NASA CR-144944

A COMPILATION OF SPACECRAFT LOADS DATA

FROM

FOUR TITAN CENTAUR LAUNCH VEHICLE FLIGHTS

VOLUME I: ACOUSTICS DATA

Compiled by George Kachadourian

Prepared under Contract No. NAS1-9100 by
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Viking Project Support Services
Hampton, Virginia

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

January 1977

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ABSTRACT

The payloads carried by the first four Titan Centaur Launch Vehicle Flights were, a Viking Spacecraft Dynamic Simulator, the Helios-A spacecraft and the two Viking Spacecraft. Dynamic loads data was accumulated by the NASA Viking Project Office from these four flights for application to the Viking Spacecraft. This report contains a compilation of that data and is presented for reference and information. The data has been compiled into the following five Volumes:

Volume I -	Acoustic Data (CR-144944)
Volume II -	Vibration Power Spectral Density Data (CR-144945)
Volume III -	Shock Spectra of Transients (CR-144946)
Volume IV -	Titan Stage I and Centaur Burn Oscillation (CR-144947)
Volume V -	Time History Plots (CR-144948)

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15. Supplementary Notes

This report is a compilation of acoustic data processed by the Langley Research Center Analysis and Computation Division under direction from the Viking Project Office.

16. Abstract

The payloads carried by the first four Titan Centaur Launch Vehicle flights were a Viking Dynamic Simulator, the Helios A Spacecraft and the two Viking Spacecraft. Dynamic loads data were gathered by the NASA Viking Project Office from these four flights for applications to the Viking Spacecraft. This volume contains time histories and spectral analysis plots of acoustic pressure measurements made in the Centaur and Payload compartment during launch flight. Summary plots are also presented to show composite spectra for Lift Off and Mach 1/Max Q periods of flight.

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Unclassified	Unclassified		

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VOLUME I

ACOUSTIC DATA

Contents

Notations Used in Volume I

Bus -	Major structural assembly of Viking Orbiter
Max Q -	Period of launch flight of maximum dynamic pressure
VDS -	Viking Dynamic Simulator, TC-1 payload
VLC -	Viking Lander Capsule
VLCA -	Viking Lander Capsule Adapter
VO -	Viking Orbiter
VS/C -	Viking Spacecraft
V-S/C-A -	Viking Spacecraft Adapter
TC-1 -	The Titan Centaur Launch Vehicle Number 1
TC-2 -	The Titan Centaur Launch Vehicle Number 2, Helios Spacecraft
TC-3 -	The Titan Centaur Launch Vehicle Number 3, Second Viking Spacecraft Launch
TC-4 -	The Titan Centaur Launch Vehicle Number 4, First Viking Spacecraft Launch

Description of Contents of Volume 1: Acoustics Data

This volume presents 1/3 octave band spectra of acoustic measurements made on the four Titan Centaur Launch Vehicles, TC-1 through TC-4. There were two microphones on TC-1, three on TC-2 and one each on TC-4 and TC-3. The measurement in the Centaur Forward Equipment Compartment (CA886Y) was common to all four flights. The general data procedure followed was to perform analyses of successive two second periods of time at lift off and through Max Q. This then shows variations of frequency spectrum as well as overall levels.

A summary of overall levels is given in Table 1. There are two sets of numbers in Table 1; the numbers not in parentheses are referred to as the "band limited" acoustic levels for the frequency band between 10 and 2000 Hz. The numbers in parentheses are referred to as overall levels, with the significant difference being that the overall includes the acoustics below 10 Hz. This is significant in the first two seconds following Stage 0 Ignition because of the relatively large, low frequency "overpressure" phenomenon. There are also some very low frequency variations in the Mach 1-Max Q period of flight which are also evidenced by large differences between the band limited and overall acoustic levels.

The Octave Band data shown in Figures 4 and 70.1-70.12 were developed by the NASA Kennedy Space Center. All other data presented here was processed by NASA Langley Research Center.

A summary and discussion of the acoustic data presented here is also contained in Reference 1.

Reference 1. Kachadourian, G., A Summary of Spacecraft Loads Data from Four Titan Centaur Launch Vehicle Flights. NASA CR-2645.

TABLE 1. TITAN CENTAUR ACOUSTIC DATA
SUMMARY OF OVERALL LEVELS

FLIGHT & SENSOR	LIFT OFF			MAX Q		
	T+0 to T+2	T+2 to T+4	T+4 to T+6	Pre Max	Max.	Post Max
TC-1						
-CY217Y	126.4 (134.5)	123.5 (125.6)	123.6 (124.3)	119.2 (119.8)	116.8 (125.0)	116.6 (119.9)
-CA886Y	(128.6)				(124.8)	
TC-2						
-GA1Y	127.3 (135.8)	126.0 (128.5)	126.4 (126.7)	121.7 (121.9)	123.6 (123.7)	122.0 (128.0)
-CA886Y	129.5 (135.3)	126.7 (128.4)	126.6 (126.9)	123.6 (123.7)	126.5 (126.6)	122.9 (125.0)
-CA888Y	128.1 (142.4)	127.4 (130.9)	125.4 (127.2)	121.8 (122.4)	123.4 (125.2)	122.4 (125.8)
TC-4						
-CA886Y	130.3 (138.1)	124.6 (126.3)	125.6 (125.7)	124.3 (124.5)	124.8 (124.8)	121.9 (122.5)
TC-3						
-CA886Y	129.2 (138.9)	125.0 (125.7)	(Not Done)	124.3 (124.4)	124.8 (125.0)	120.8 (122.2)

Locations:
CA886Y - Centaur Fwd Equipment Compartment
CA888Y - Centaur Engine Compartment
CY217Y - TC-1 Payload (VO Bus)
GA1Y - TC-2 Payload (Helios Attach Frame)

Units - Db re .0002 dyne/cm^2 10 - 2000 Hz BW
Numbers in parentheses are overall SPL, 0-2048 Hz

FIGURE 1. TC-1 Acoustic Instrumentation Description

Launch Date	**February 12, 1974**
Stage 0 Ignition	**13:48:01 GMT (49681 Sec.)**
Payload	**Viking Dynamic Simulator**

Acoustic Instrumentation

Sensor No.	Location	FM/FM Link	IRIG No.	Range	Filter Cutoff Frequency Hz
CY217Y	VO Bus	2215.5 MHz	19	150 Db	2800
CA886Y	Fwd Equip Comp	2208.5 MHz	19	150 Db	2800

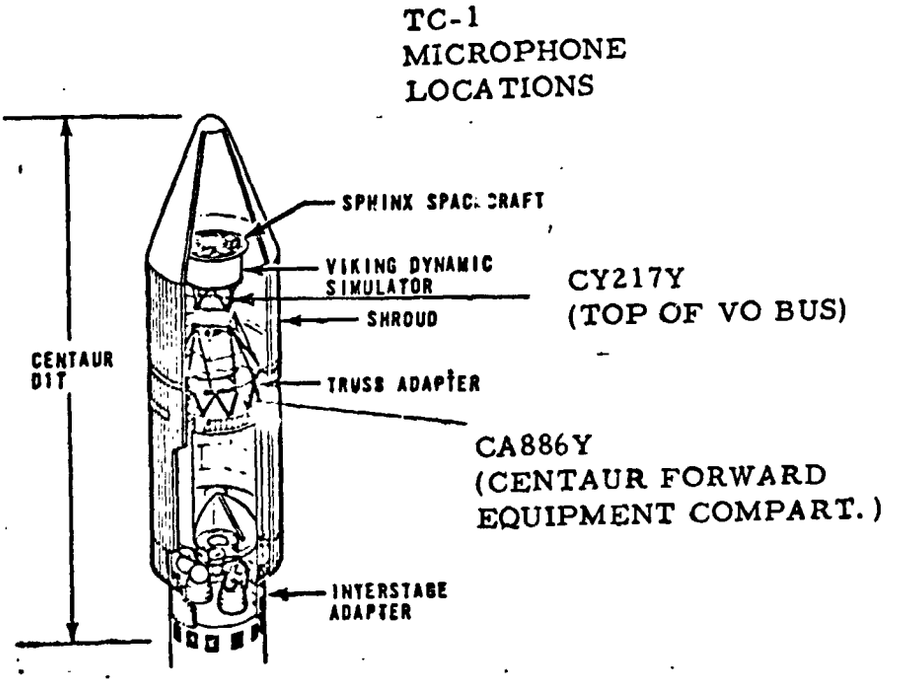


FIGURE 2. TC-2 Acoustic Instrumentation Description

Launch Date	**December 10, 1974**
Stage 0 Ignition	**7:11:01 GMT (25861 Sec.)**
Payload	**Helios - A**

Acoustic Instrumentation

Sensor No.	Location	FM/FM Link	IRIG Channel	Range Db	Filter Cutoff Frequency Hz
GA1Y	P/L Support Frame	2250.5 Hz	19	150	2800
CA886Y	Fwd. Equip. Comp.	2208.5 Hz	19	150	2800
CA888Y	Centaur Eng. Comp.	2208.5 Hz	20	150	2800

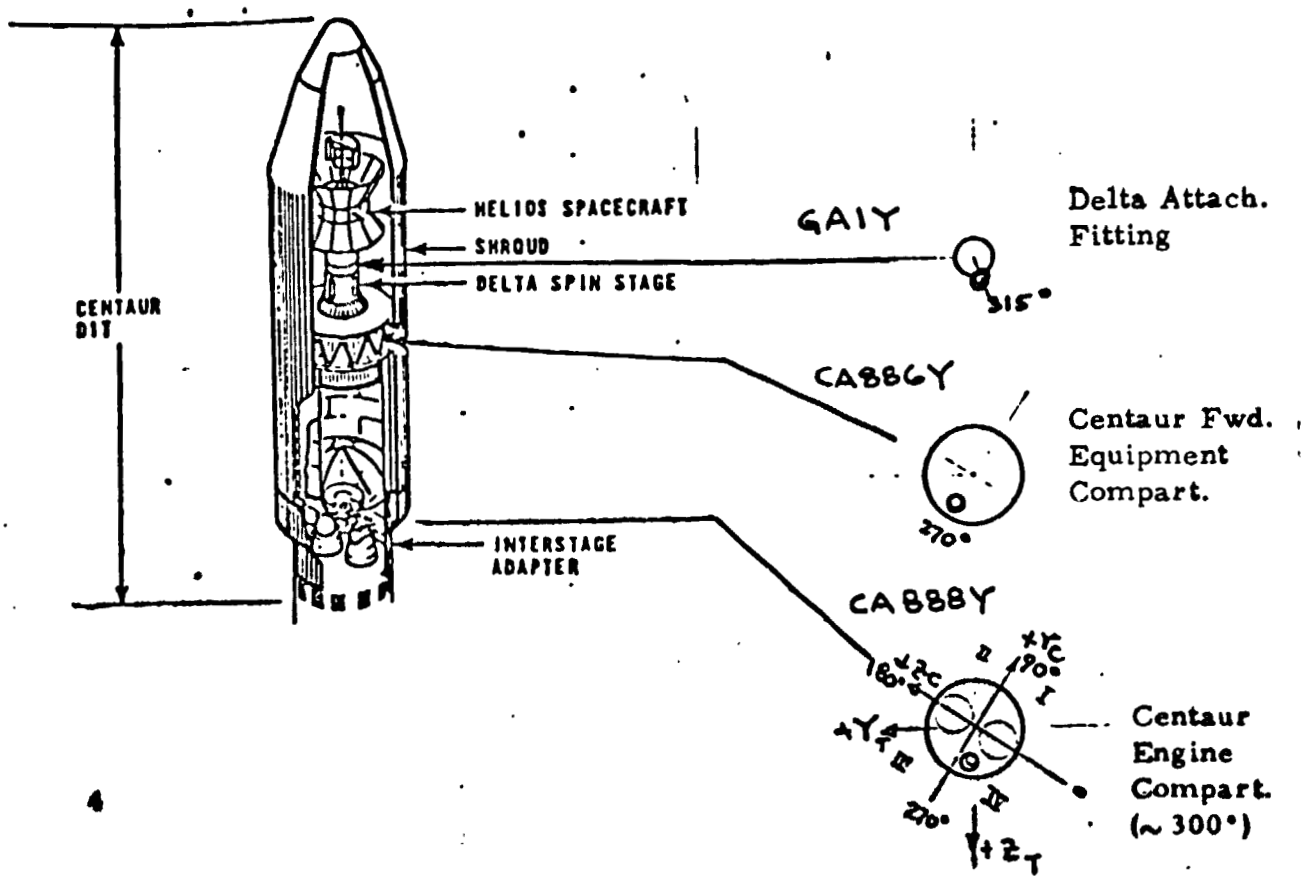
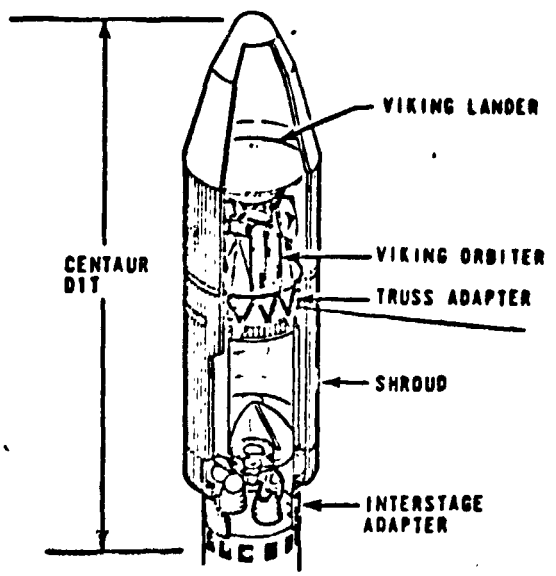


FIGURE 3. TC-4 & TC-3 Acoustic Instrumentation Description

Launch Vehicle	**TC-4**	**TC-3**
Launch Date	**August 20, 1975**	**September 9, 1975**
Stage 0 Ignition	**21:22:00 GMT (76920 Seconds)**	**18:39:00 GMT (67140 Seconds)**
Payload	**Viking A**	**Viking B**

Acoustic Instrumentation

Sensor No.	Location	FM/FM Link	IRIG No.	Range	Filter Cutoff Frequency Hz
CA886Y	Fwd. Equip. Comp.	2208.5 MHz	19	150 Db	2800



CA886Y

(Centaur Forward Equipment Compart.)

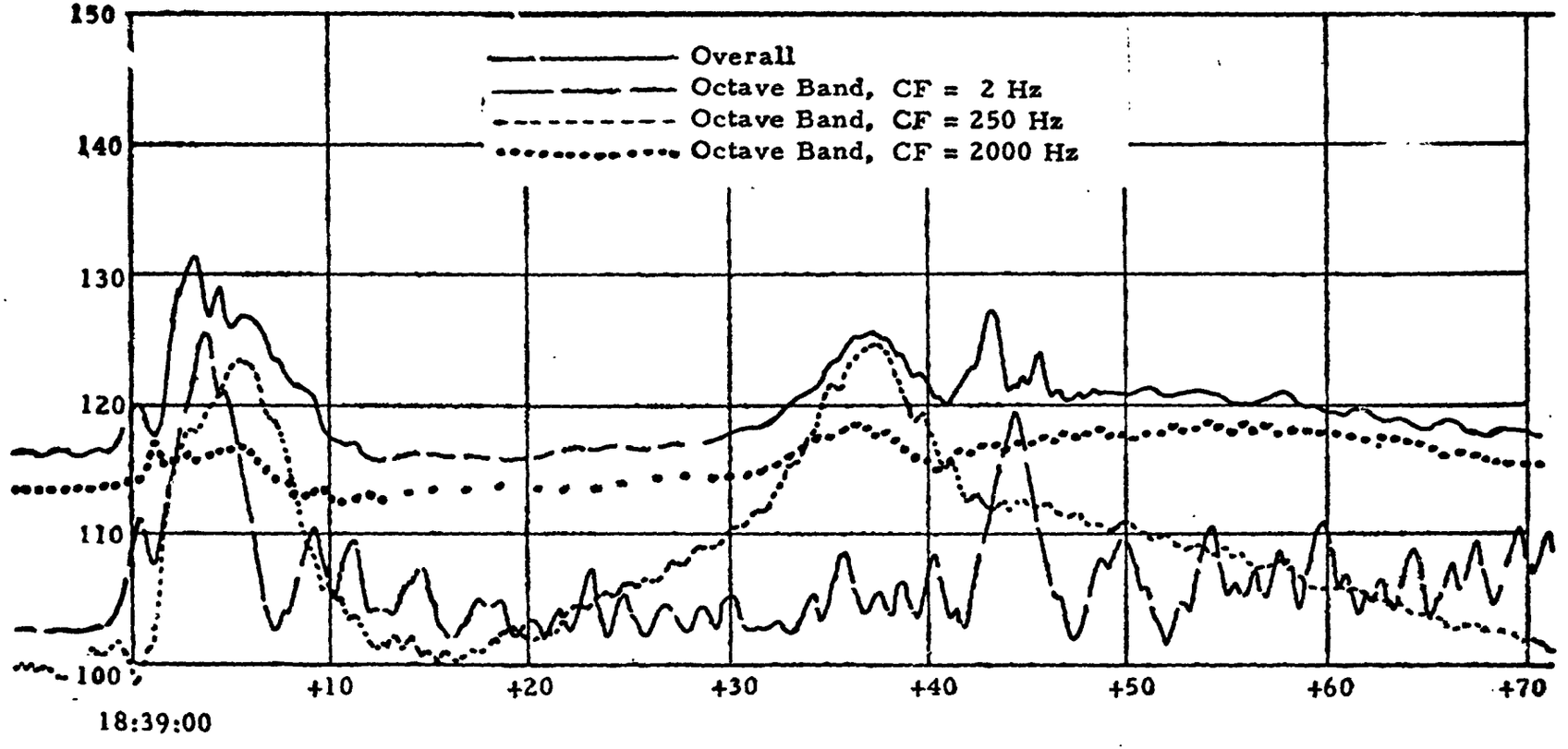


Figure 4 - Variation with Flight Time of Overall and Selected Octave Band Acoustic Levels, TC-3 Data

