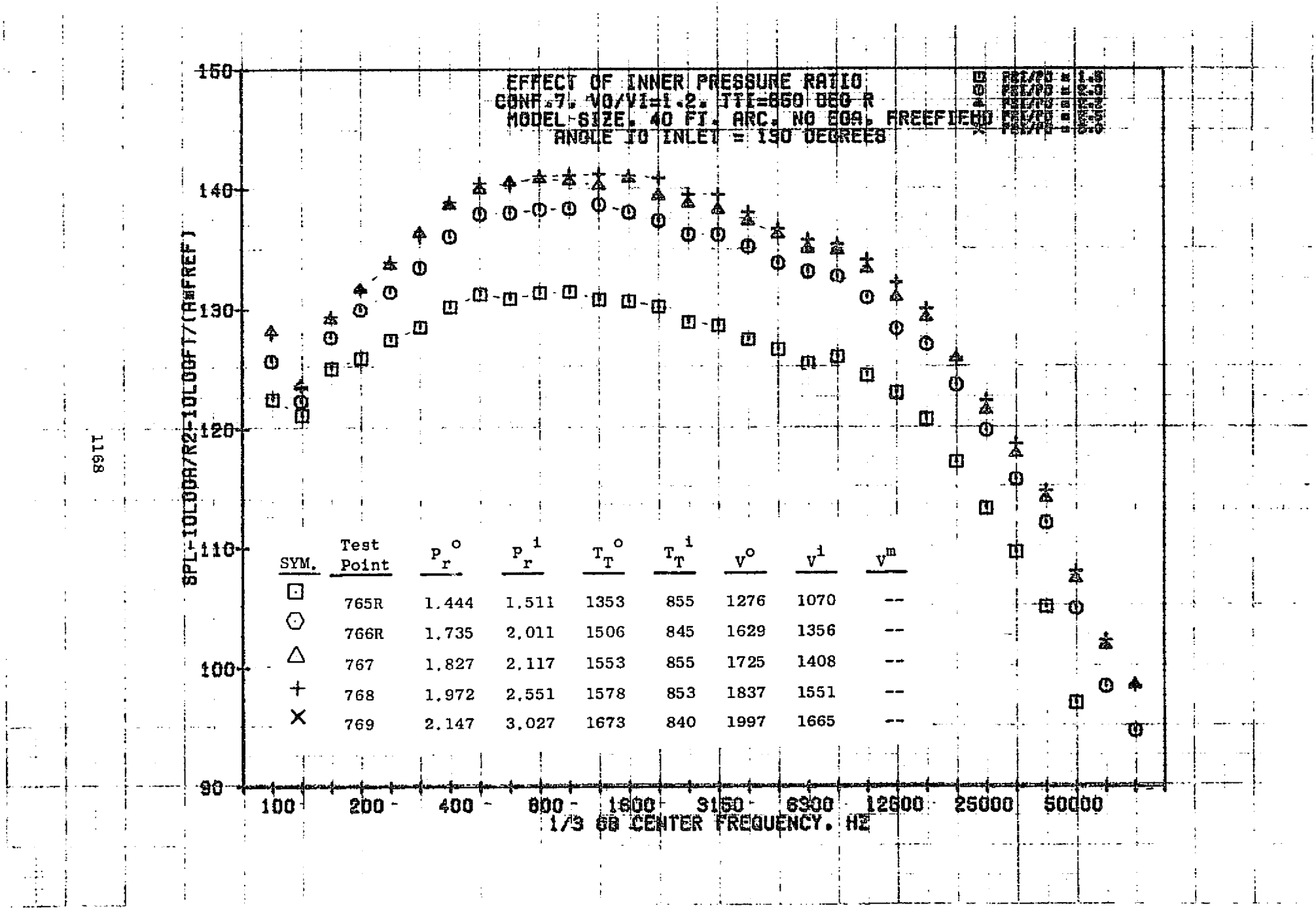


11/09/76
18336-001



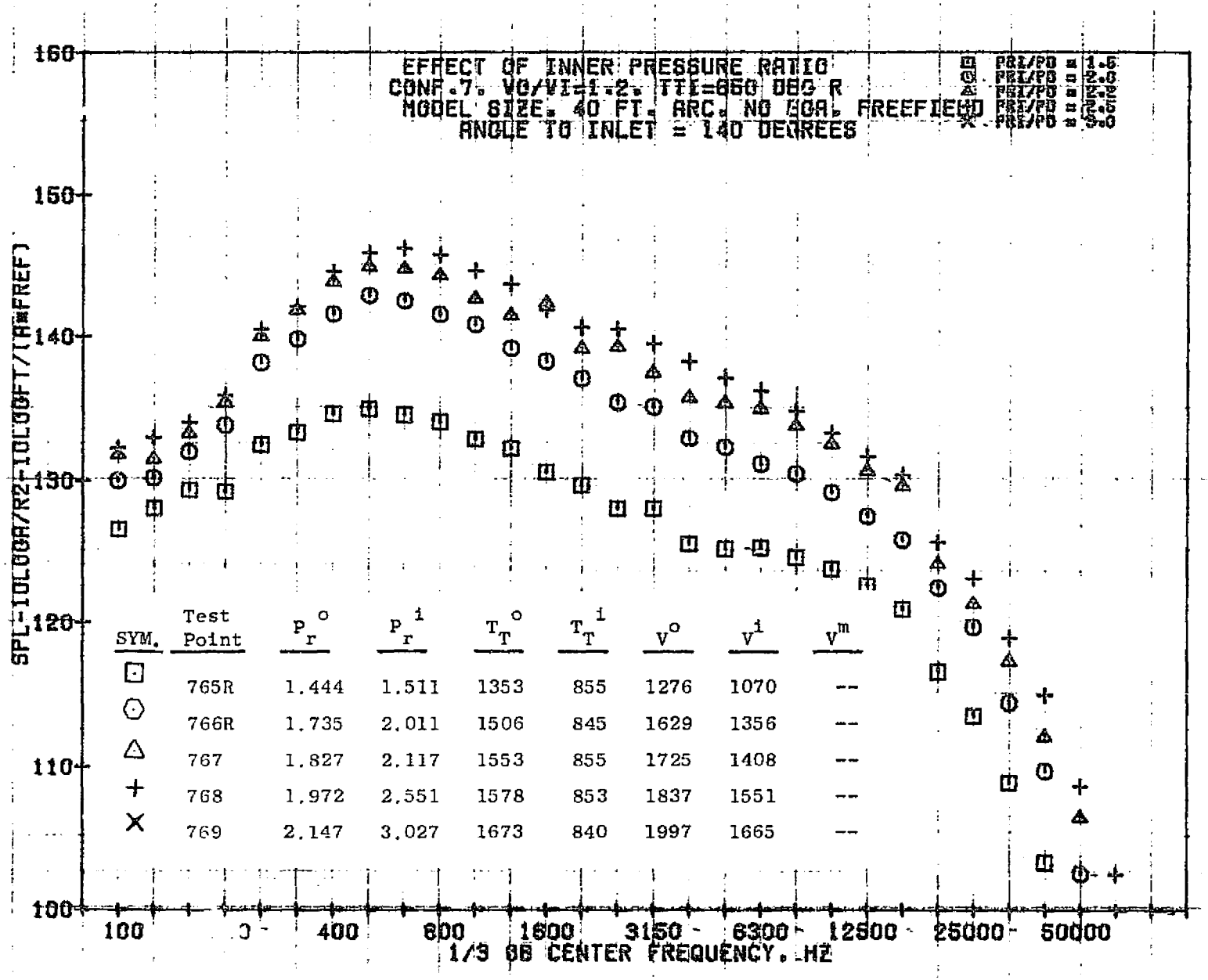
11/09/76
1R336-001

79 AUBURN A.



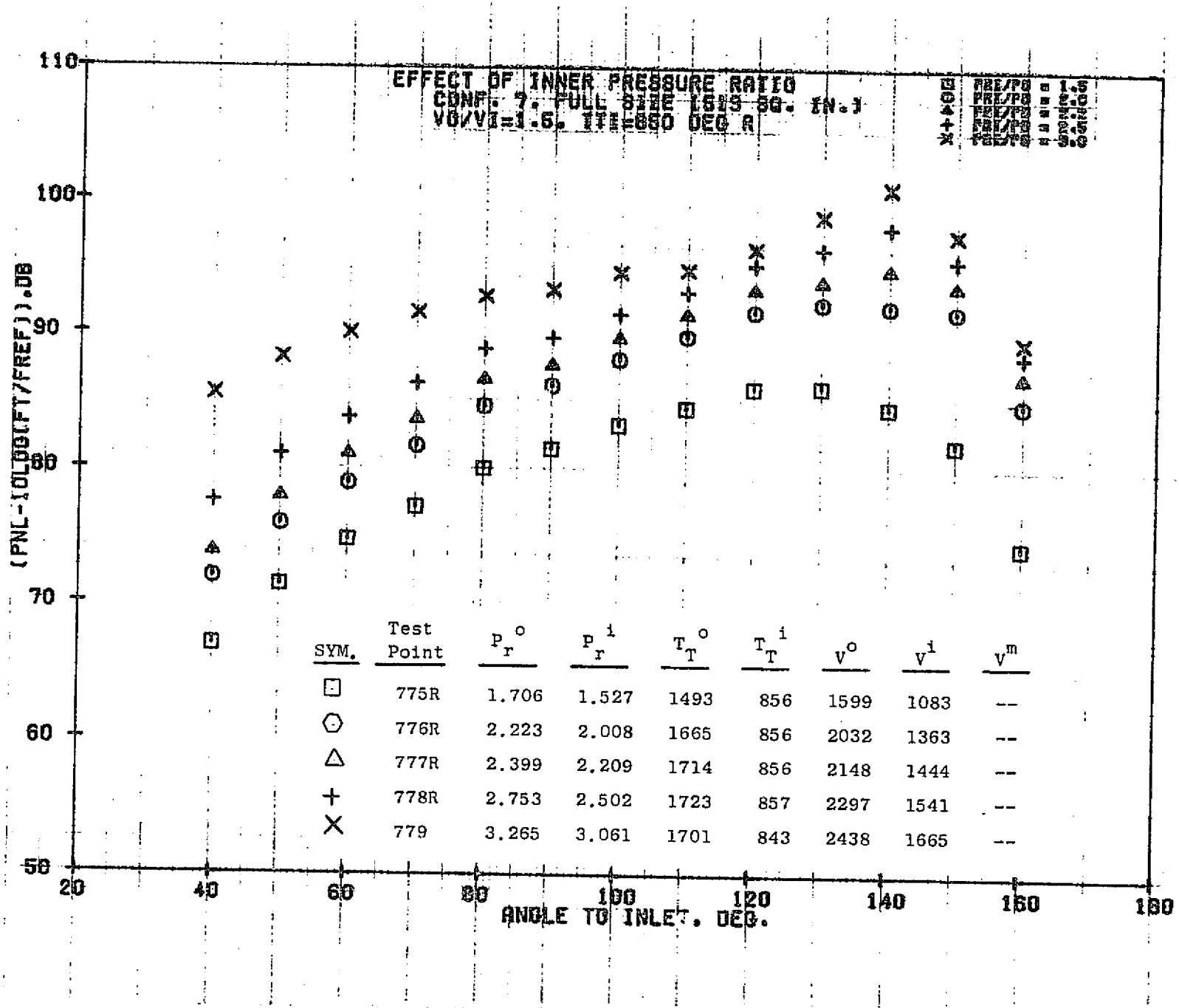
11/09/76
18336-001

79 BIRCH S.



11/09/76
18336-001

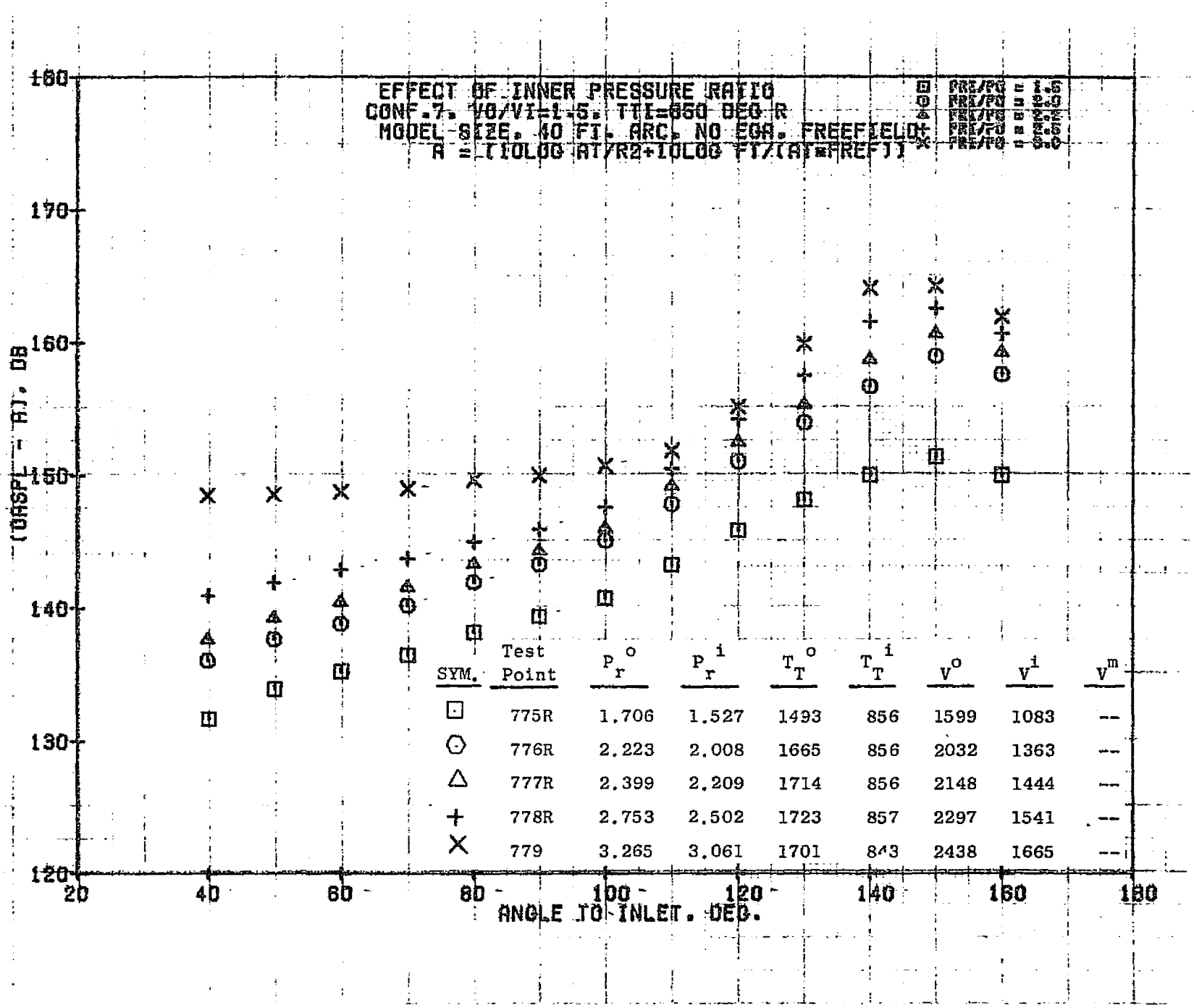
79 BIRCH R.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	775R	1.706	1.527	1493	856	1599	1083	--
⬡	776R	2.223	2.008	1665	856	2032	1363	--
△	777R	2.399	2.209	1714	856	2148	1444	--
+	778R	2.753	2.502	1723	857	2297	1541	--
X	779	3.265	3.061	1701	843	2438	1665	--

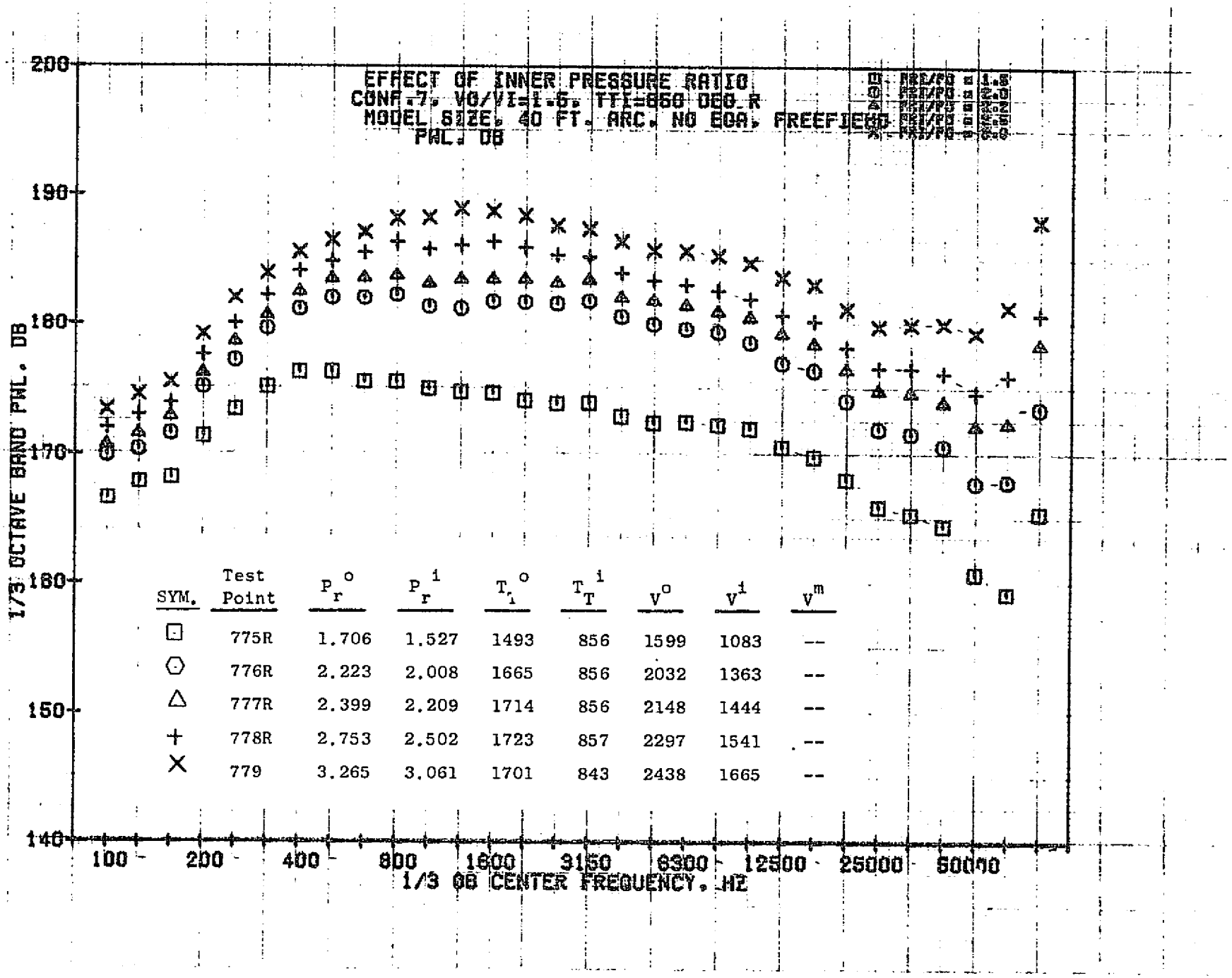
11/04/76
18660-001

79 BURCH A.



11/09/76
18336-001

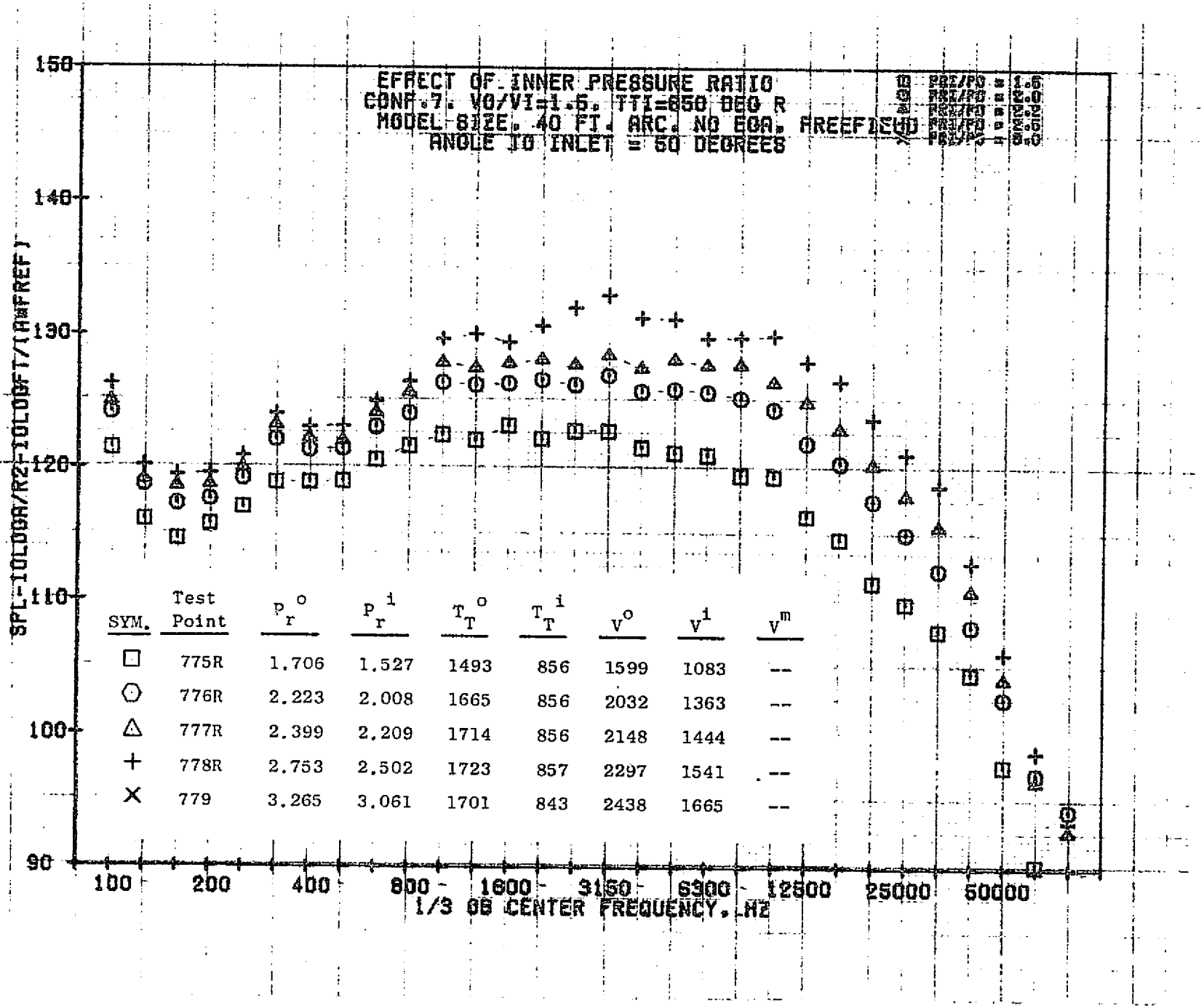
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_i^o	T_T^i	V^o	V^i	V^m
□	775R	1.706	1.527	1493	856	1599	1083	--
⊙	776R	2.223	2.008	1665	856	2032	1363	--
△	777R	2.399	2.209	1714	856	2148	1444	--
+	778R	2.753	2.502	1723	857	2297	1541	--
×	779	3.265	3.061	1701	843	2438	1665	--

11/09/76
18336-001

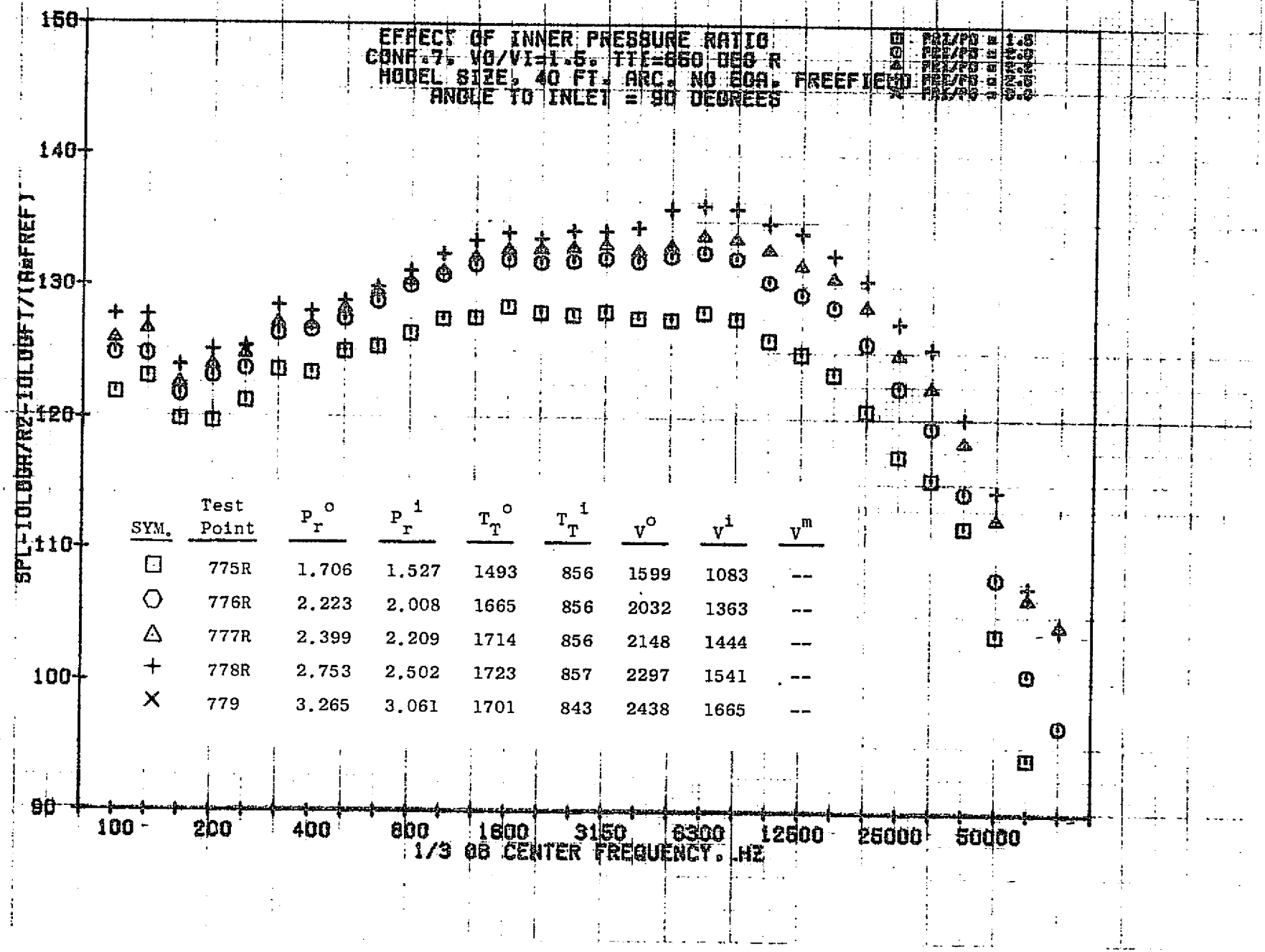
79 AIRCH A.



1173

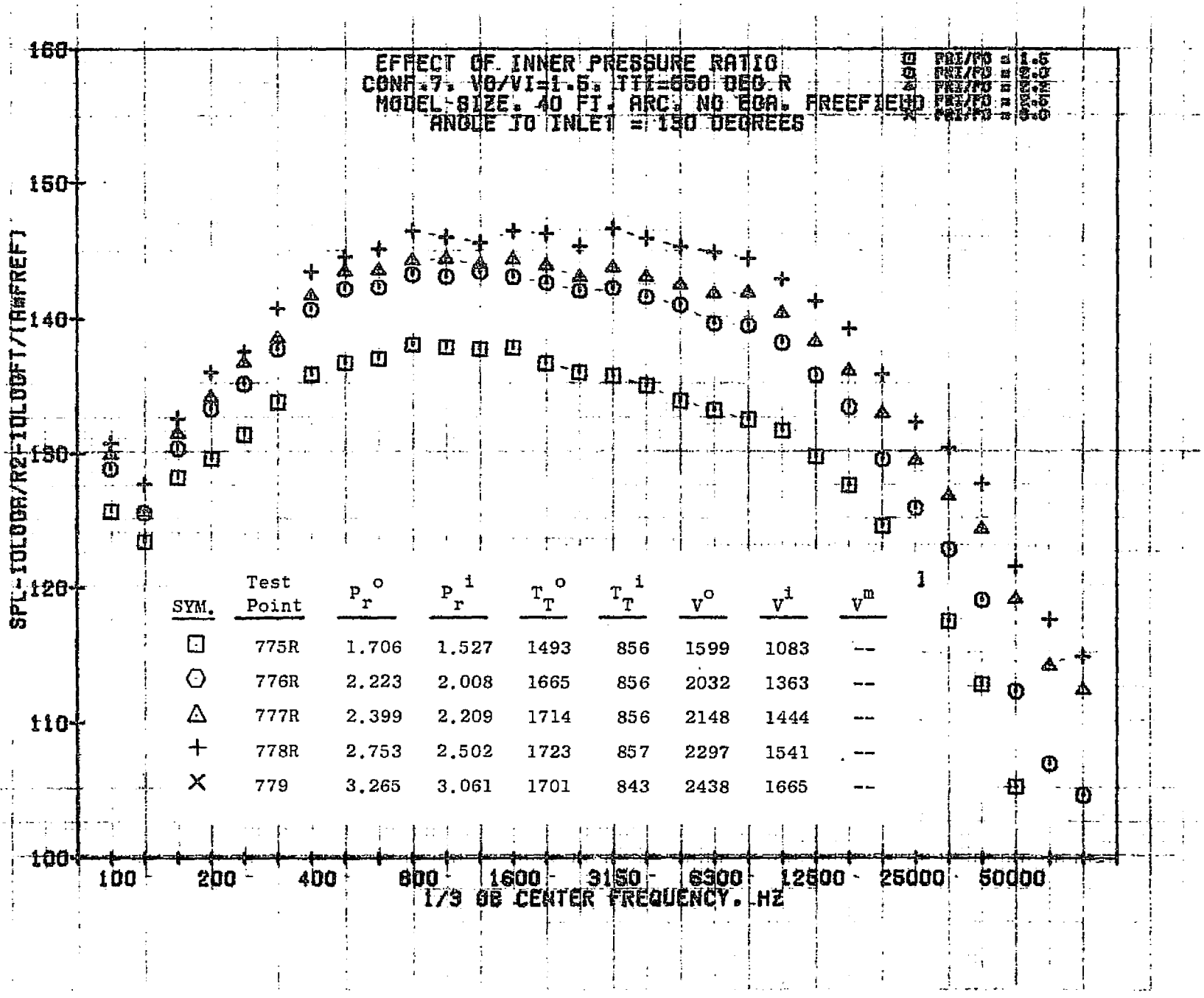
11/09/76
18336-001

79 BIRCH R.



11/09/76
18396-001

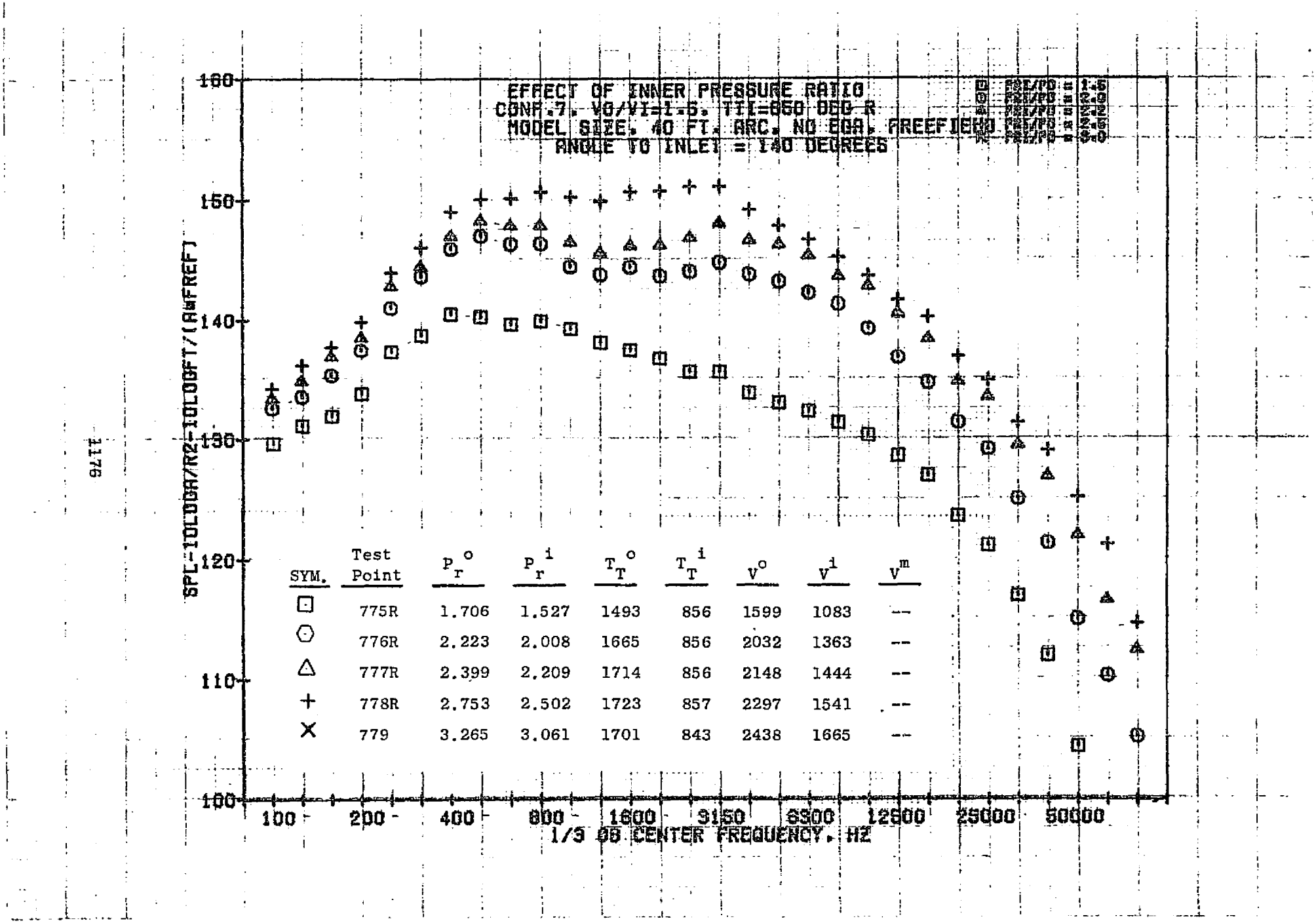
79 AUBURN A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	775R	1.706	1.527	1493	856	1599	1083	--
○	776R	2.223	2.008	1665	856	2032	1363	--
△	777R	2.399	2.209	1714	856	2148	1444	--
+	778R	2.753	2.502	1723	857	2297	1541	--
×	779	3.265	3.061	1701	843	2438	1665	--