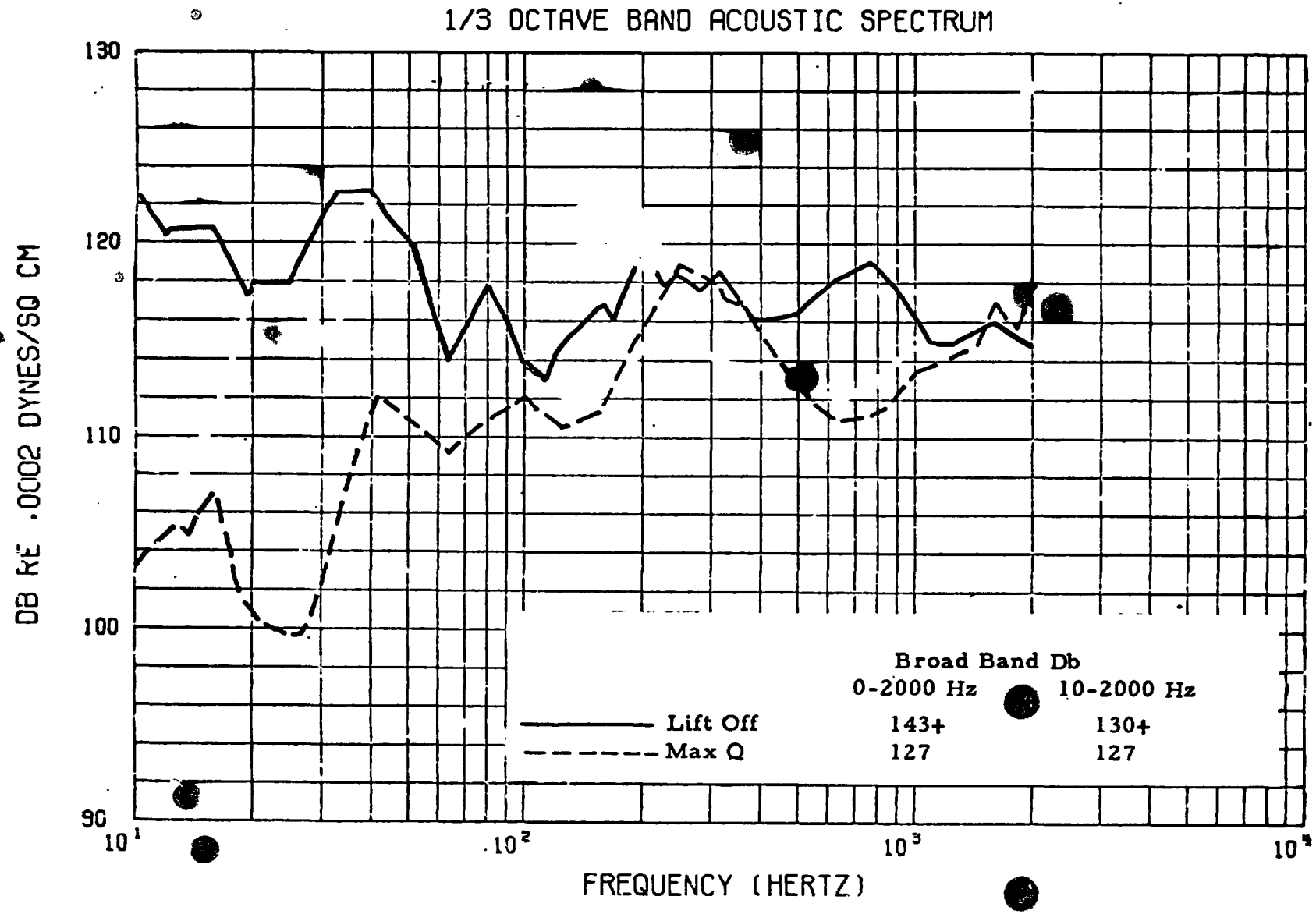


Figure 5 - Envelope of All Measurements & All Flights

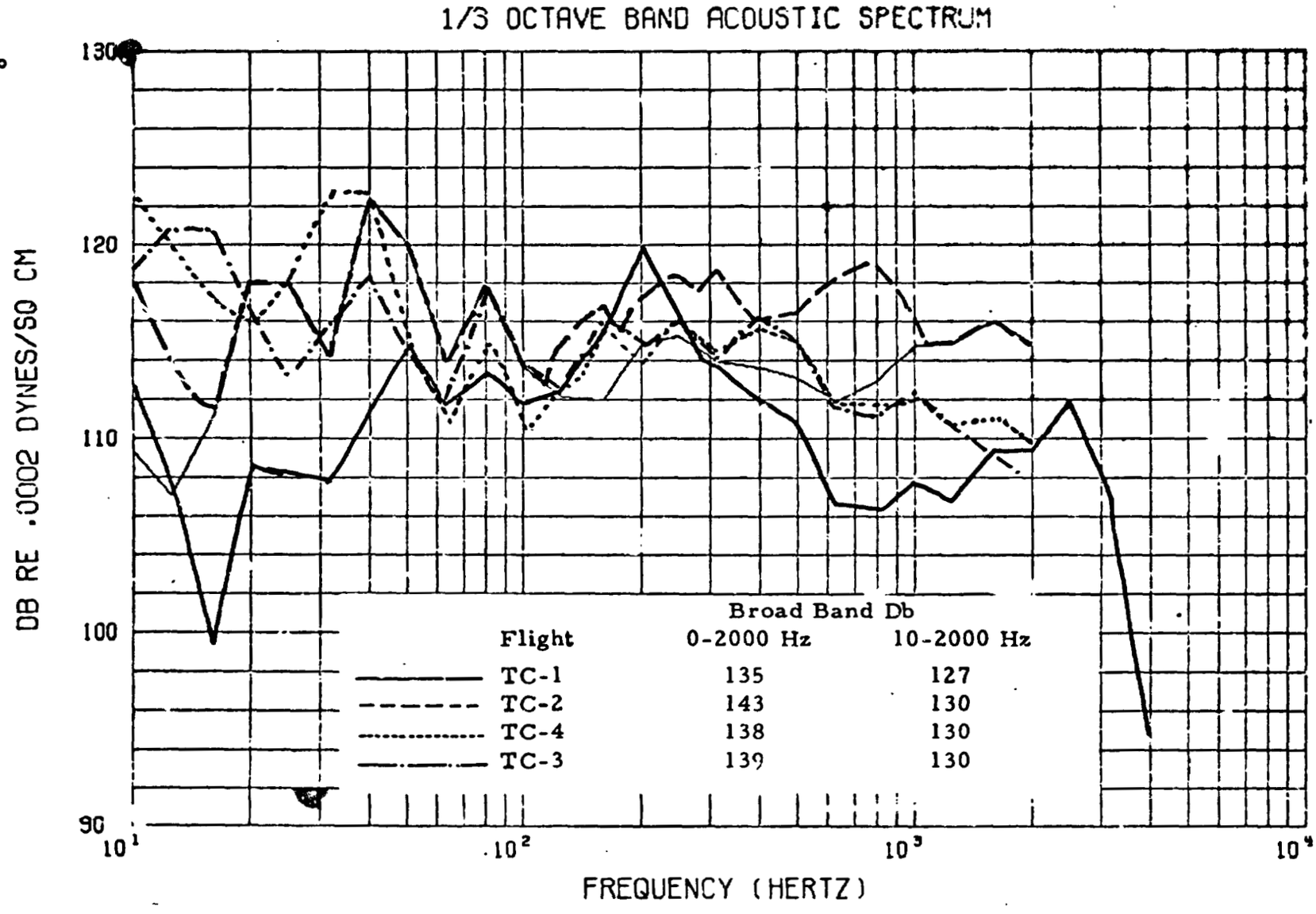


Figure (Comparison by Flight of Lift Off Spectra

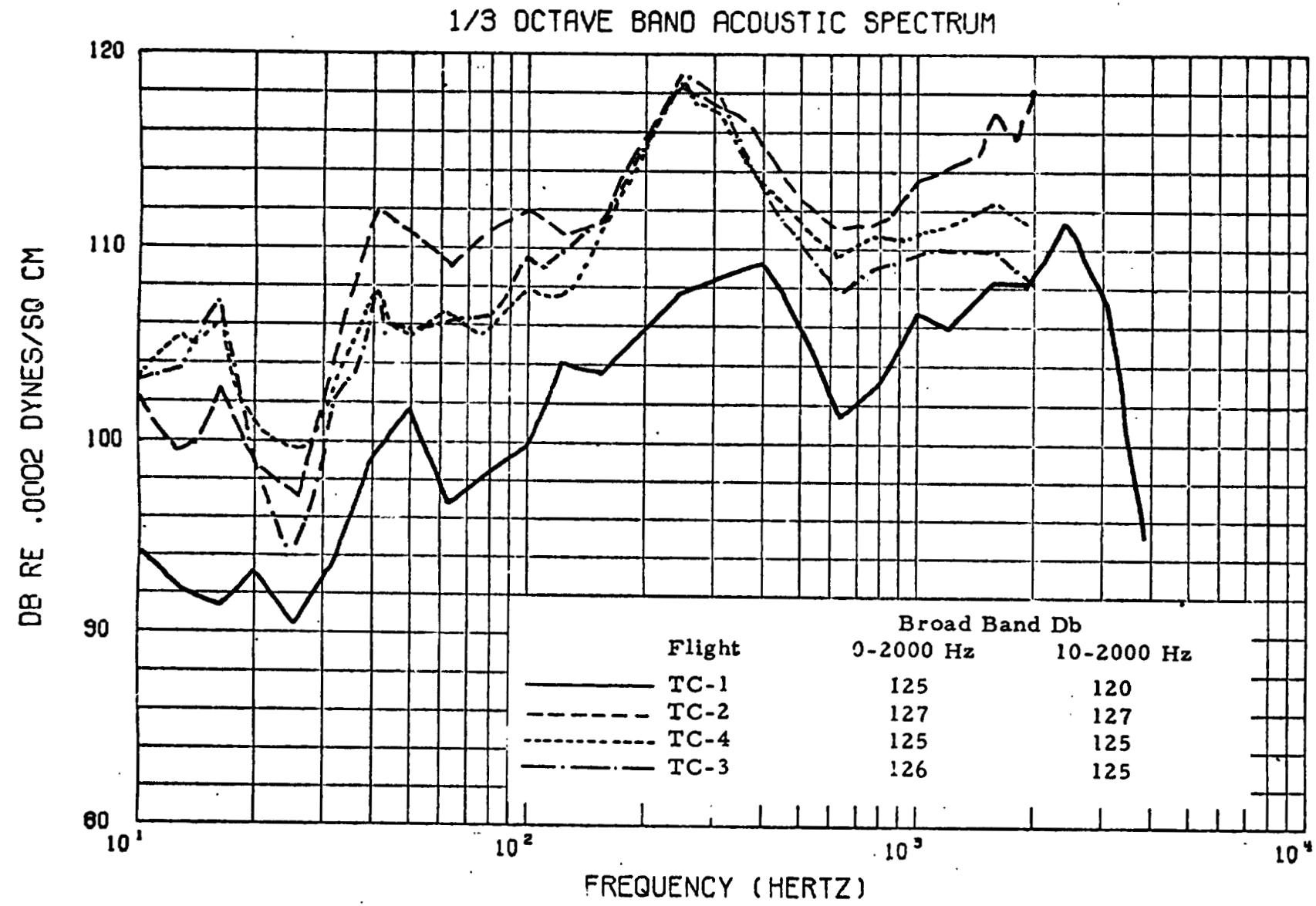


Figure 7 Comparison by Flight of Max Q Spectra

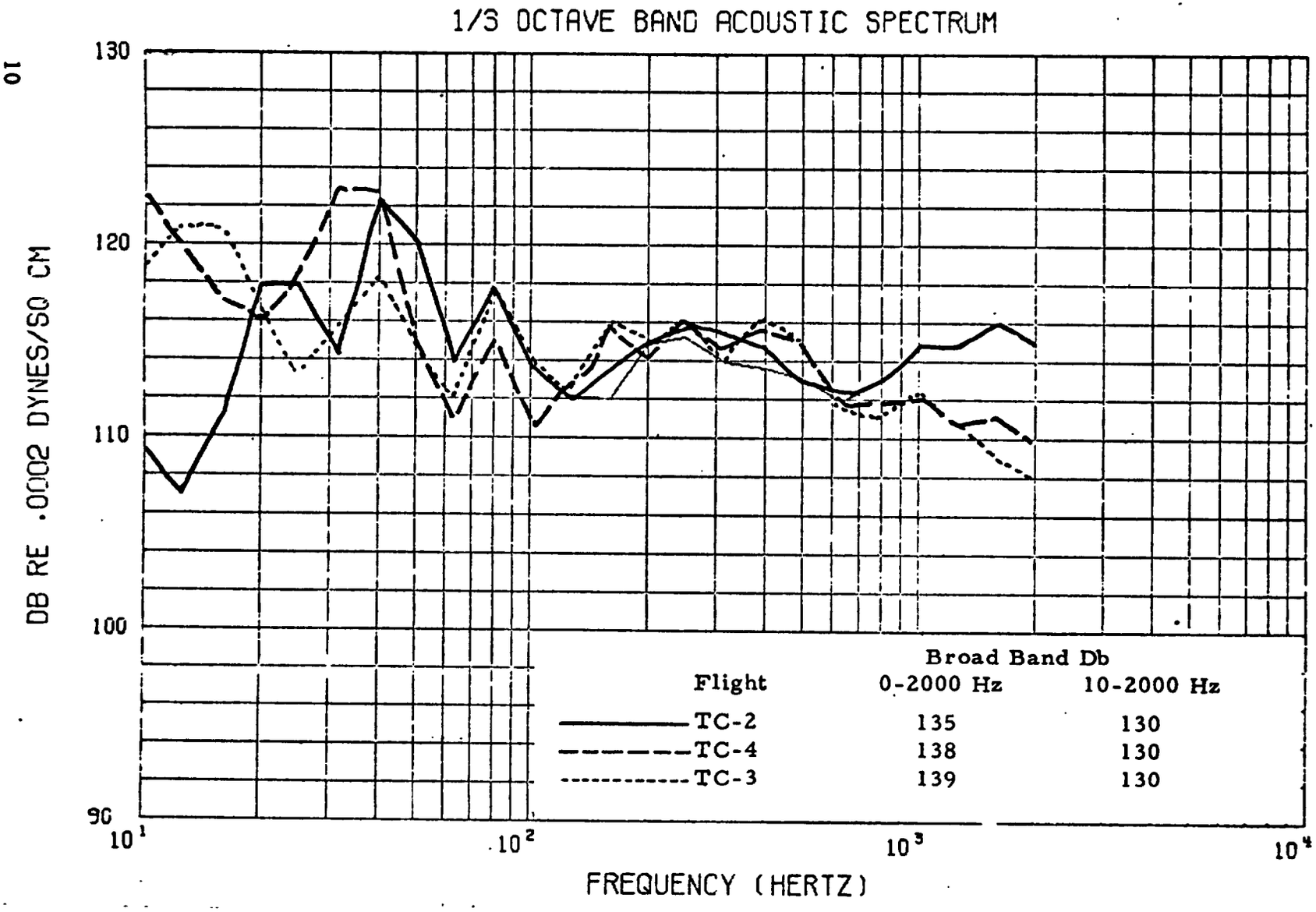


Figure 8 Comparison by Flight, for Lift Off, CA 886Y

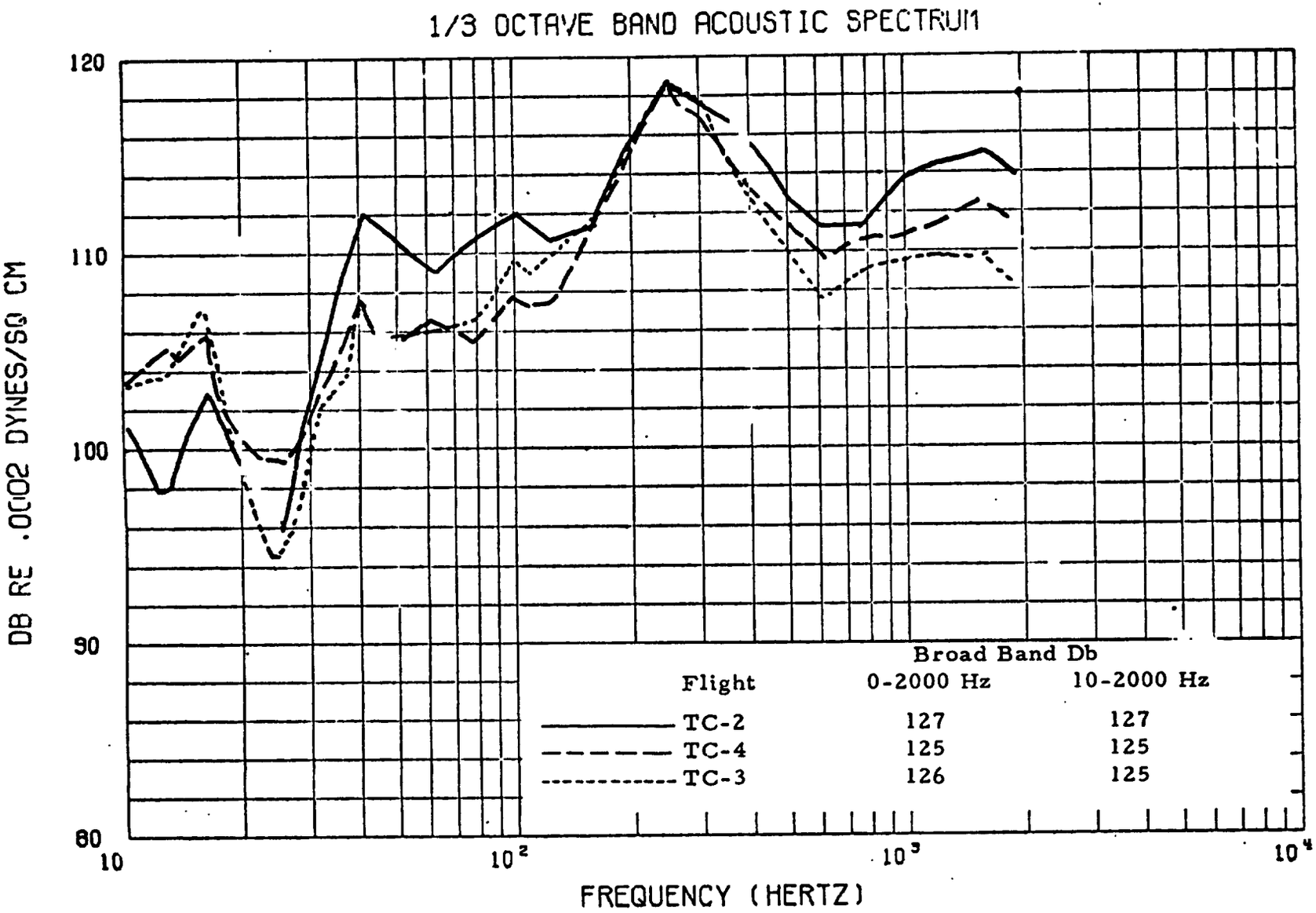


Figure 9. Comparison by Flight, for Max Q, of CA 886Y

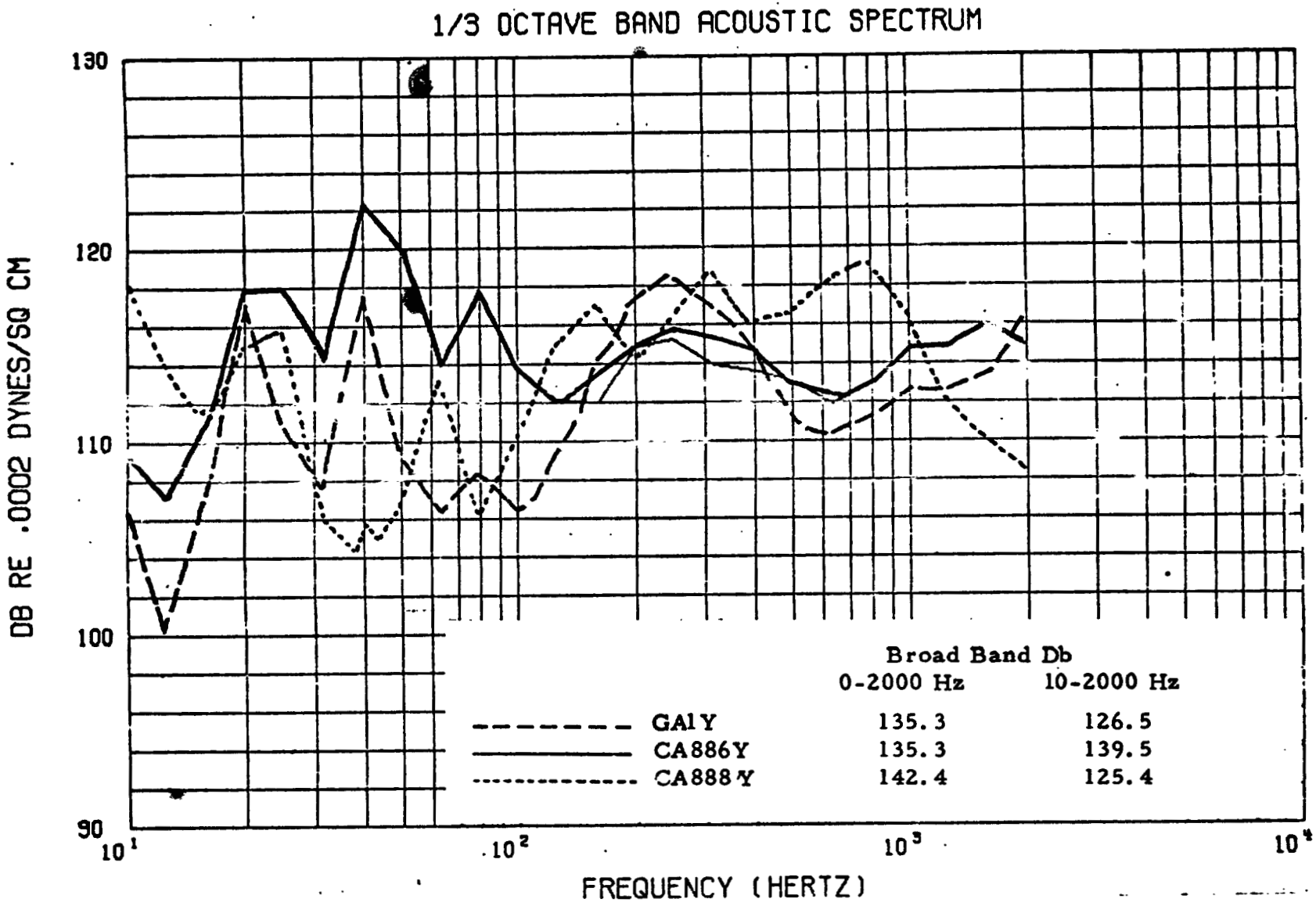


Figure 10. Comparison by Location of TC-2 Lift Off Data

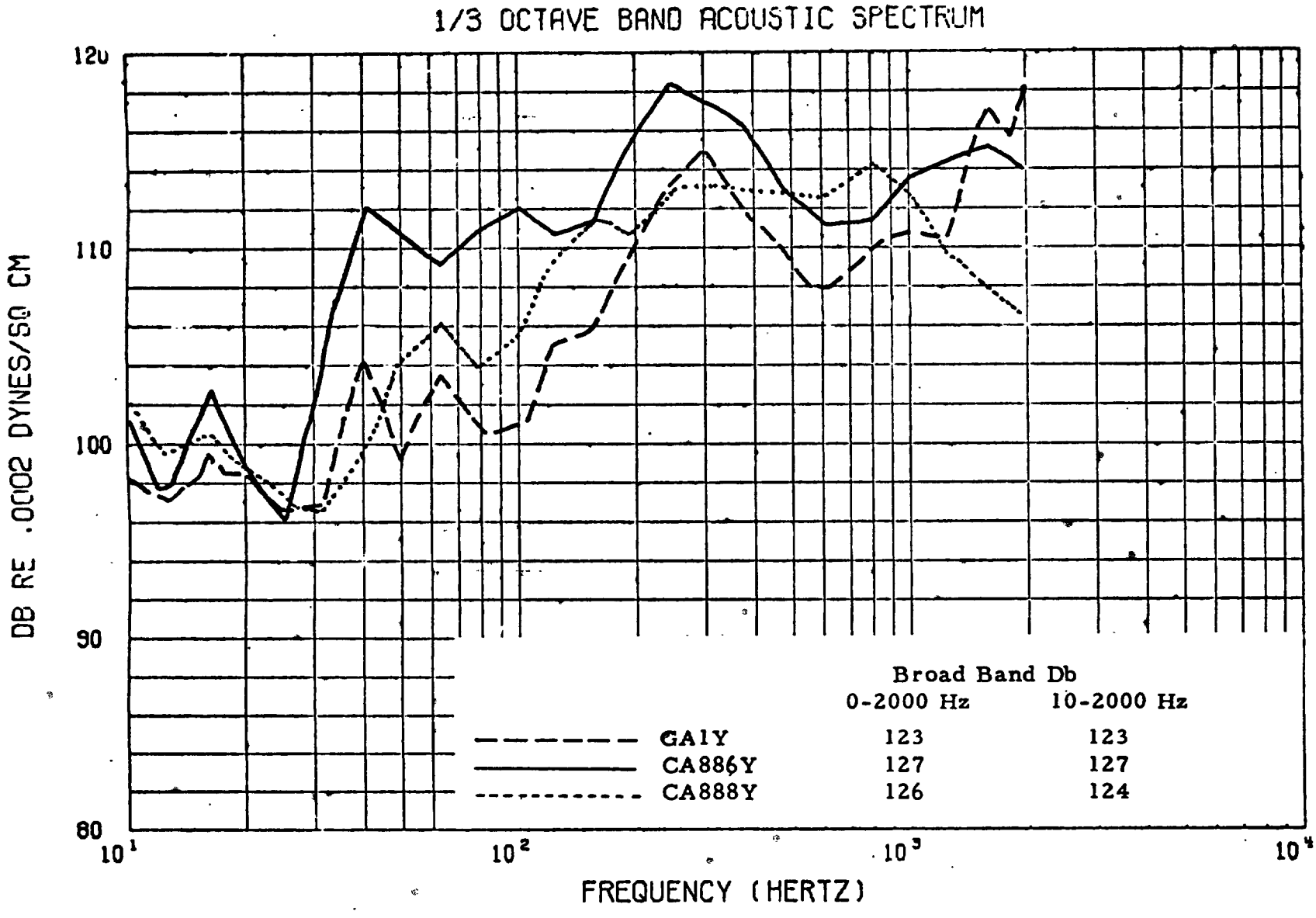


Figure 11. Comparison by Location of TC-2 Max Q Data

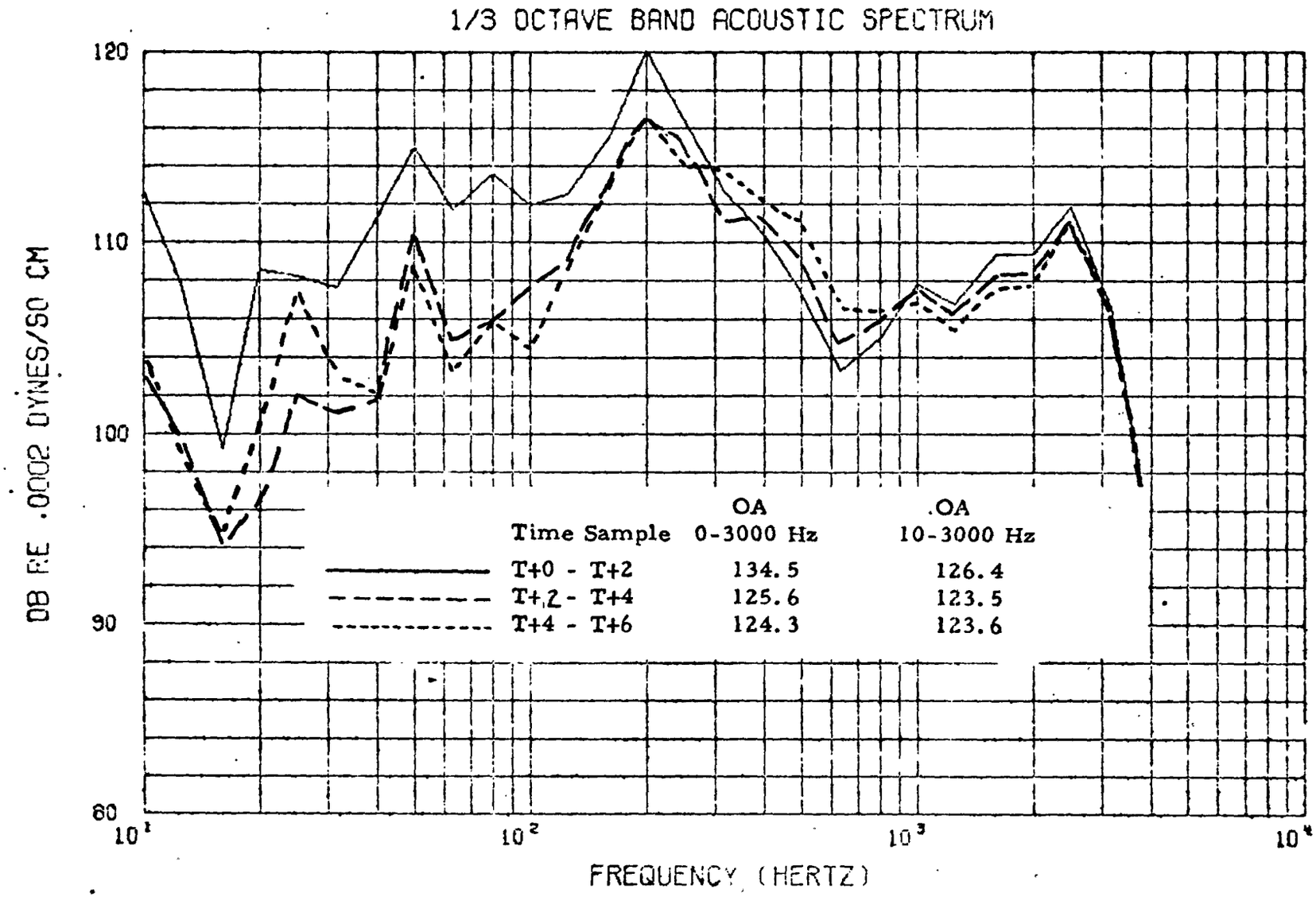


Figure 12. Summary of TC-1 Stage O Ign.

CY117Y

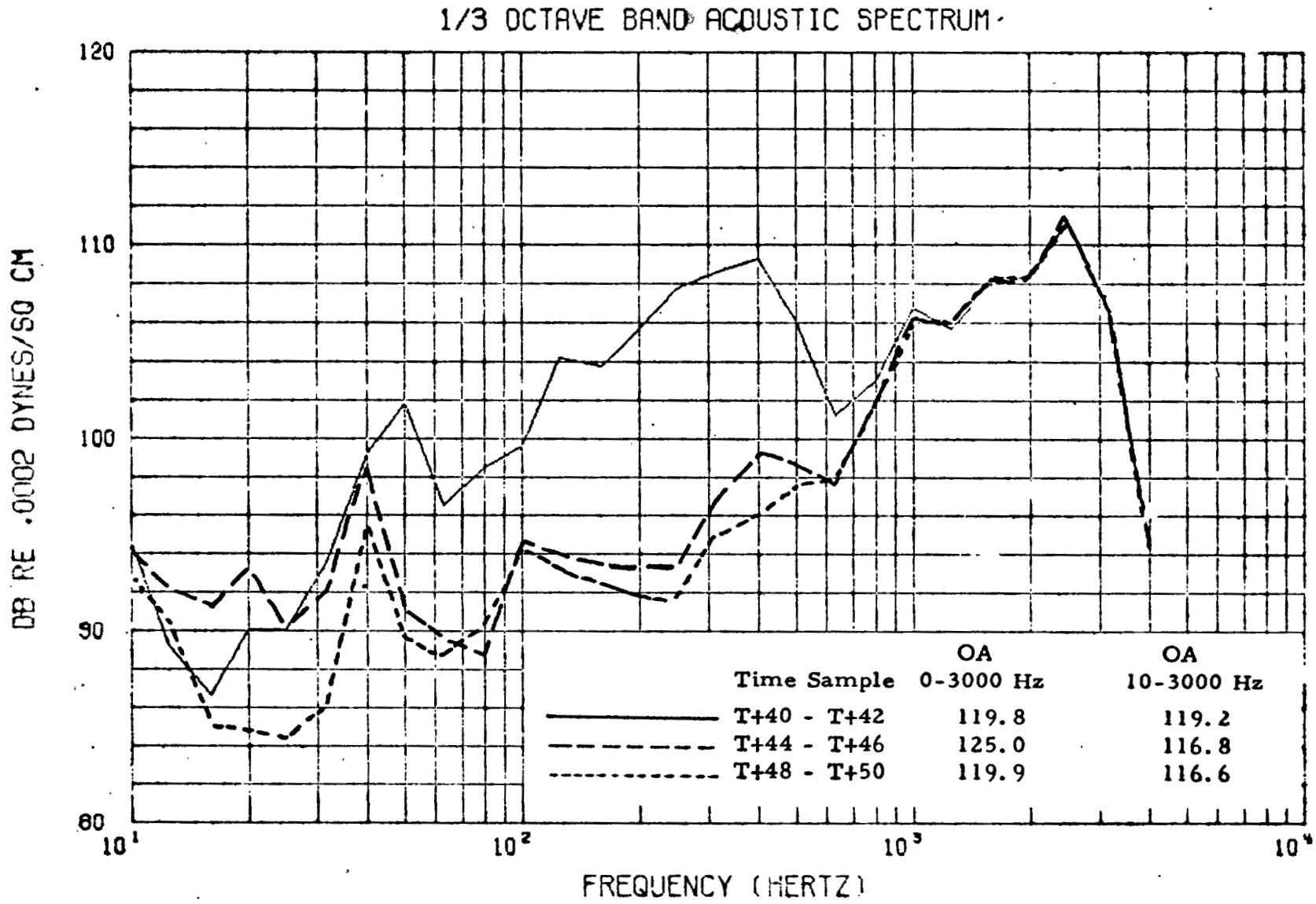


Figure 13. Summary TC-1 Max Q

CY 117 Y

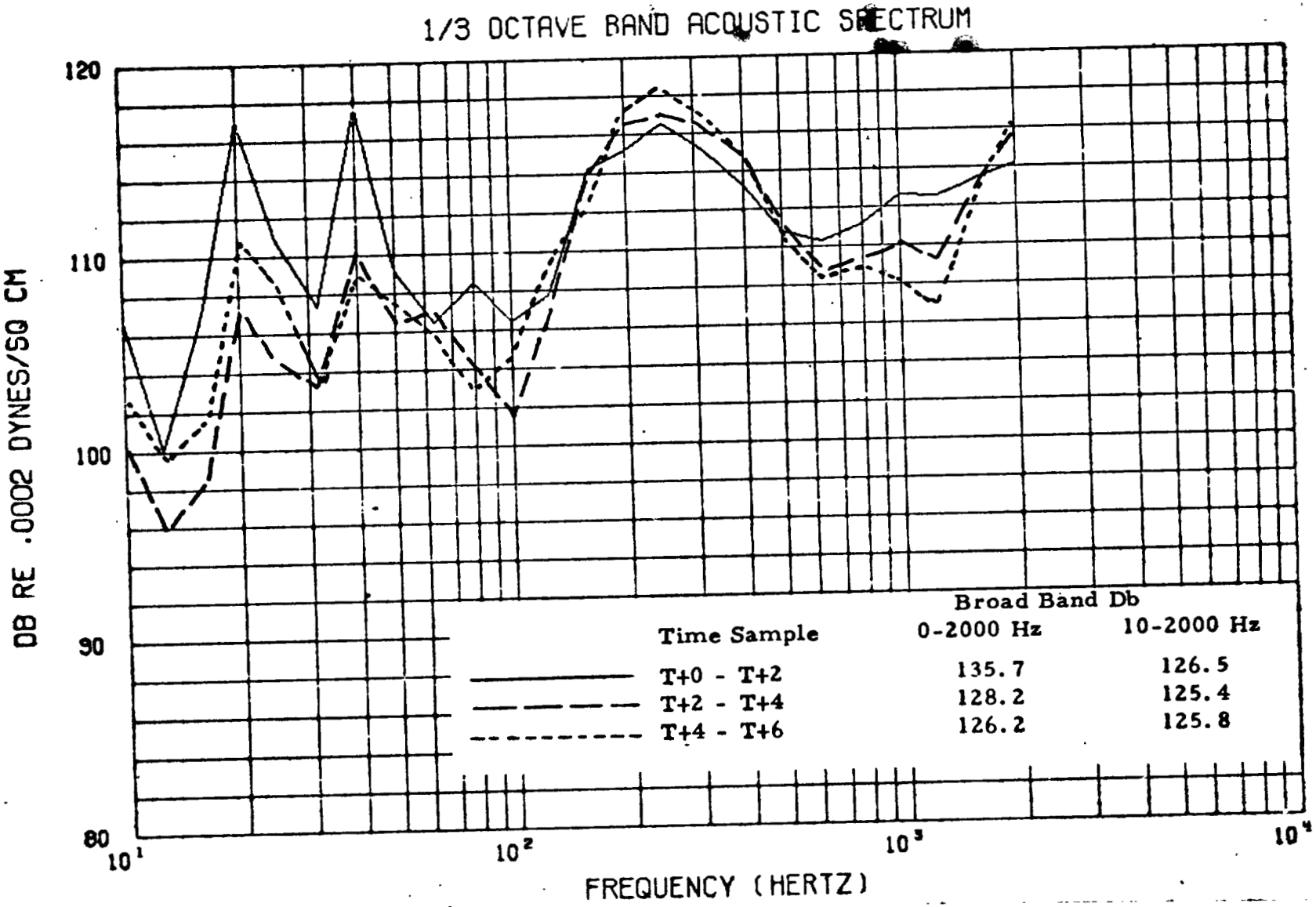


Figure 14. TC-2 SUMMARY Stg 0 Ign/Lift-off GA1Y

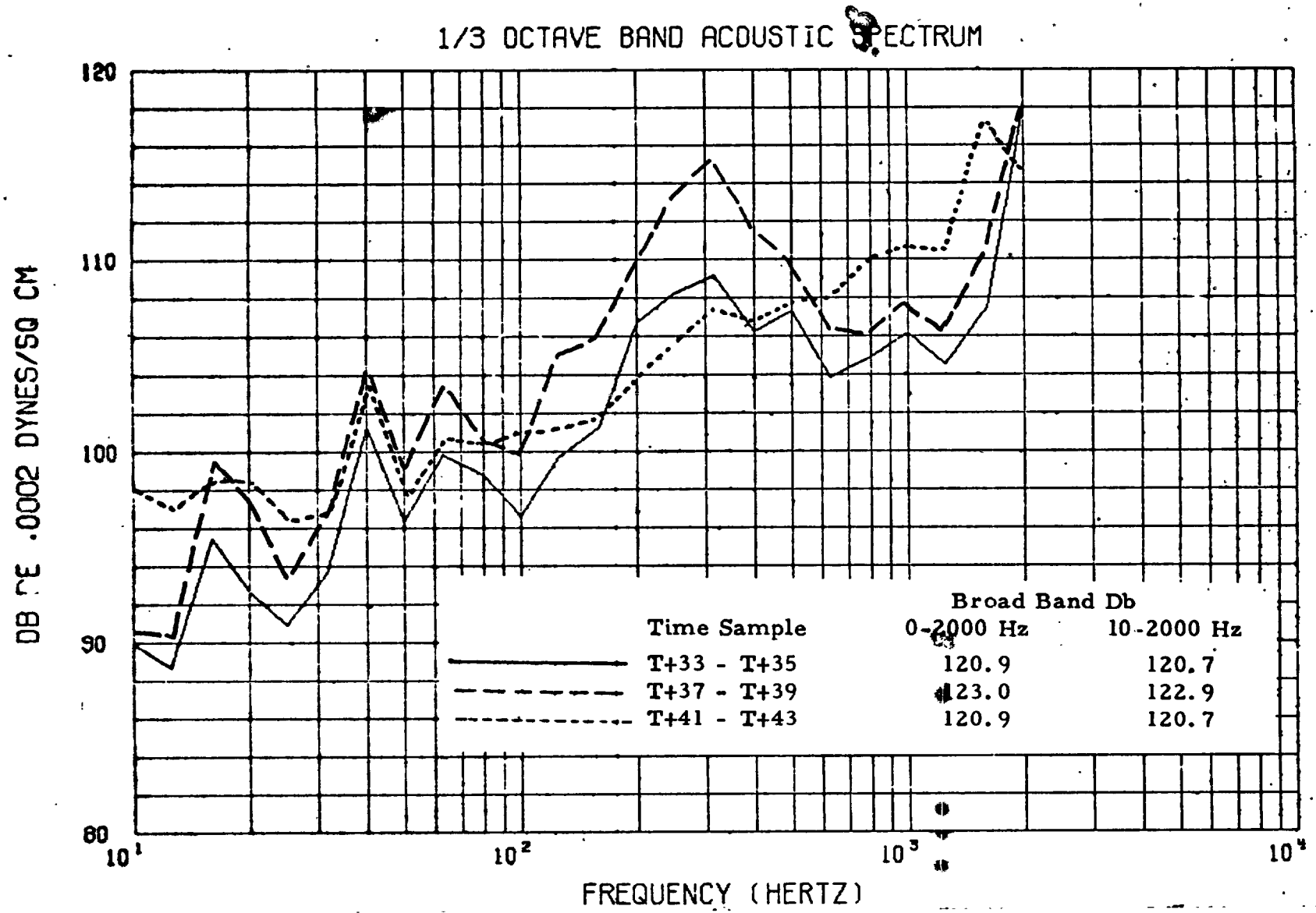


Figure 15. TC-2 Summary Max Q GALY

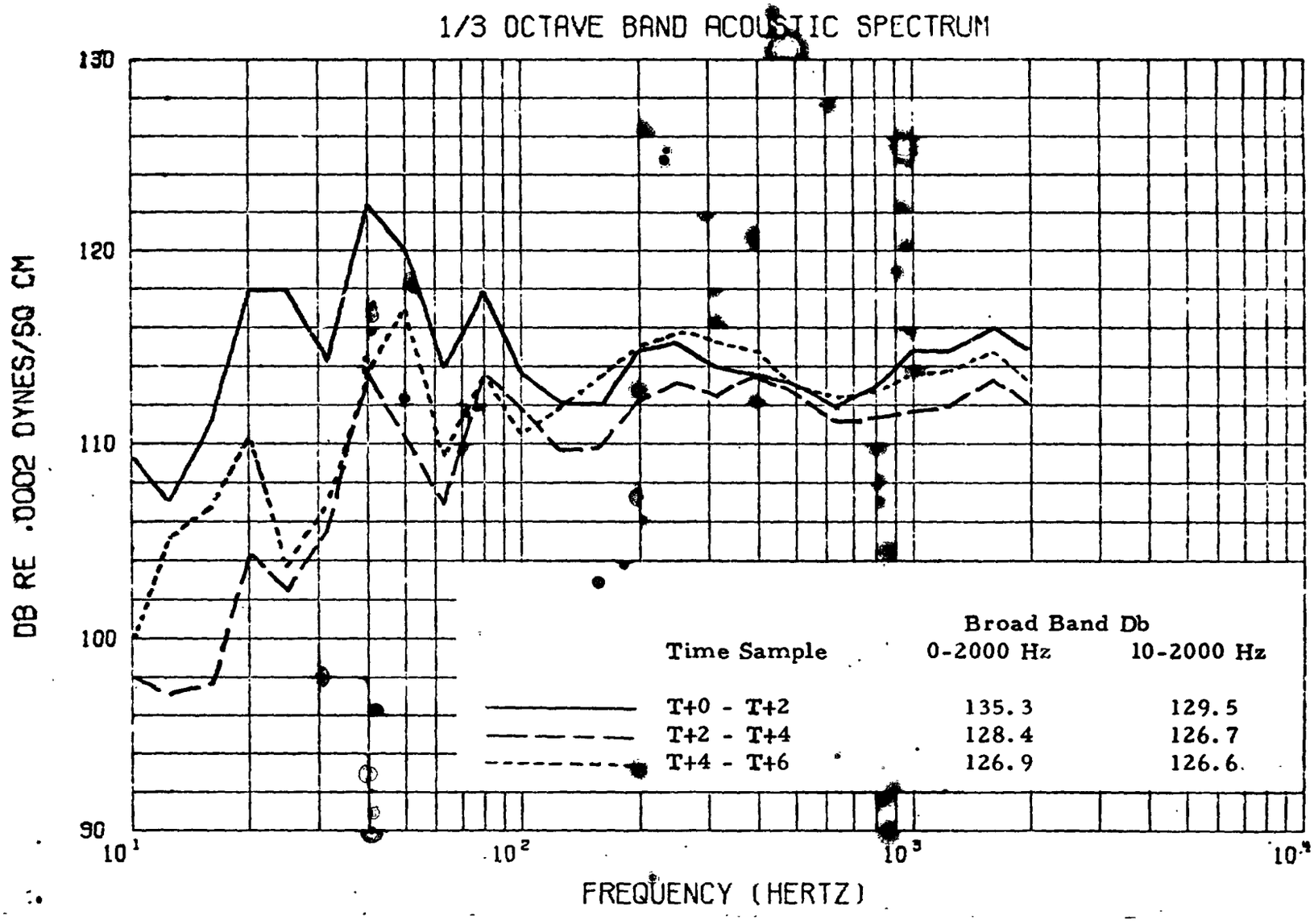


Figure 16. TC-2 Summary

STG 0 IGN/Lift Off

CA886Y

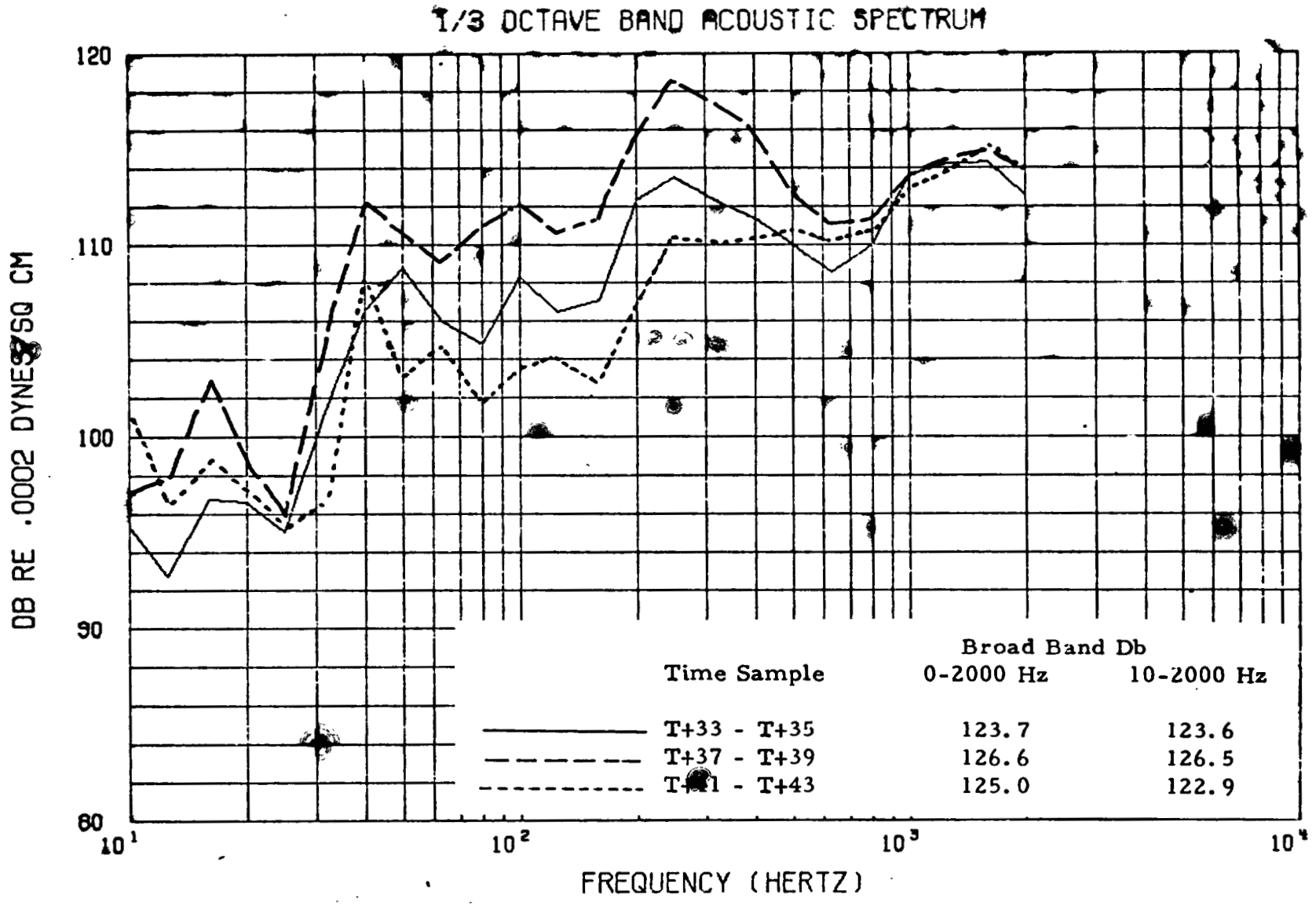


Figure 17. TC-2 Summary

MAX Q

CA 886 Y

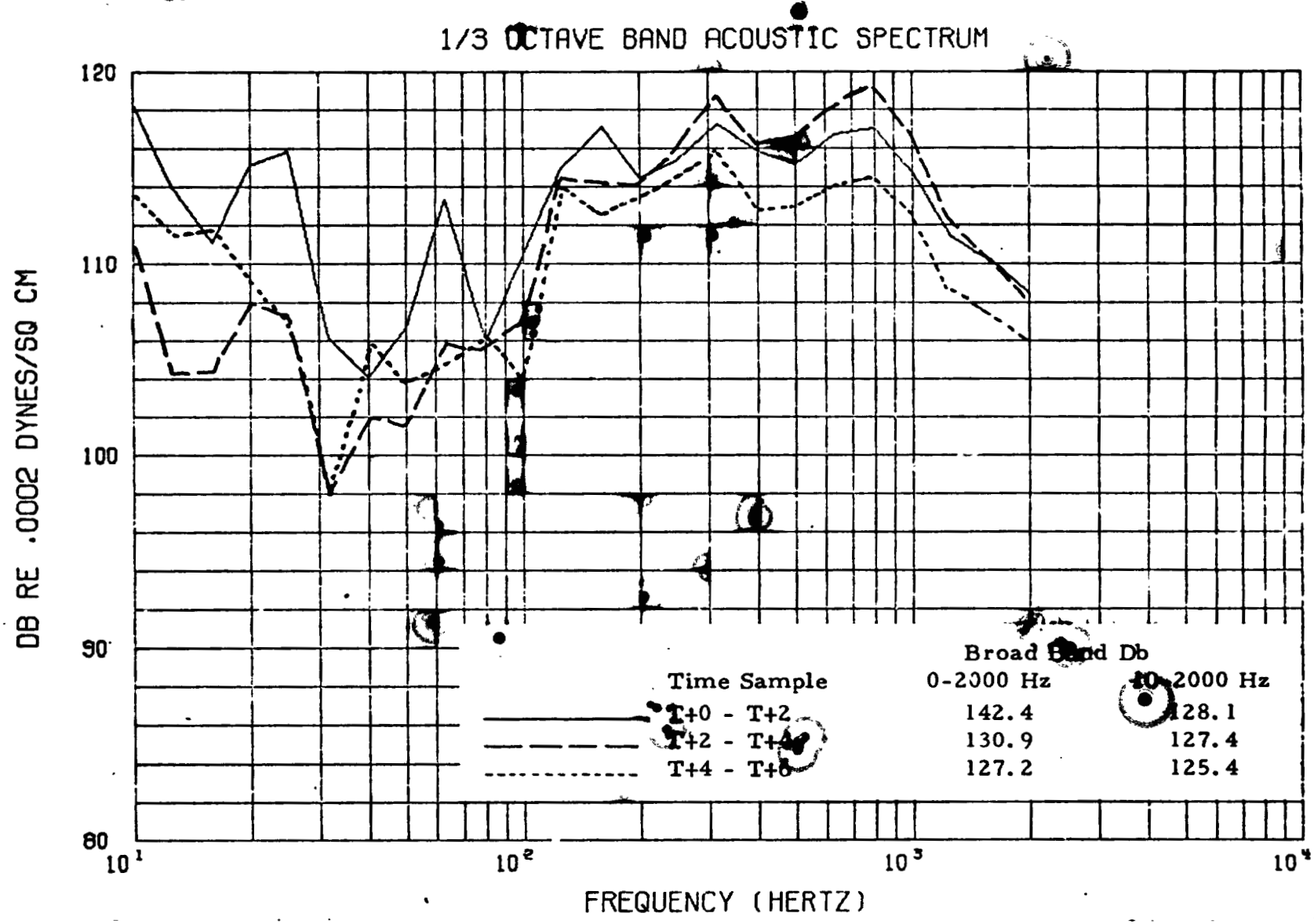