11/09/76
18336-001

79 BIRCH A.

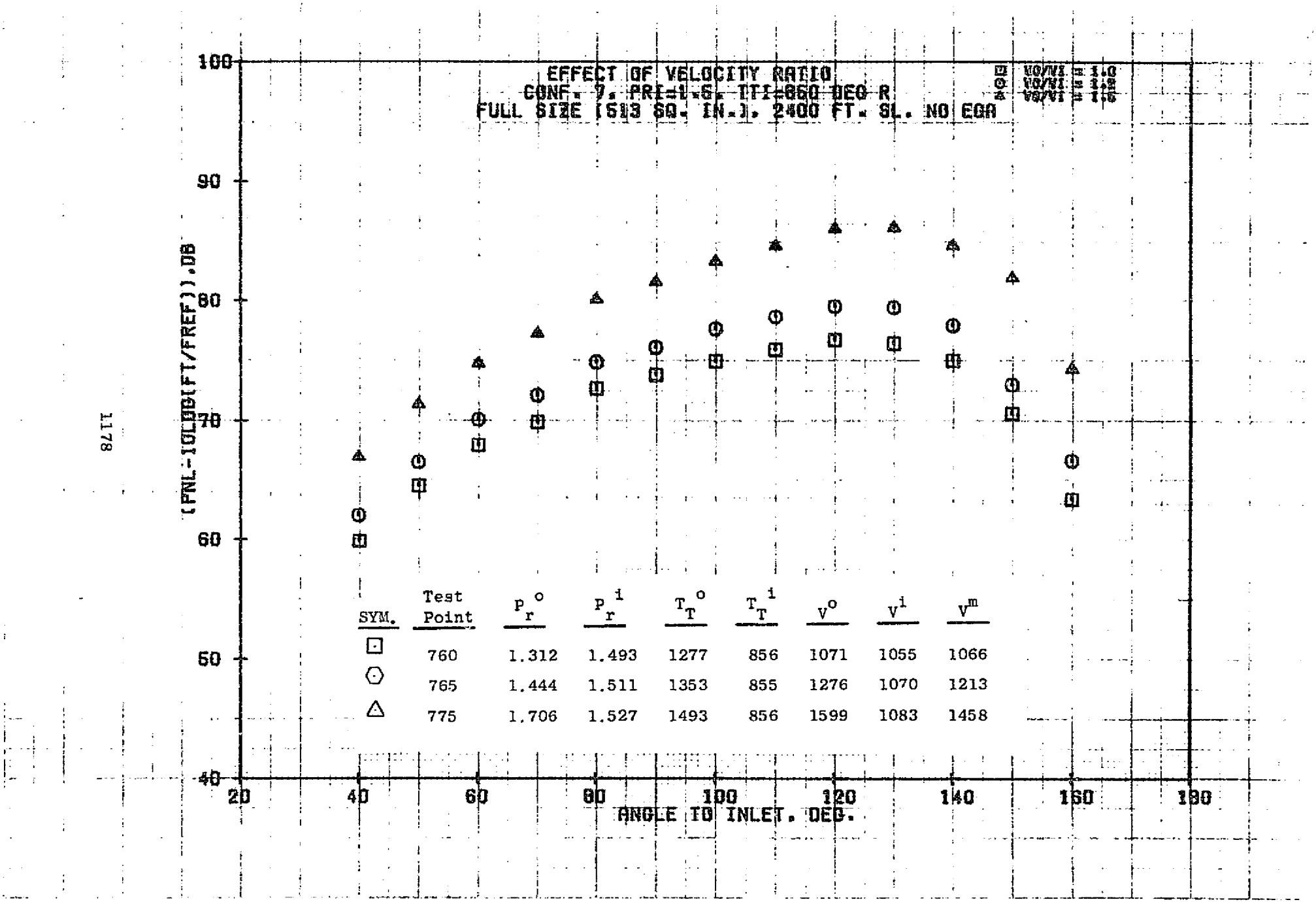


11/09/76
18336-001

79 AIRCH A.

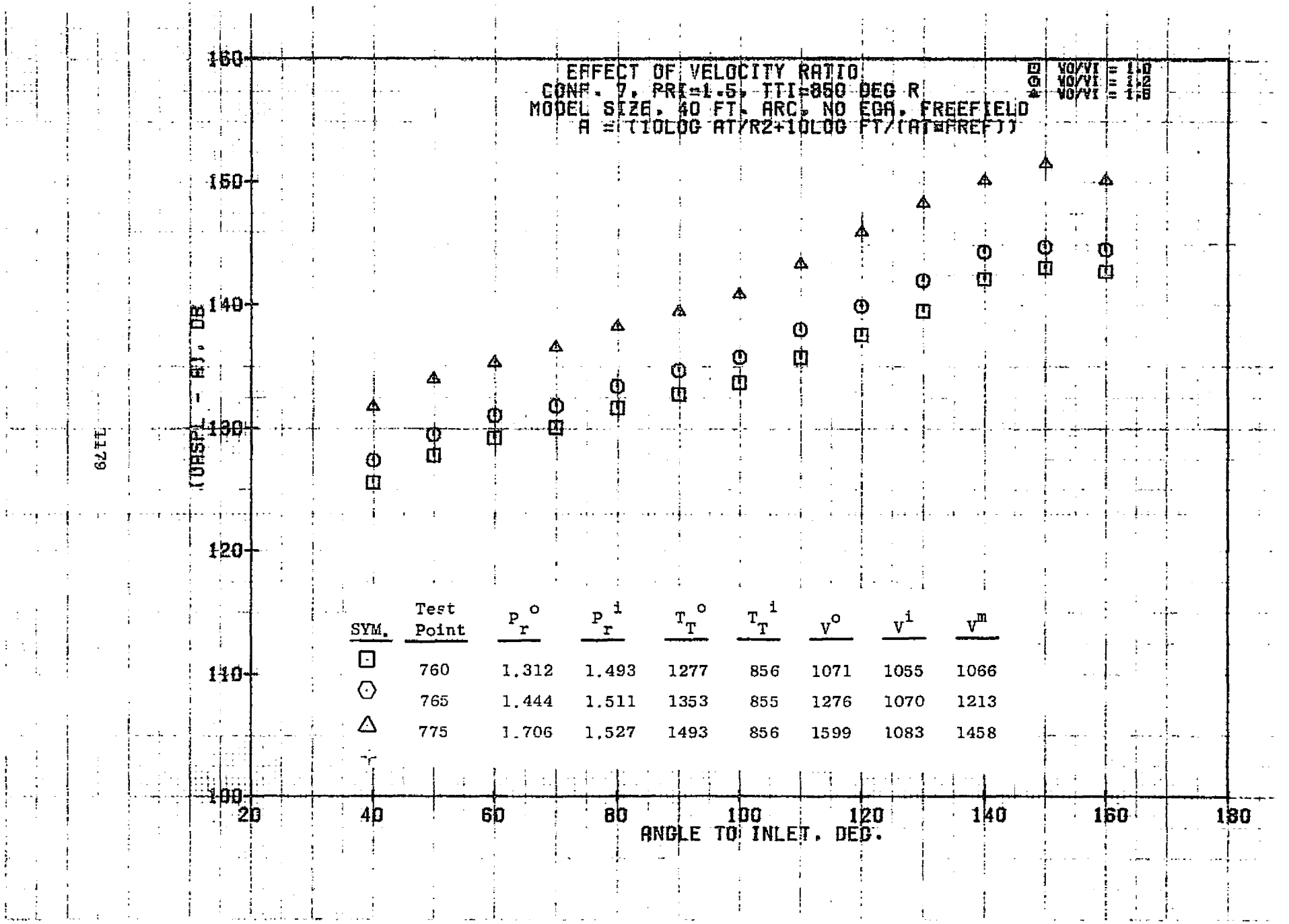
7.4.6 Effect of Velocity Ratio at Constant Inner Pressure Ratio

This section presents comparisons showing the influence of velocity ratio for a series of tests for Configuration 7 where the inner pressure ratio was held constant at different levels.



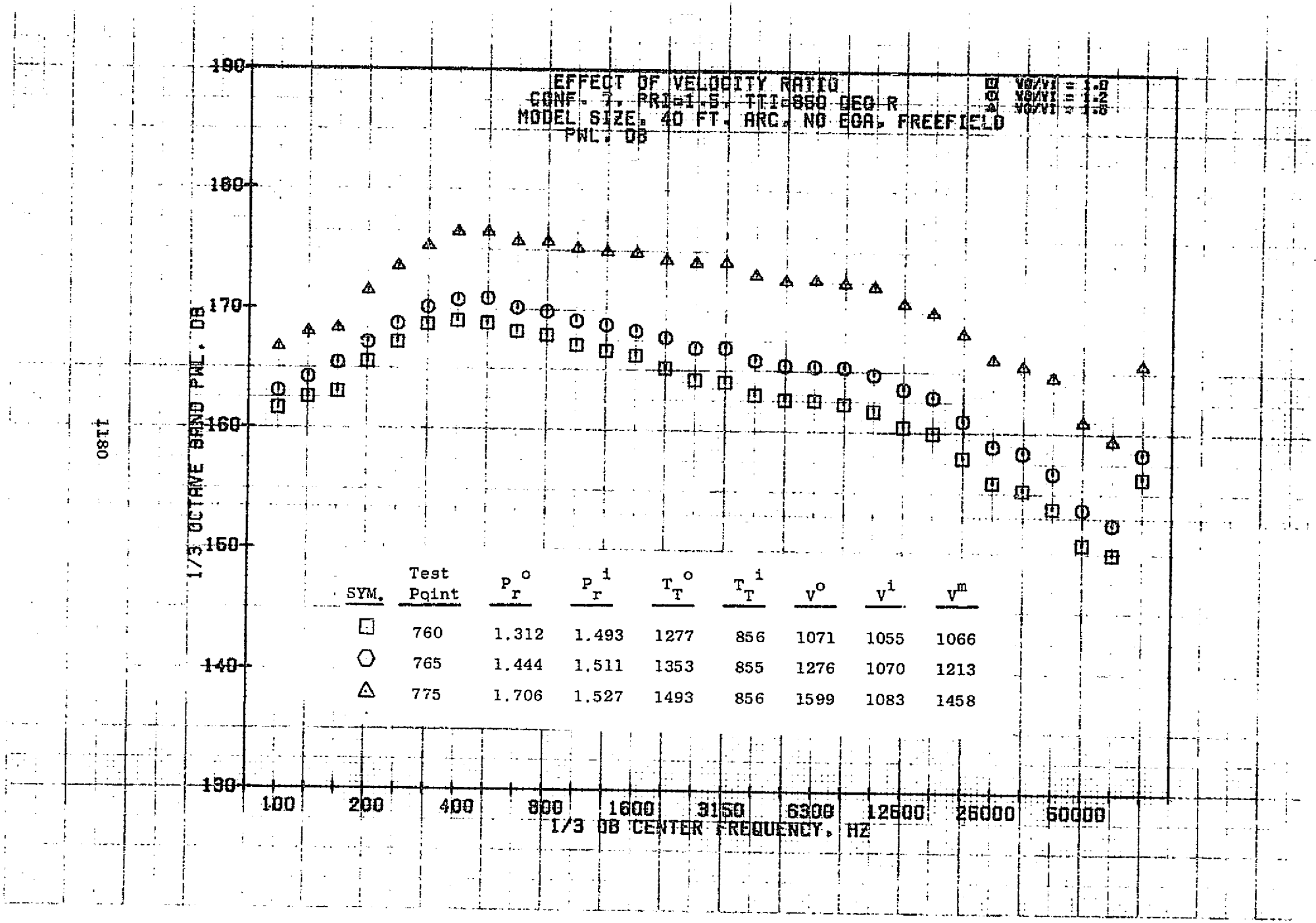
11/01/76
18421-001

79 BURCH A.



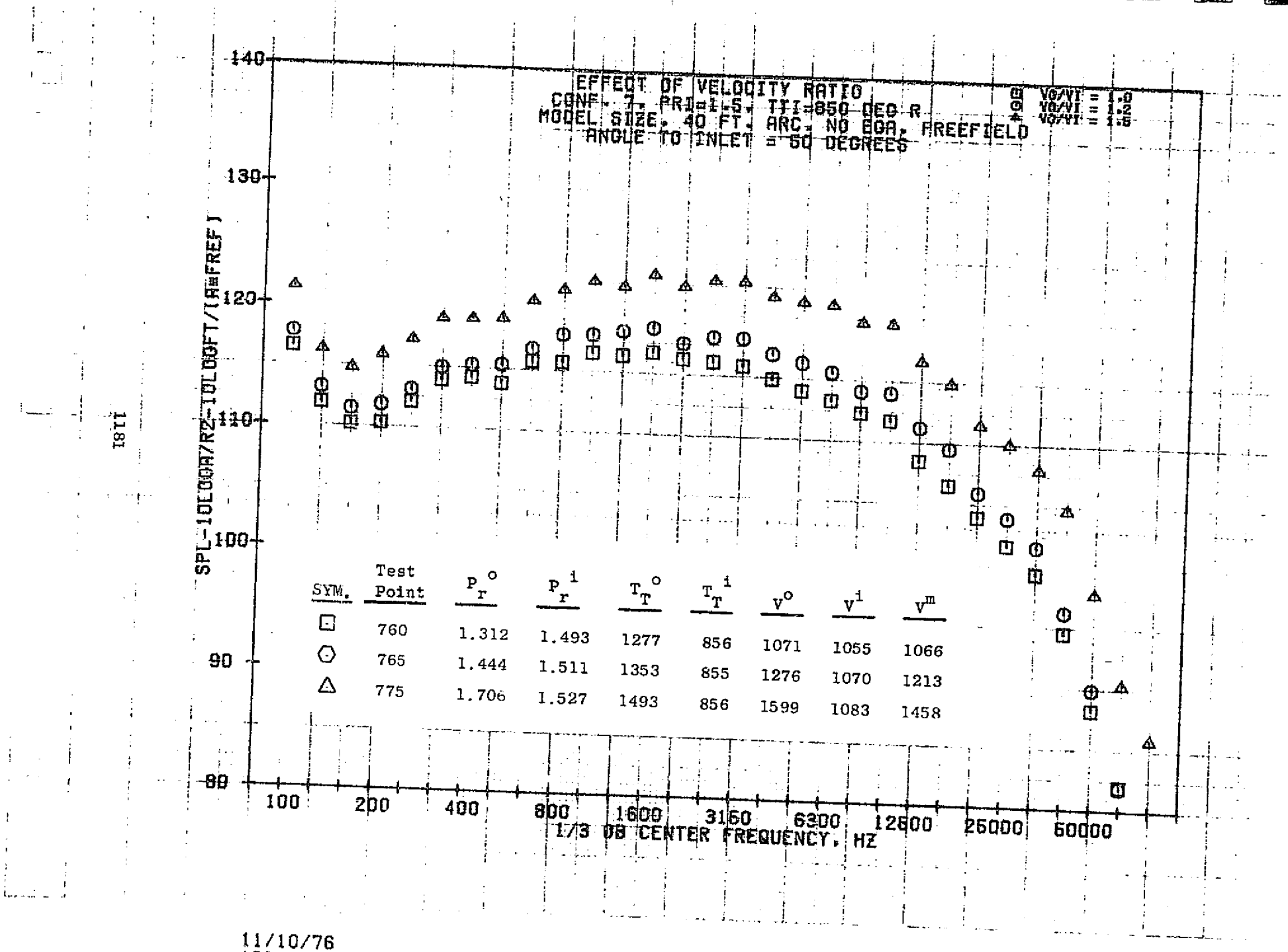
11/10/76
18048-001

79 BURCH A.



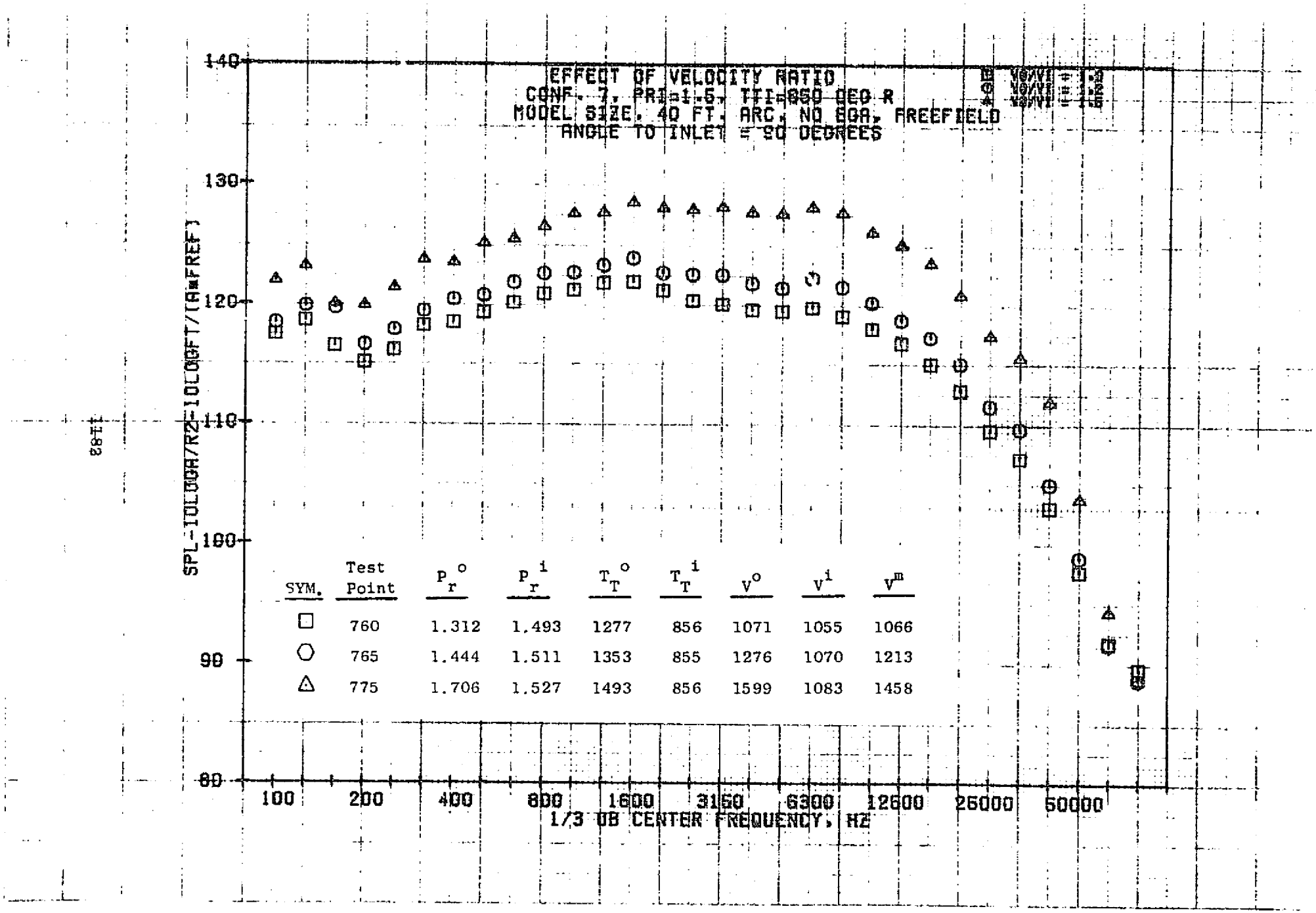
11/10/76
18048-001

79 BURCH A.



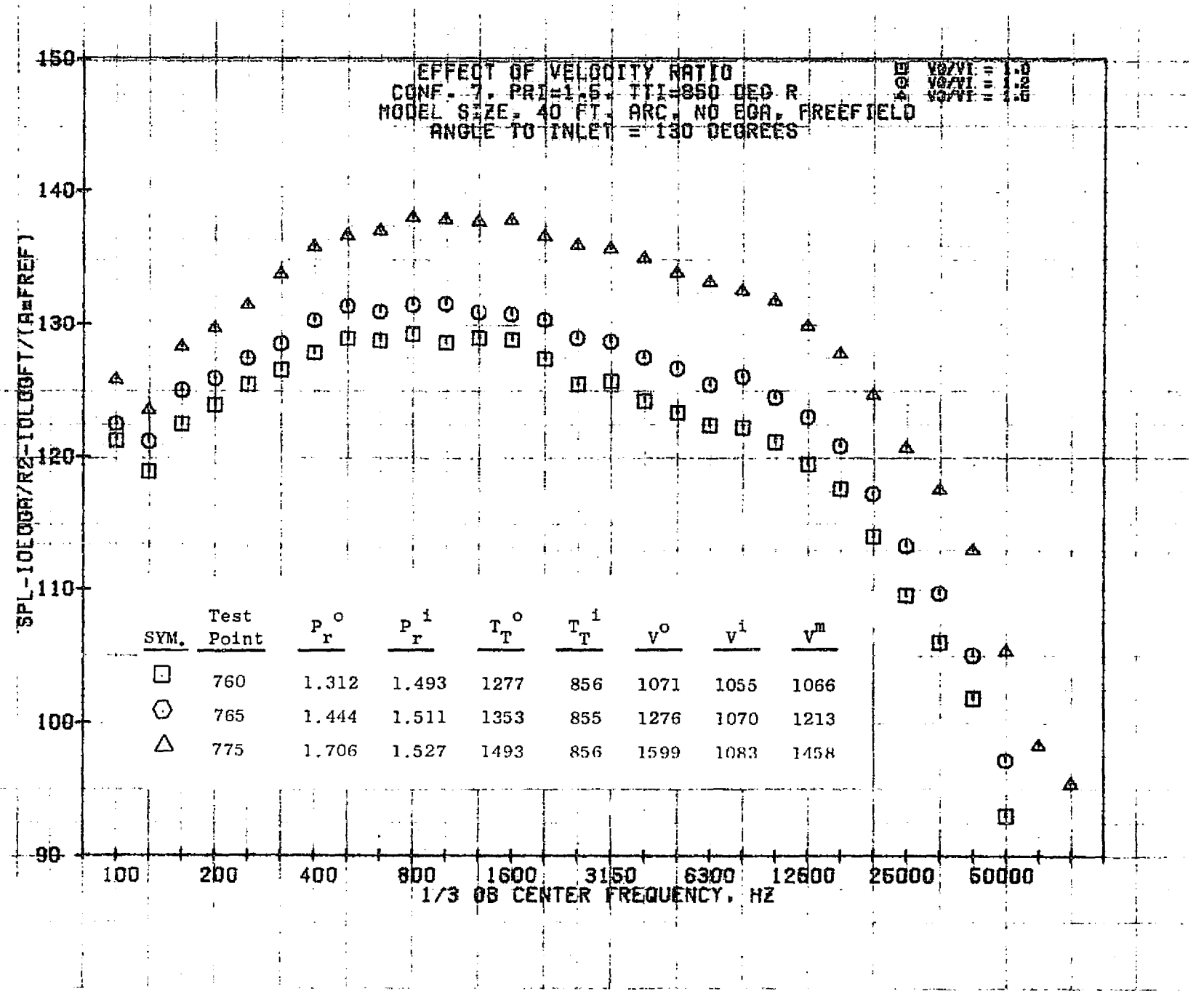
11/10/76
18048-001

79 BURCH A.



11/10/76
18048-001

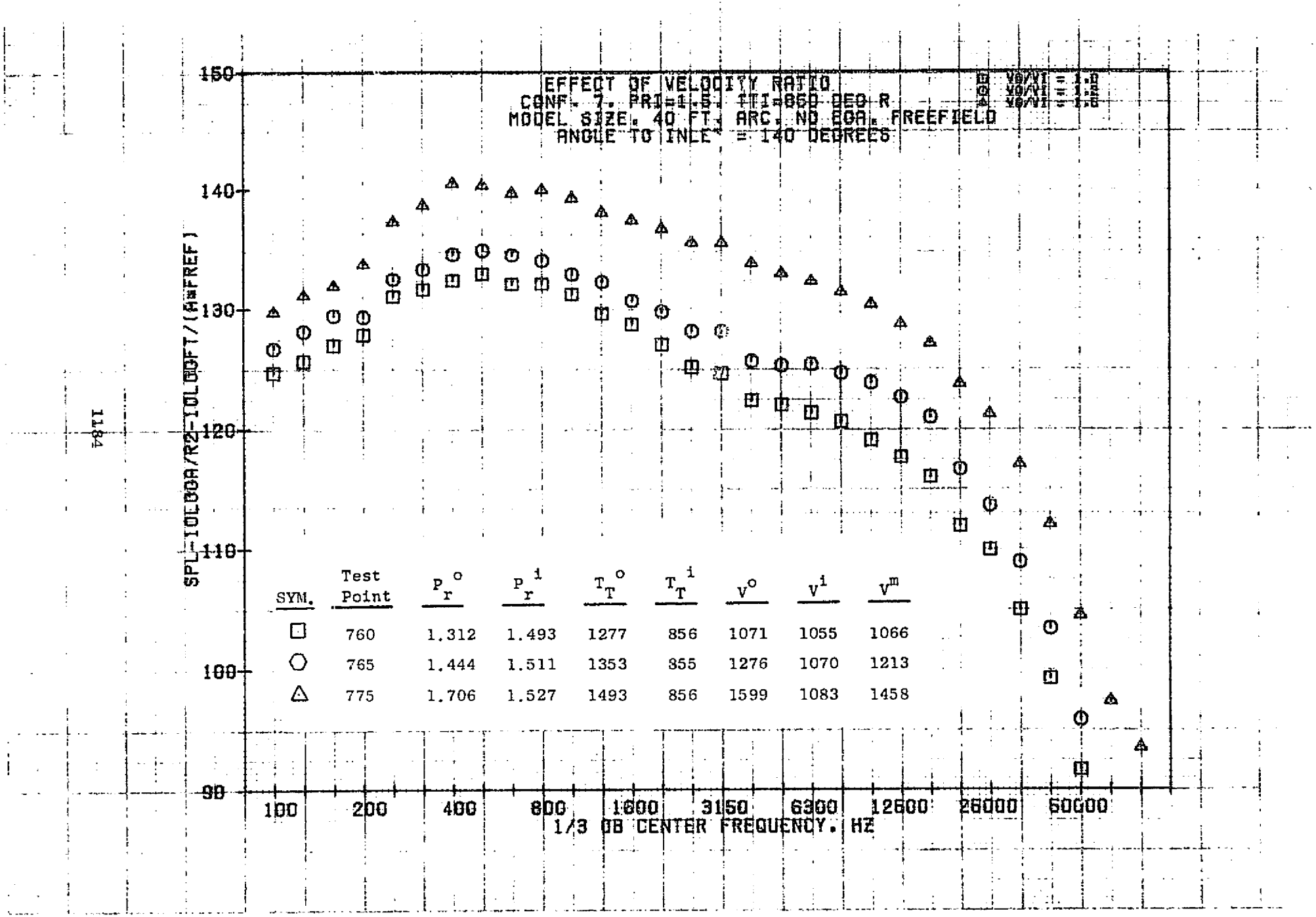
79 BURCH A.