Figure 18. TC-2 Summary Stg. 0 Ignition / Lift Off CA888Y

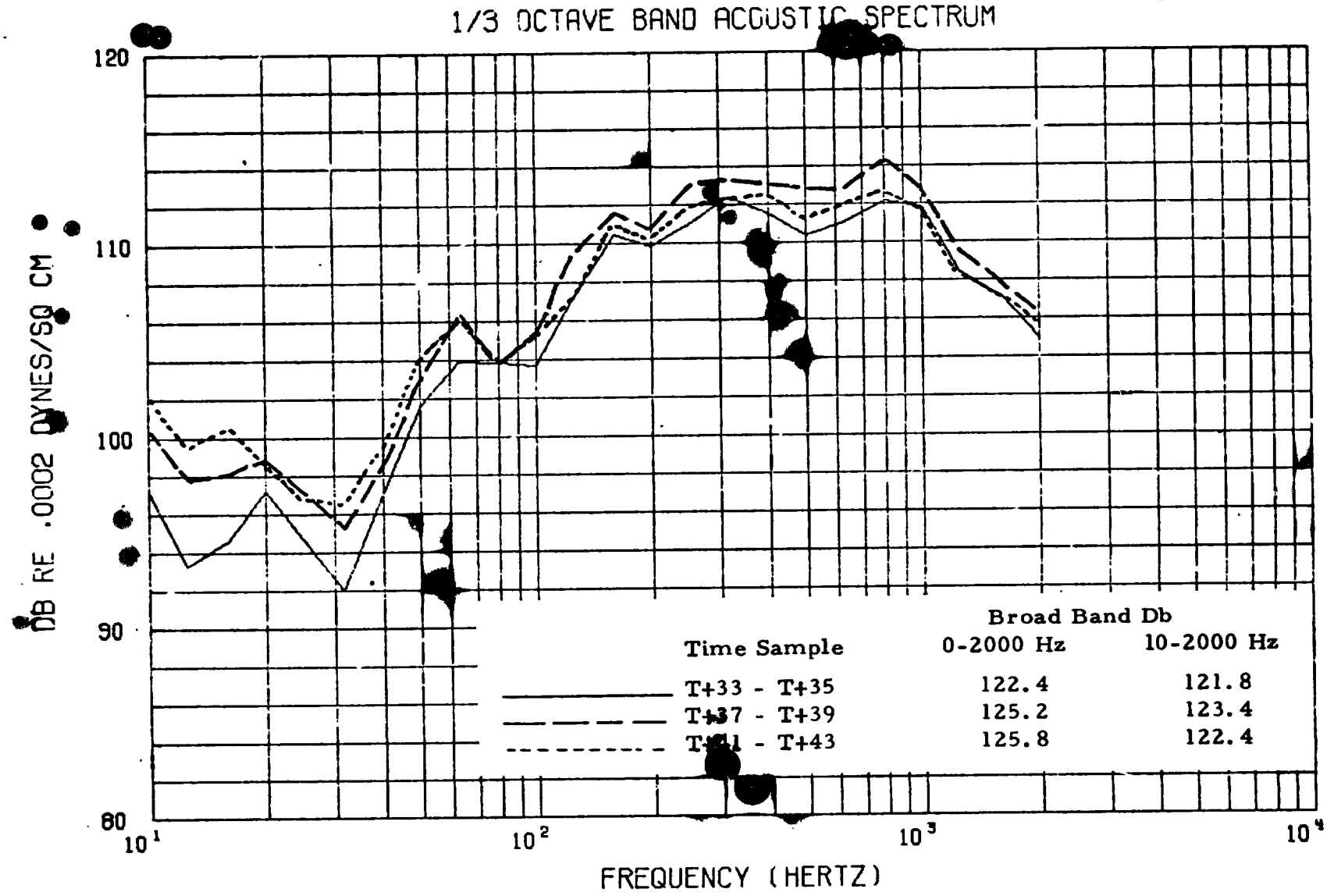


Figure 19. TC[illegible]ary

MAX Q

CA888Y

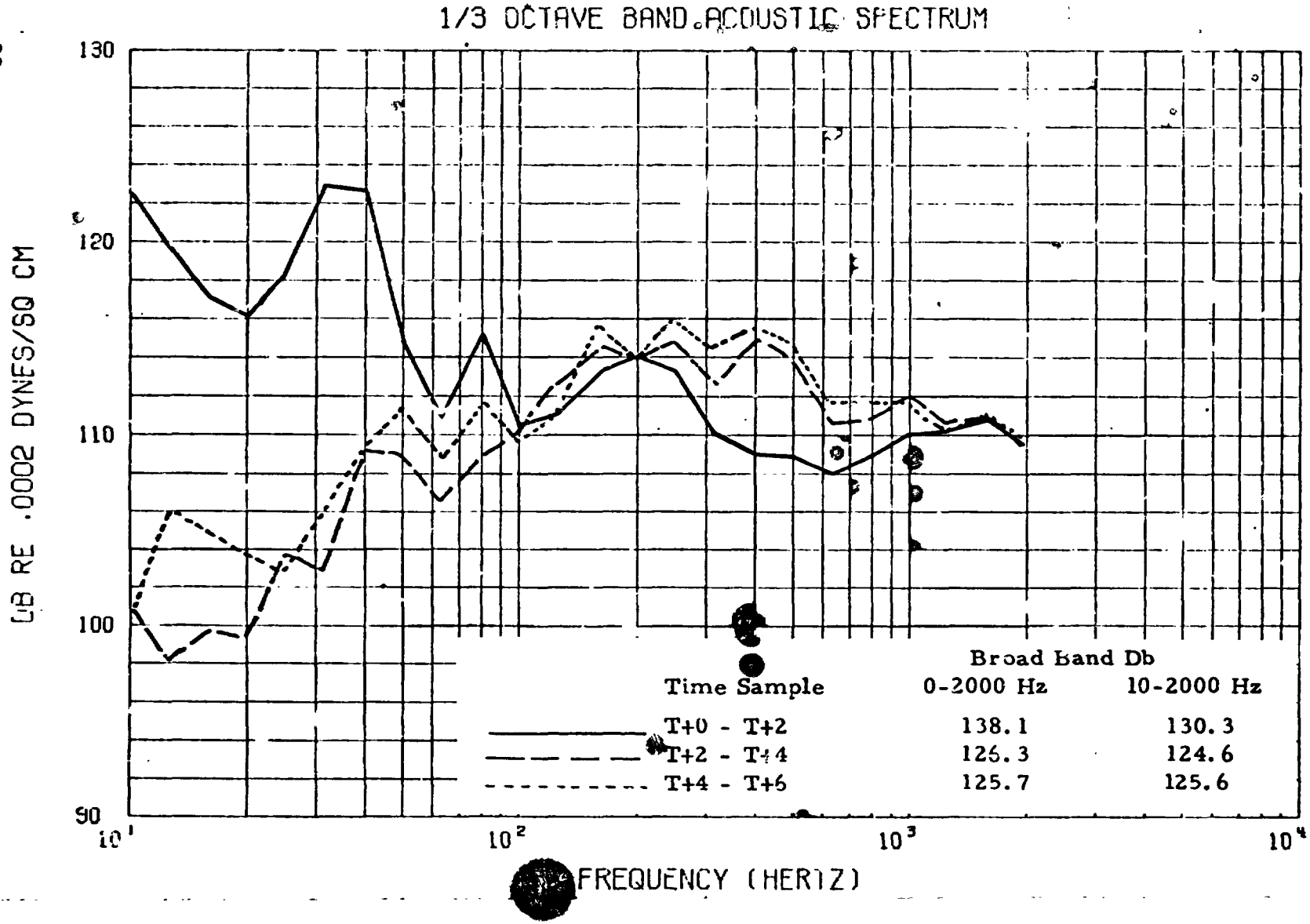


Figure 20. TC-4 Summary **Stage 0 Ignition** **CA886Y**

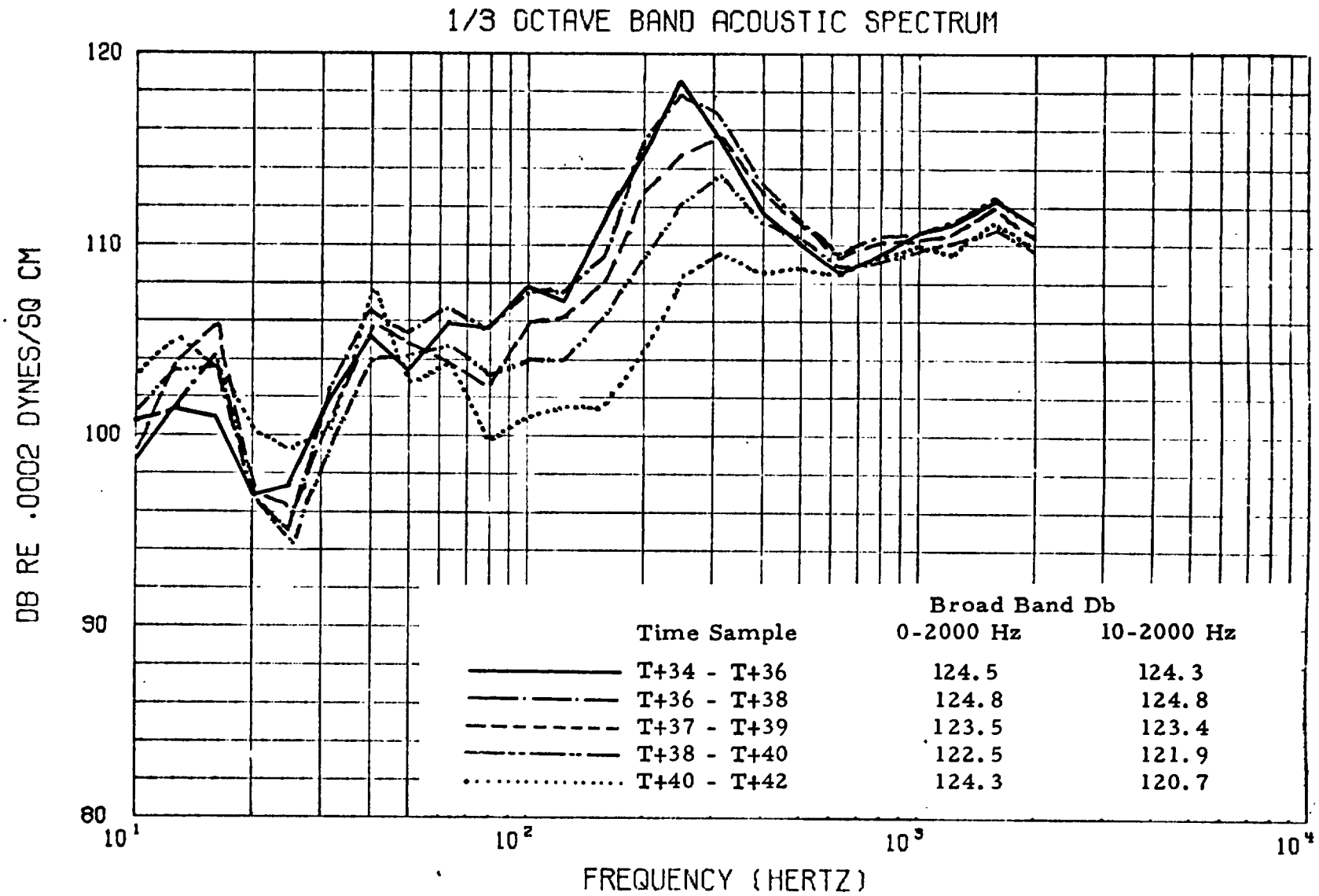


Figure 21. TC-4 Summary Max Q CA886Y

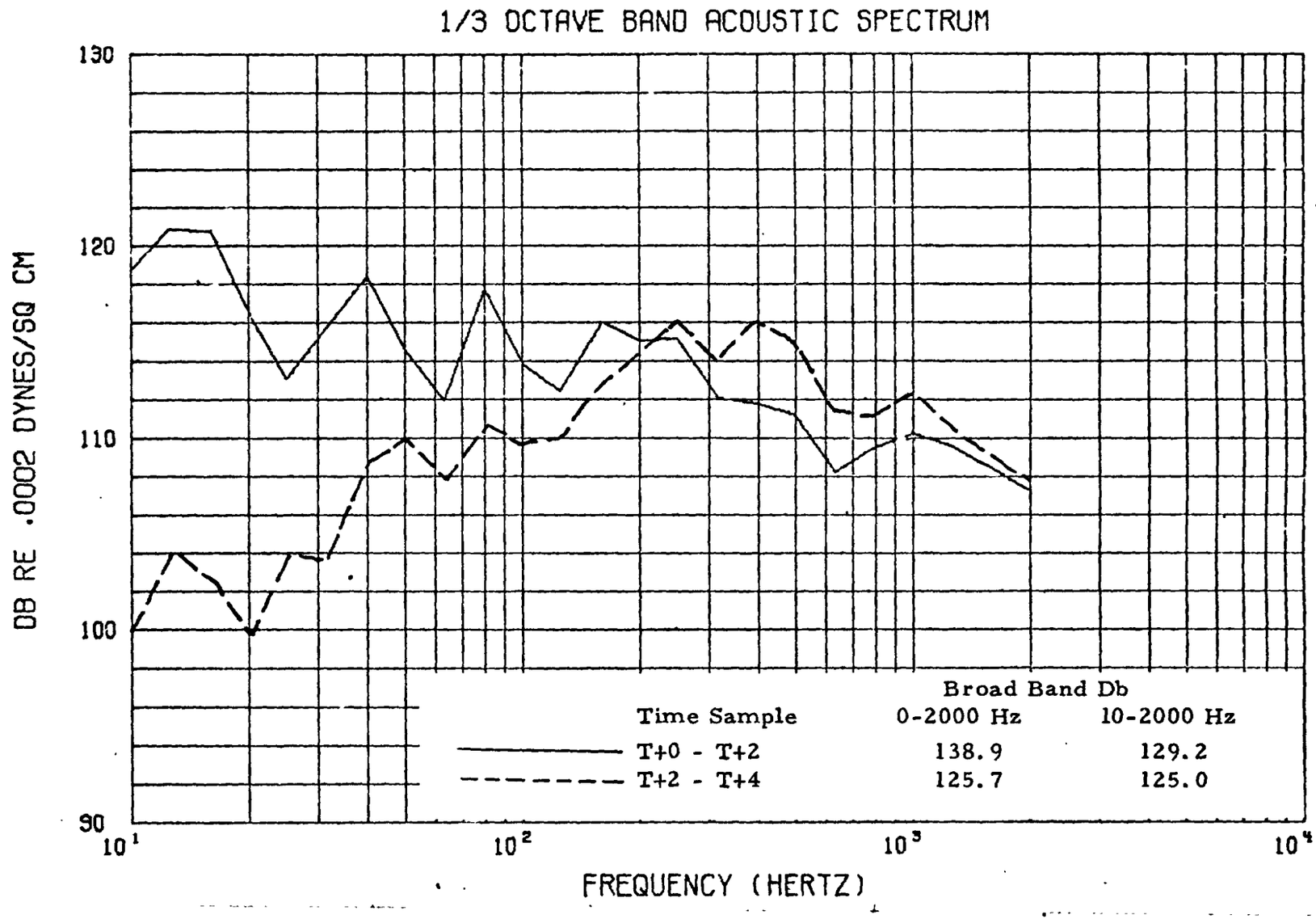


Figure 22. TC-3 Summary Stage 0 Ign. CA886Y

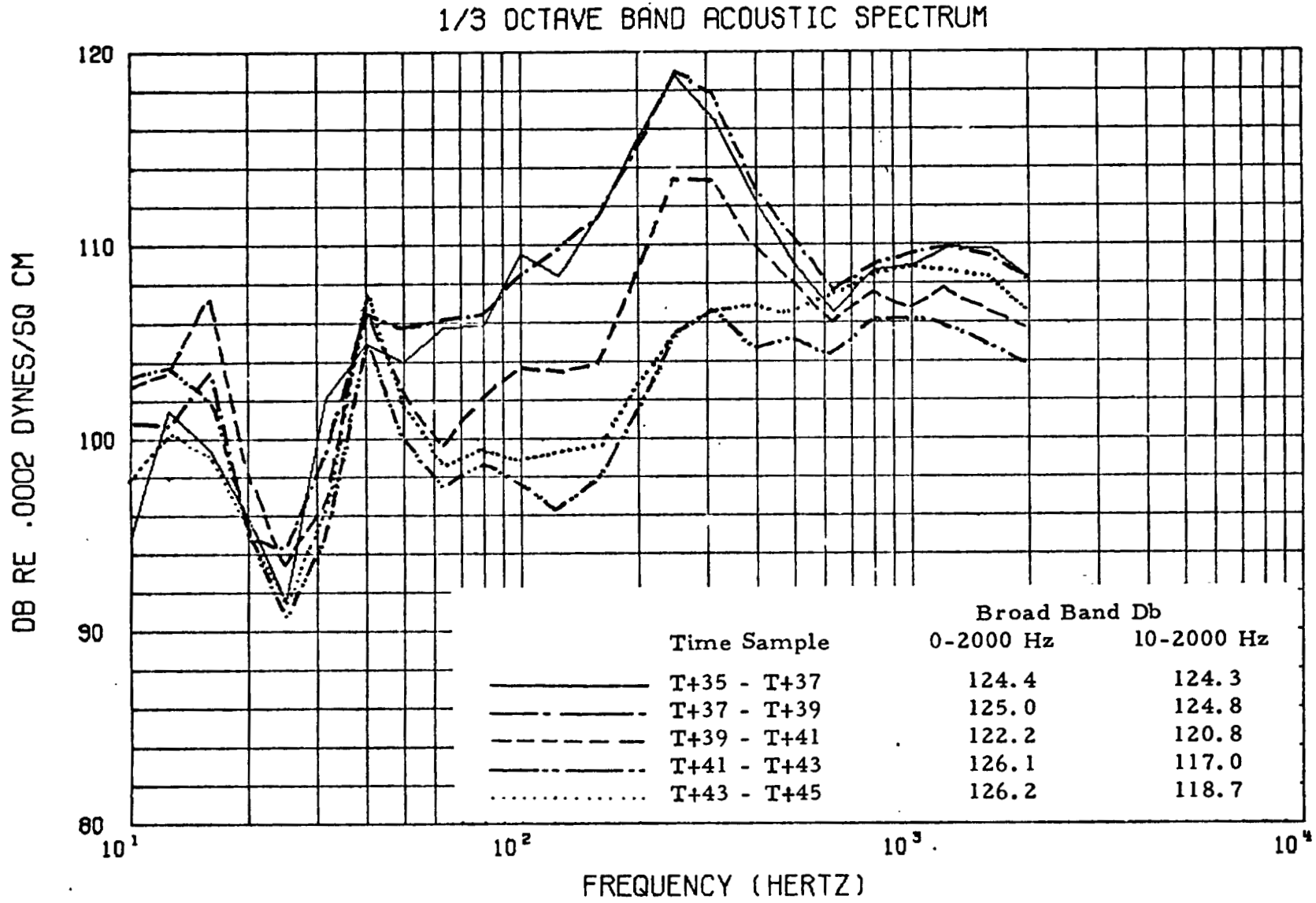
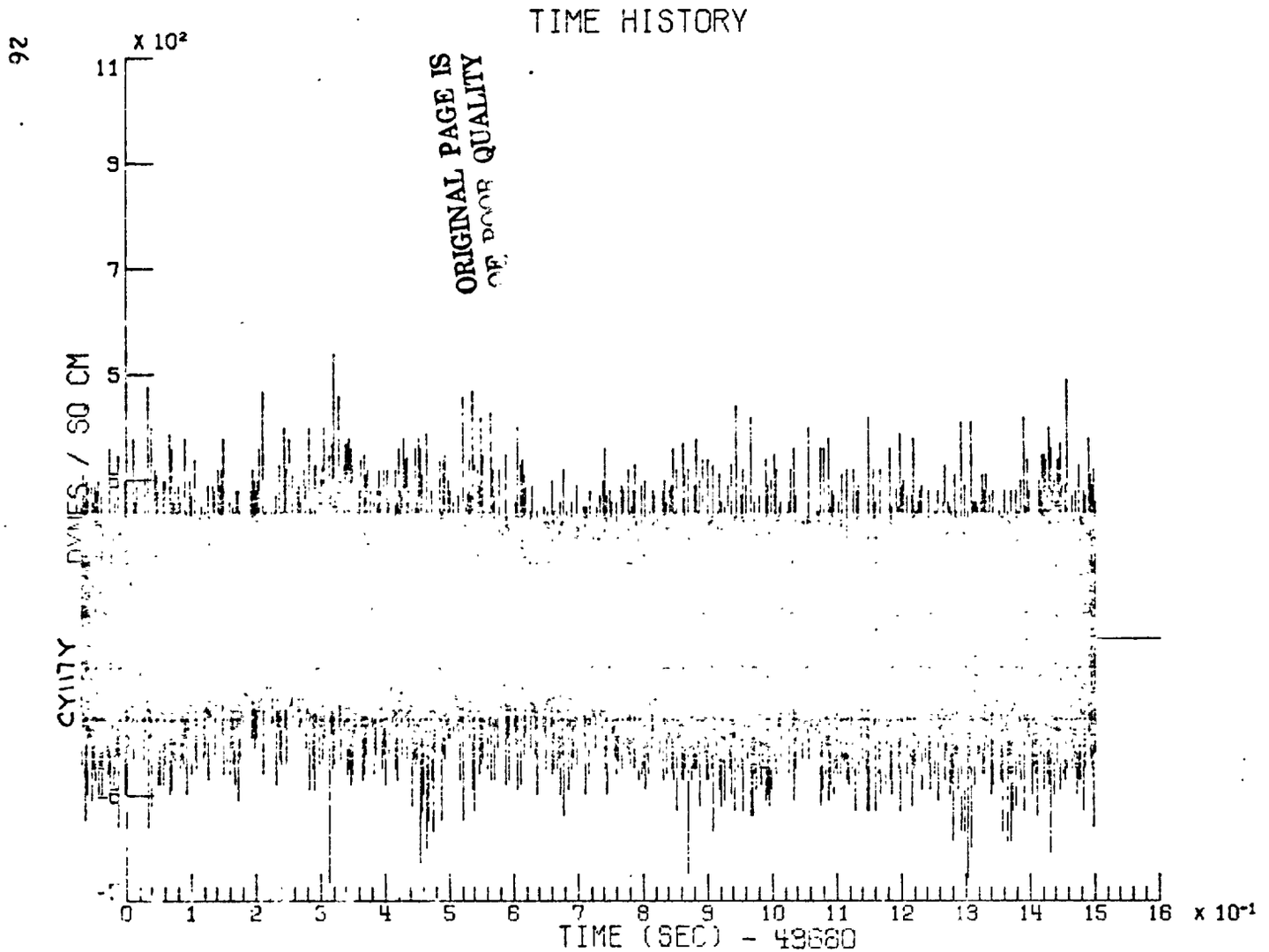


Figure 23. TC-3 Summary

MAX Q

CA886Y



MAX = 536.319 MIN = -466.796

VDS DATA (LRC-3A) PRE-IGNITION CY117Y

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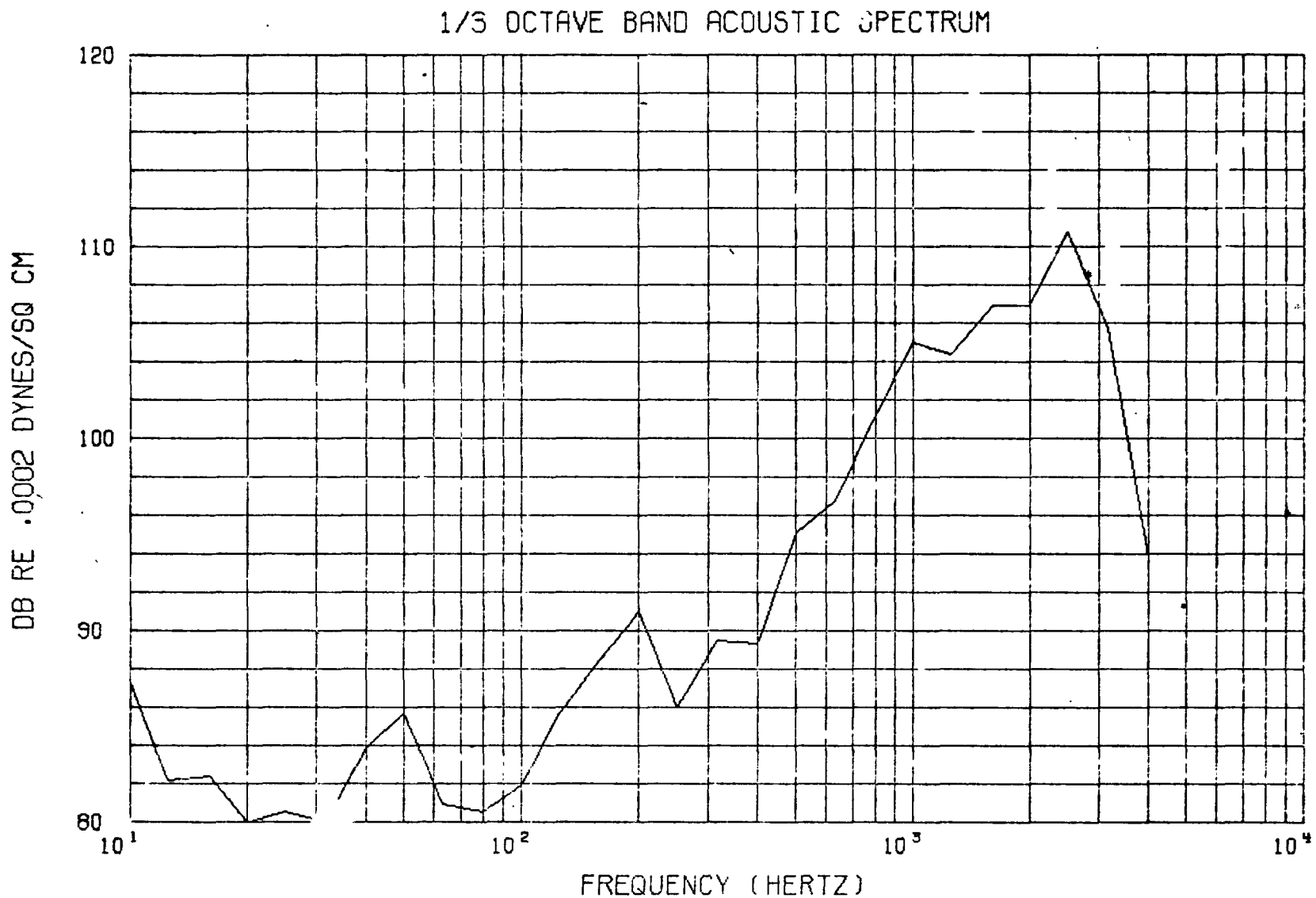
Figure 24a



START 49679.931 SEC
STOP 49681.500 SEC

OVERALL SOUND PRESSURE LEVEL = 115.42 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 115.36 DB

27

VDS DATA (LRC-3A)
PRE-IGNITION
CY117Y

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Figure 24b

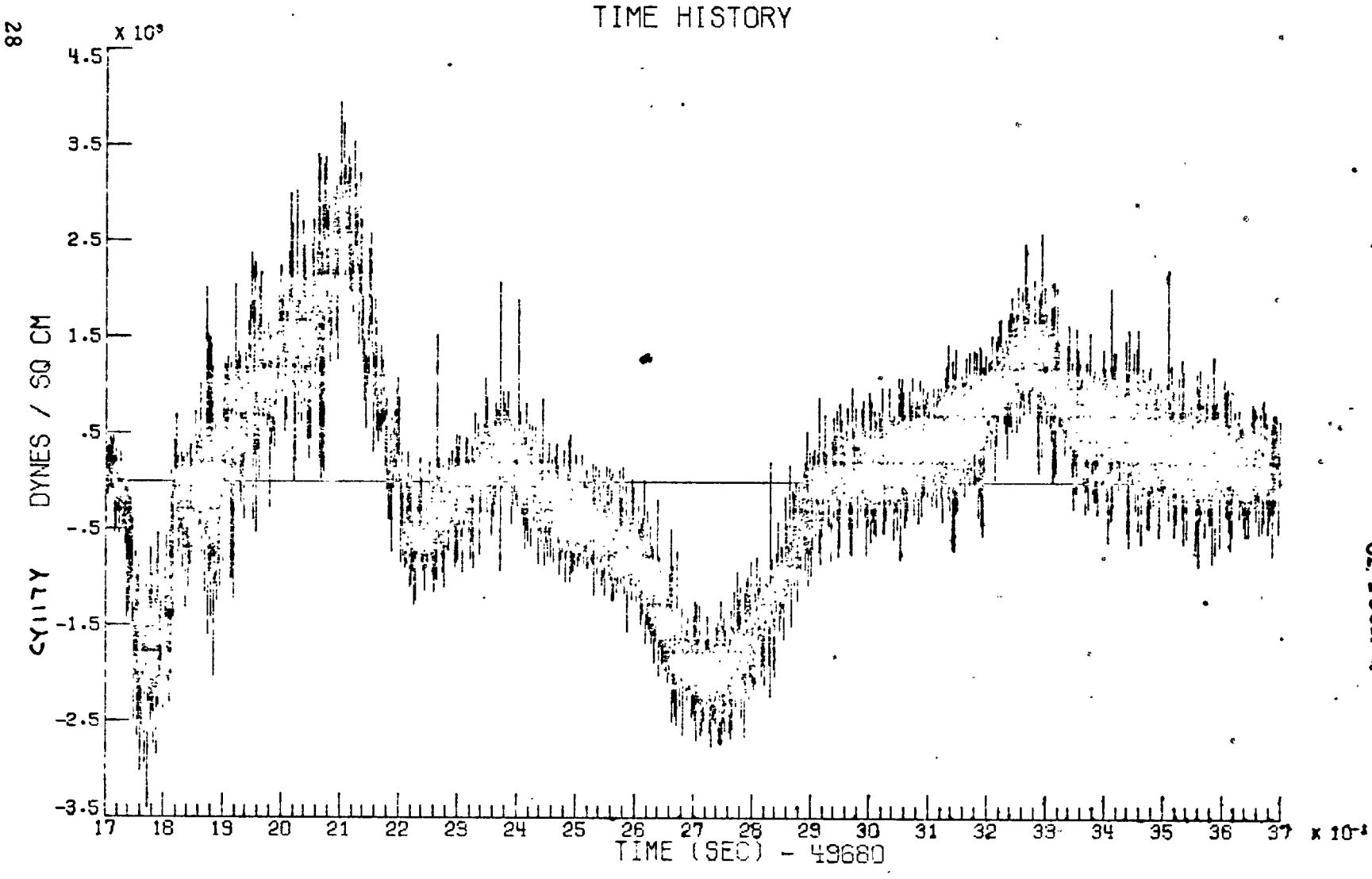

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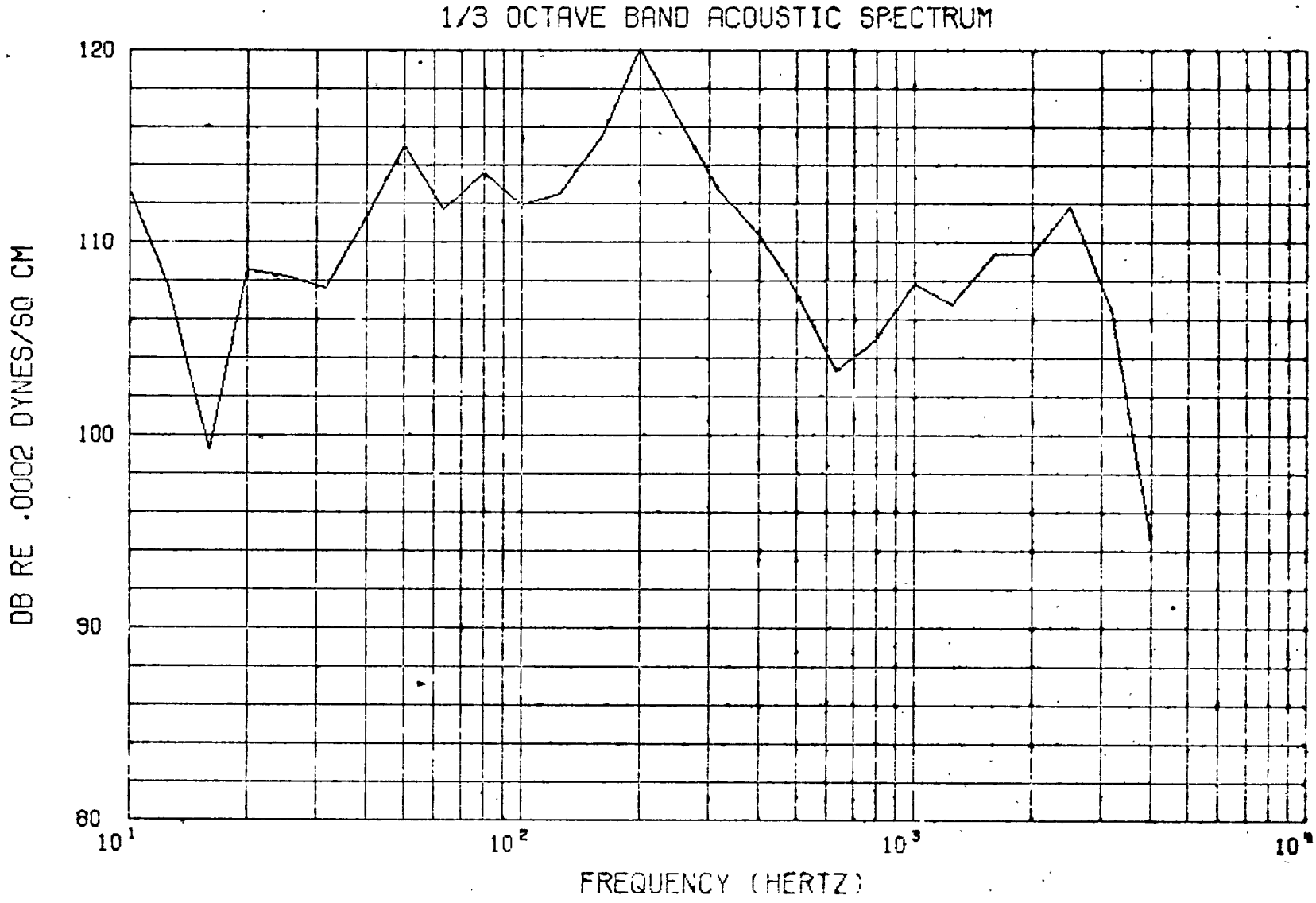
Figure 25a



START 49681.701 SEC
OVERALL SOUND PRESSURE LEVEL = 134.54 DB

STOP 49683.699 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 126.36 DB

VDS DATA (LRC-3A)

STAGE 0 IGN

CYLTY

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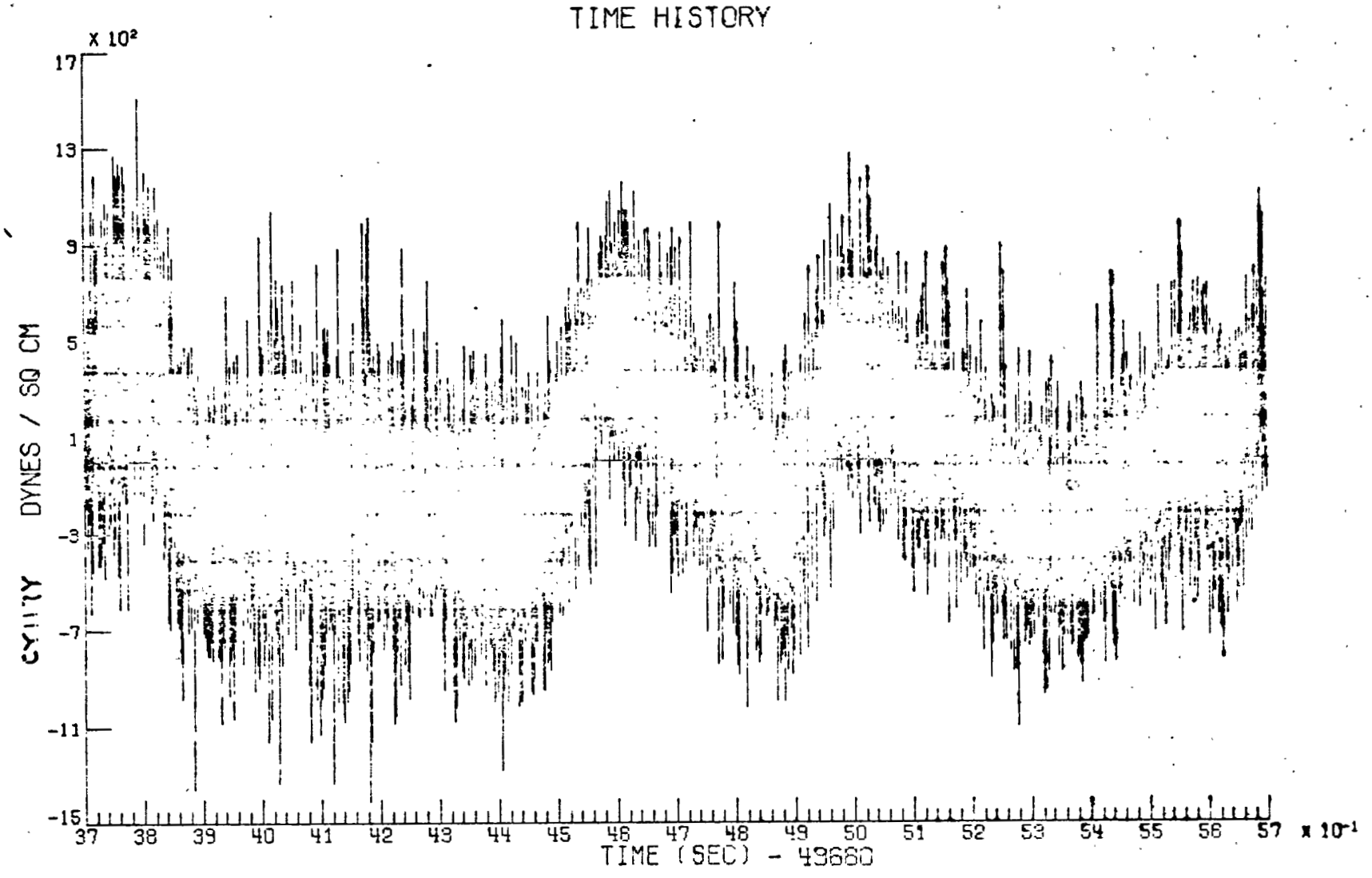
Figure 25b



MAX = 1509.641

MIN = -1410.322

VDS DATA (LRC-3A)

STAGE 0 IGN

CYIITY

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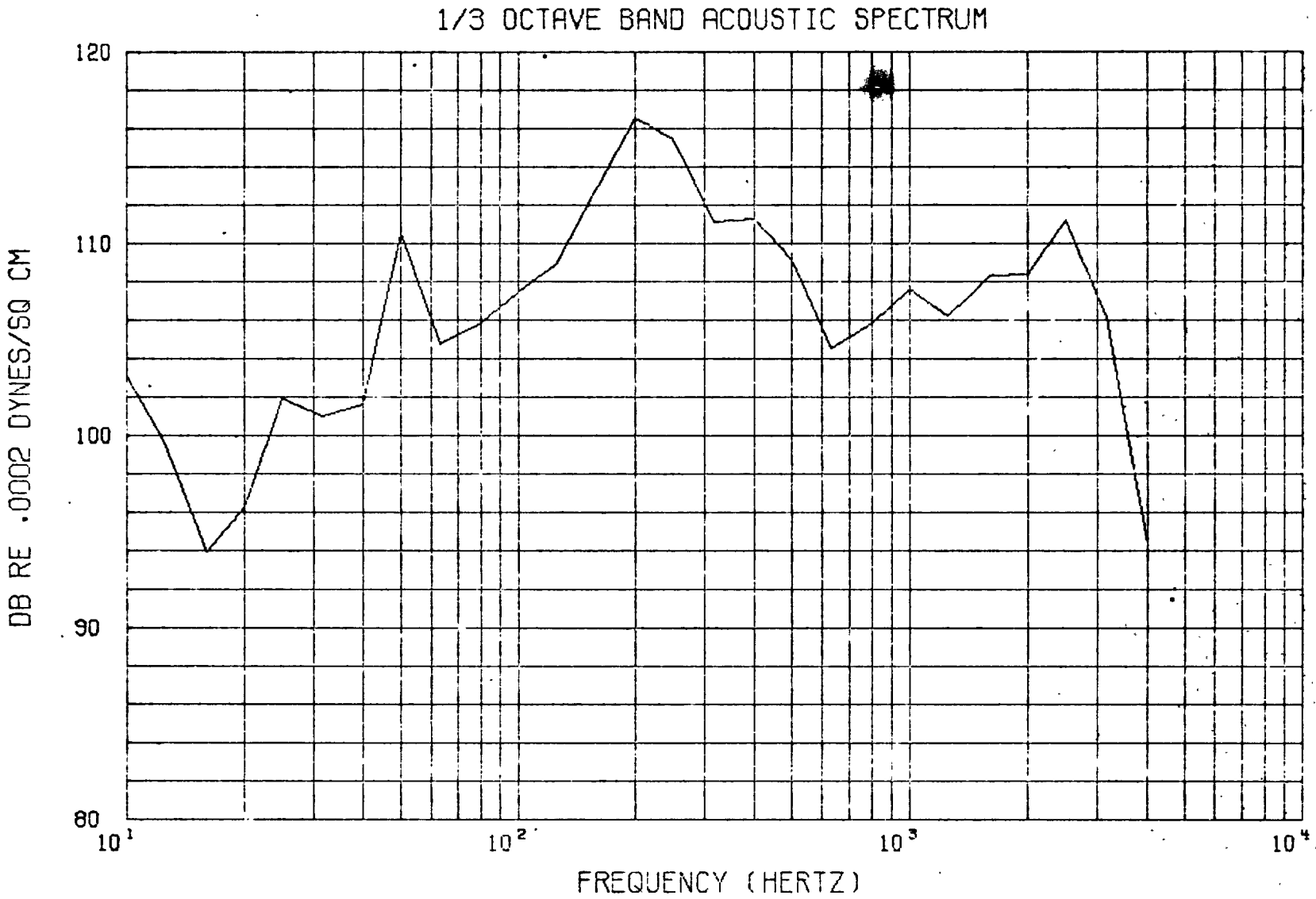
Figure 26a



START 49683.701 SEC STOP 49685.699 SEC

OVERALL SOUND PRESSURE LEVEL = 125.63 DB BAND-LIMITED SOUND PRESSURE LEVEL = 123.47 DB

VDS DATA (LRC-3A) STAGE 0 IGN

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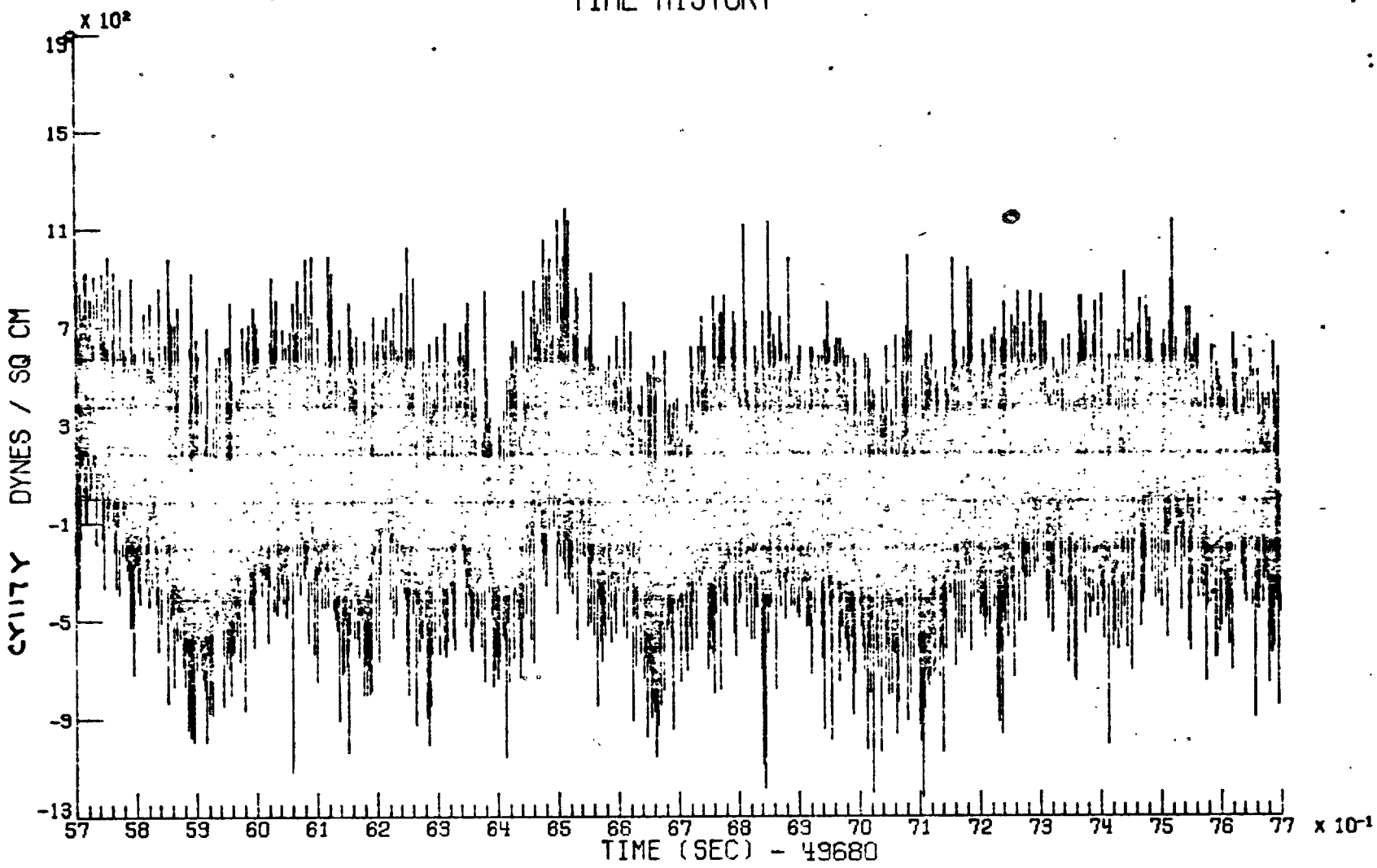
Figure 26b



MAX = 1181.890

MIN = -1221.617

VDS DATA (LRC-3A)

STAGE 0 IGN.