1183

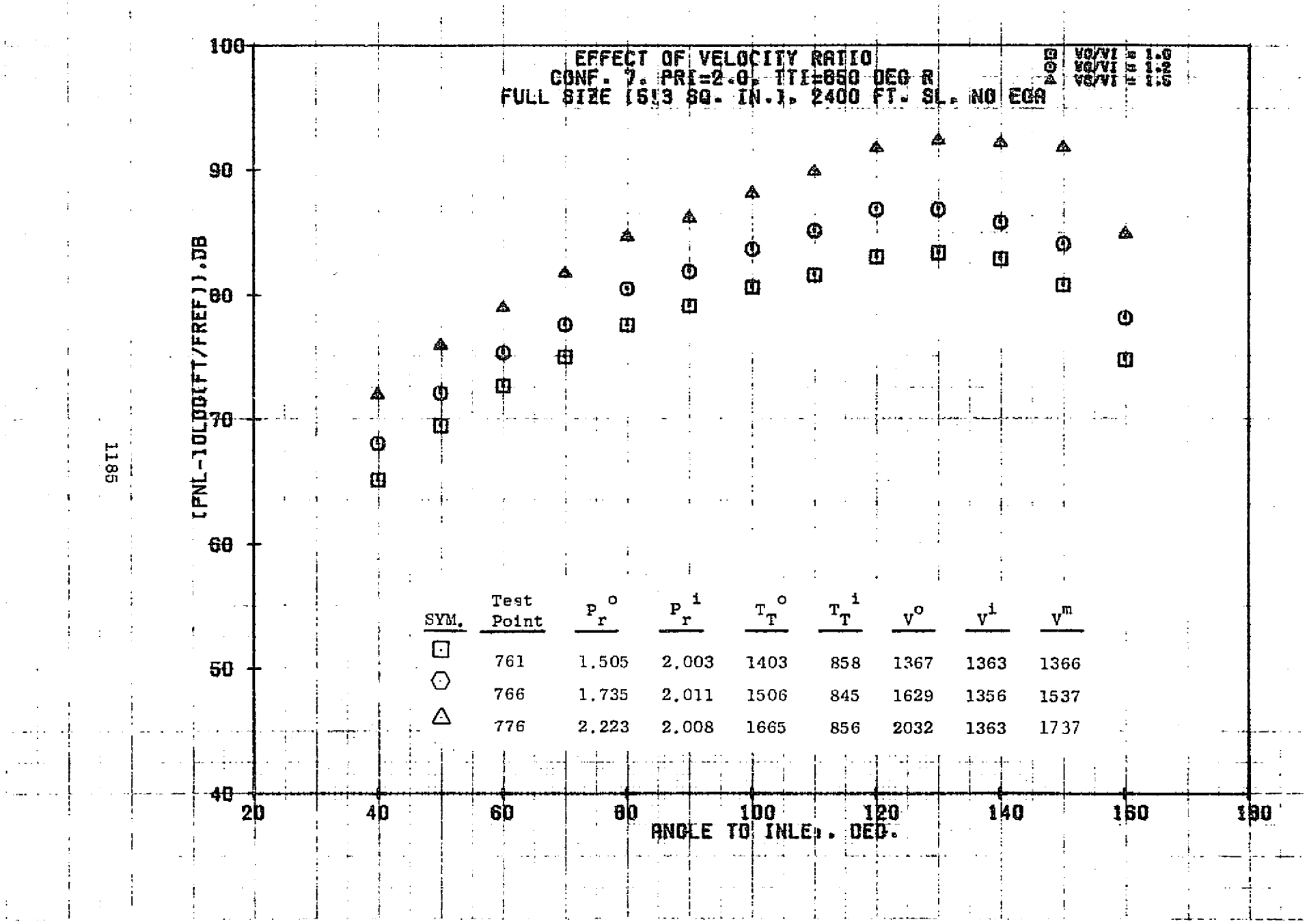
11/10/76
18048-001

79 BURCH A.



11/10/76
18048-001

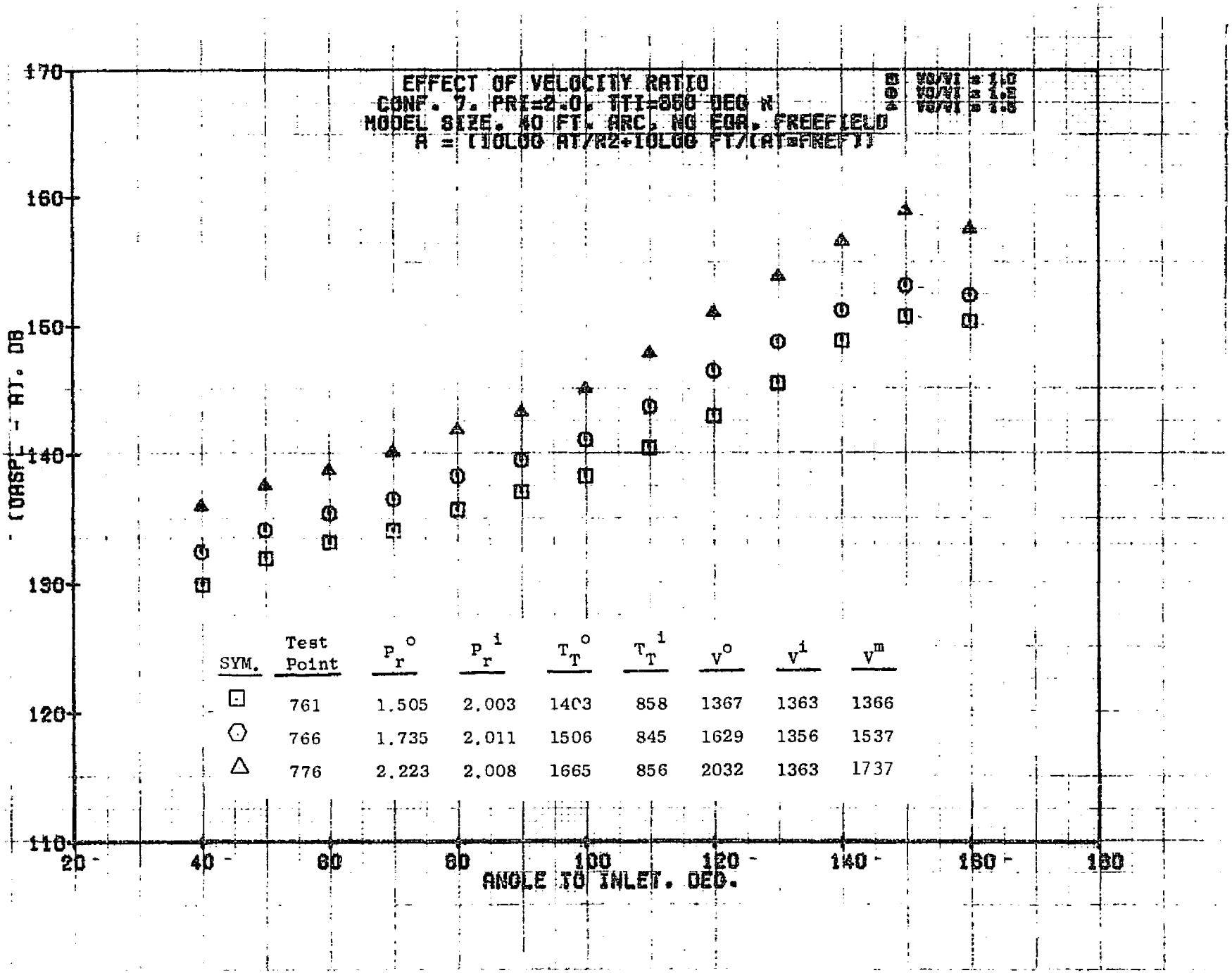
79 BURCH A.



1185

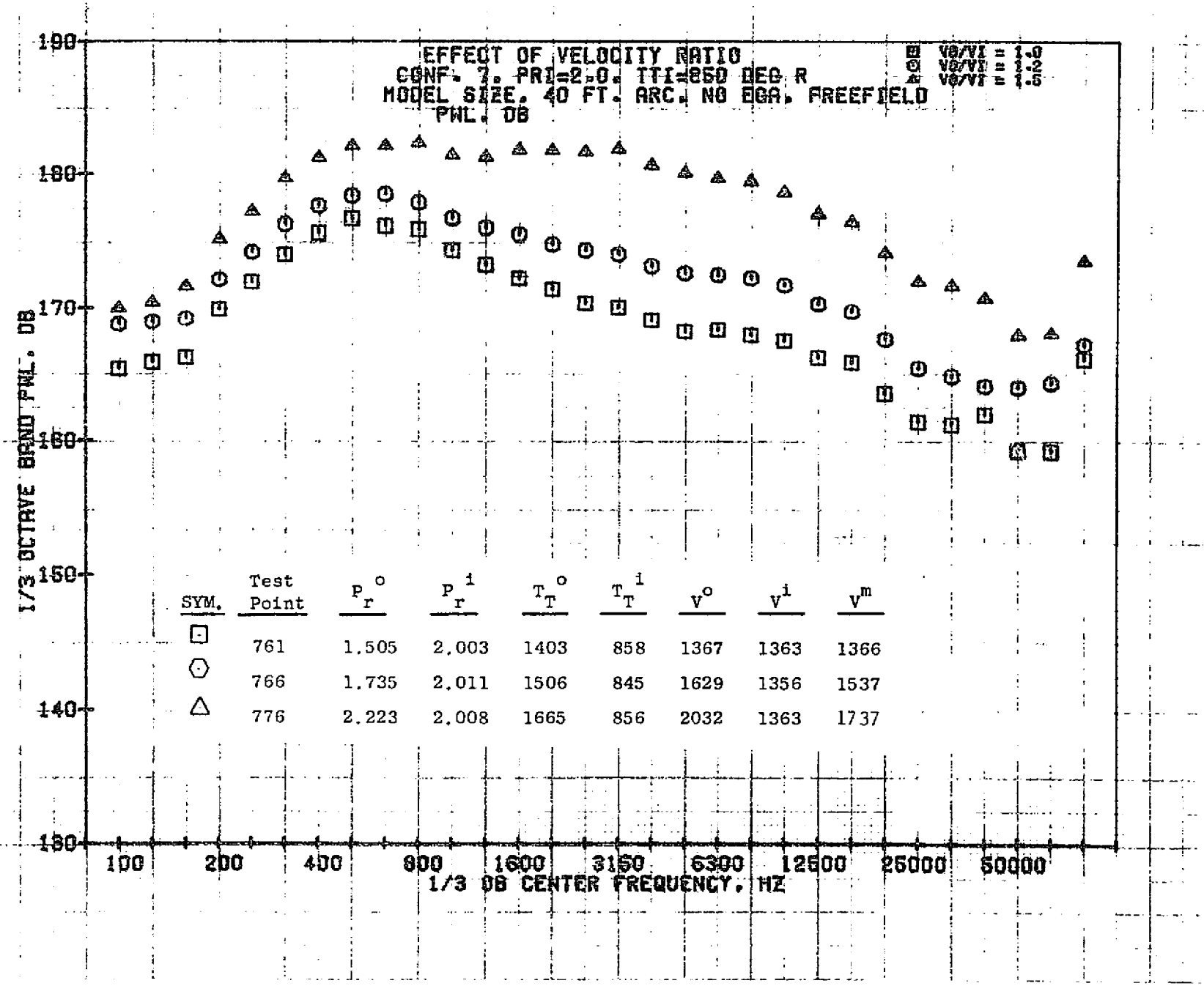
11/01/76
18421-001

79 BURCH A.



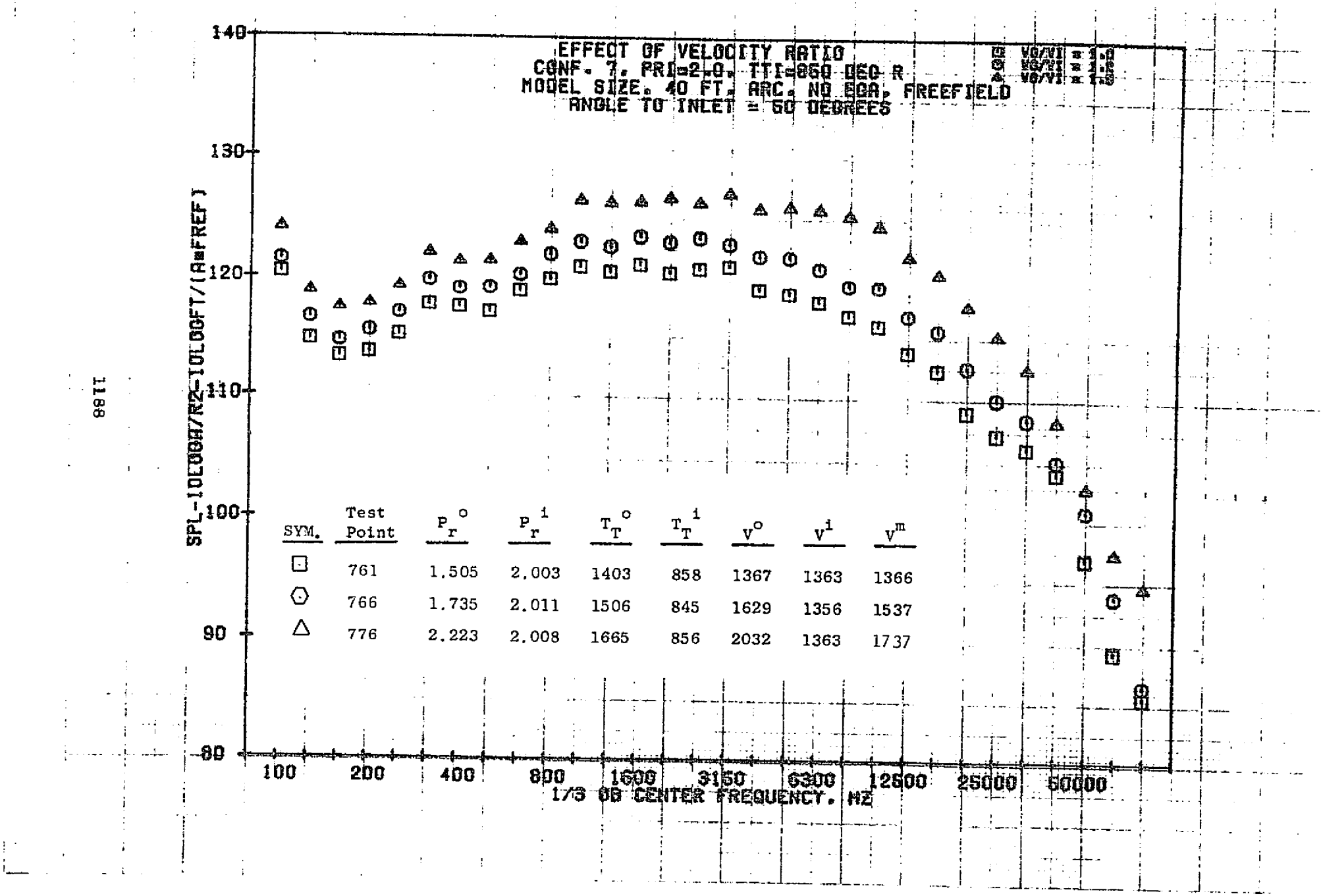
1186

11/09/76
18998-001



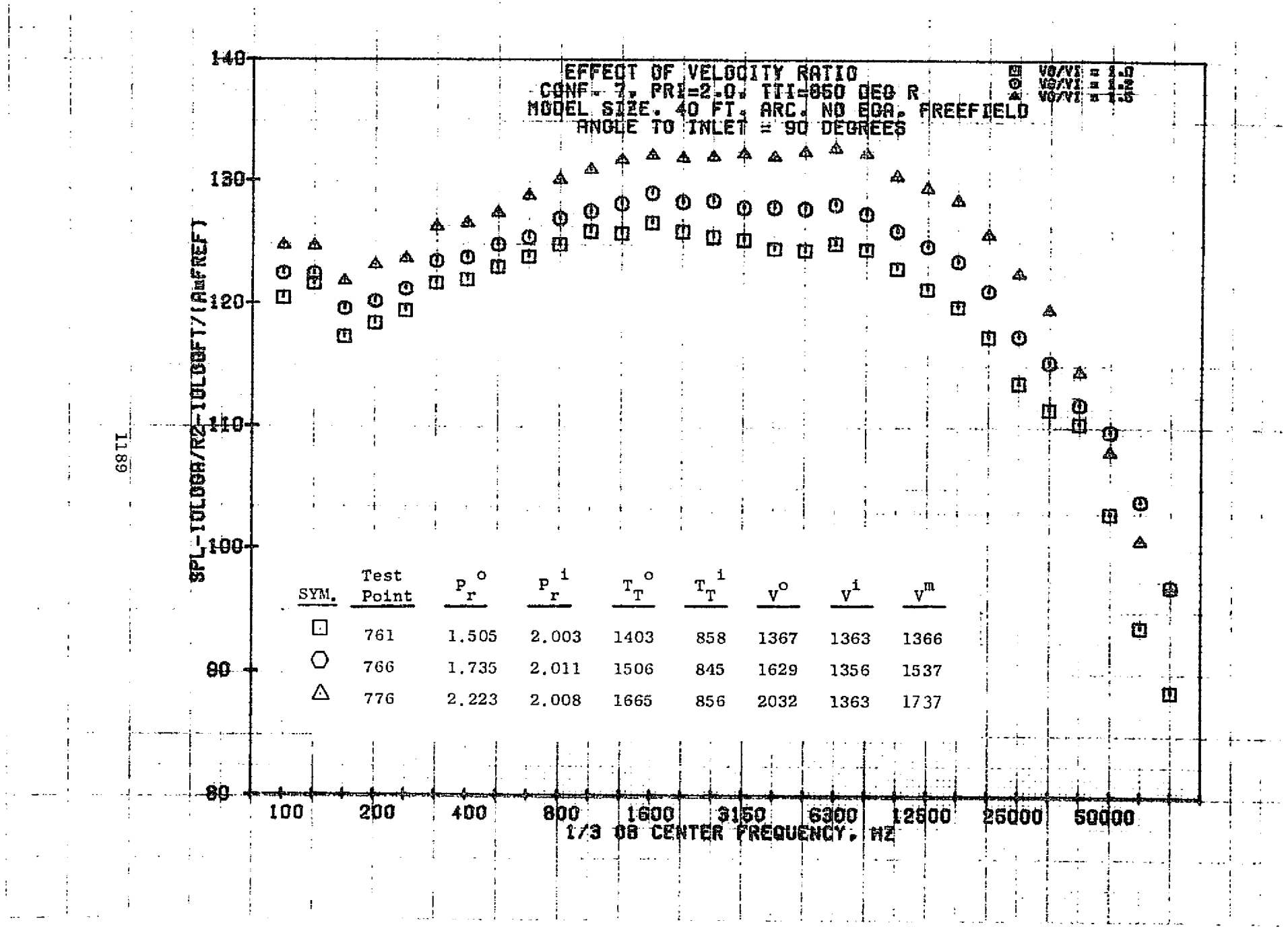
11/03/76
18575-001

79 BURCH A.



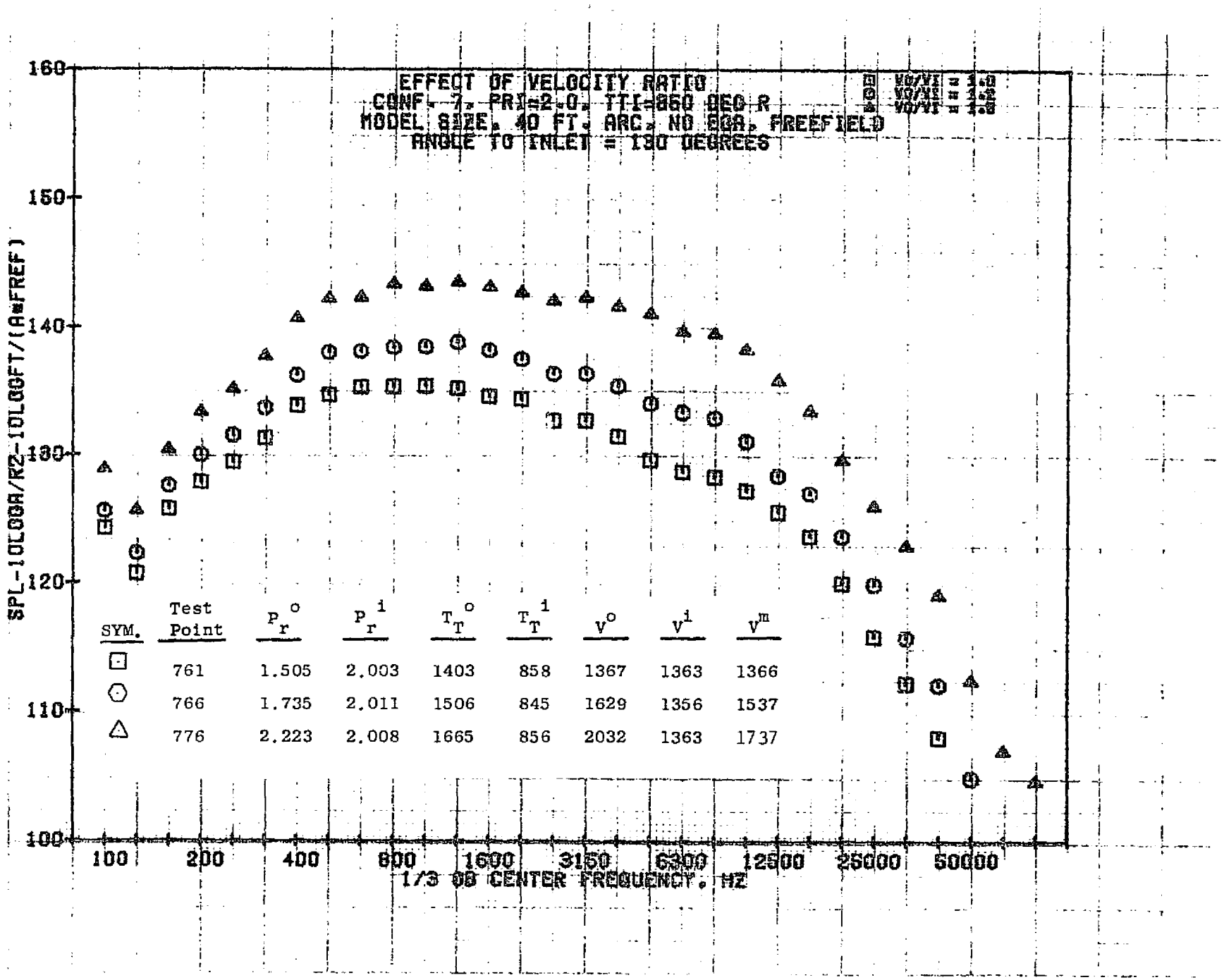
11/03/76
18675-001

79 BURCH A.



11/03/76
18575-001

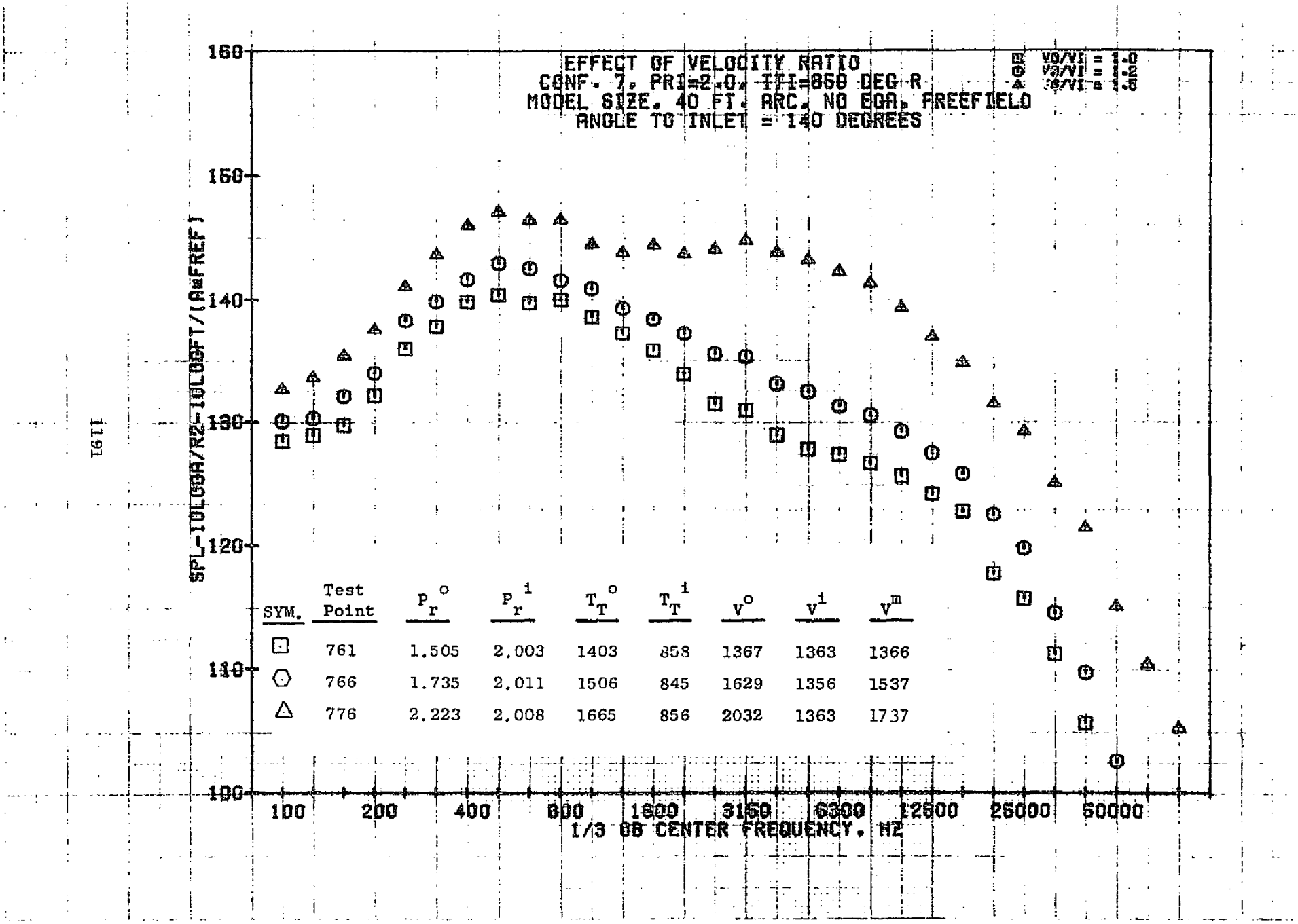
79 BURCH A.



1190

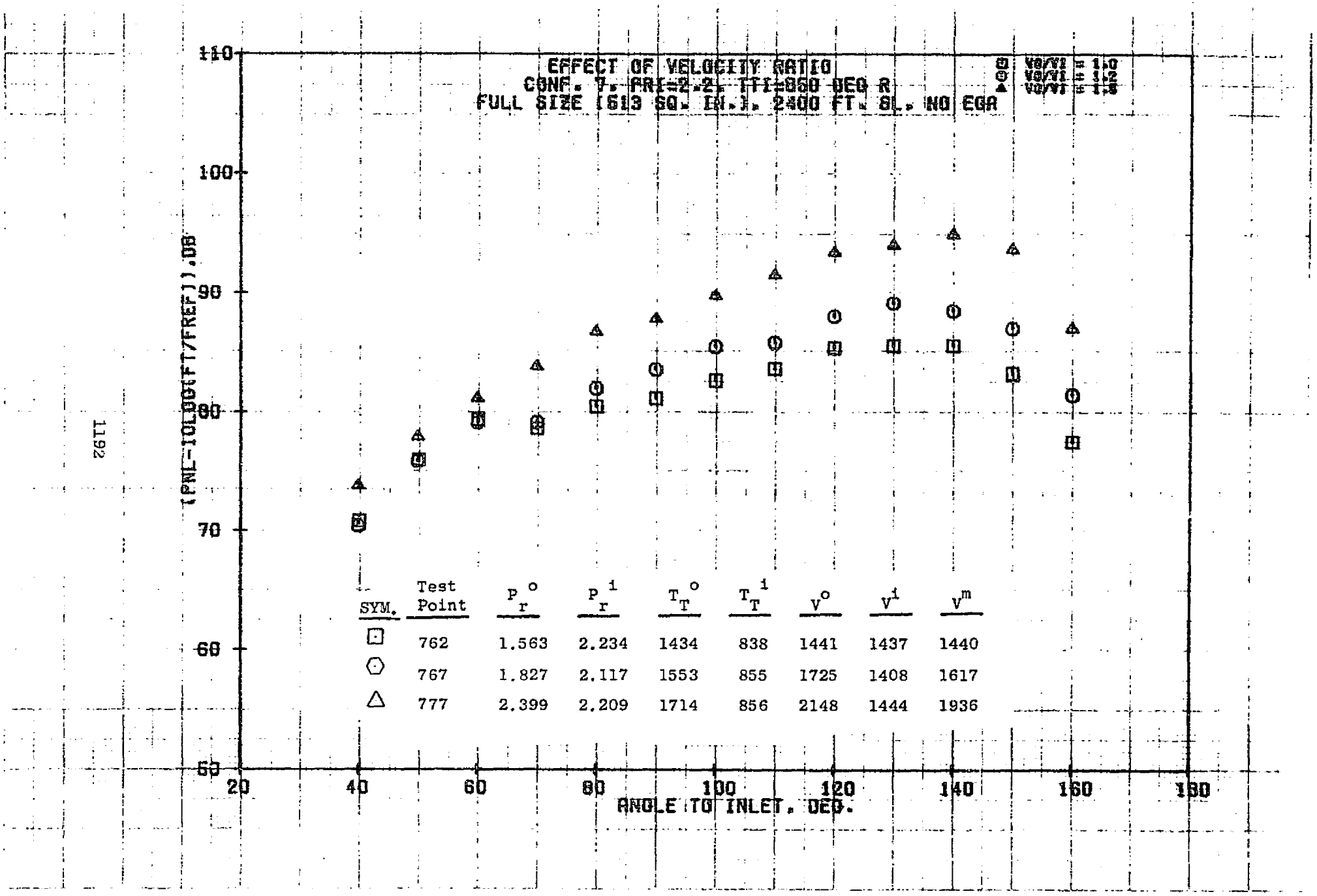
11/03/76
18675-001

79 BURCH A.



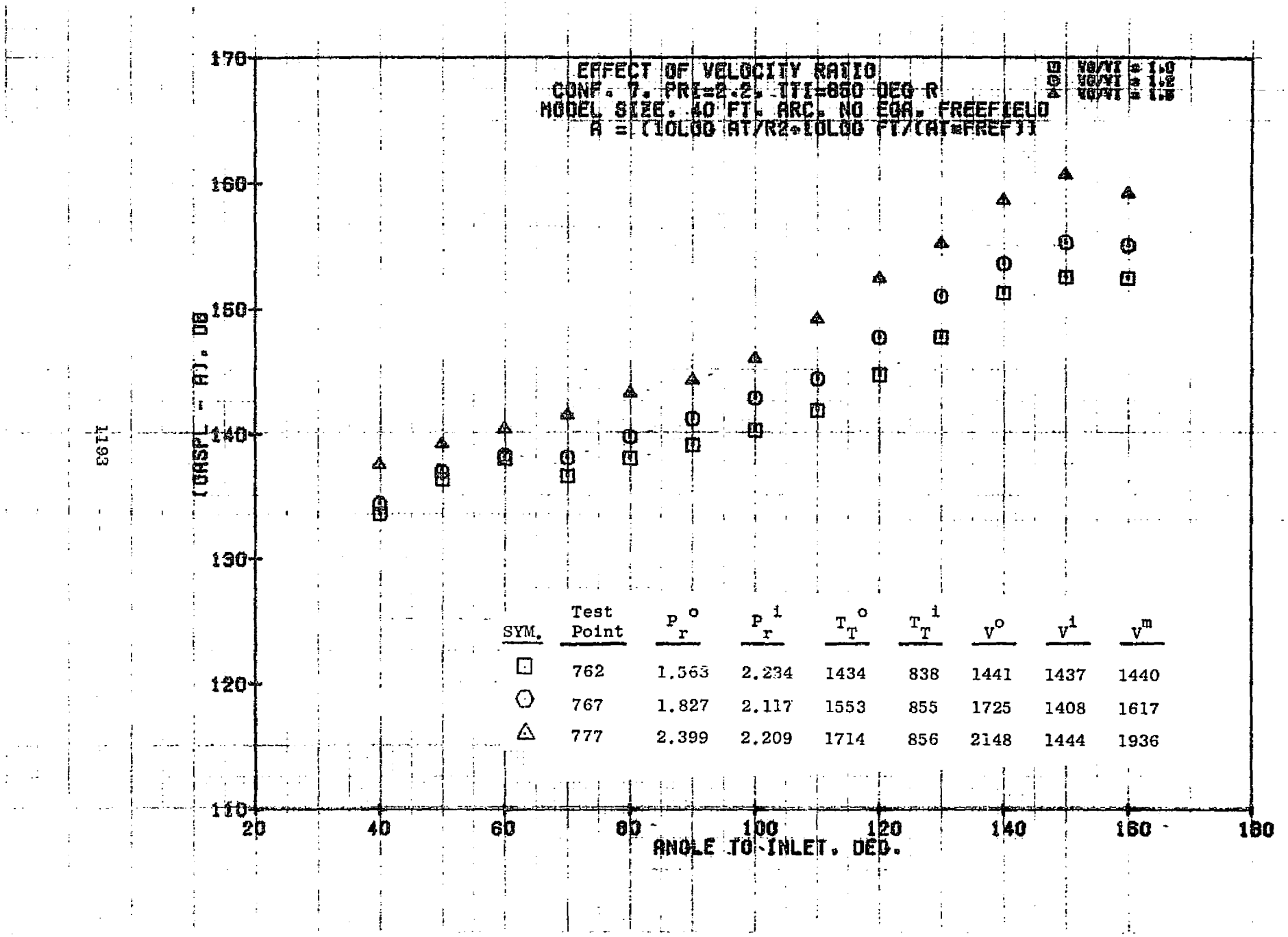
11/03/76
18575-001

79 BURCH A.



11/01/76
18421-001

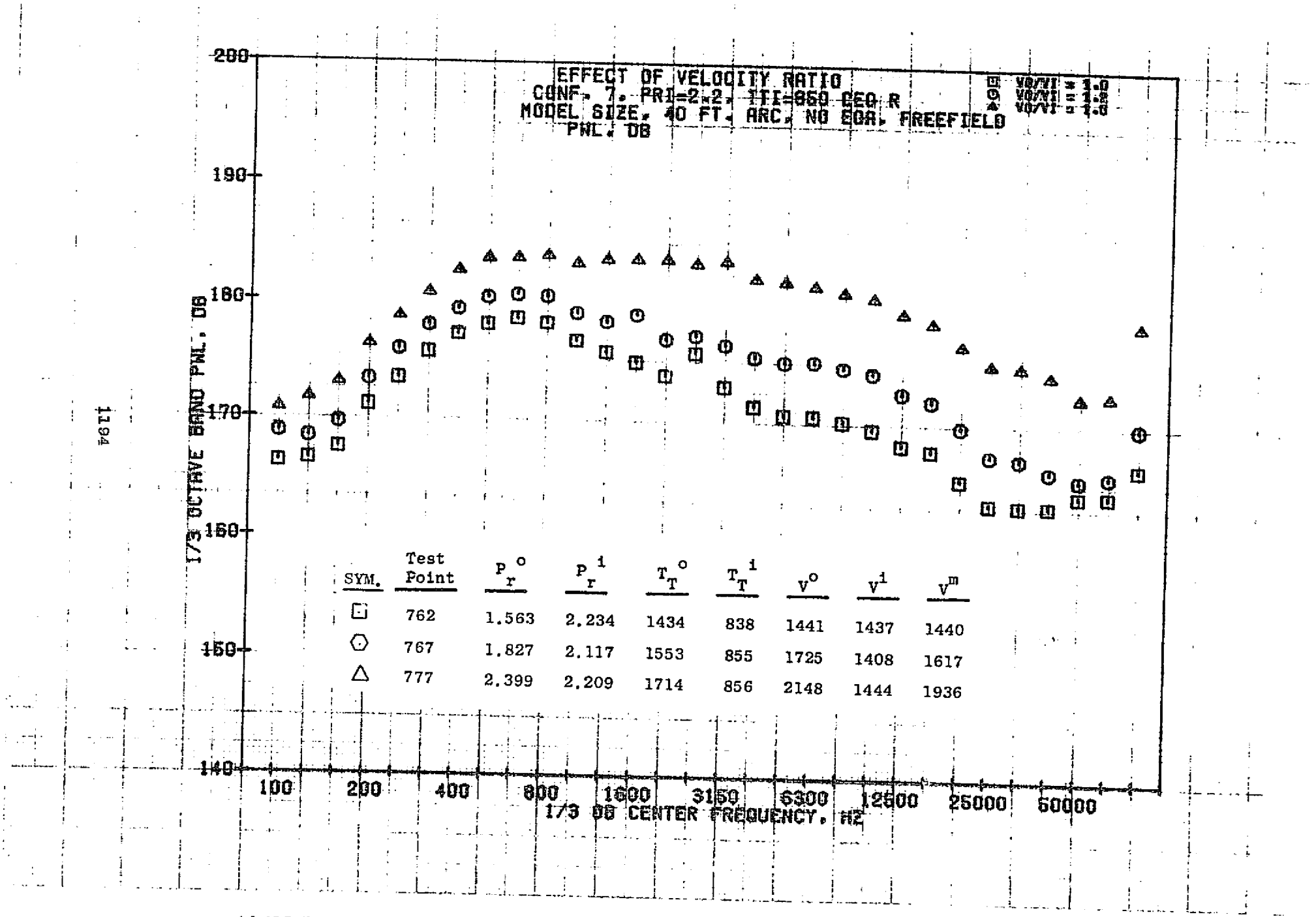
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	762	1.563	2.234	1434	838	1441	1437	1440
○	767	1.827	2.117	1553	855	1725	1408	1617
△	777	2.399	2.209	1714	856	2148	1444	1936