CY117Y

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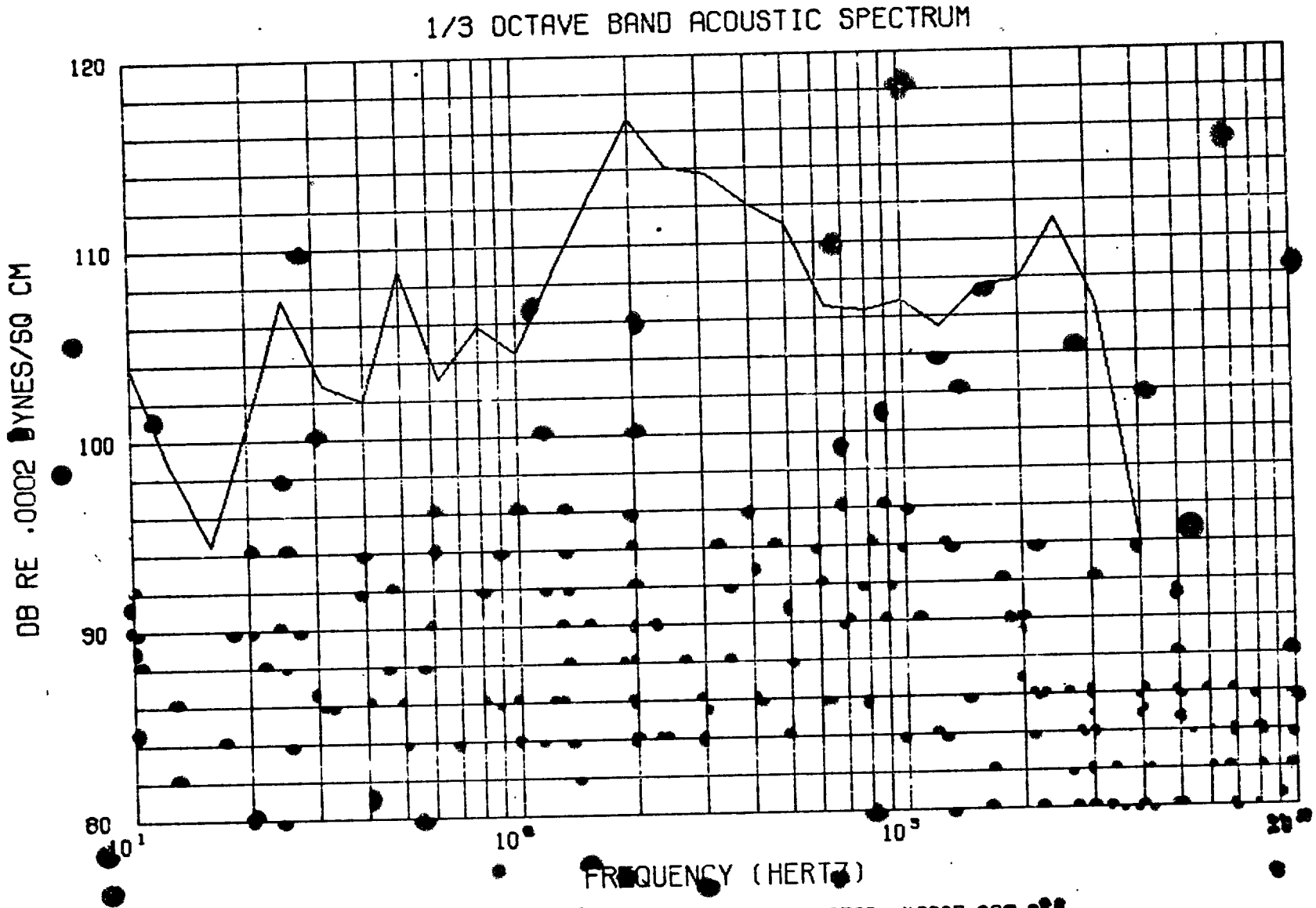
Figure 27a



START 49685.701 SEC

STOP 49687.885 SEC

OVERALL SOUND PRESSURE LEVEL = 124.29 DB

BAND-LIMITED SOUND PRESSURE LEVEL = 123.56 DB

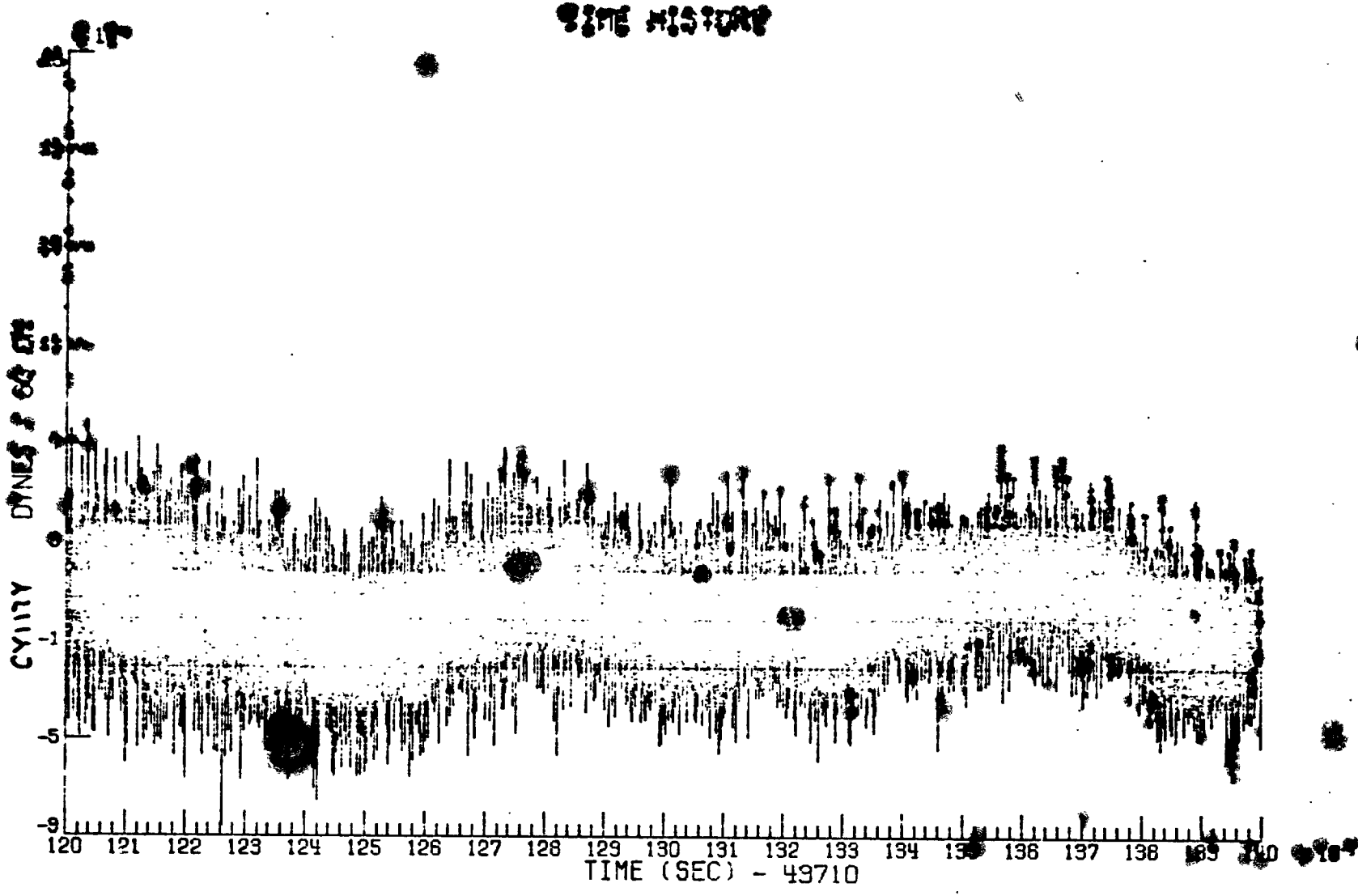
VDS DATA (LRC-3A)

STAGE 3 IGN

CYBY

LANGLEY SIGNAL ANALYSIS PROGRAM 87/30

Figure 3b



MAX = 548

MIN = -854.139

VDS DATA (LRC-3A)

MAX Q

CYIITY

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Figure 28a

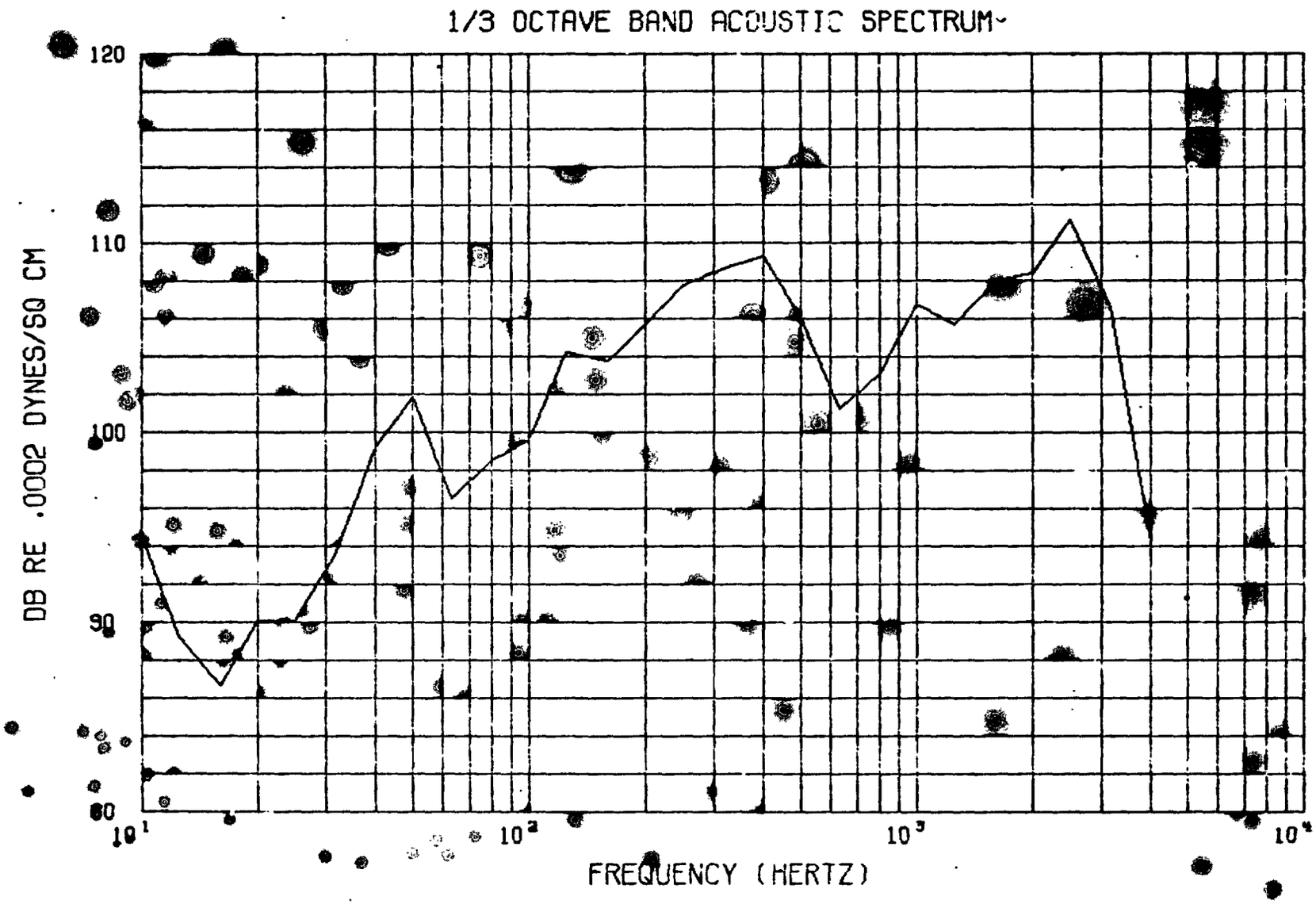

1/3 OCTAVE BAND ACOUSTIC SPECTRUM
120
110
100
90
80
DB RE .0002 DYNES/SQ CM
10^1
10^2
10^3
10^4
FREQUENCY (HERTZ)
START 49722.001 SEC
STOP 49723.998 SEC
OVERALL SOUND PRESSURE LEVEL = 119.81 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 119.18 DB
VDS DATA (LRC-3A)
MAX Q
CYIIY
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 07/30/75

Figure 28b

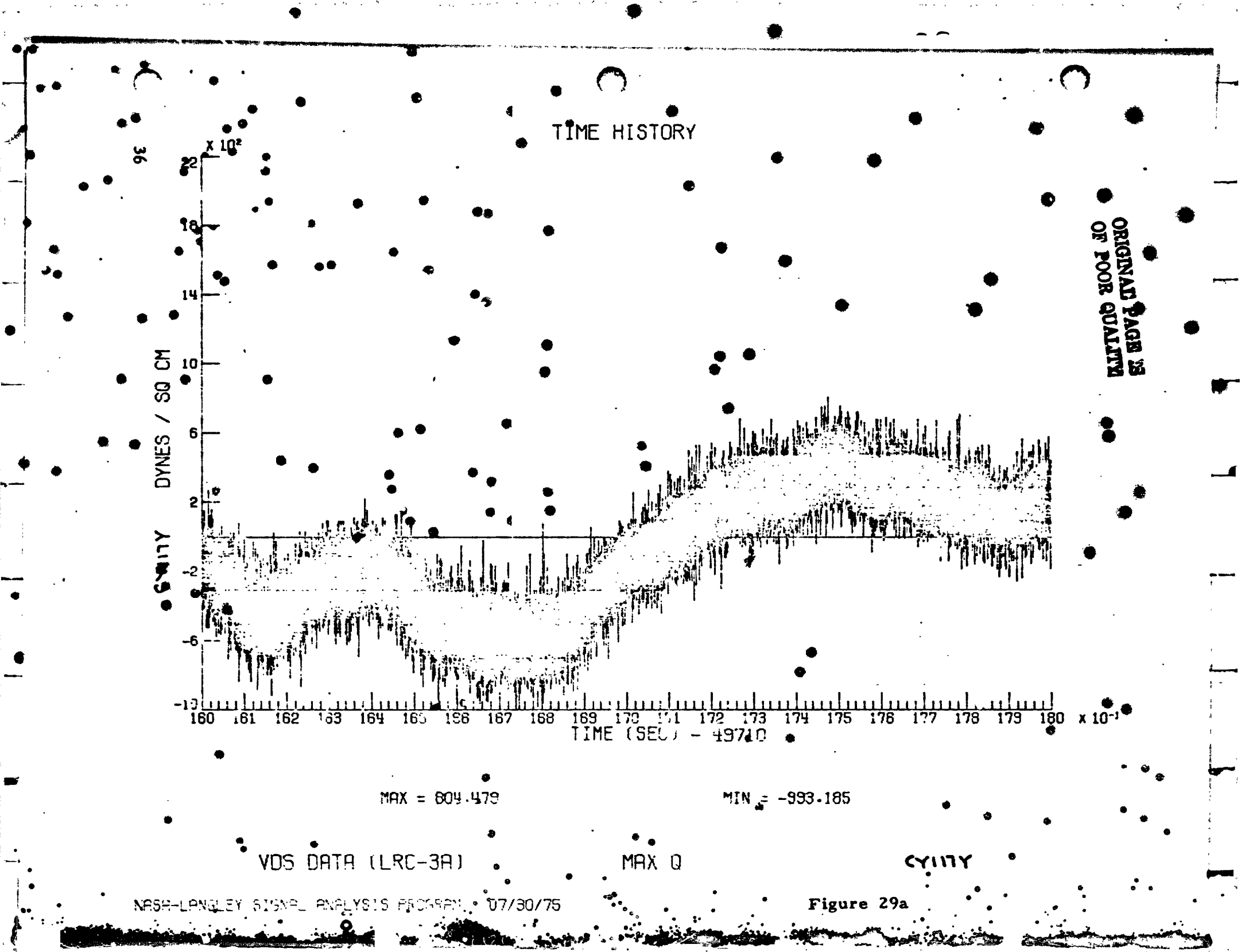


Figure 29a

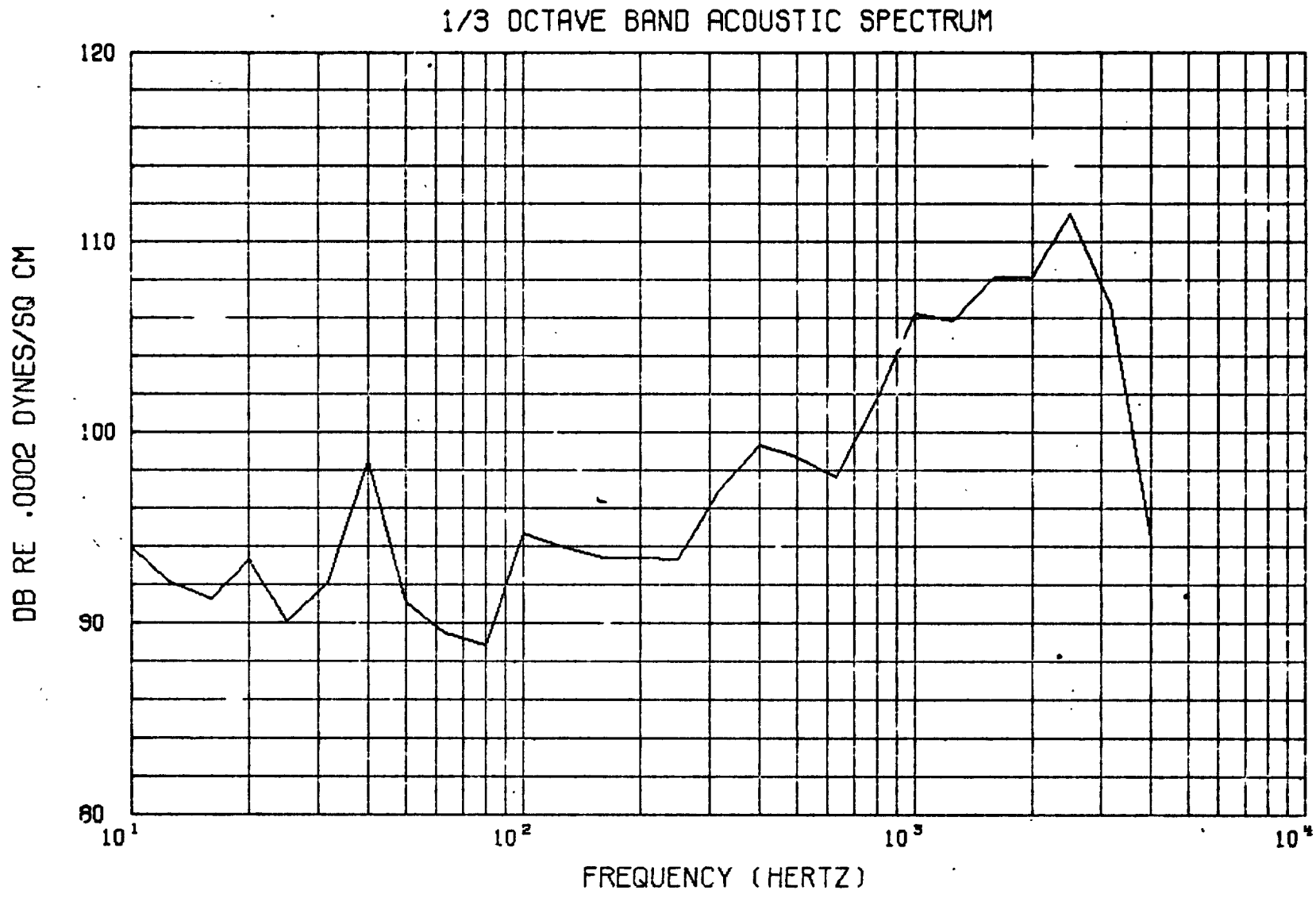
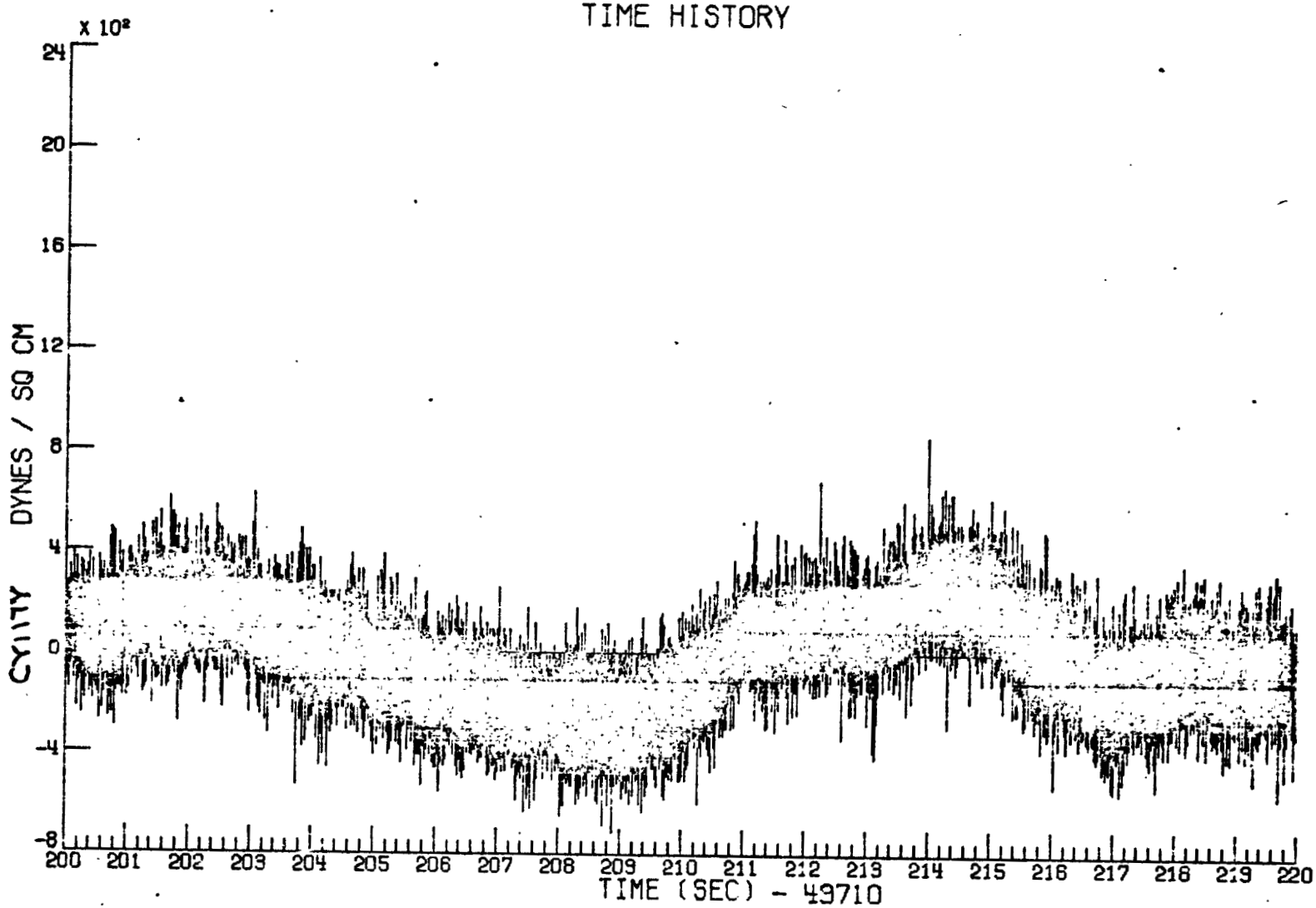

1/3 OCTAVE BAND ACOUSTIC SPECTRUM
120
110
100
90
80
DB RE .0002 DYNES/SQ CM
10^1
10^2
10^3
10^4
FREQUENCY (HERTZ)
START 49726.001 SEC
STOP 49727.998 SEC
OVERALL SOUND PRESSURE LEVEL = 124.99 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 116.76 DB
VDS DATA (LRC-3A)
MAX Q
CYLINY
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 07/30/75

Figure 29b



MAX = 864.071

MIN = -715.093

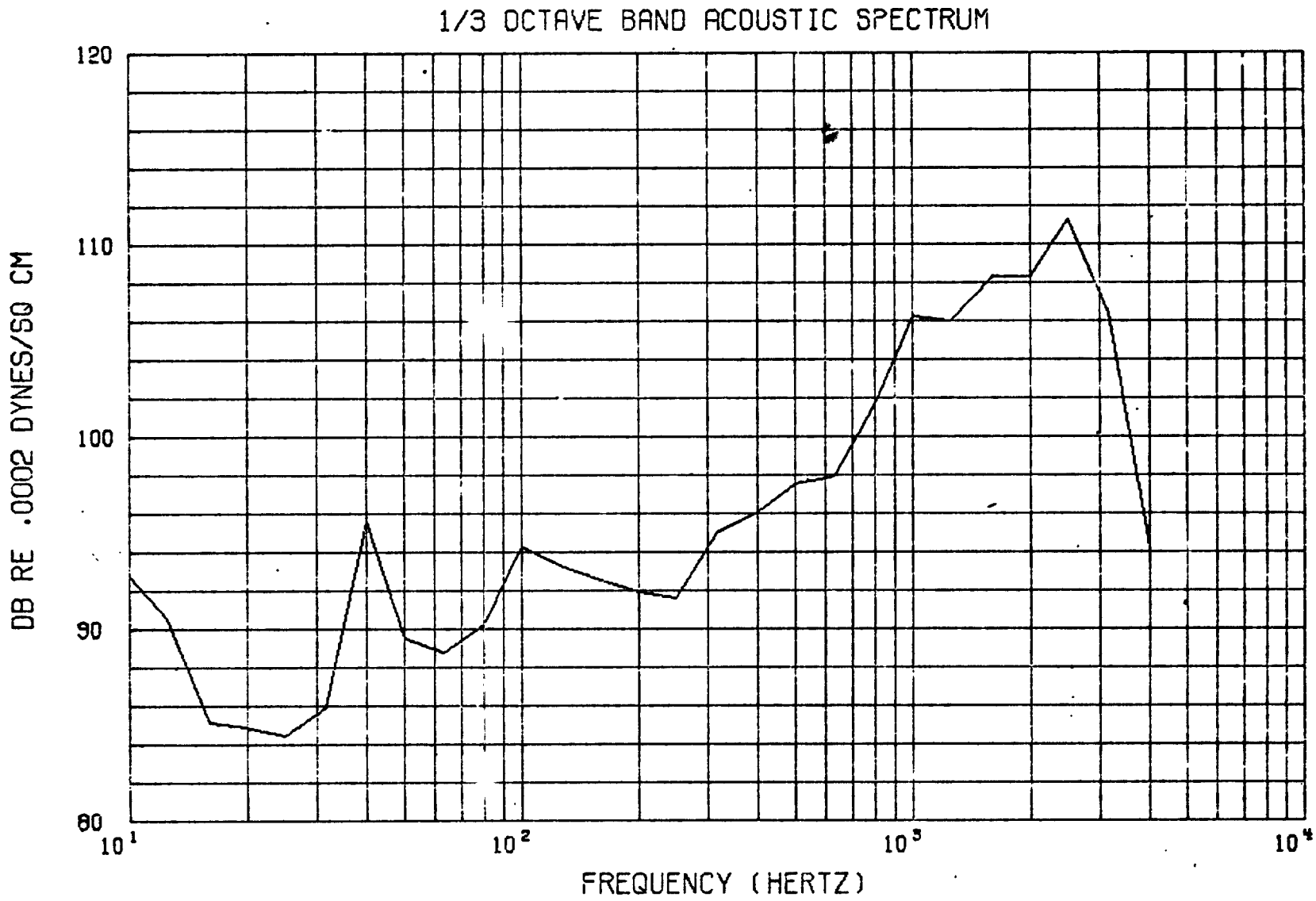
VDS DATA (LRC-3A)

MAX Q

CYNTY

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 07/30/75

Figure 30a

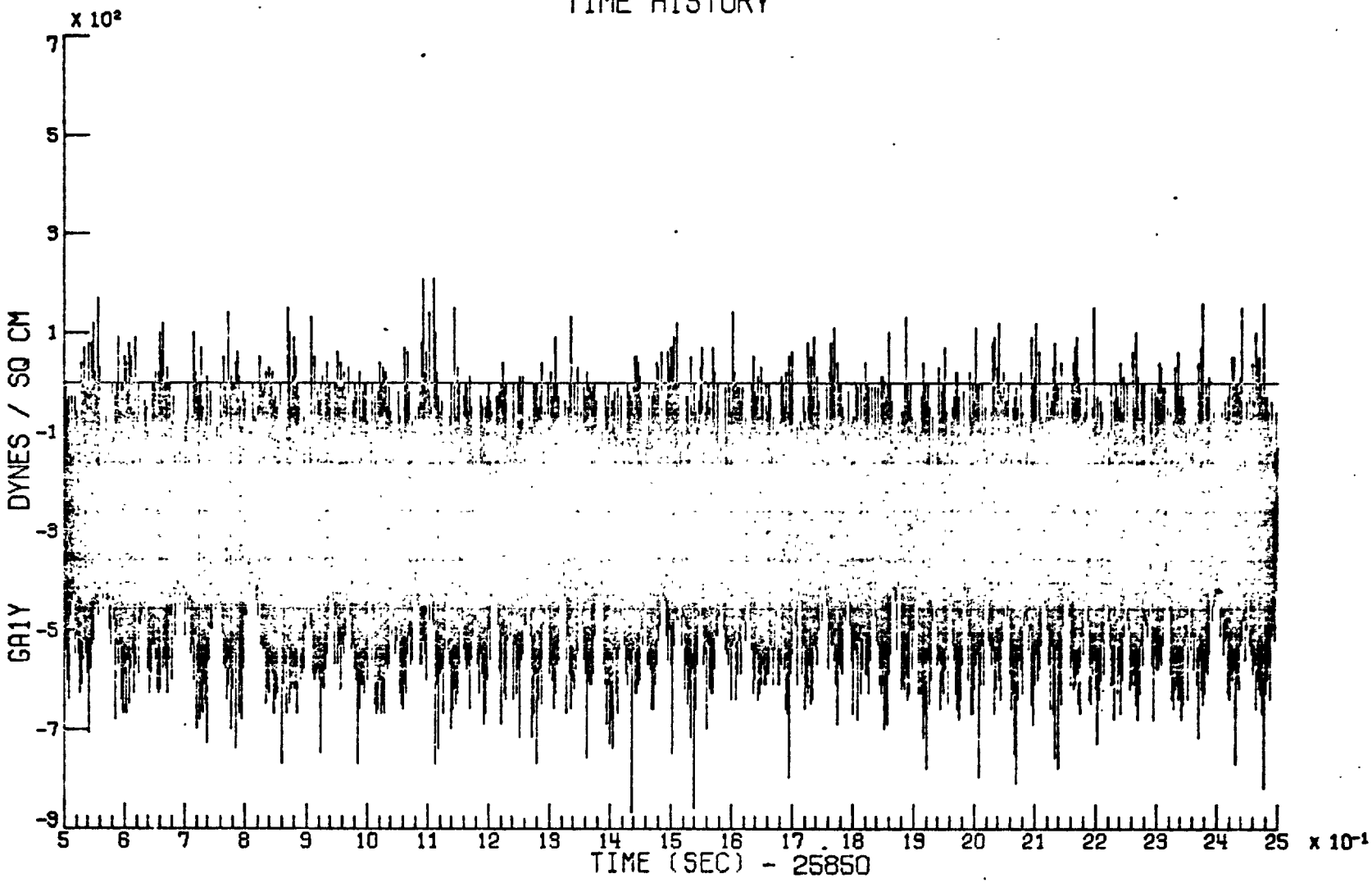


START 49730.001 SEC
STOP 49731.998 SEC
OVERALL SOUND PRESSURE LEVEL = 119.85 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 116.55 DB

VDS DATA (LRC-3A)
MAX Q
CAVITY

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 07/30/75

Figure 30b

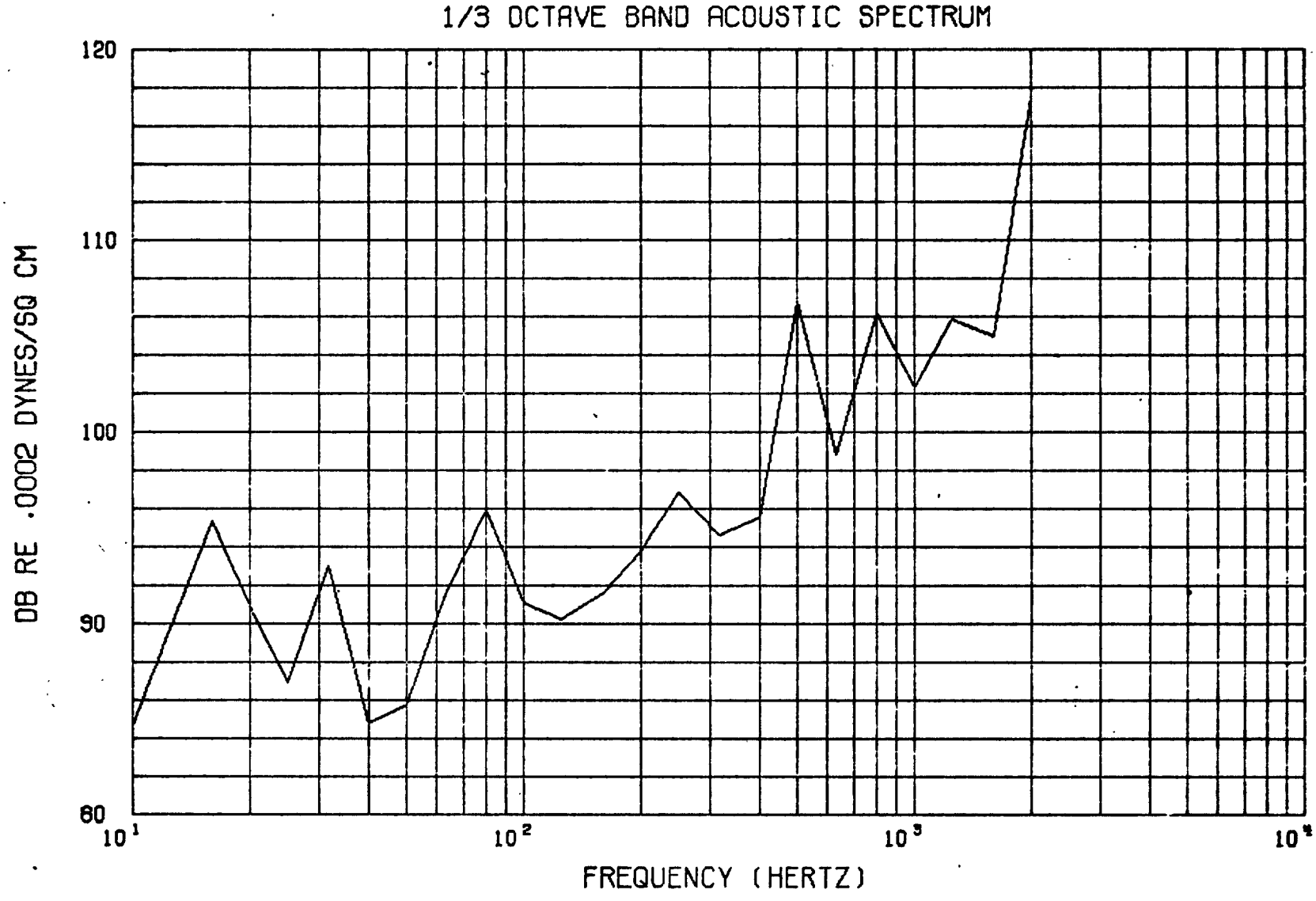


MAX = 209.094 MIN = -866.248

TC-2 ACOUSTIC PRE-IGNITION GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 31a



START 25850.500 SEC STOP 25852.500 SEC

OVERALL SOUND PRESSURE LEVEL = 118.96 DB BAND-LIMITED SOUND PRESSURE LEVEL = 118.92 DB

TC-2 ACOUSTIC PRE-IGNITION GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 31b

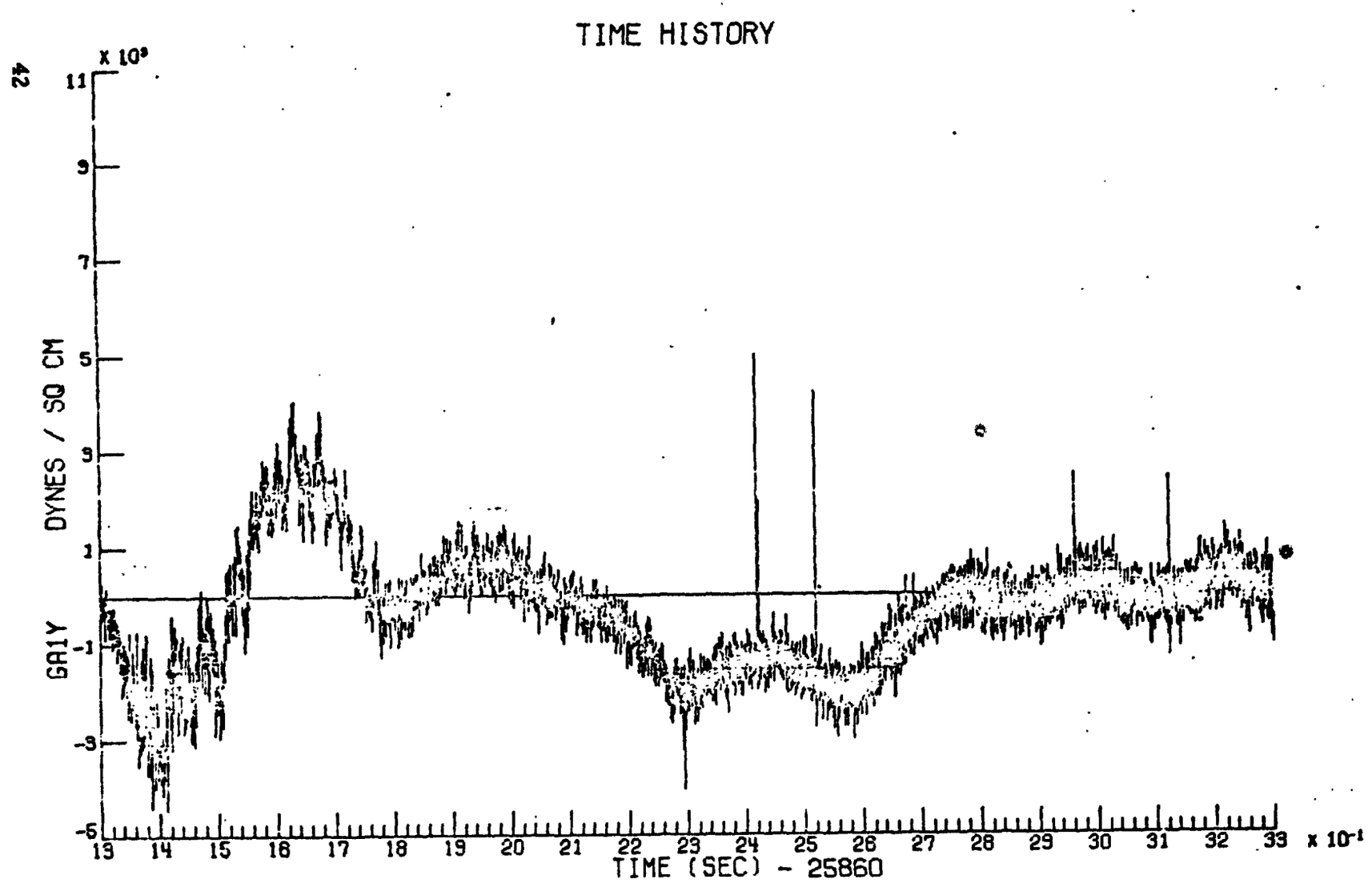
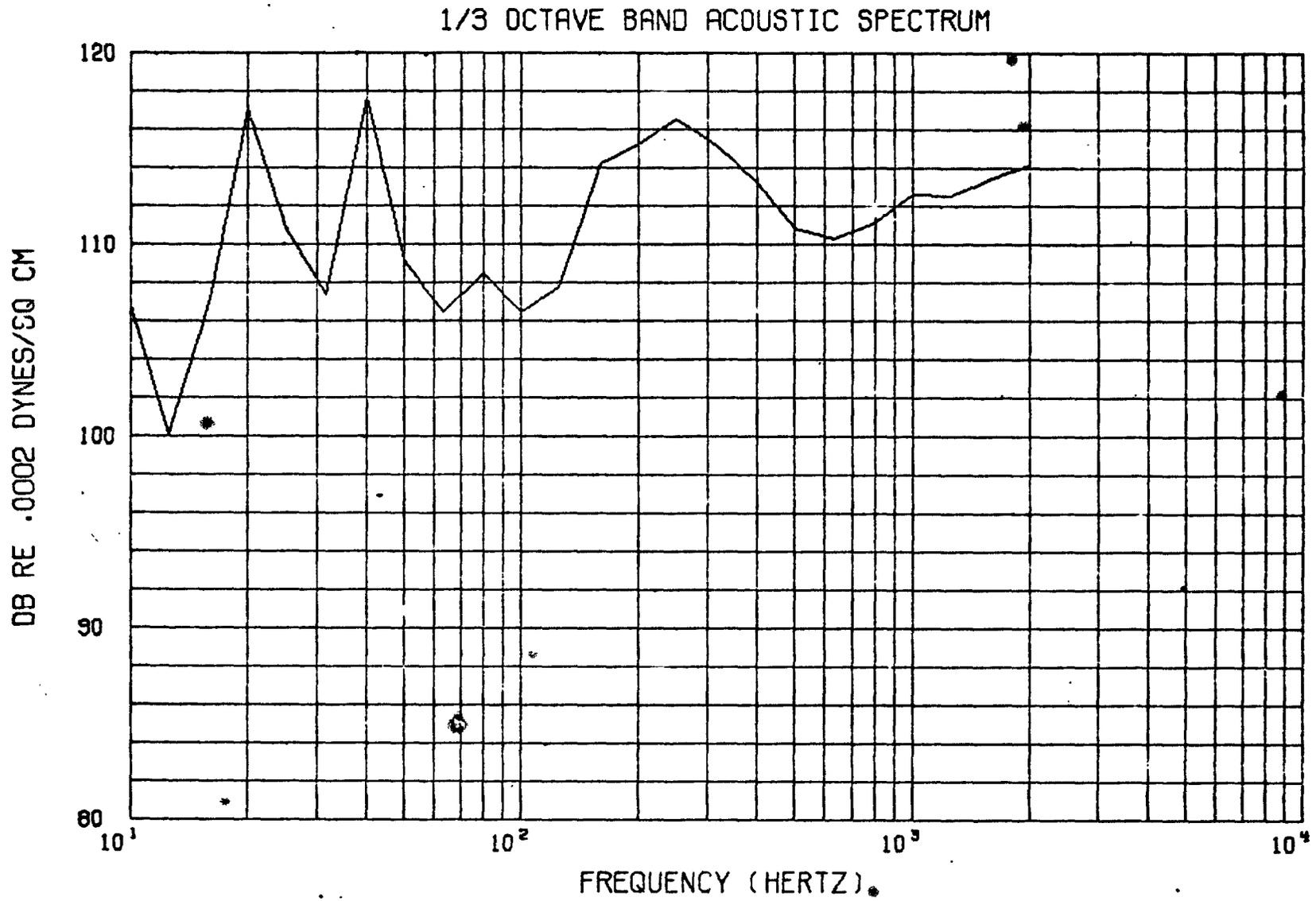

TIME HISTORY
42
X 10³
11
9
7
5
3
1
-1
-3
-5
DYNES / SQ CM
GA1Y
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 x 10⁻¹
TIME (SEC) - 25860
MAX = 4978.437
MIN = -4460.679
TC-2 ACOUSTIC
STG 0 IGN / LIFT-OFF GA1Y
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 32a