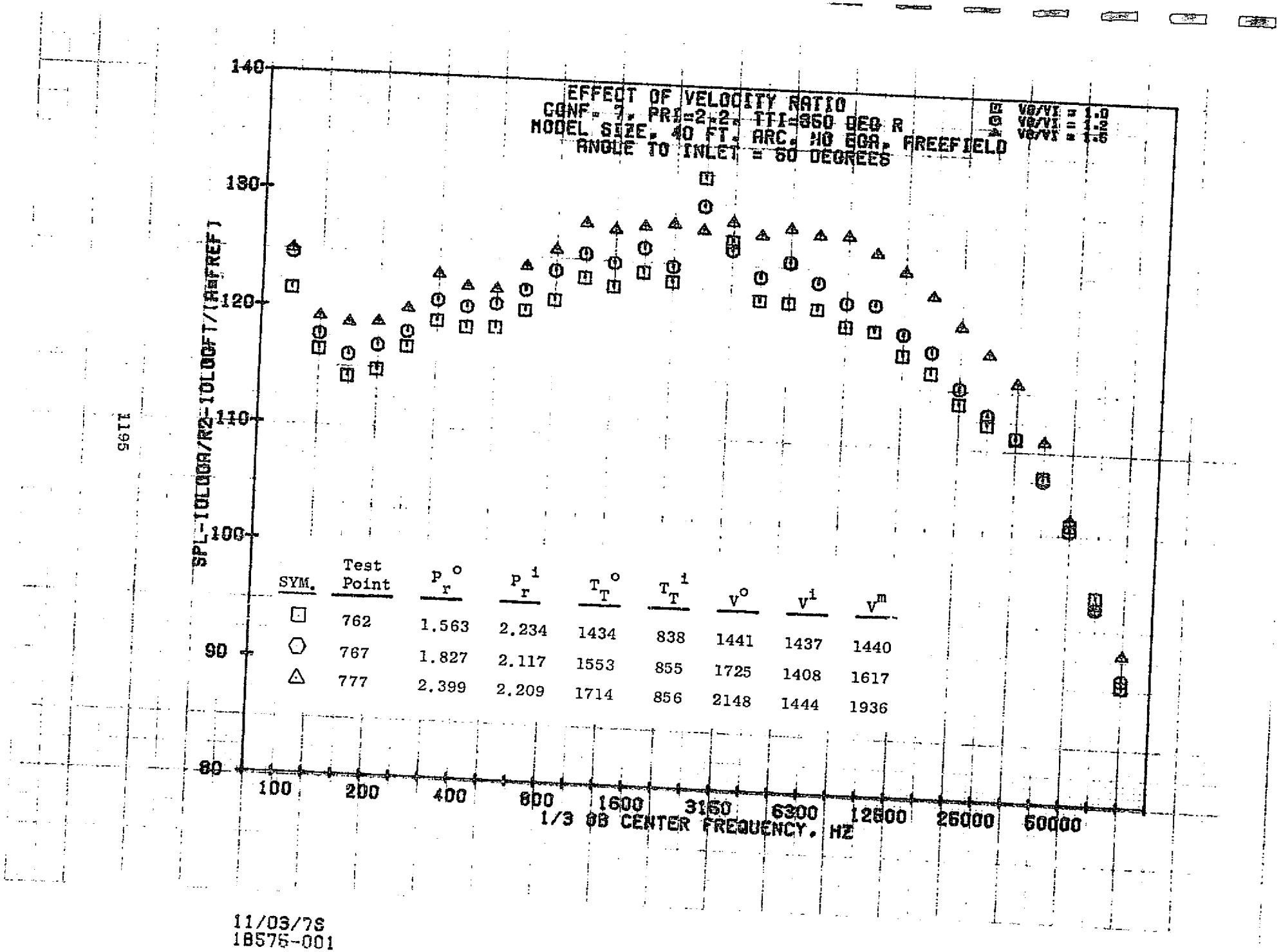
11/09/76
18938-001

79 AUBCH 0.



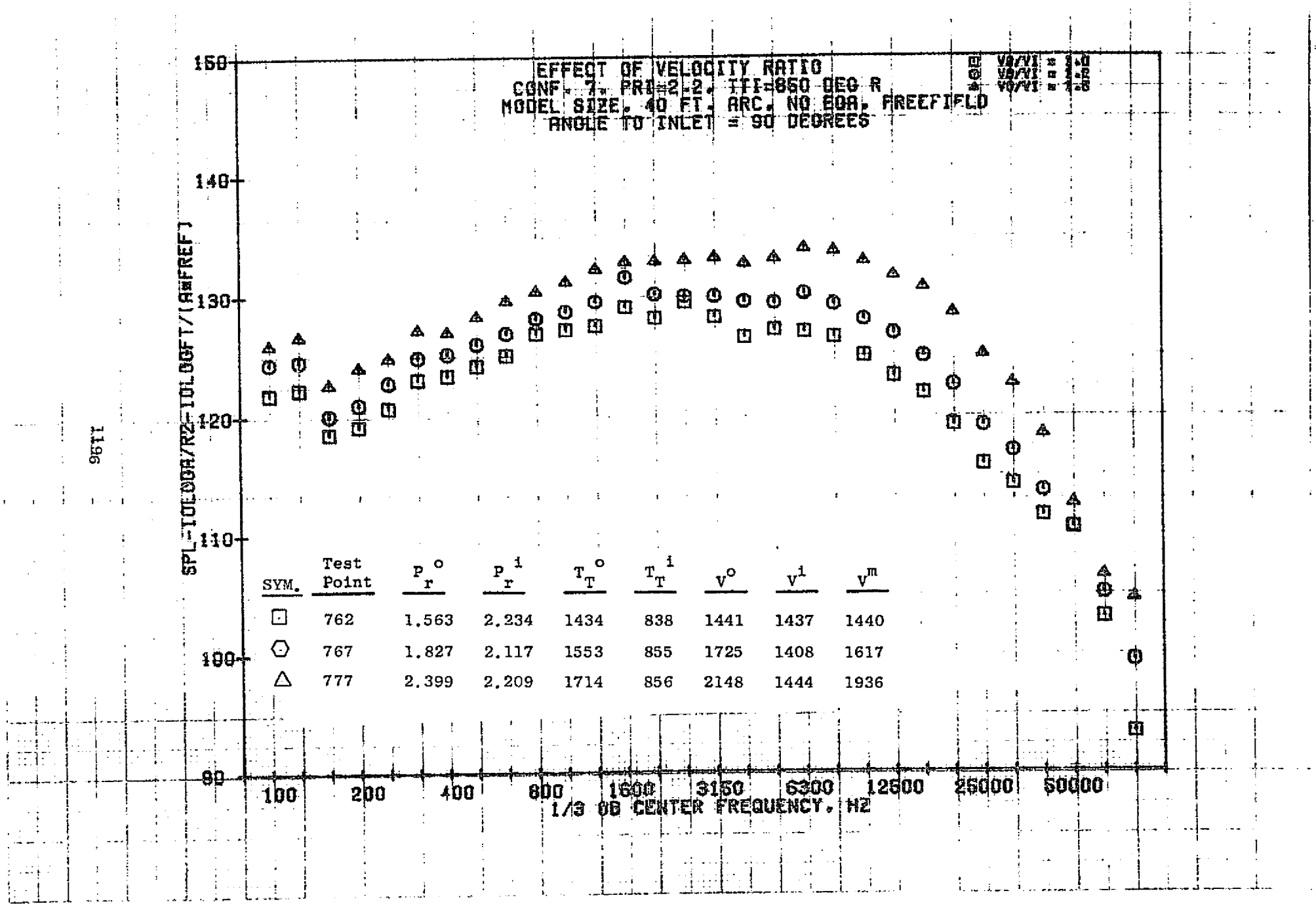
11/03/76
18575-001

79 BURCH A.



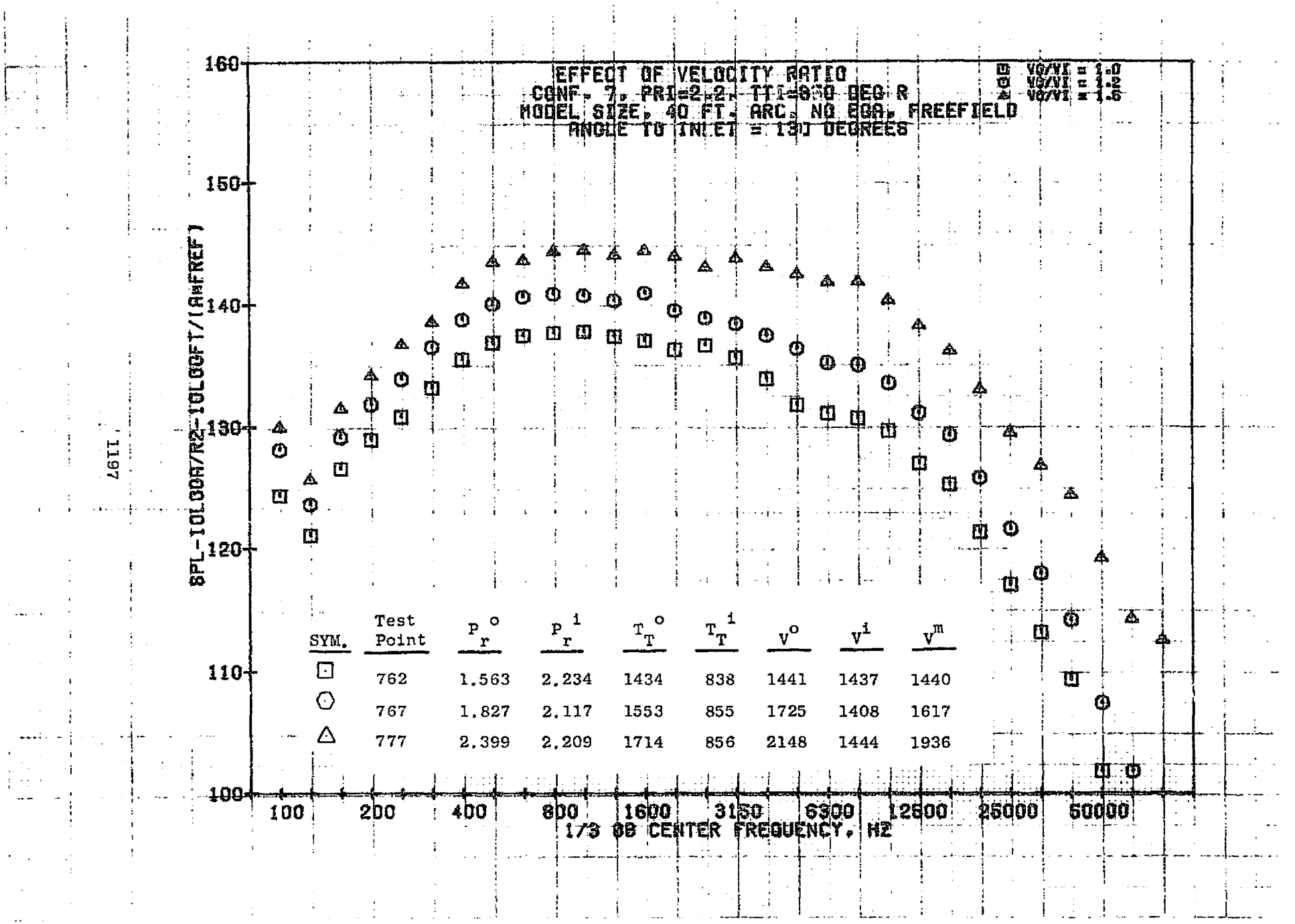
11/03/78
18575-001

79 BURCH A.



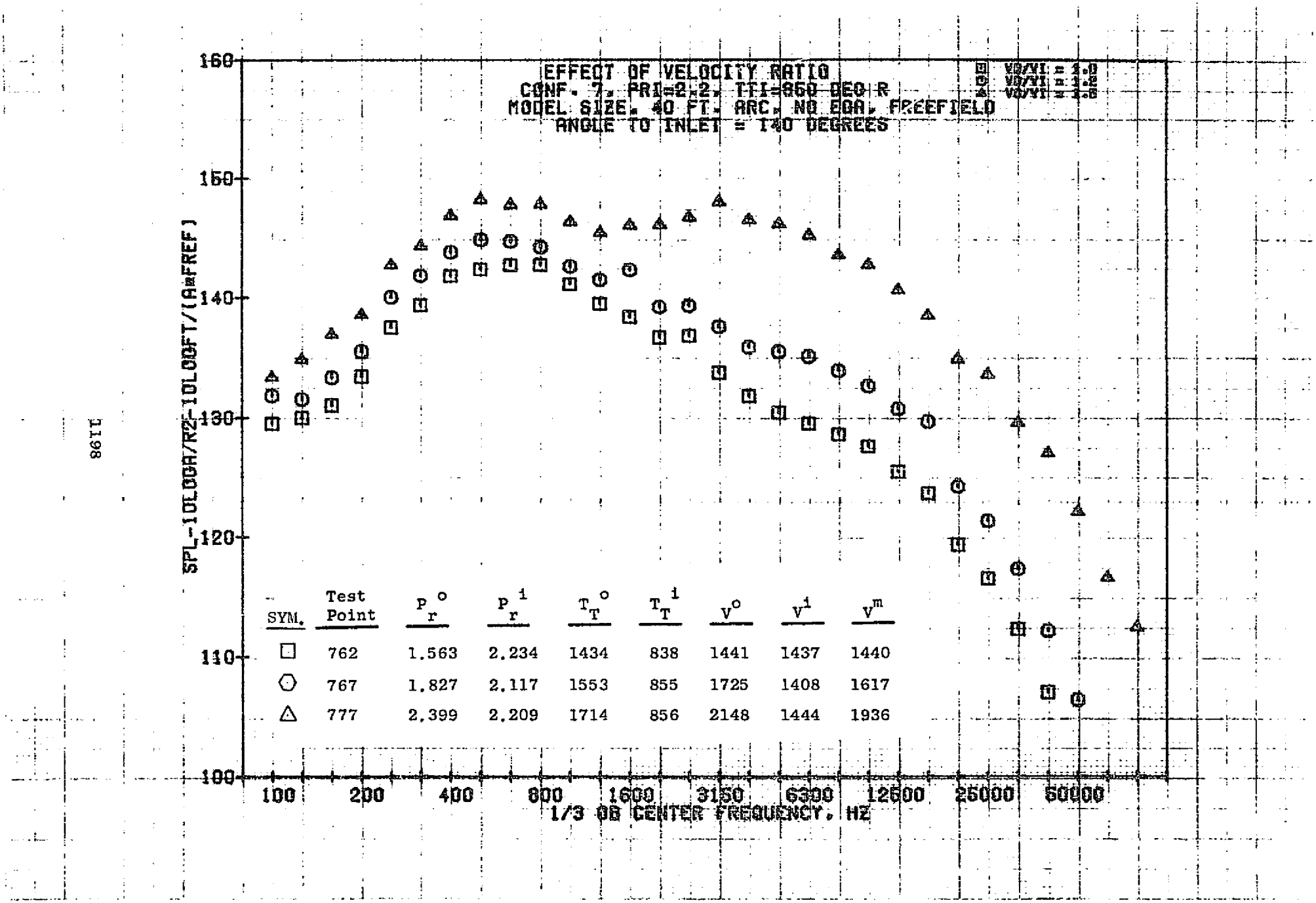
11/03/76
1B575-001

79 BURCH A.



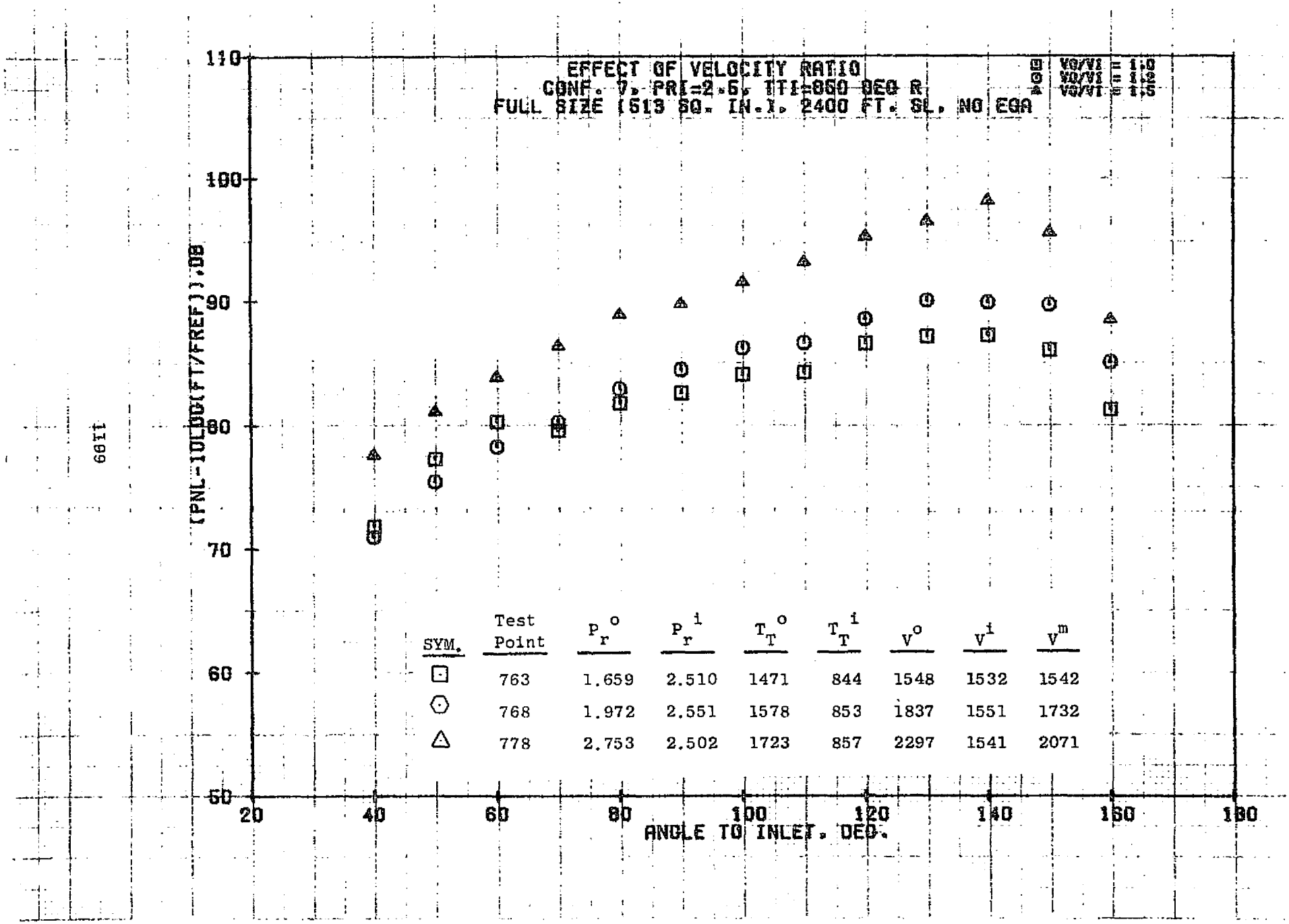
11/03/'7o
18575-001

79 BURCH A.



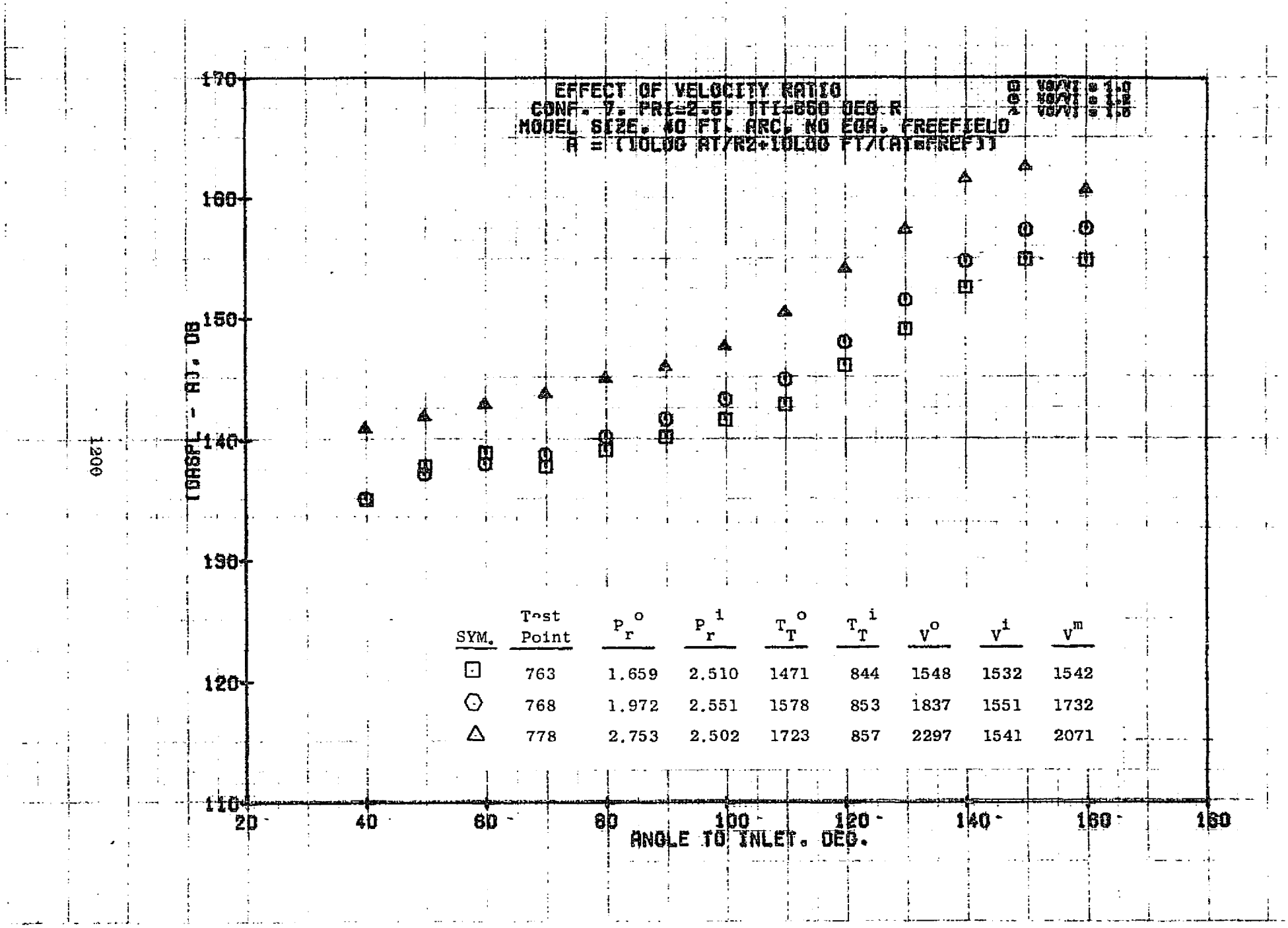
11/03/76
18575-001

79 BURCH A.



11/01/76
18421-001

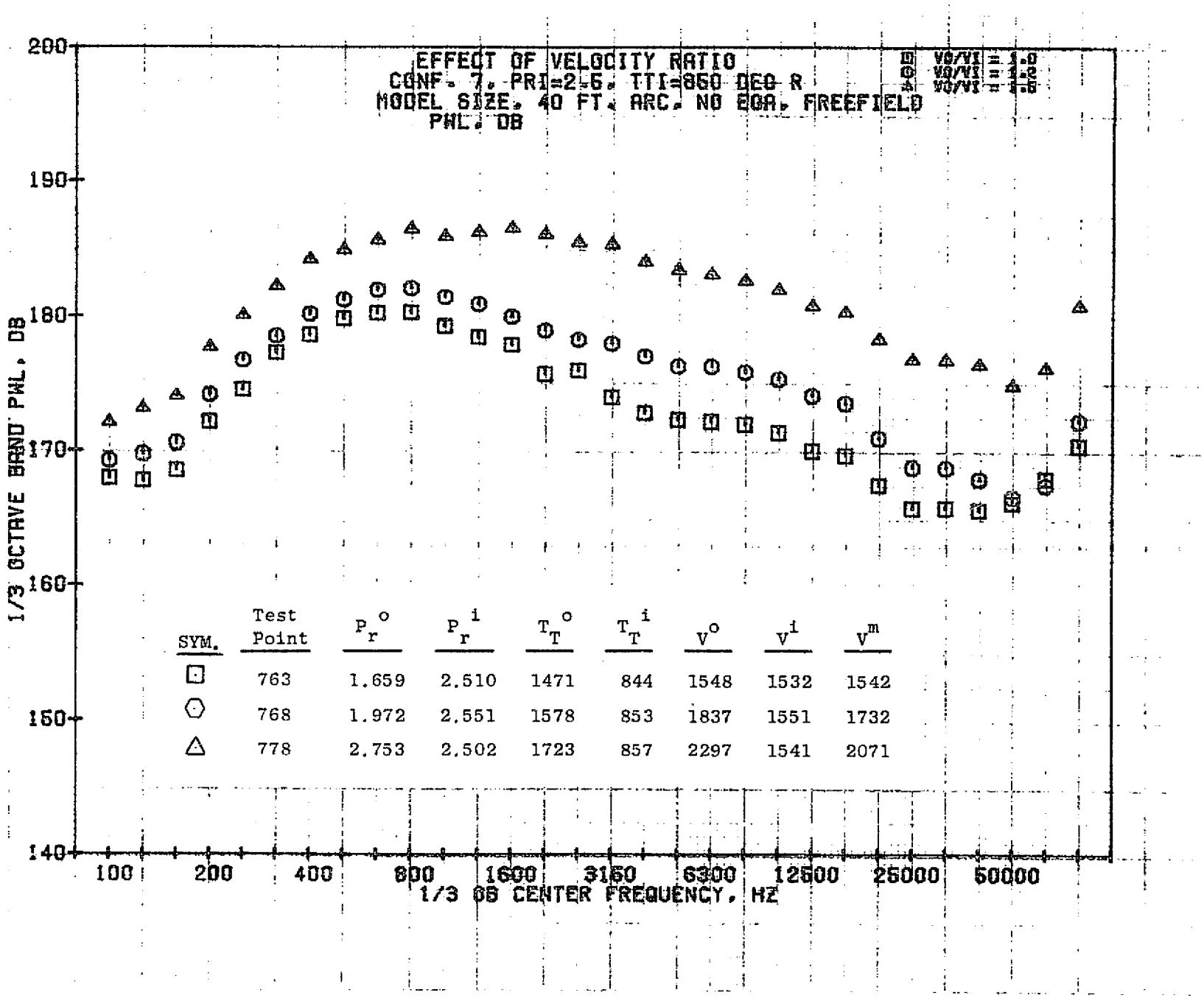
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	763	1.659	2.510	1471	844	1548	1532	1542
○	768	1.972	2.551	1578	853	1837	1551	1732
△	778	2.753	2.502	1723	857	2297	1541	2071

11/09/76
18336-001

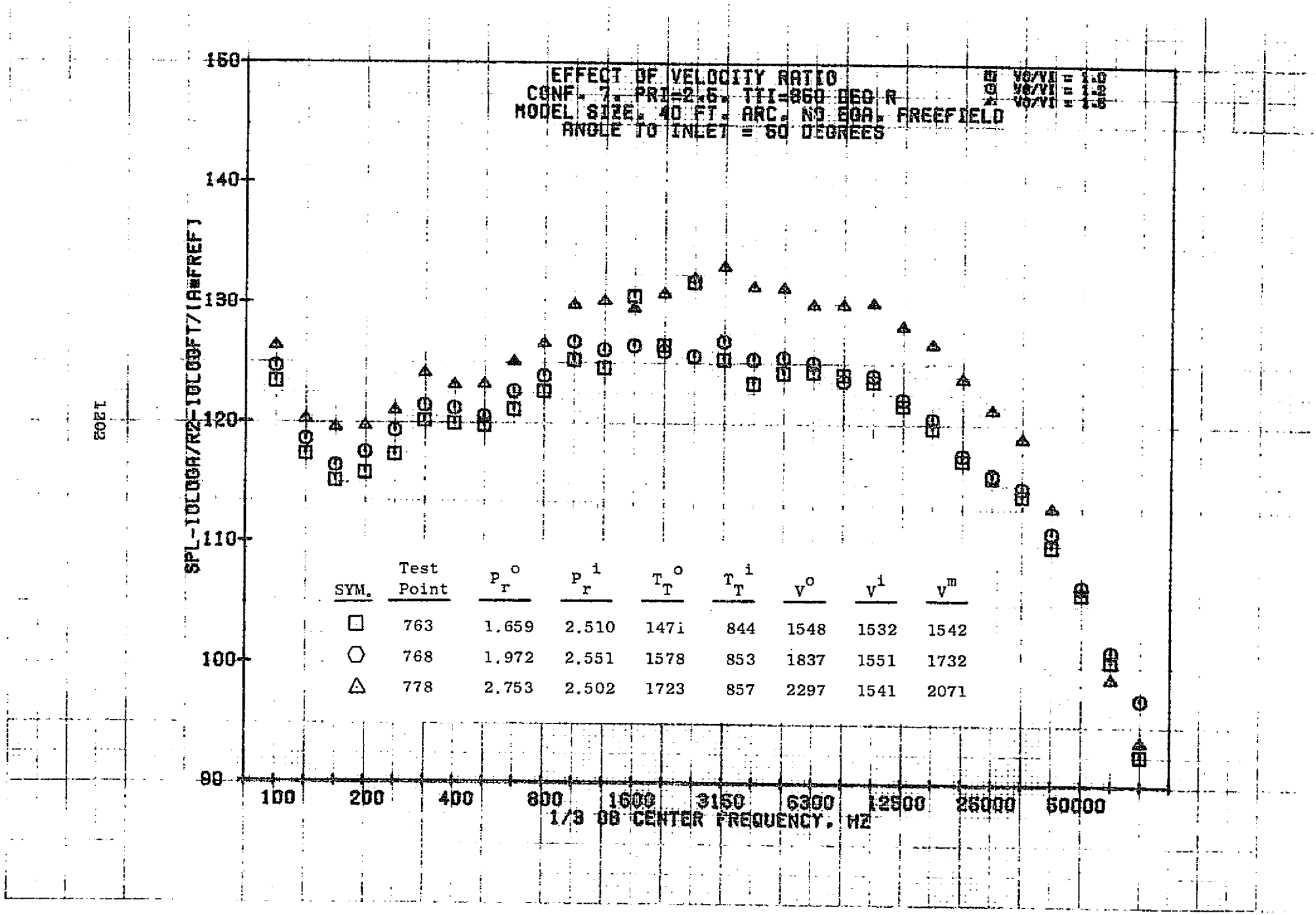
79 AIRCH A.



1201

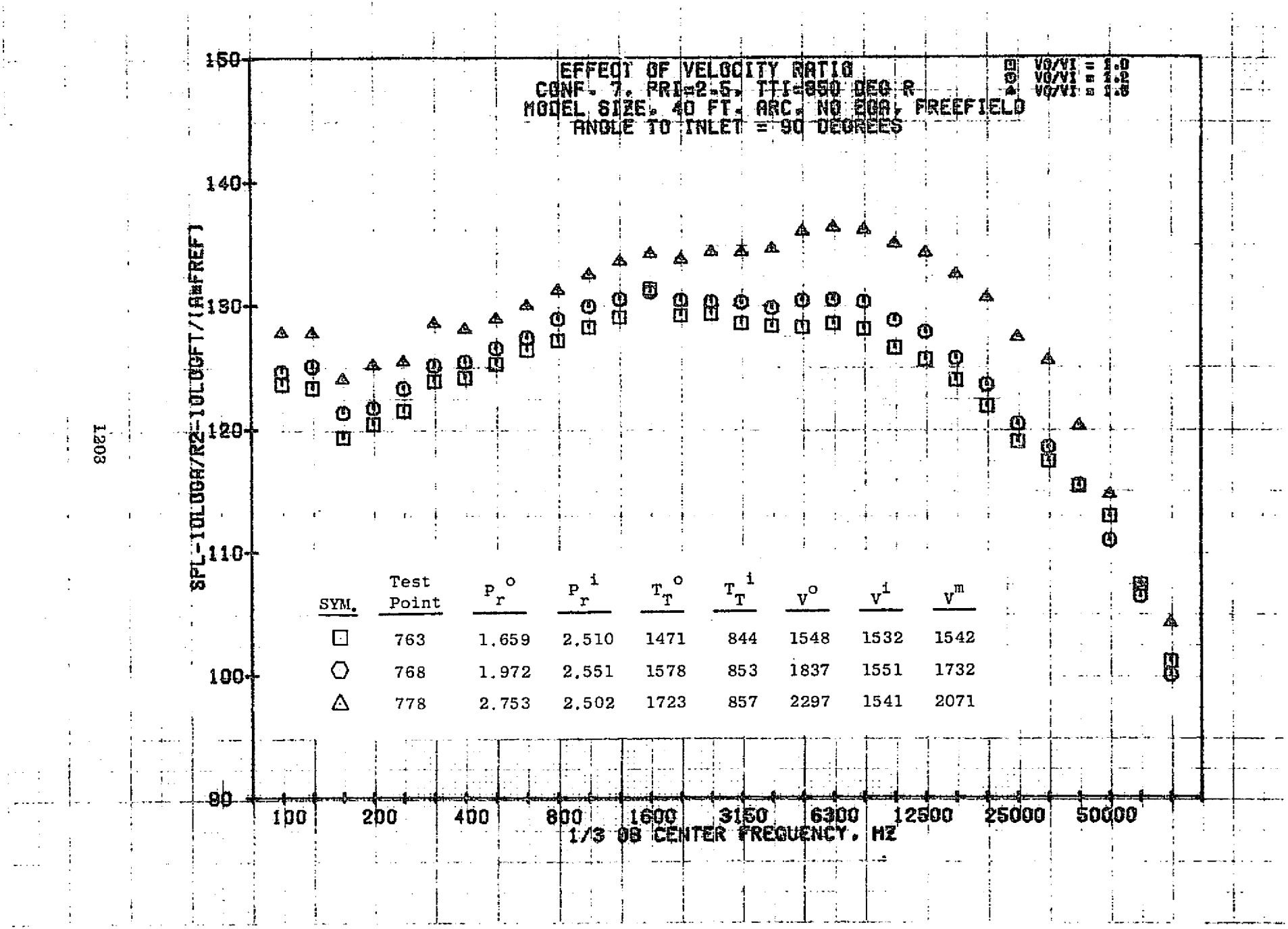
11/03/76
18575-001

79 BURCH A.



11/03/76
18575-001

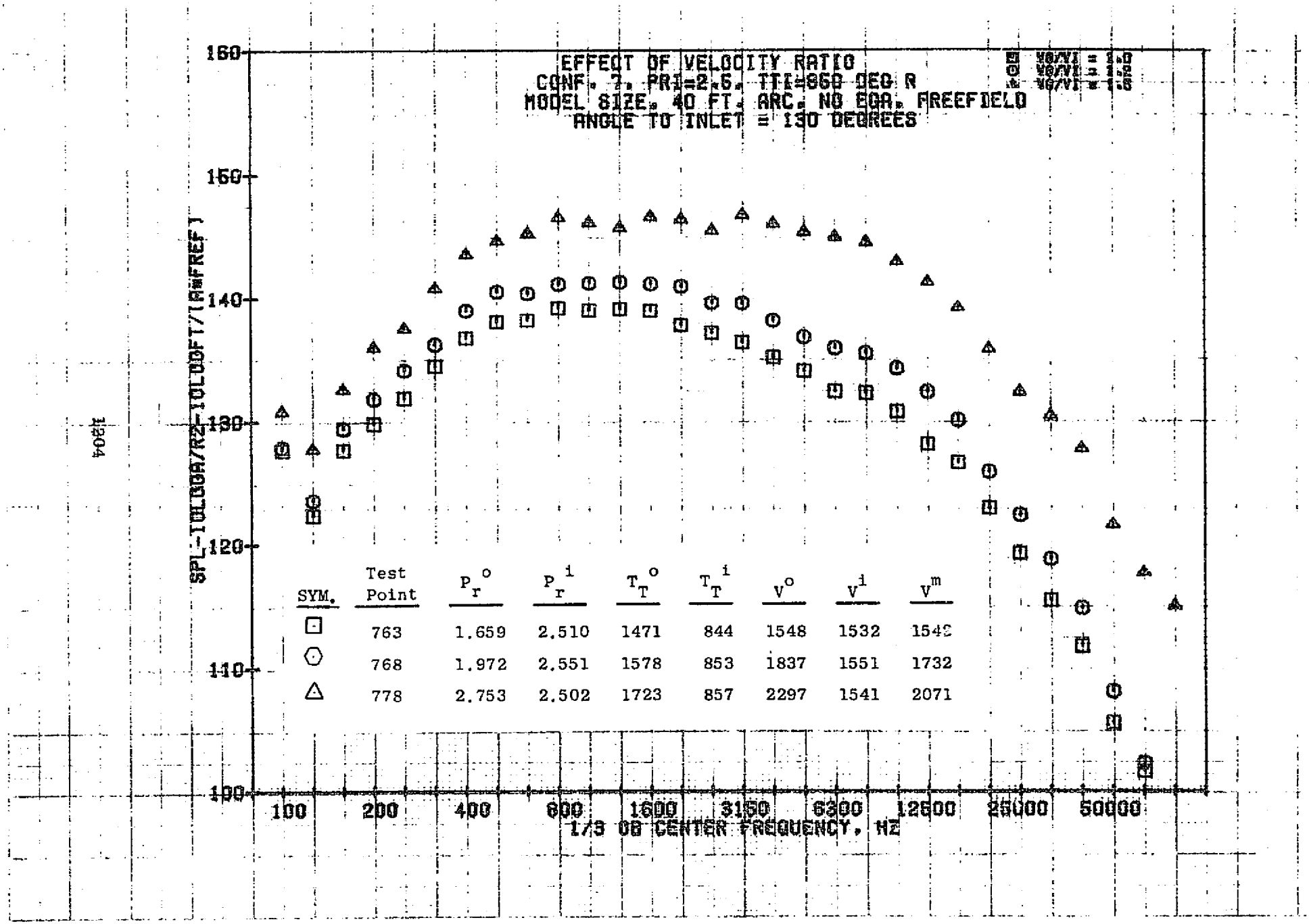
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	763	1.659	2.510	1471	844	1548	1532	1542
⬡	768	1.972	2.551	1578	853	1837	1551	1732
△	778	2.753	2.502	1723	857	2297	1541	2071

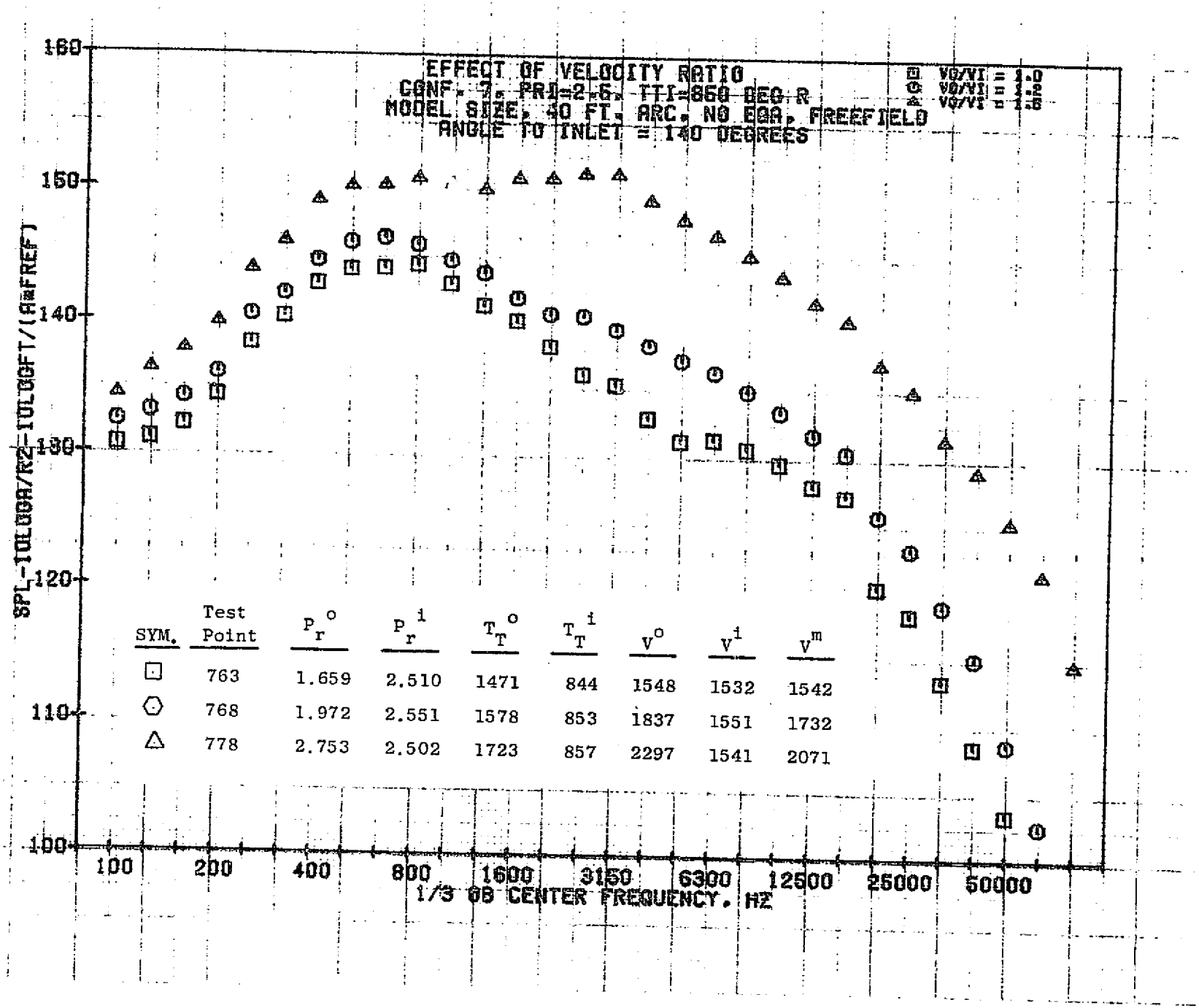
11/03/76
1B575-001

79 BURCH A.



11/03/76
18575-001

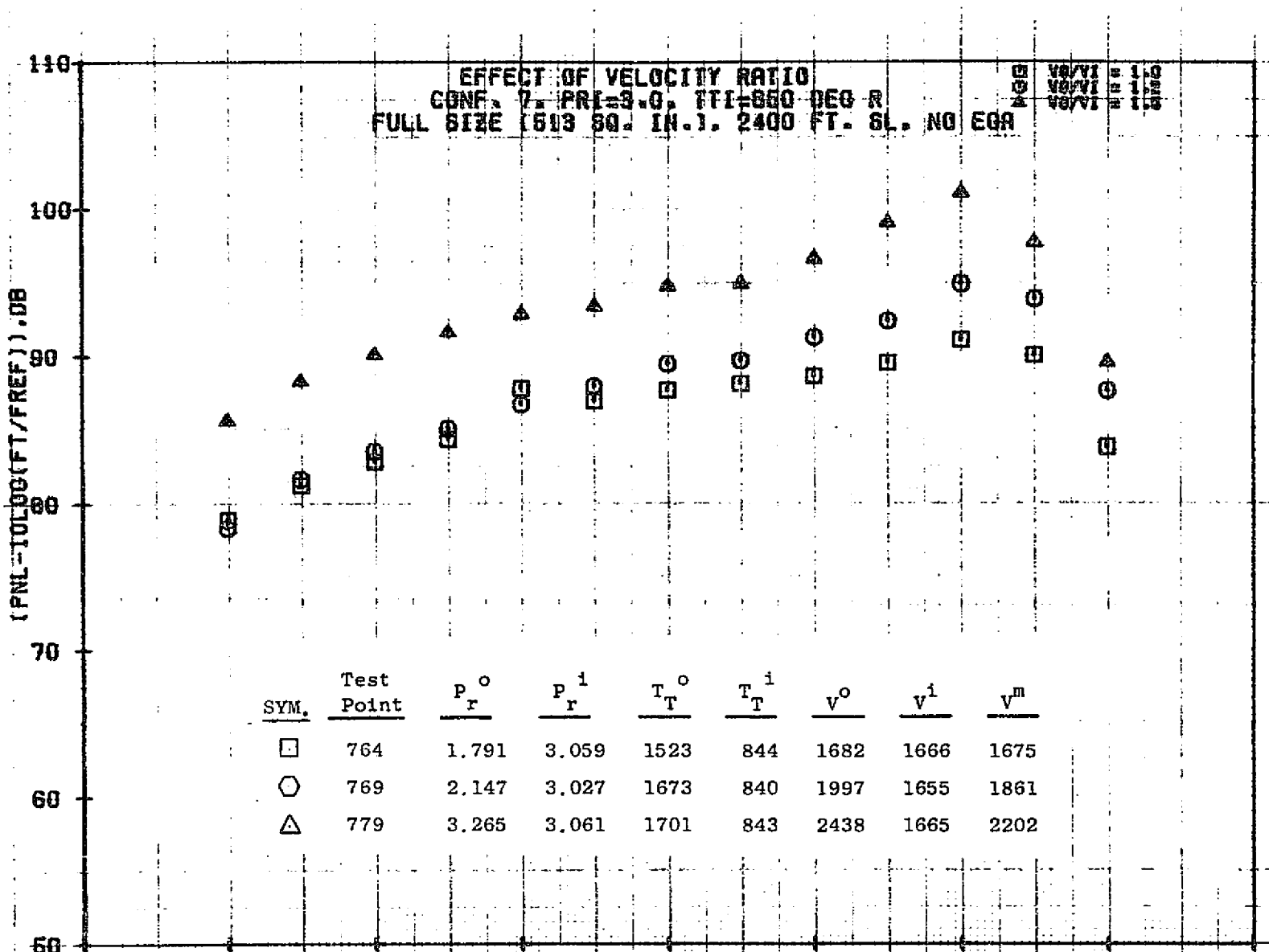
79 BURCH A.



1205

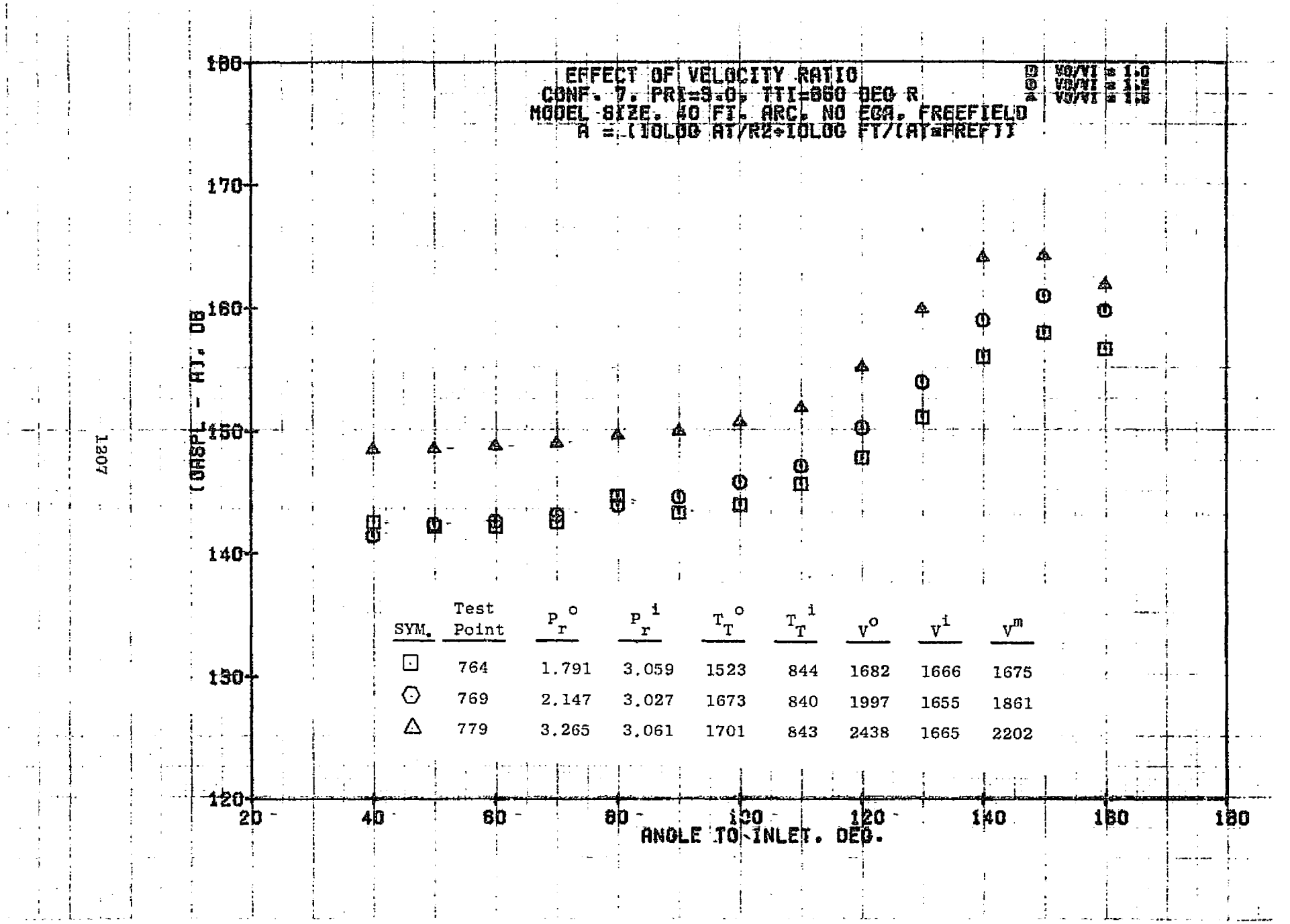
11/03/76
18575-001

79 BURCH A.



11/01/76
18421-001

79 BURCH A.

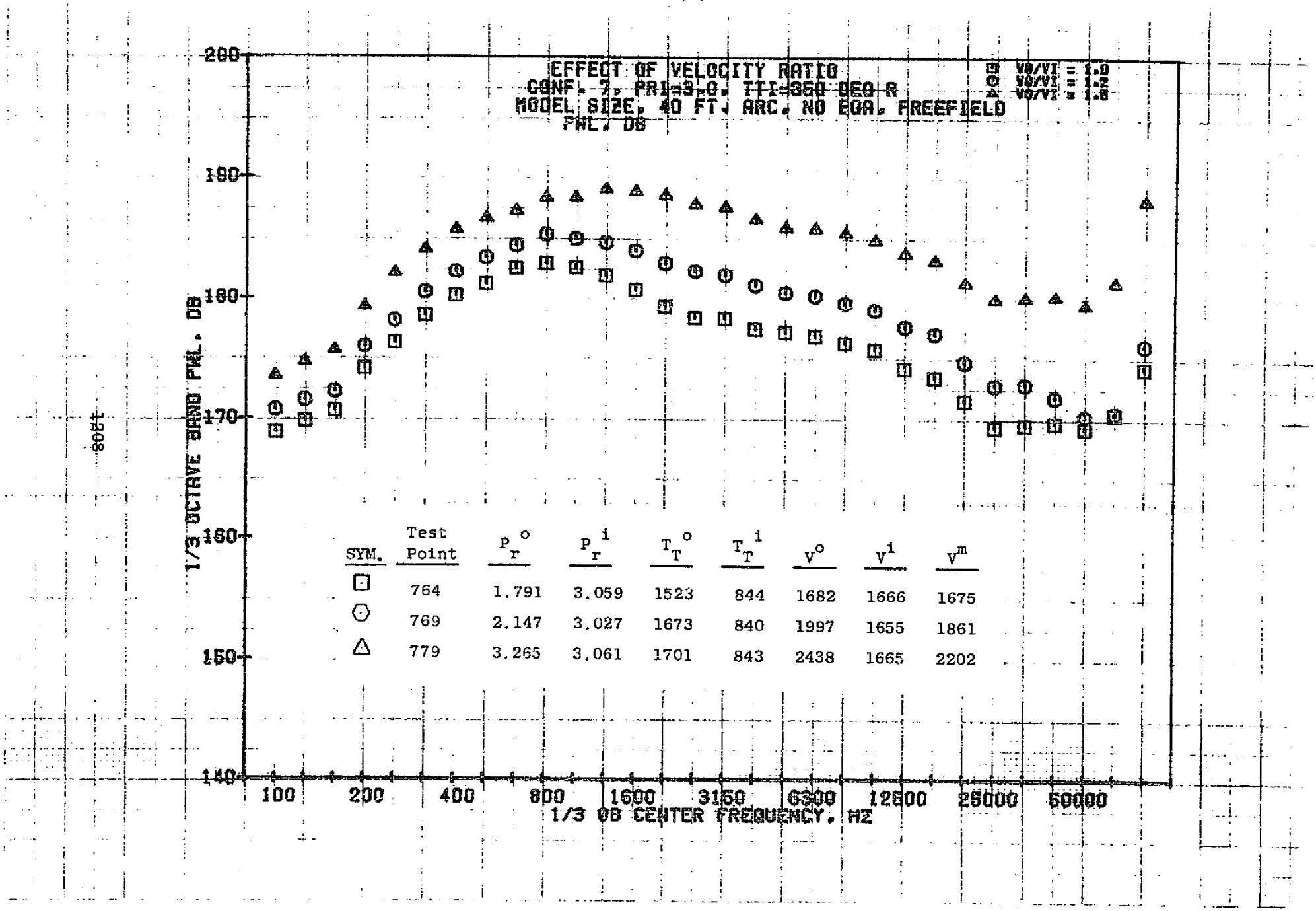


SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	764	1.791	3.059	1523	844	1682	1666	1675
⬡	769	2.147	3.027	1673	840	1997	1655	1861
△	779	3.265	3.061	1701	843	2438	1665	2202

1207

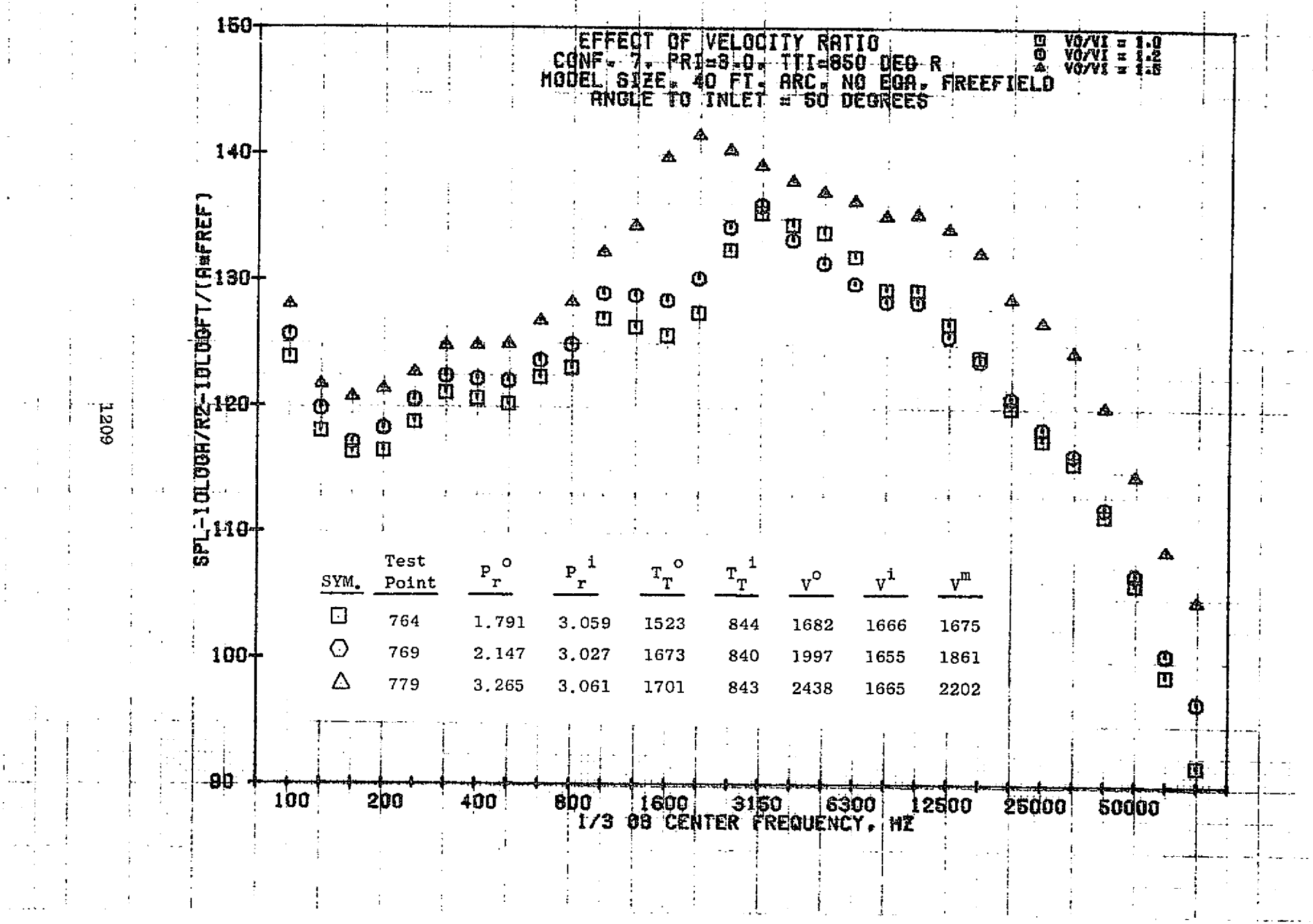
11/09/76
18936-001

79 AIRCH A.



11/03/76
18575-001

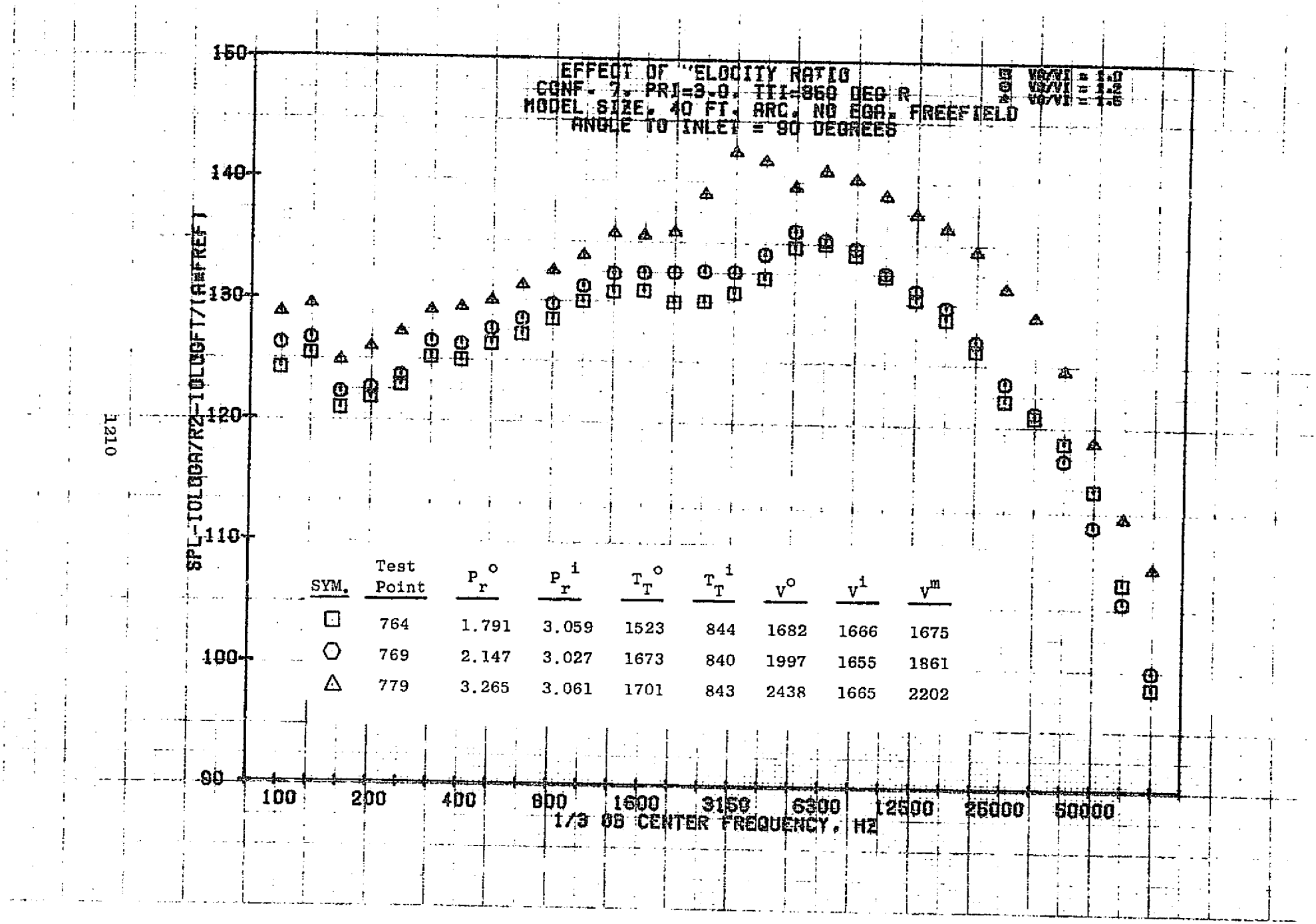
79 BURCH A.



1209

11/03/76
18575-001

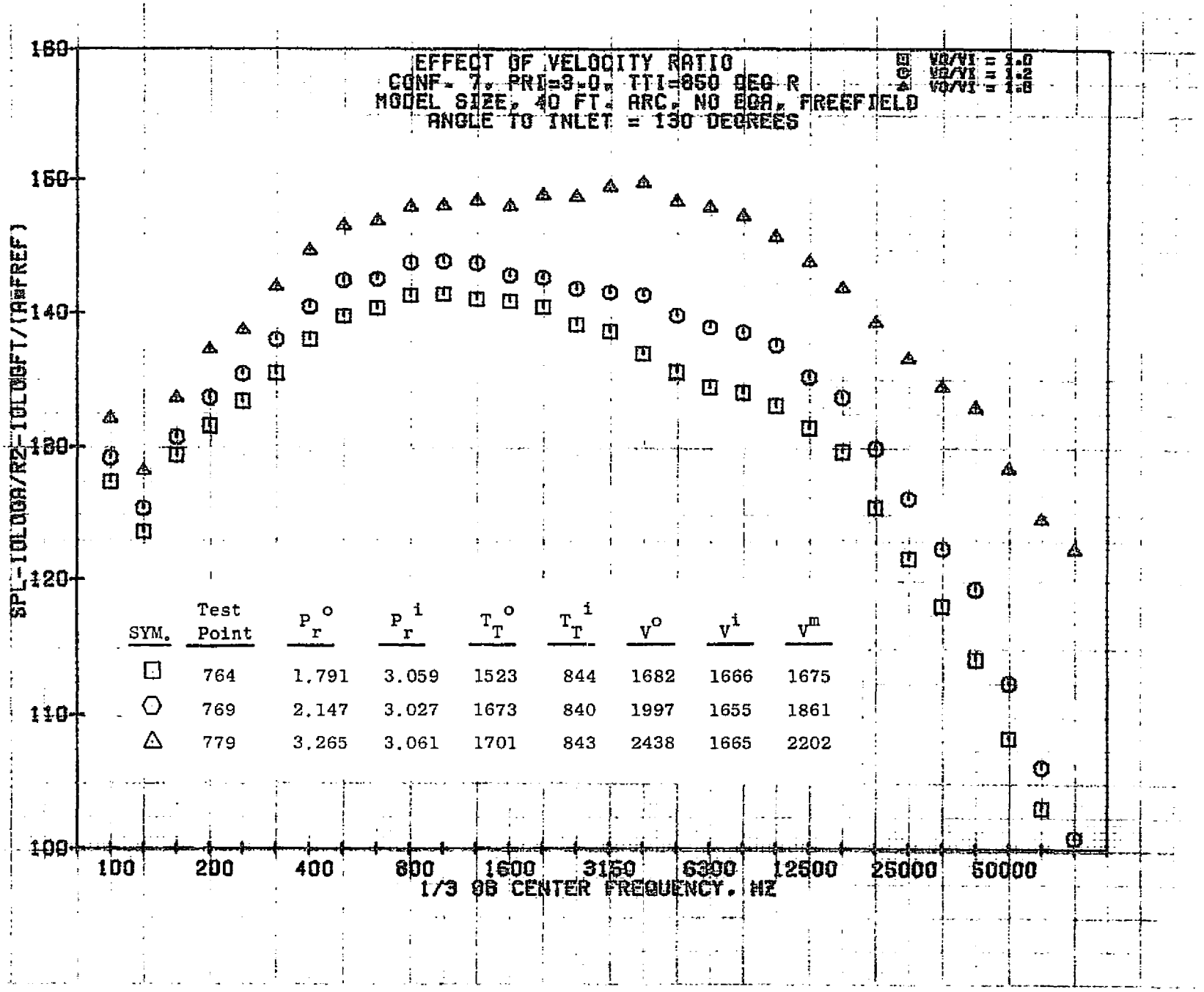
79 BURCH A.



SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	764	1.791	3.059	1523	844	1682	1666	1675
⬡	769	2.147	3.027	1673	840	1997	1655	1861
△	779	3.265	3.061	1701	843	2438	1665	2202

11/03/76
18575-001

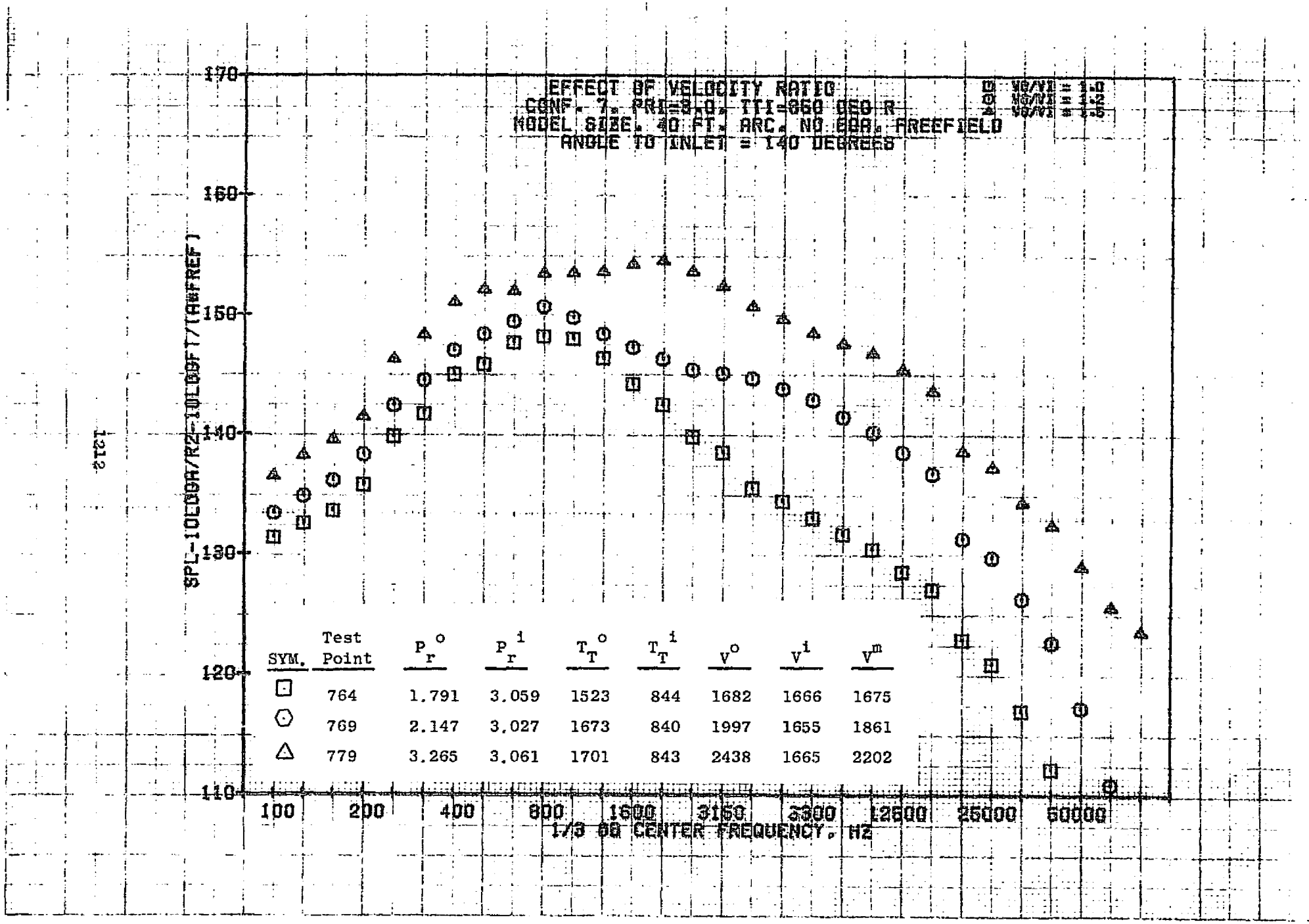
79 BURCH A.



1211

11/03/76
18575-001

79 BURCH A.

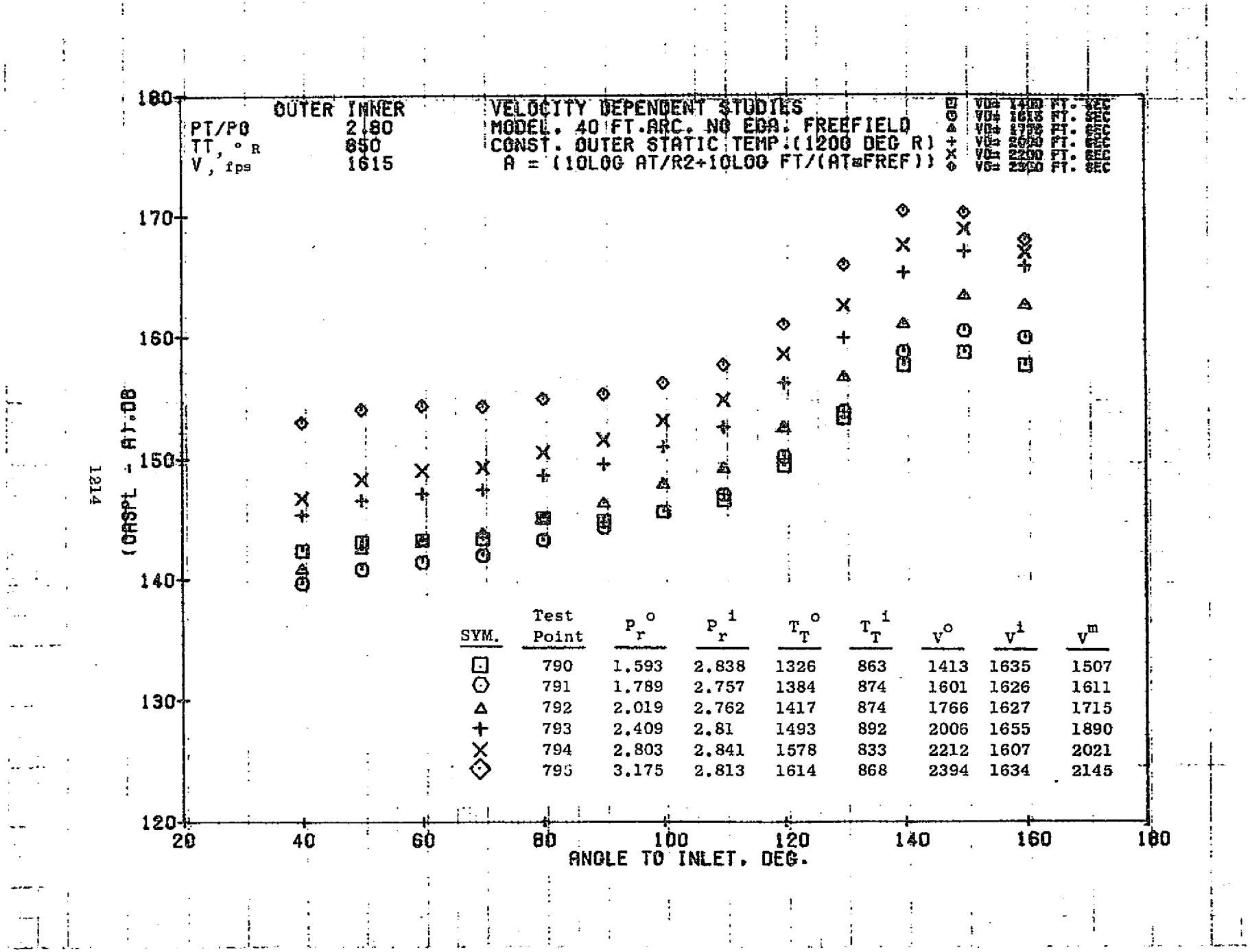


11/03/76
18575-001

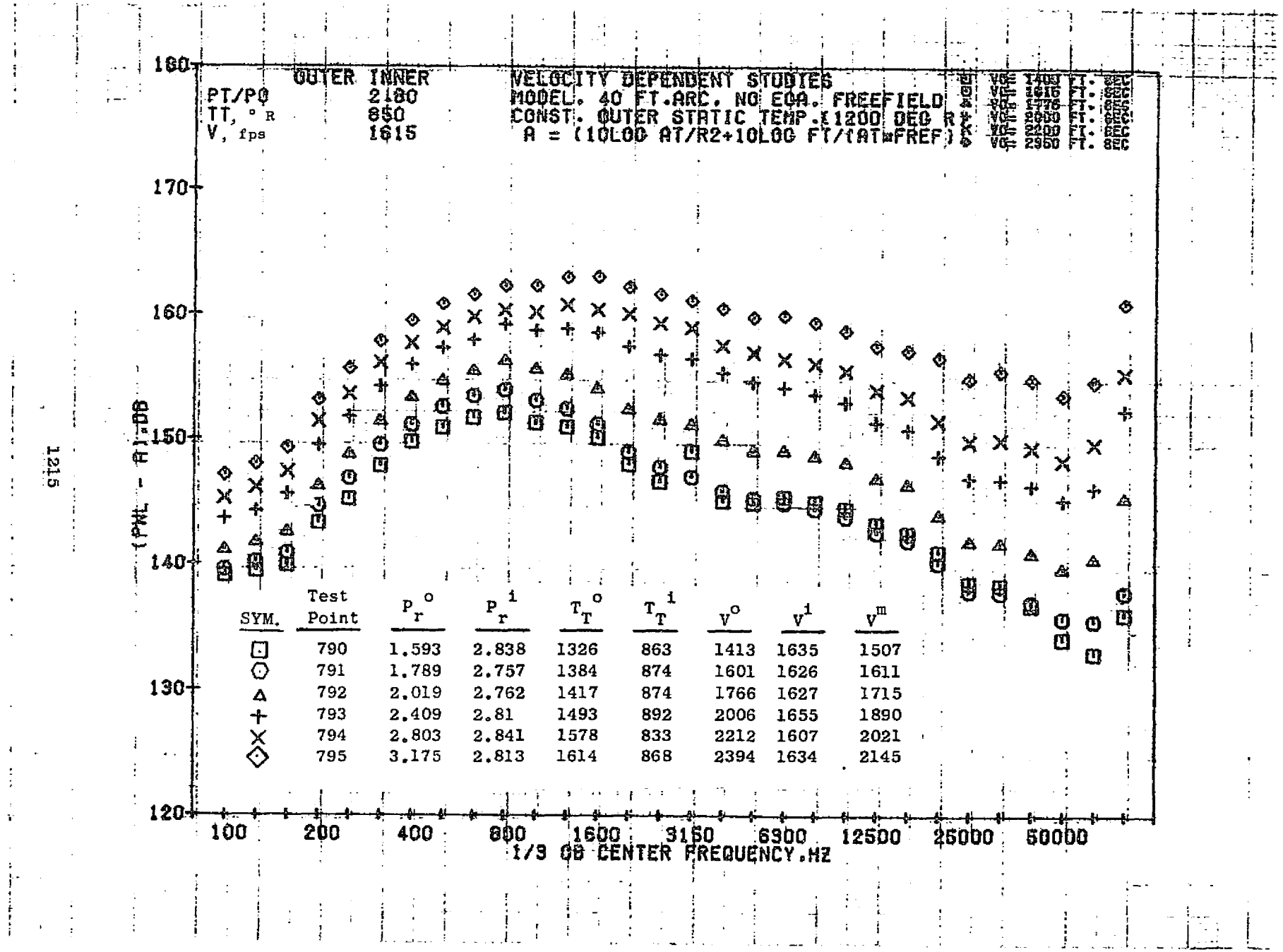
79 BURCH A.

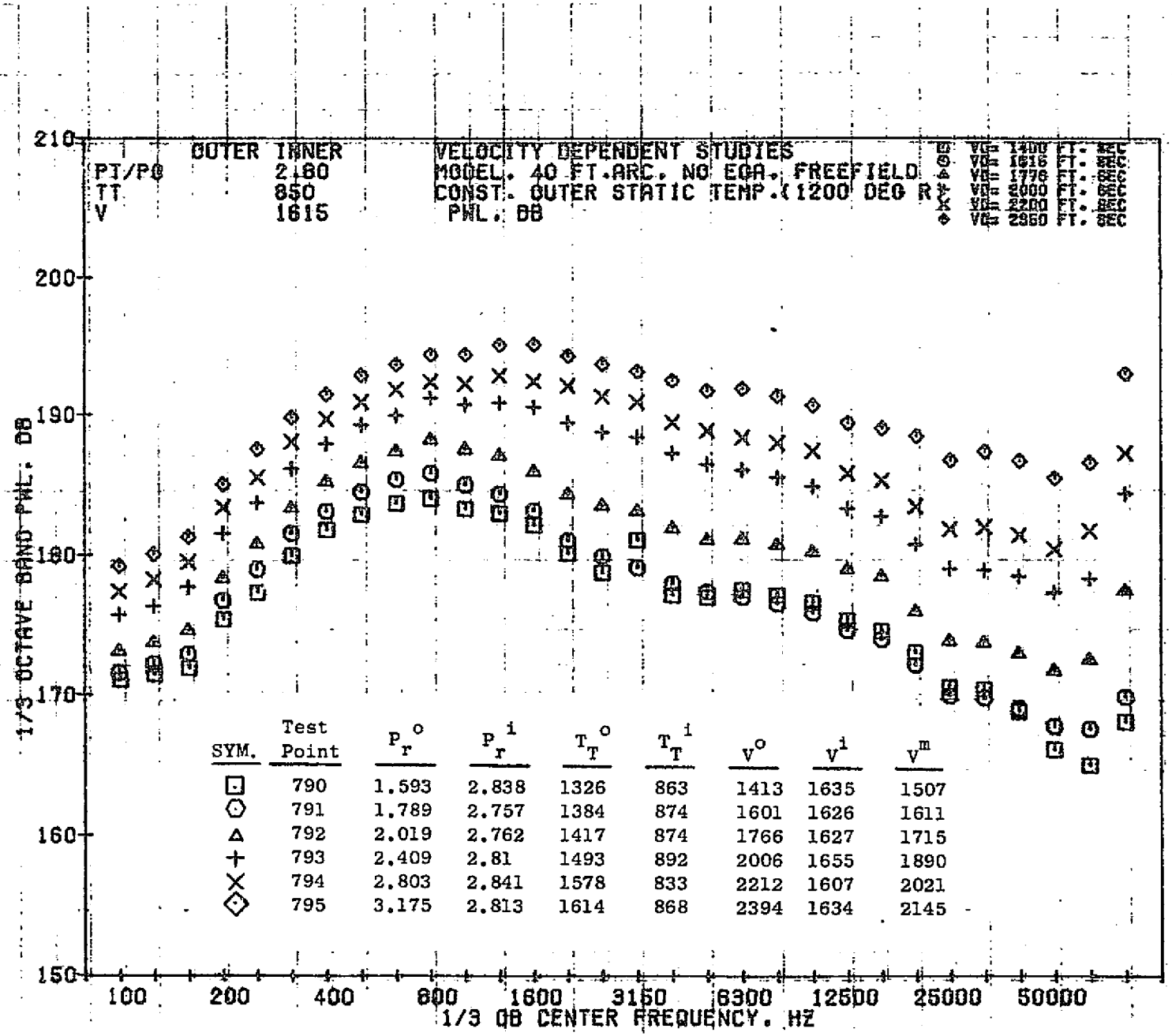
7.4.7 Velocity Dependence Study

For Configuration 7, a series of tests was run to examine the velocity dependence of a high inner flow annular nozzle. Seven test points were taken at constant inner flow conditions and constant outer stream static temperature. The outer stream velocity was varied from point to point. The results are presented in this section.

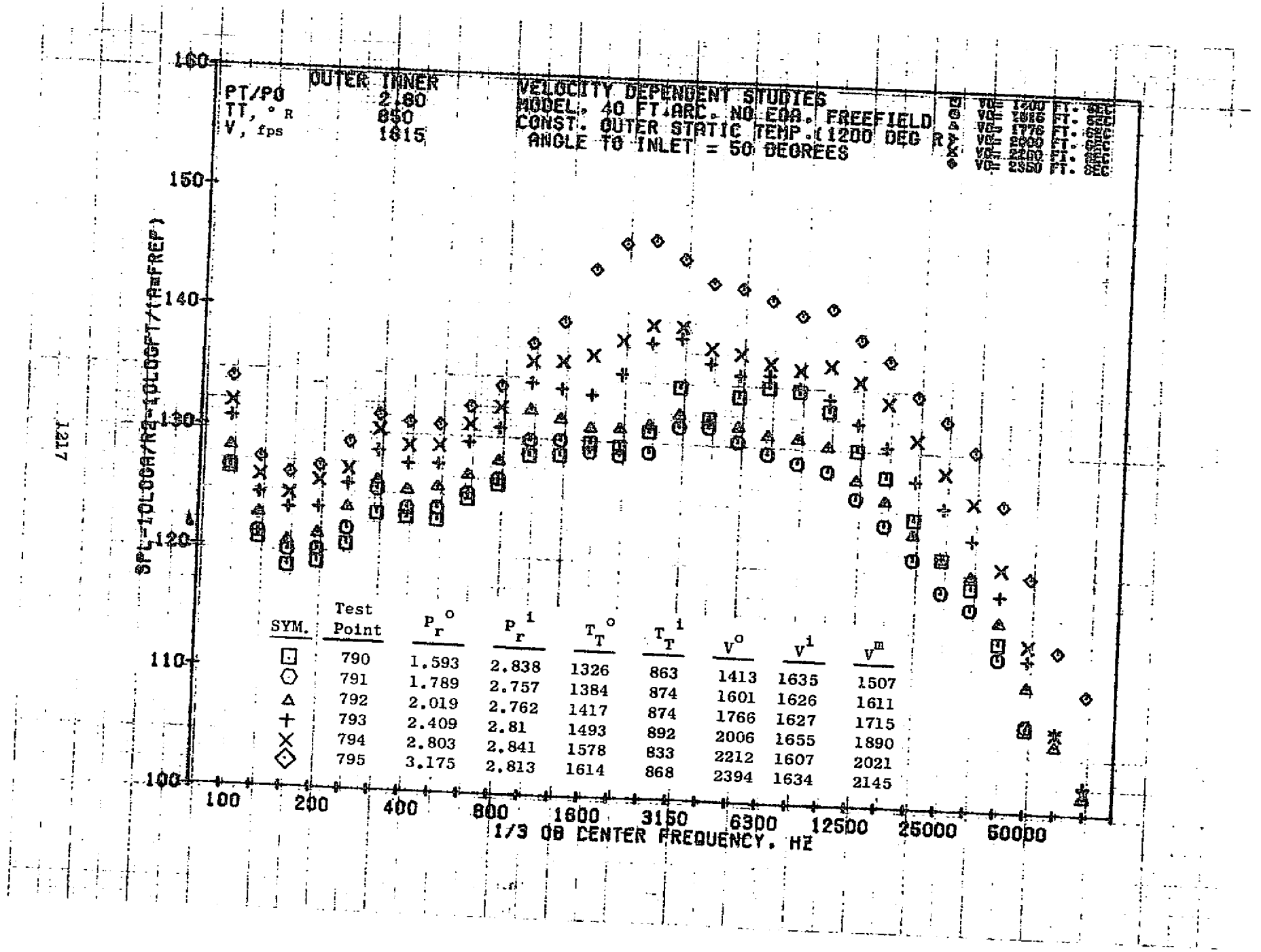


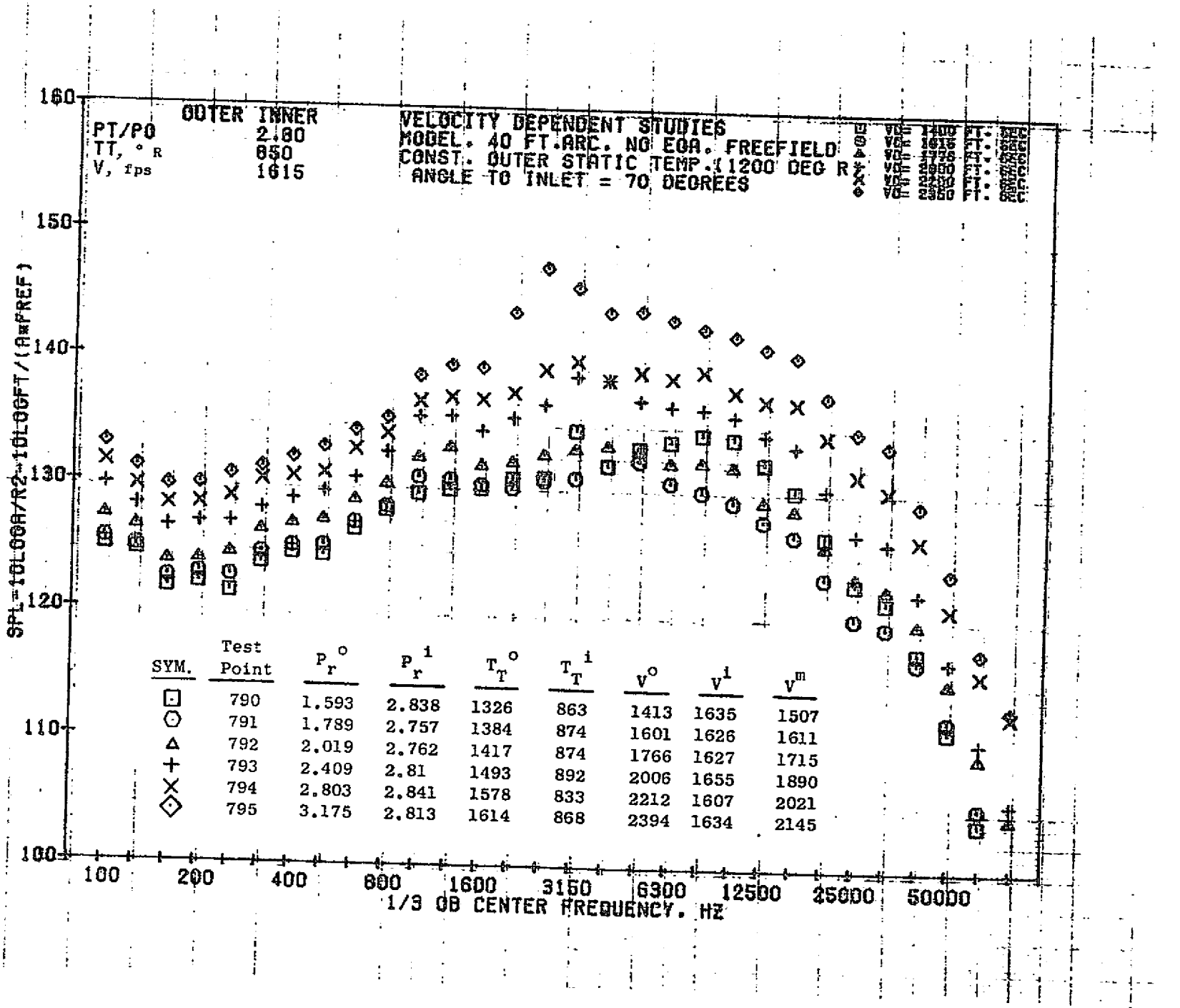
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	790	1.593	2.838	1326	863	1413	1635	1507
○	791	1.789	2.757	1384	874	1601	1626	1611
△	792	2.019	2.762	1417	874	1766	1627	1715
+	793	2.409	2.81	1493	892	2006	1655	1890
×	794	2.803	2.841	1578	833	2212	1607	2021
◇	795	3.175	2.813	1614	868	2394	1634	2145

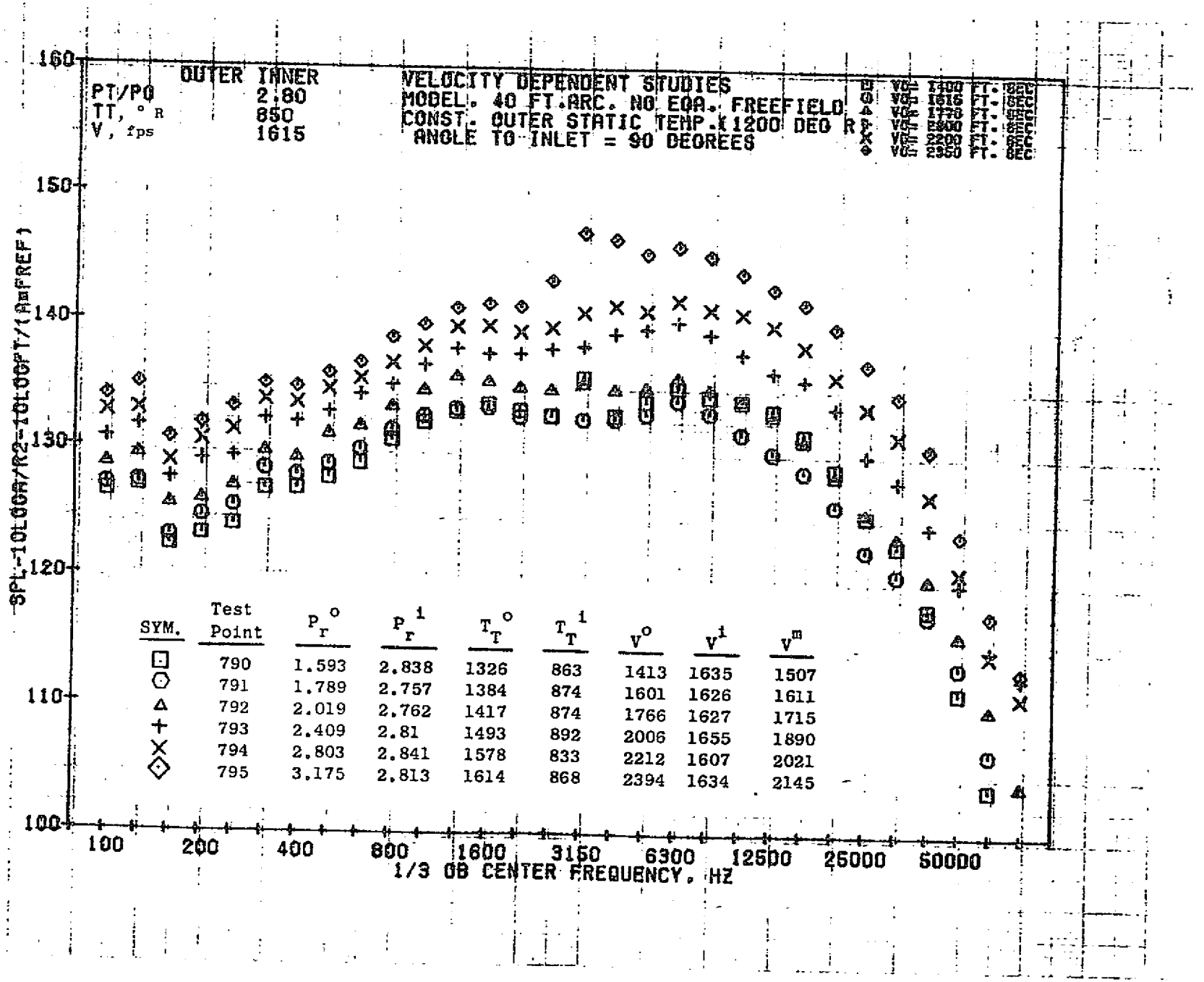

OUTER INNER
PT/PQ 2180
TT, °R 850
V, fps 1615
VELOCITY DEPENDENT STUDIES
MODEL. 40 FT.ARC. NO EQA. FREEFIELD
CONST. OUTER STATIC TEMP.(1200 DEG R
A = (10LOG AT/R2+10LOG FT/(AT=FREF)
VC= 1403 FT. SEC
VC= 1616 FT. SEC
VC= 1776 FT. SEC
VC= 2000 FT. SEC
VC= 2200 FT. SEC
VC= 2950 FT. SEC
160
170
160
150
140
130
120
(PWL - A)-DB
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY.HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
790 1.593 2.838 1326 863 1413 1635 1507
791 1.789 2.757 1384 874 1601 1626 1611
792 2.019 2.762 1417 874 1766 1627 1715
793 2.409 2.81 1493 892 2006 1655 1890
794 2.803 2.841 1578 833 2212 1607 2021
795 3.175 2.813 1614 868 2394 1634 2145

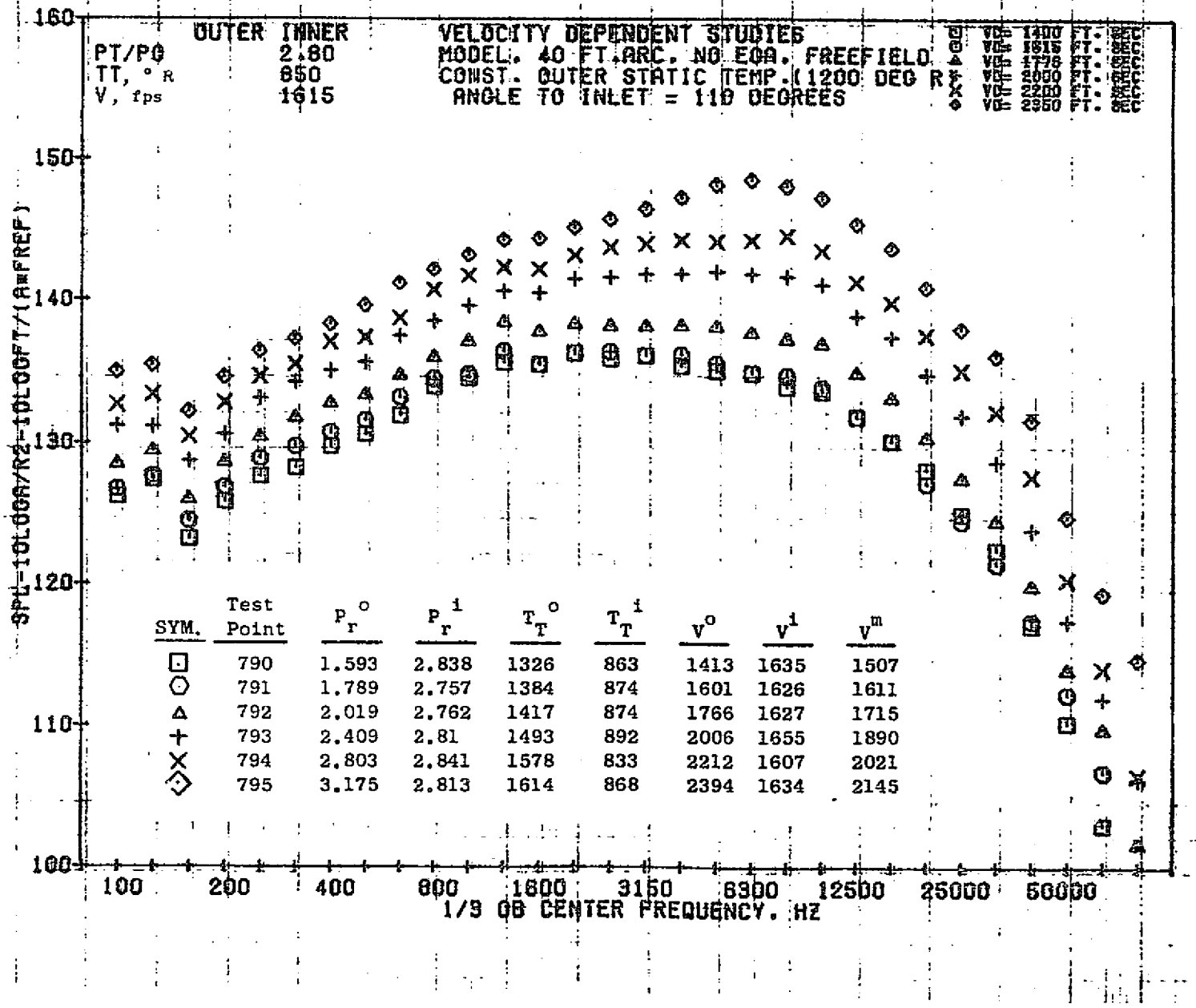


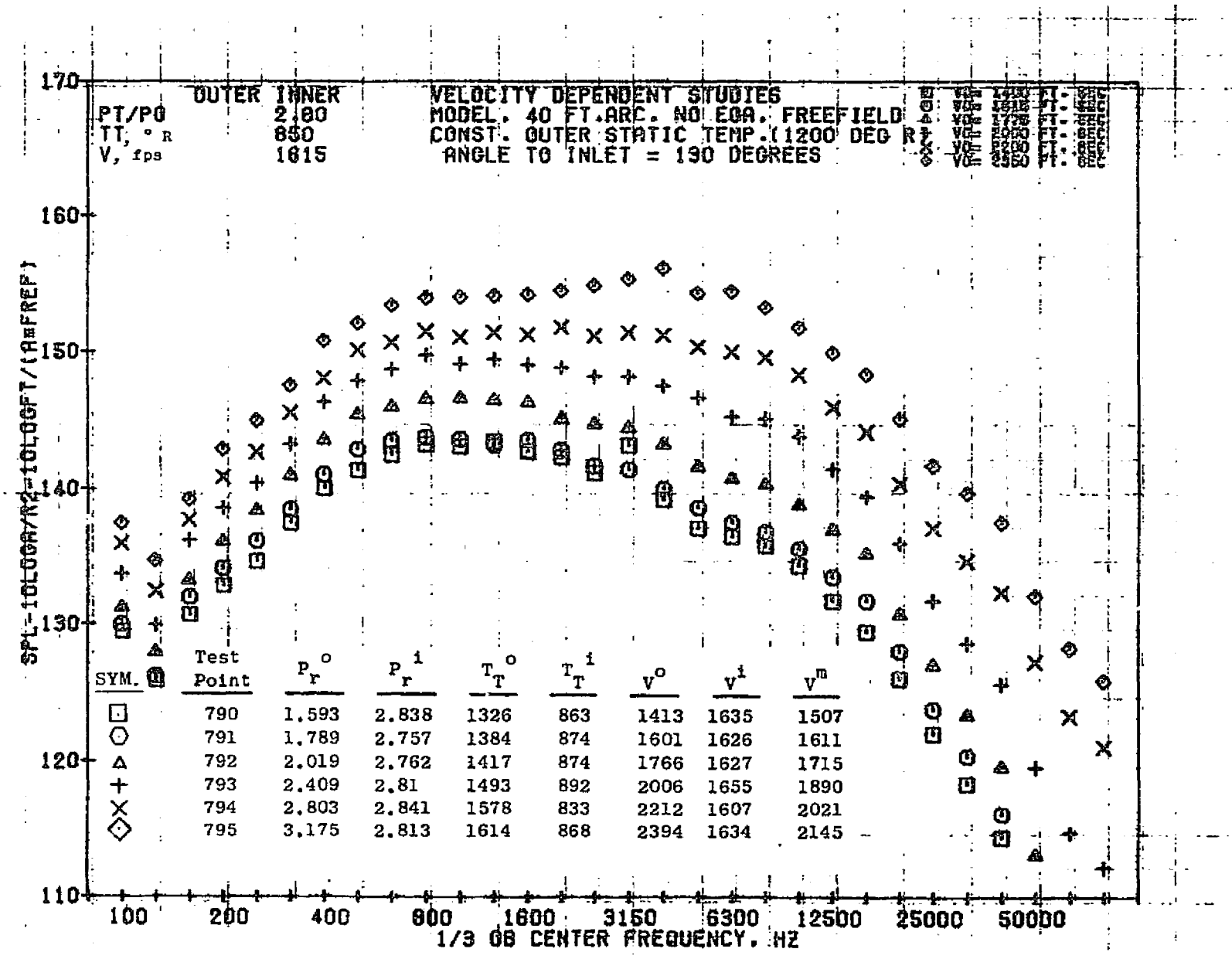
SYM.	Test Point	P_r^o	P_r^i	T_T^o	T_T^i	V^o	V^i	V^m
□	790	1.593	2.838	1326	863	1413	1635	1507
○	791	1.789	2.757	1384	874	1601	1626	1611
△	792	2.019	2.762	1417	874	1766	1627	1715
+	793	2.409	2.81	1493	892	2006	1655	1890
×	794	2.803	2.841	1578	833	2212	1607	2021
◇	795	3.175	2.813	1614	868	2394	1634	2145


VELOCITY DEPENDENT STUDIES
MODEL, 40 FT ARC, NO EOA, FREEFIELD
CONST. OUTER STATIC TEMP. (1200 DEG R
ANGLE TO INLET = 50 DEGREES
OUTER INNER
PT/P0 2.80
TT, °R 850
V, fps 1615
SPL-10LOG(R2-10LOGFT/1FmFREF)
100
110
120
130
140
150
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
790 1.593 2.838 1326 863 1413 1635 1507
791 1.789 2.757 1384 874 1601 1626 1611
792 2.019 2.762 1417 874 1766 1627 1715
793 2.409 2.81 1493 892 2006 1655 1890
794 2.803 2.841 1578 833 2212 1607 2021
795 3.175 2.813 1614 868 2394 1634 2145


OUTER INNER
PT/P0 2.80
TT, °R 650
V, fps 1615
VELOCITY DEPENDENT STUDIES
MODEL. 40 FT.ARC. NO EOA. FREEFIELD
CONST. OUTER STATIC TEMP.(1200 DEG R
ANGLE TO INLET = 70 DEGREES
SPL=10LOGA/R2-10LOGFT/(A*FREF)
1/3 OB CENTER FREQUENCY, HZ
100
200
400
800
1600
3150
6300
12500
25000
50000
160
150
140
130
120
110
100
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
790 1.593 2.838 1326 863 1413 1635 1507
791 1.789 2.757 1384 874 1601 1626 1611
792 2.019 2.762 1417 874 1766 1627 1715
793 2.409 2.81 1493 892 2006 1655 1890
794 2.803 2.841 1578 833 2212 1607 2021
795 3.175 2.813 1614 868 2394 1634 2145

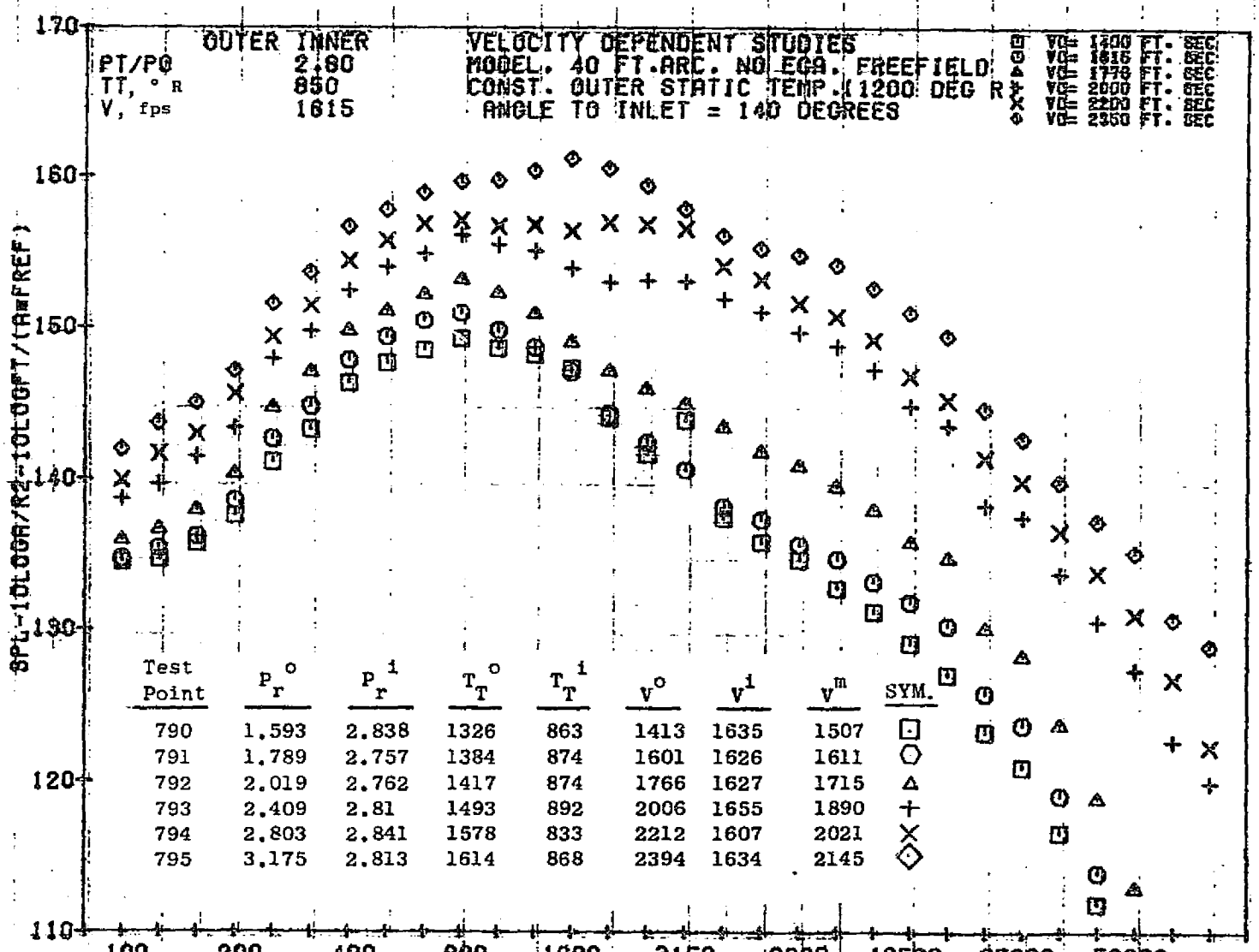

VELOCITY DEPENDENT STUDIES
MODEL. 40 FT.ARC. NO EQA. FREEFIELD
CONST. OUTER STATIC TEMP.(1200 DEG R
ANGLE TO INLET = 90 DEGREES
OUTER INNER
PT/P0 2.80
TT, °R 850
V, fps 1615
SPL-10LOG(A/R2=10LOGPT/(PaFREF)
1/3 OB CENTER FREQUENCY, HZ
100
200
400
800
1600
3150
6300
12500
25000
50000
160
150
140
130
120
110
100
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
790 1.593 2.838 1326 863 1413 1635 1507
791 1.789 2.757 1384 874 1601 1626 1611
792 2.019 2.762 1417 874 1766 1627 1715
793 2.409 2.81 1493 892 2006 1655 1890
794 2.803 2.841 1578 833 2212 1607 2021
795 3.175 2.813 1614 868 2394 1634 2145


OUTER INNER
PT/P0 2.80
TT, °R 850
V, fps 1615
VELOCITY DEPENDENT STUDIES
MODEL. 40 FT.ARC. NO EQA. FREEFIELD
CONST. OUTER STATIC TEMP.(1200 DEG R
ANGLE TO INLET = 110 DEGREES
VO= 1400 FT. SEC
VO= 1615 FT. SEC
VO= 1776 FT. SEC
VO= 2000 FT. SEC
VO= 2200 FT. SEC
VO= 2350 FT. SEC
SPL-10LOGA/R2-10LOGFT/(AmFREF)
160
150
140
130
120
110
100
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
790 1.593 2.838 1326 863 1413 1635 1507
791 1.789 2.757 1384 874 1601 1626 1611
792 2.019 2.762 1417 874 1766 1627 1715
793 2.409 2.81 1493 892 2006 1655 1890
794 2.803 2.841 1578 833 2212 1607 2021
795 3.175 2.813 1614 868 2394 1634 2145



10/13/76
1X930-001

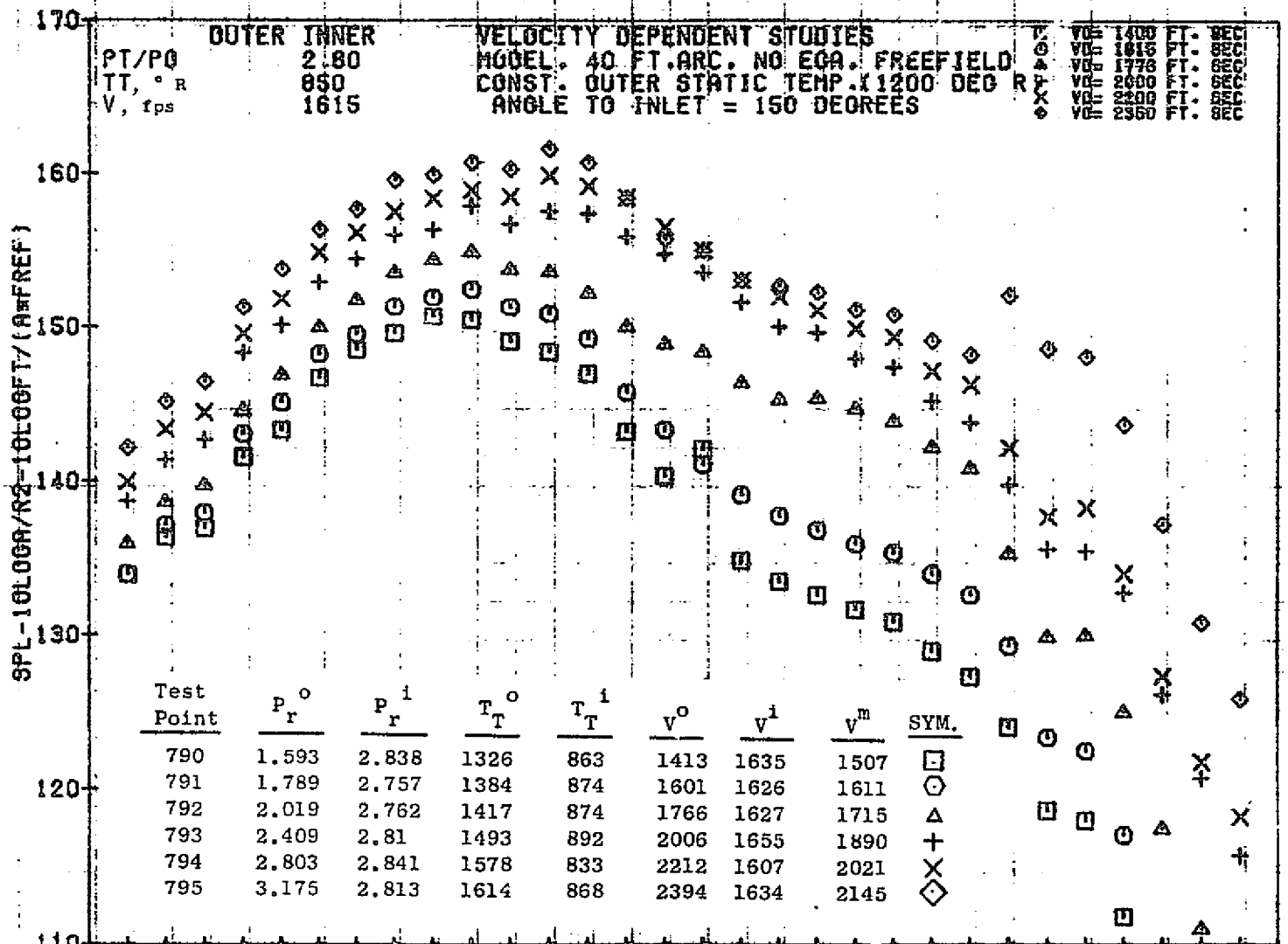
73KOLLSTEDT



1222

10/13/76
1X930-001

73KOLLSTEDT

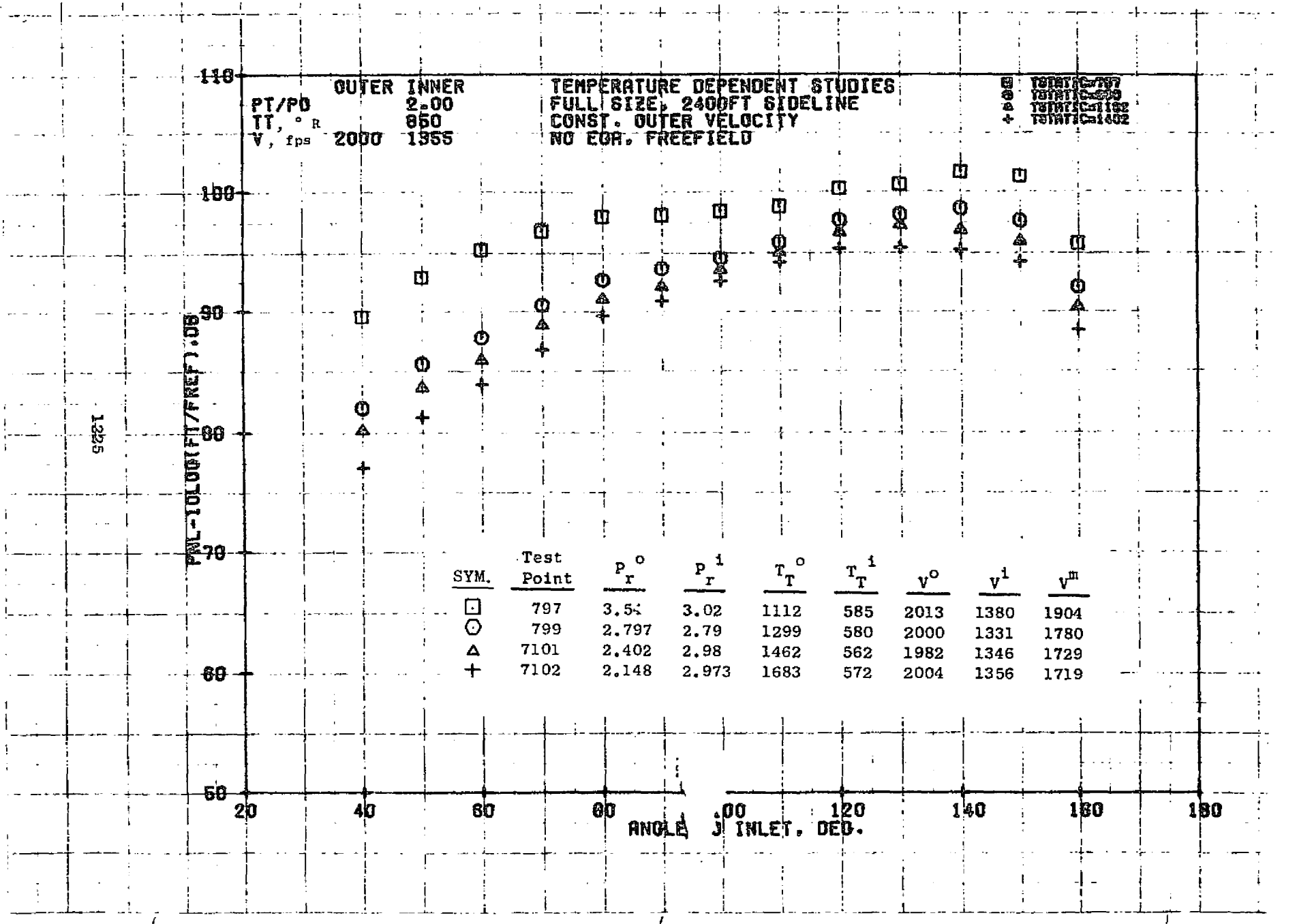


10/13/76
1X930-001

73KOLLSTEDT

7.4.8 Temperature Dependence Study

For Configuration 7, another series of tests was run to examine the temperature dependence of a high inner flow annular nozzle. For this study, the inner stream conditions were held constant, while the outer stream velocity was held constant and the static temperature of the outer stream was varied. The results are presented in this section.


OUTER INNER
PT/PD 2.00
TT, °R 860
V, fps 2000 1355
TEMPERATURE DEPENDENT STUDIES
FULL SIZE, 2400FT SIDELINE
CONST. OUTER VELOCITY
NO EGR, FREEFIELD
PNL-TOL(DELFT/FREF),DB
110
100
90
80
70
60
50
20
40
60
80
100
120
140
160
180
ANGLE, INLET, DEG.
1225
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
797 3.54 3.02 1112 585 2013 1380 1904
799 2.797 2.79 1299 580 2000 1331 1780
7101 2.402 2.98 1462 562 1982 1346 1729
7102 2.148 2.973 1683 572 2004 1356 1719
10/25/76
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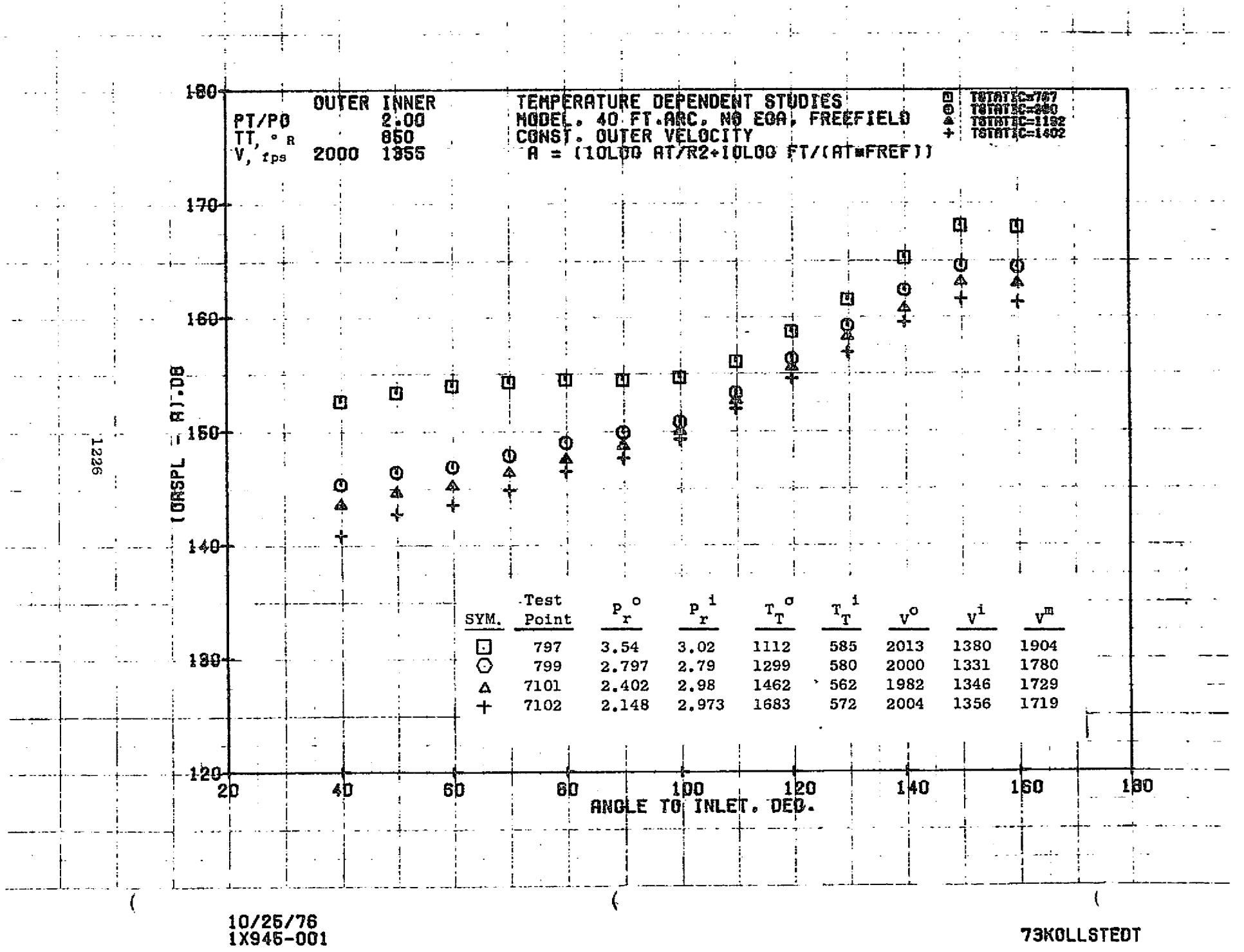
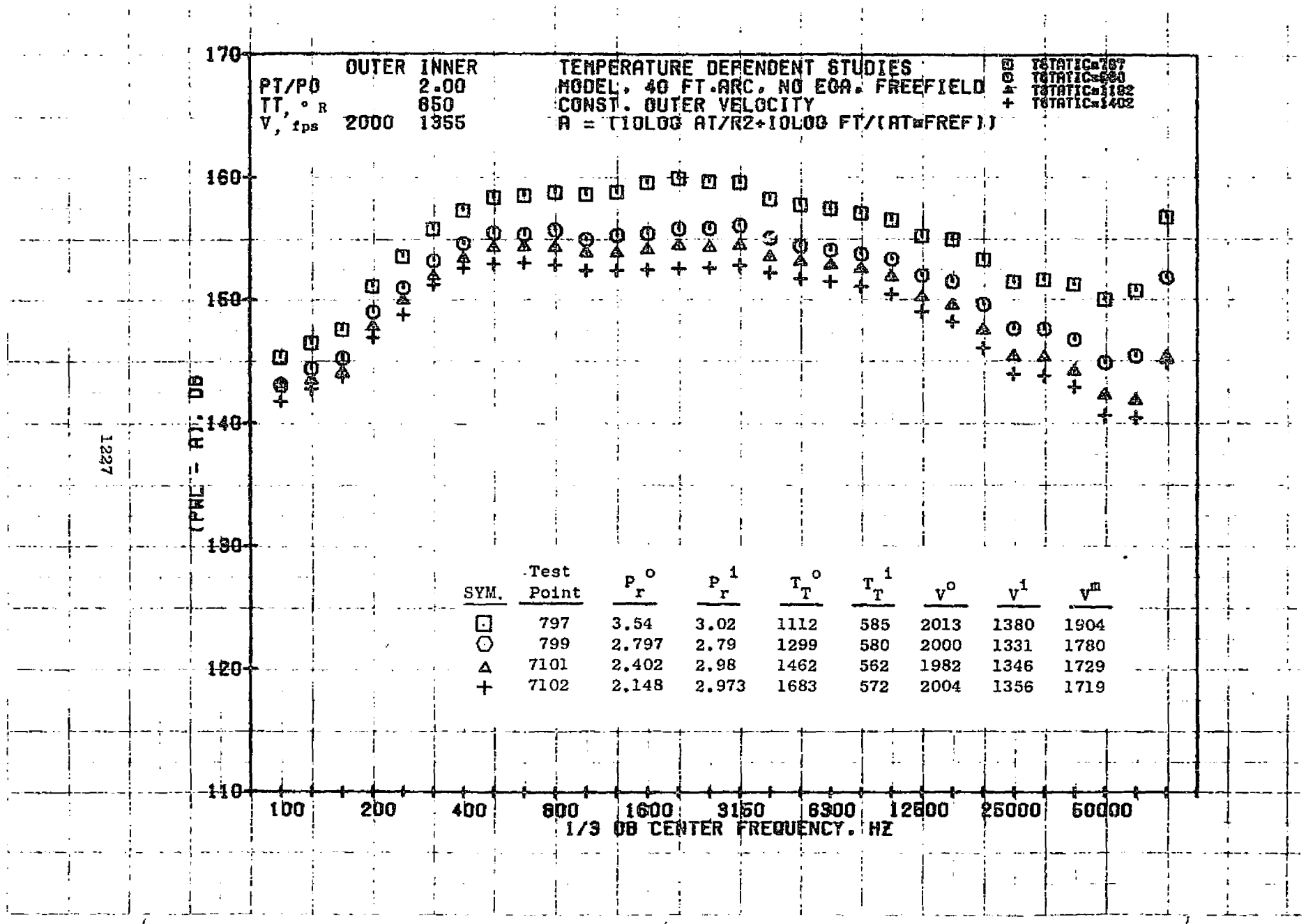
73KOLLETEST


OUTER INNER
PT/P0 2.00
TT, °R 850
V, fps 2000 1355
TEMPERATURE DEPENDENT STUDIES
MODEL, 40 FT.ARC, NO EGA, FREEFIELD
CONST. OUTER VELOCITY
A = (10LOG AT/R2+10LOG FT/(AT*FREF))
TSTATIC=797
TSTATIC=280
TSTATIC=1192
TSTATIC=1402
180
170
160
150
140
130
120
20
40
60
80
100
120
140
160
180
ANGLE TO INLET, DEG.
SPL (DB) = 10LOG (PSD)
1226
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
797 3.54 3.02 1112 585 2013 1380 1904
799 2.797 2.79 1299 580 2000 1331 1780
7101 2.402 2.98 1462 562 1982 1346 1729
7102 2.148 2.973 1683 572 2004 1356 1719
10/25/76
1X945-001
73KOLLSTEDT



1227

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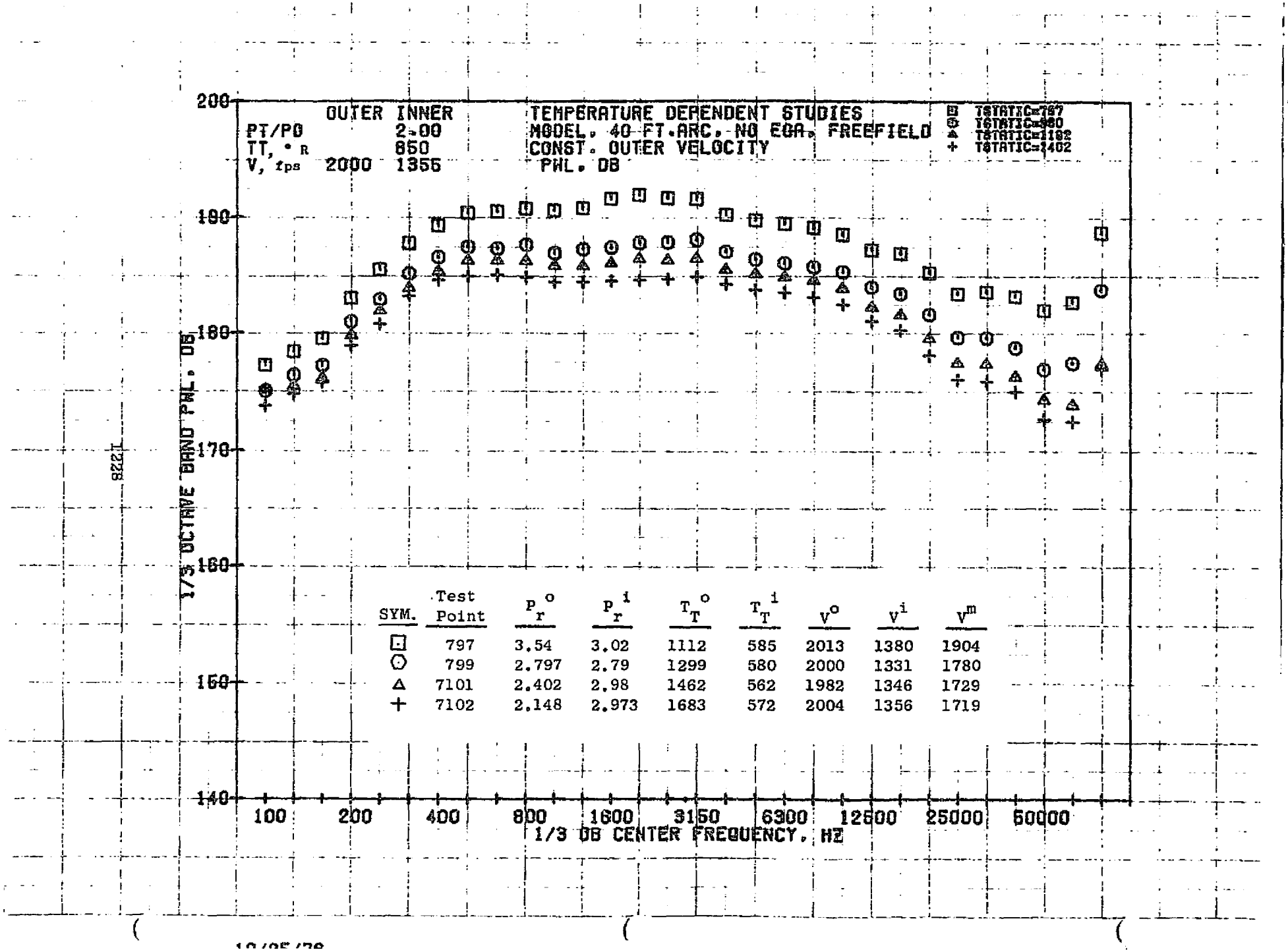
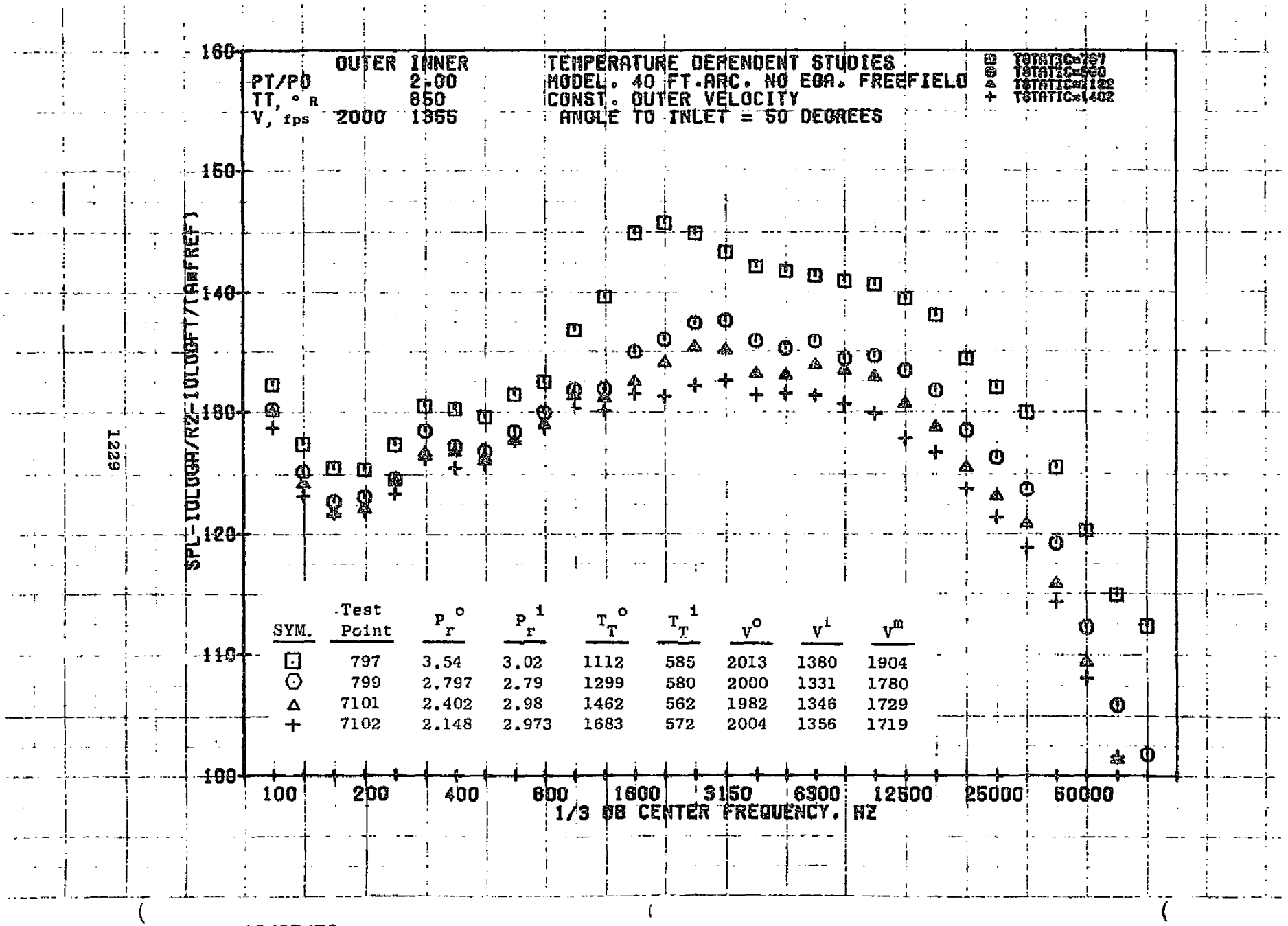
1X946-001

73K0LLSTED1

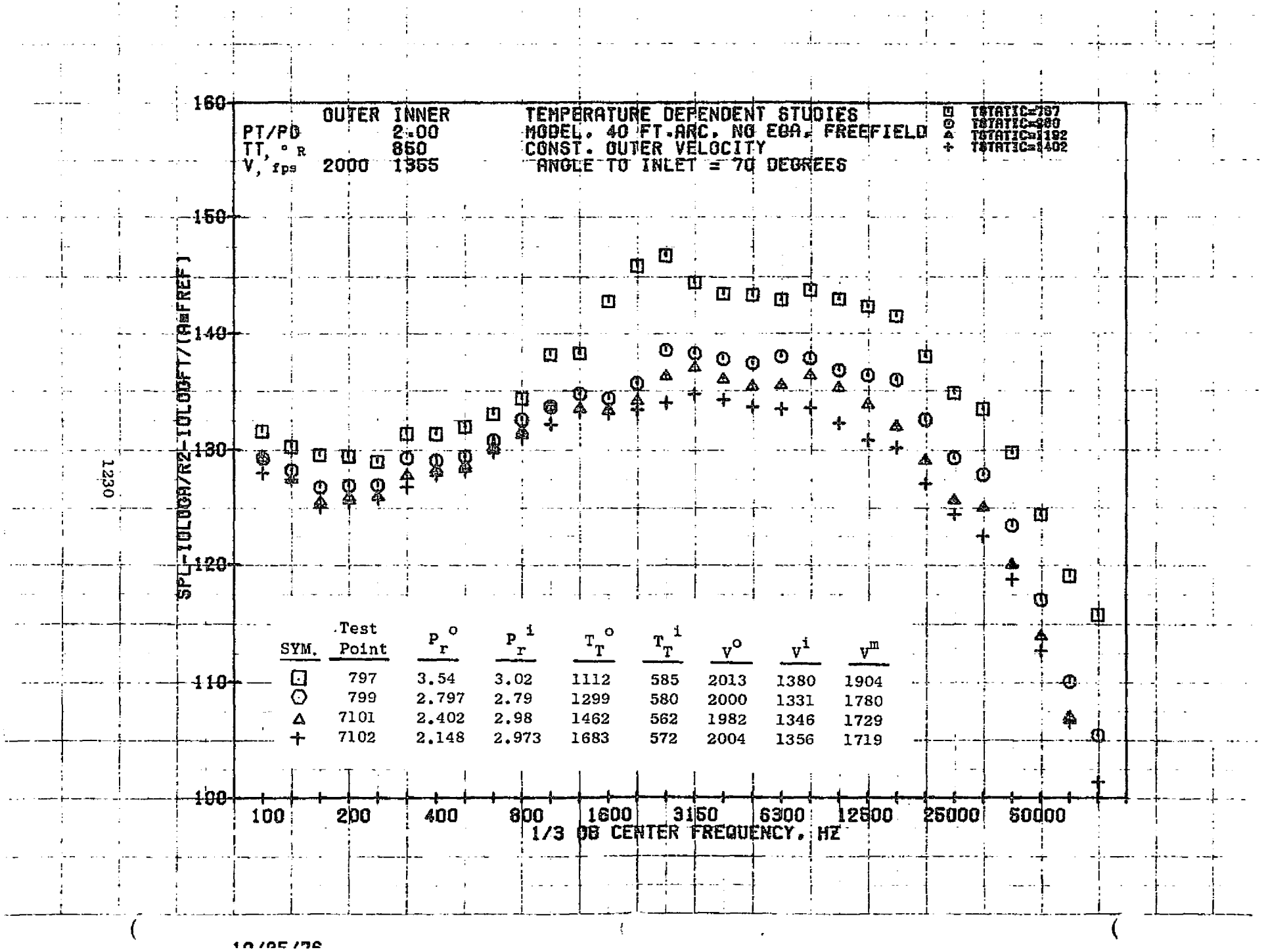

TEMPERATURE DEPENDENT STUDIES
MODEL. 40 FT.ARC. NO EGA. FREEFIELD
CONST. OUTER VELOCITY
PWL. DB
TSTATIC=797
TSTATIC=980
TSTATIC=1182
TSTATIC=1402
OUTER INNER
PT/P0 2.00
TT, °R 650
V, fps 2000 1356
1/3 OCTAVE BAND PWL. DB
200
190
180
170
160
150
140
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
797 3.54 3.02 1112 585 2013 1380 1904
799 2.797 2.79 1299 580 2000 1331 1780
7101 2.402 2.98 1462 562 1982 1346 1729
7102 2.148 2.973 1683 572 2004 1356 1719



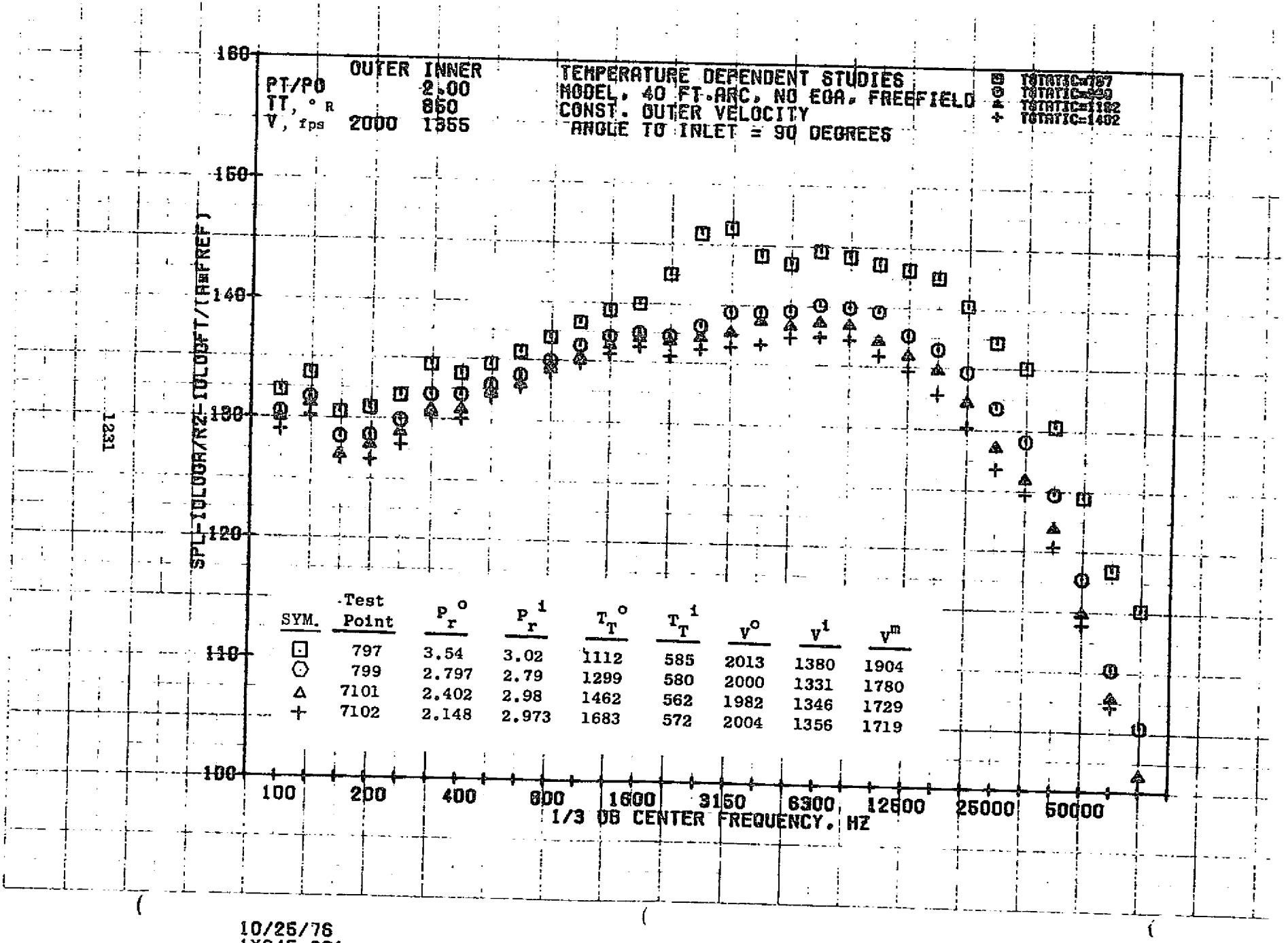
1229

10/25/76
1X945-001

73KOLLSTED


OUTER INNER
PT/PD 2.00
TT, °R 850
V, fps 2000 1355
TEMPERATURE DEPENDENT STUDIES
MODEL. 40 FT.ARC. NG EGA. FREEFIELD
CONST. OUTER VELOCITY
ANGLE TO INLET = 70 DEGREES
TSTATIC=787
TSTATIC=980
TSTATIC=1182
TSTATIC=1402
SPL-10LOG(A/R2)-10LOG(FT/(A=FREF))
160
150
140
130
120
110
100
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
797 3.54 3.02 1112 585 2013 1380 1904
799 2.797 2.79 1299 580 2000 1331 1780
7101 2.402 2.98 1462 562 1982 1346 1729
7102 2.148 2.973 1683 572 2004 1356 1719

1230



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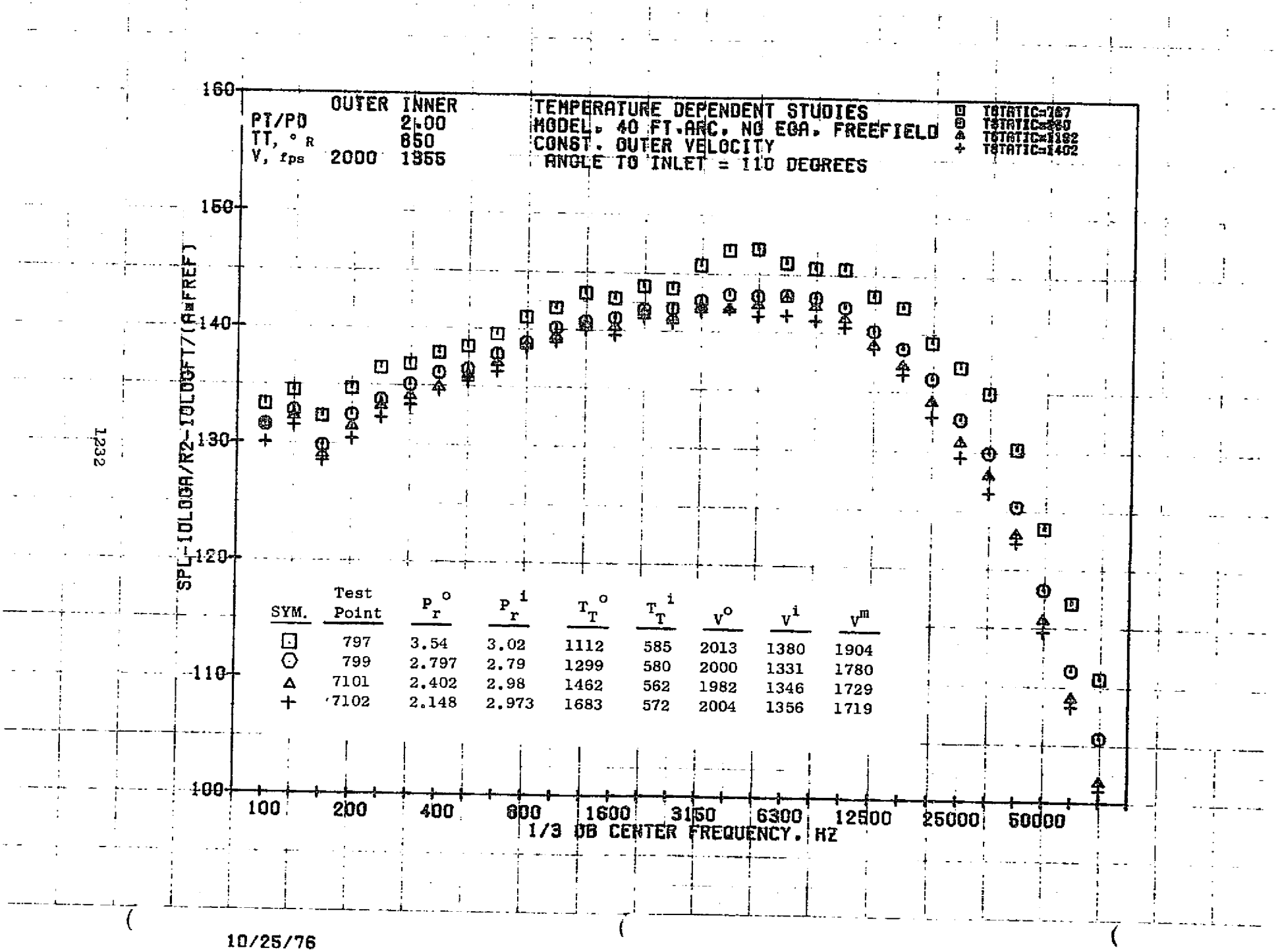
79KOLL.STE


TEMPERATURE DEPENDENT STUDIES
MODEL, 40 FT.ARC, NO EGA, FREEFIELD
CONST. OUTER VELOCITY
ANGLE TO INLET = 110 DEGREES
OUTER INNER
PT/PD 2.00
TT, °R 2000 650
V, fps 2000 1355
TSTATIC=787
TSTATIC=1162
TSTATIC=1402
SPL-10LOG(R2-10LOGT/(A*FREF)
1/3 OB CENTER FREQUENCY, HZ
160
150
140
130
120
110
100
100
200
400
800
1600
3150
6300
12500
25000
50000
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
797 3.54 3.02 1112 585 2013 1380 1904
799 2.797 2.79 1299 580 2000 1331 1780
7101 2.402 2.98 1462 562 1982 1346 1729
7102 2.148 2.973 1683 572 2004 1356 1719

1232

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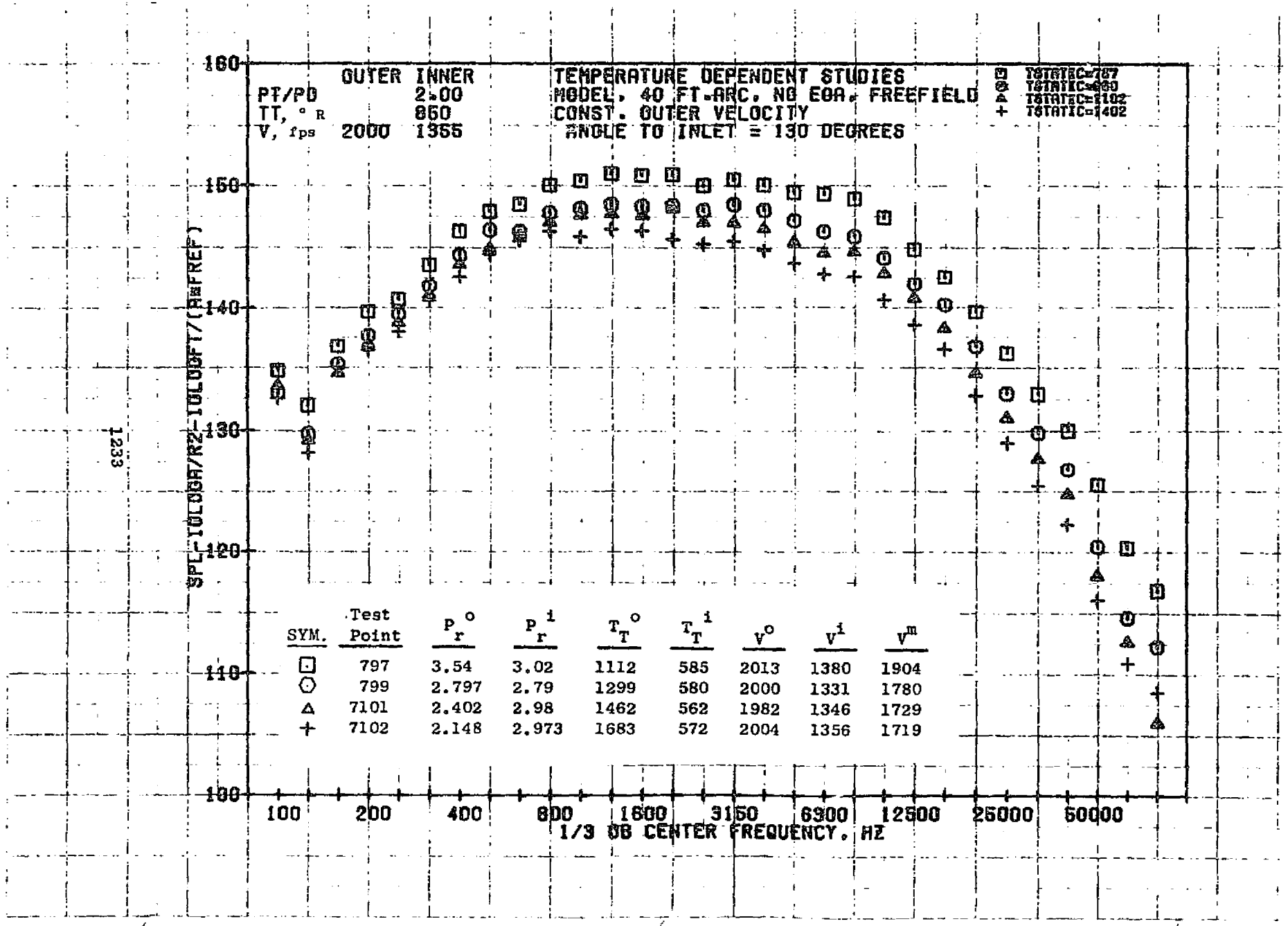

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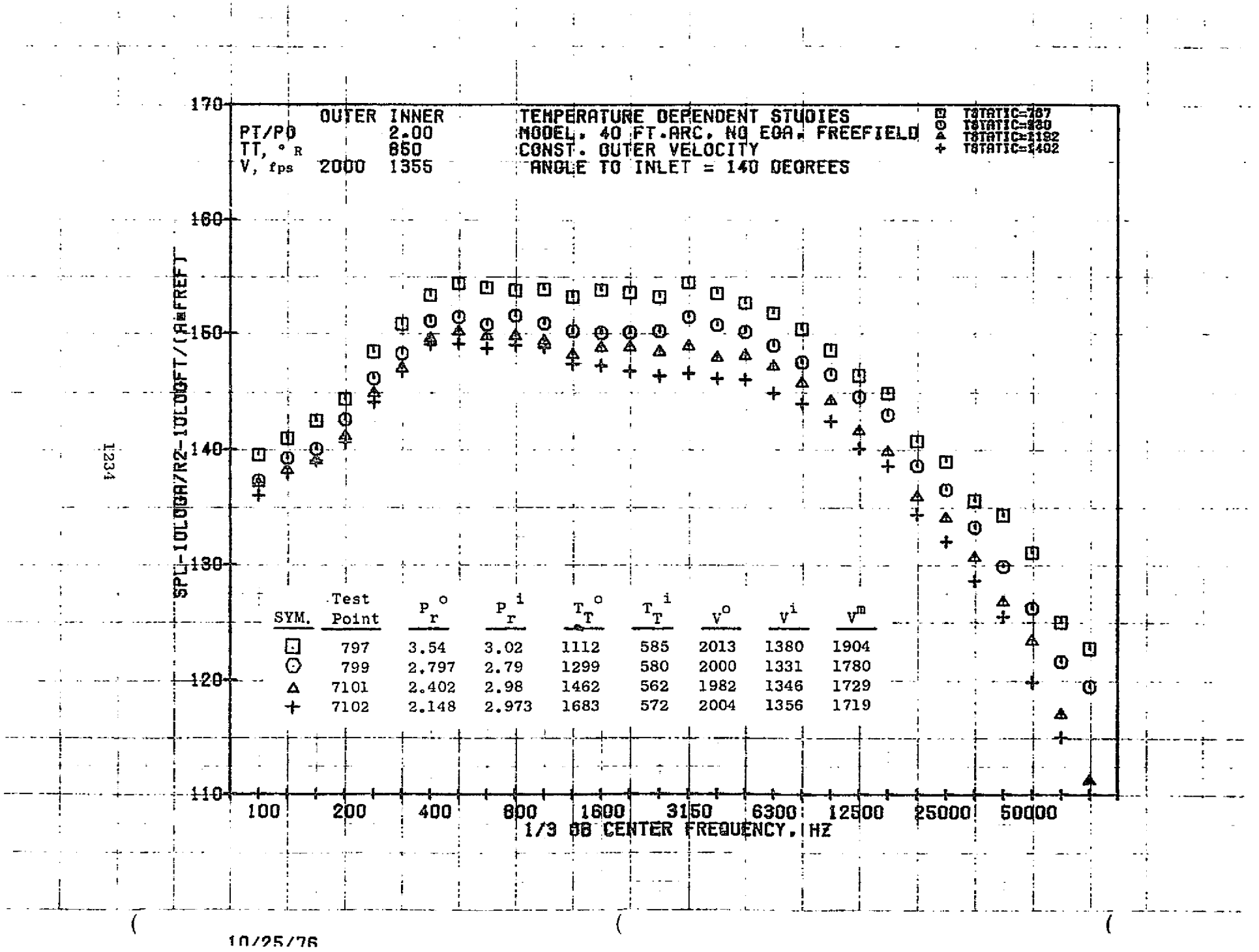
79KOLLSTEDT


OUTER INNER
PT/P0 2.00
TT, °R 650
V, fps 2000 1355
TEMPERATURE DEPENDENT STUDIES
MODEL, 40 FT.ARC, NO EOA, FREEFIELD
CONST. OUTER VELOCITY
ANGLE TO INLET = 140 DEGREES
T0TATIC=787
T0TATIC=880
T0TATIC=1182
T0TATIC=1402
SPL-10LOGA/R2-10LOGFT/(A*FREF)
170
160
150
140
130
120
110
100
200
400
800
1600
3150
6300
12500
25000
50000
1/3 OB CENTER FREQUENCY, HZ
1234
SYM. Test Point P_r^o P_r^i T_T^o T_T^i V^o V^i V^m
797 3.54 3.02 1112 585 2013 1380 1904
799 2.797 2.79 1299 580 2000 1331 1780
7101 2.402 2.98 1462 562 1982 1346 1729
7102 2.148 2.973 1683 572 2004 1356 1719

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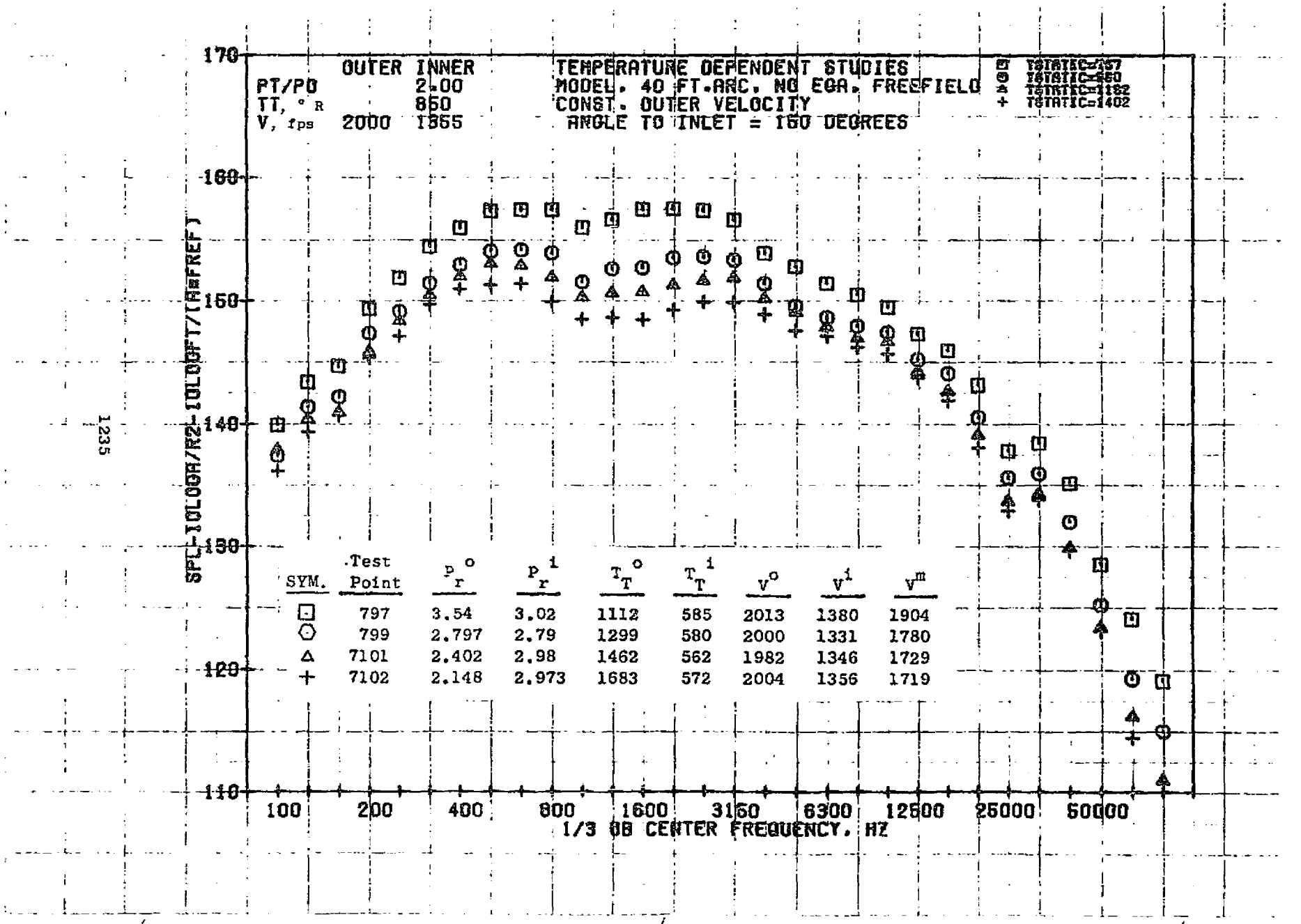

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7SKOLI STEDT