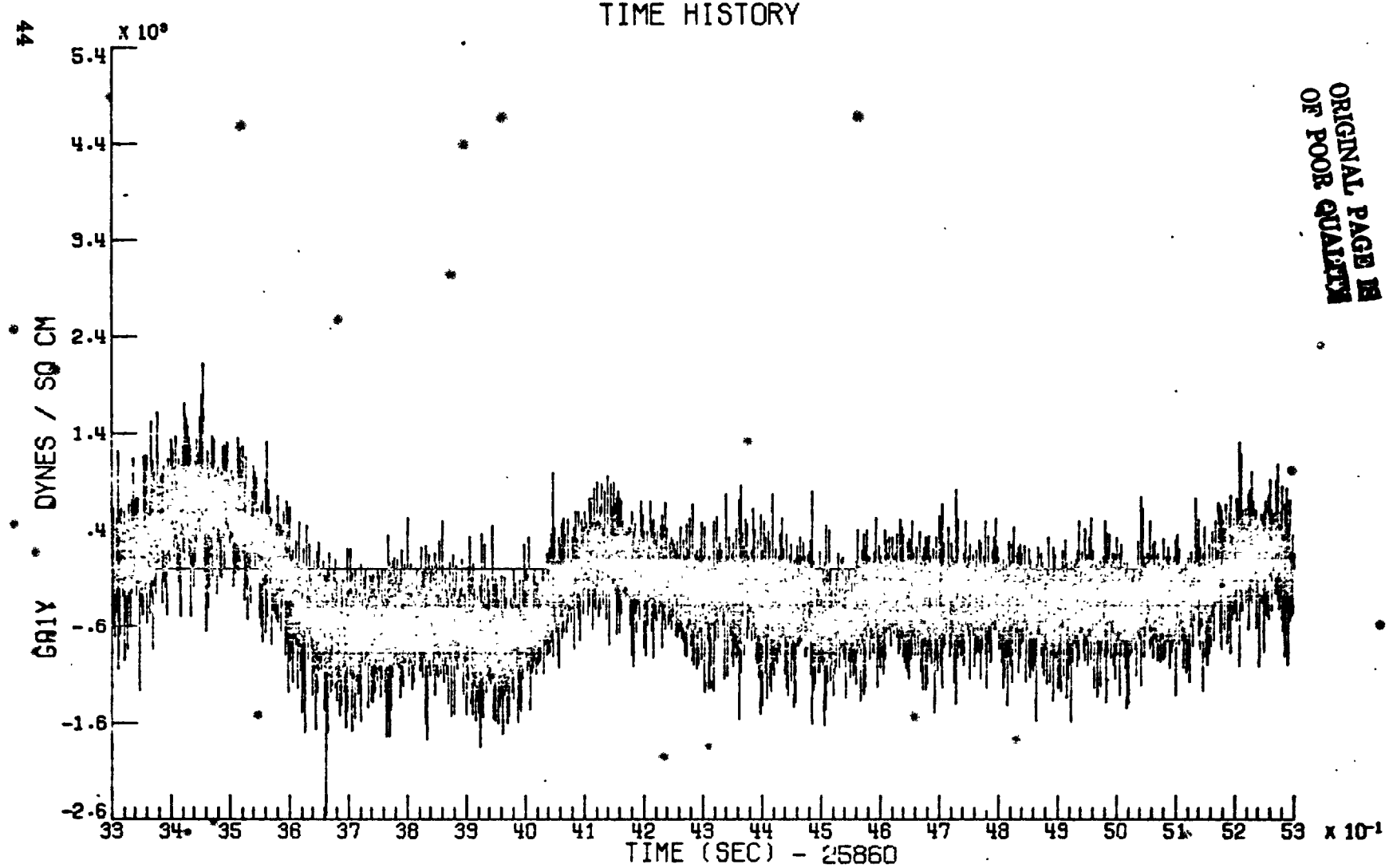
START 25861.300 SEC
STOP 25869.300 SEC

OVERALL SOUND PRESSURE LEVEL = 135.71 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 126.51 DB

TC-2 ACOUSTIC
STG 0 IGN / LIFT-OFF GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 32b

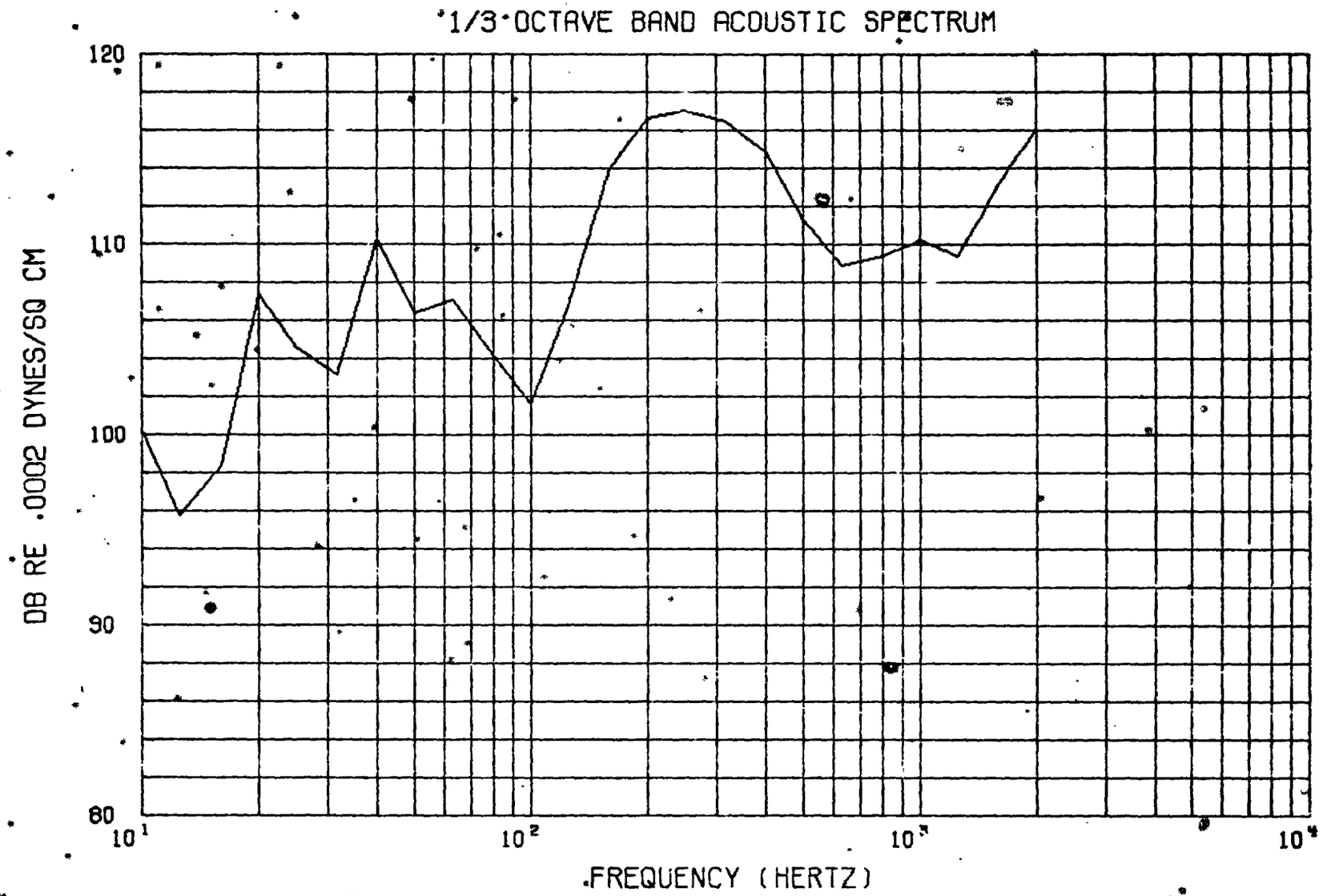


MAX = 2120.814 MIN = -2548.959

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 33a



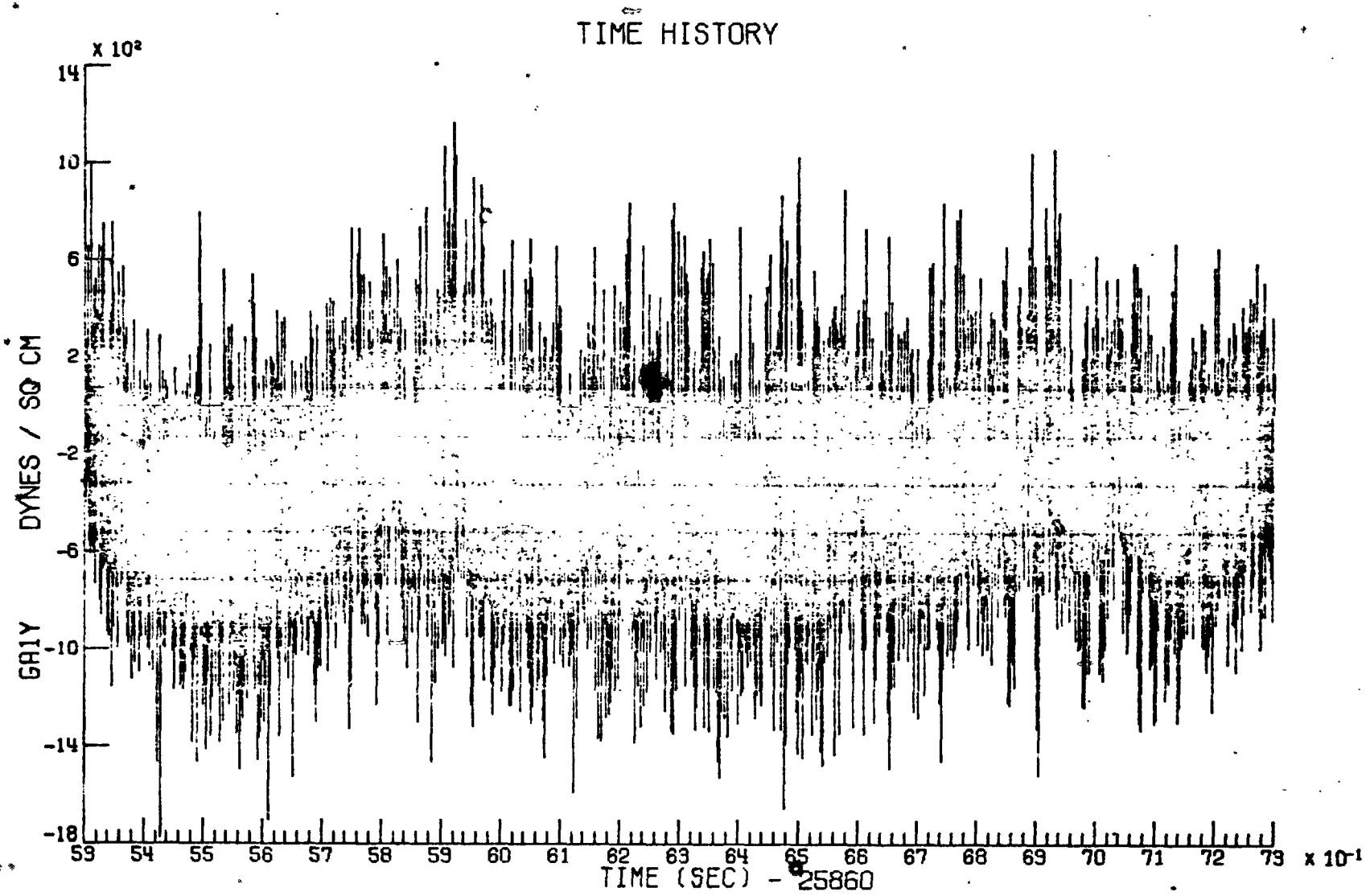
START 25863.300 SEC STOP 25865.299 SEC

OVERALL SOUND PRESSURE LEVEL = 128.19 DB BAND-LIMITED SOUND PRESSURE LEVEL = 125.41 DB

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 33b

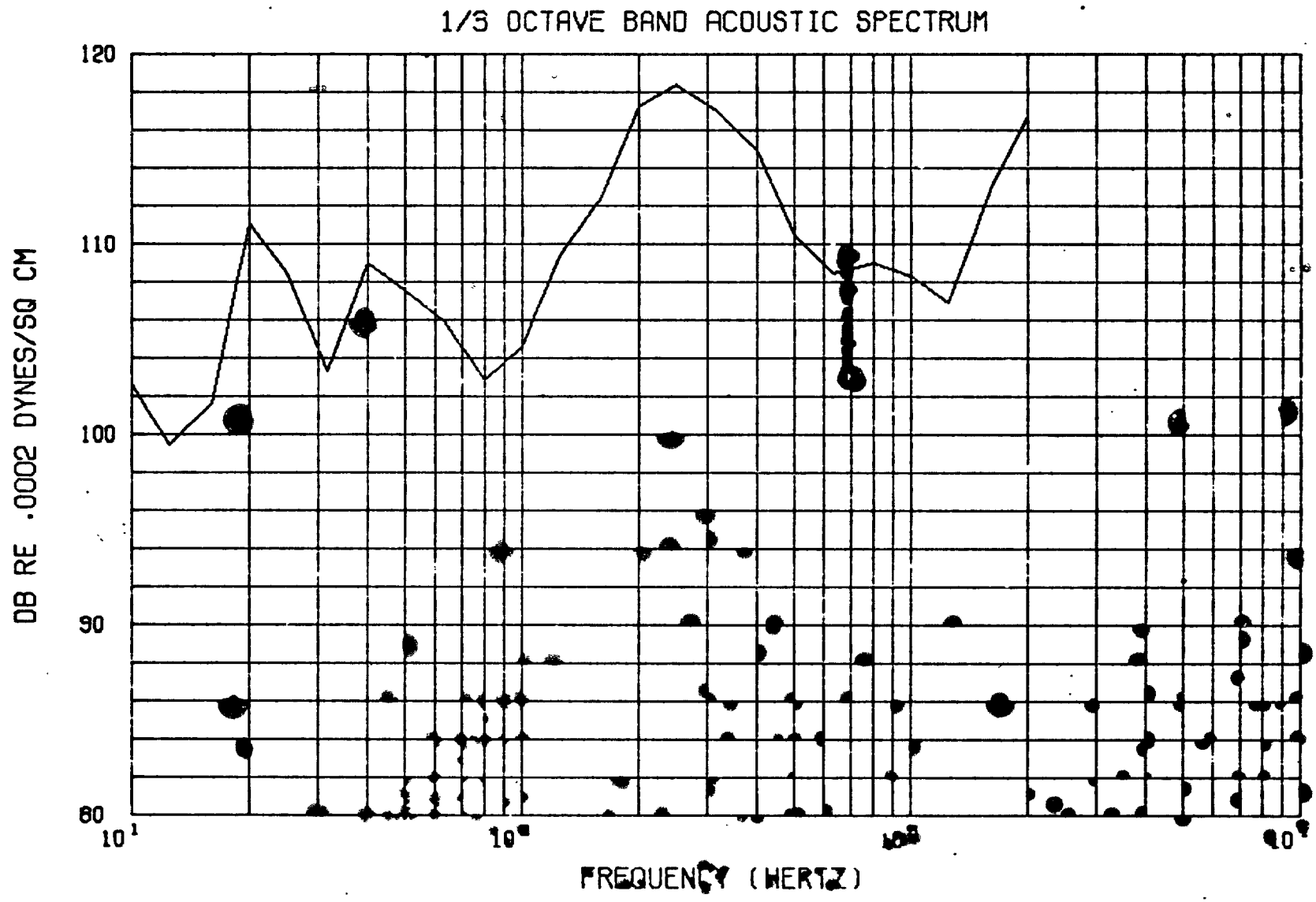


MAX = 1164.954 MIN = -1772.325

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 06/07/75

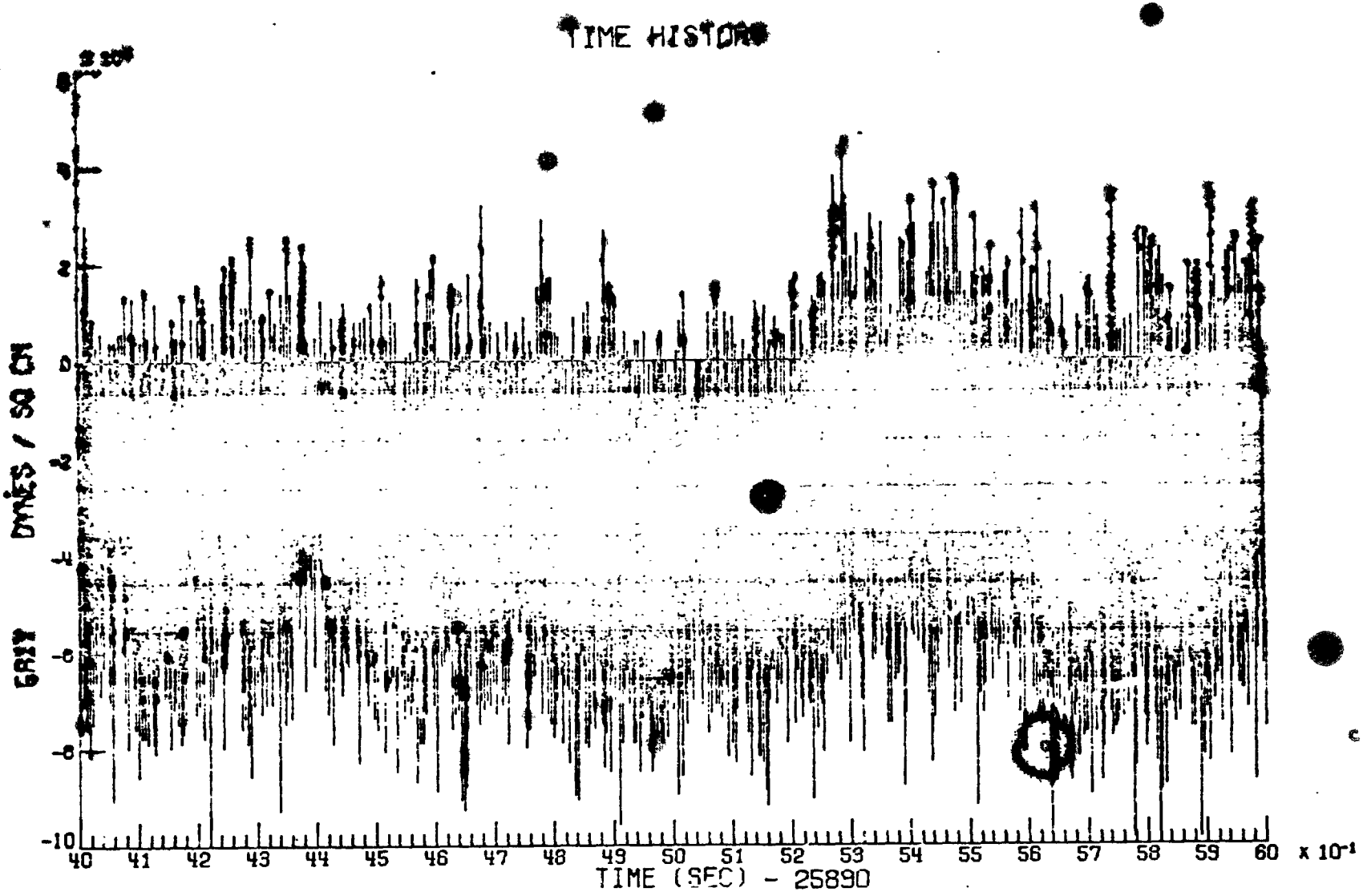
Figure 34a



START 2586.300 SEC
STOP 2586.295 SEC
OVERALL SOUND PRESSURE LEVEL = 126.13 DB
BAND LIMITED SOUND PRESSURE LEVEL = 128.81 DB

TE-2 ACOUSTIC
STS 0 IGN / LIFT-OFF GAP

NASA ANGLE DIGITAL ANALYSIS PROGRAM 08/07/75
Figure 41

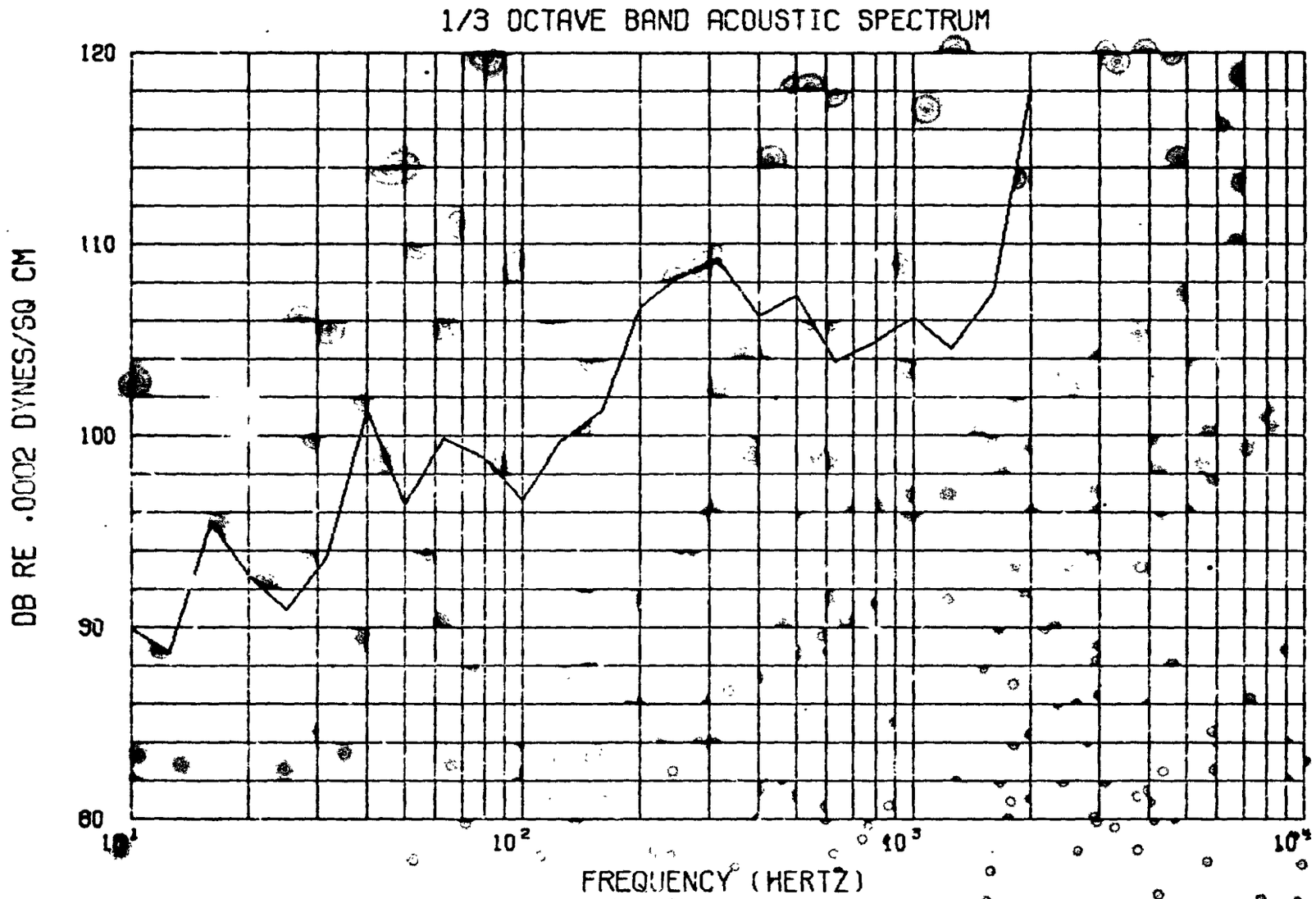


MAX = 458.016 MIN = -995.687

TC-2 ACOUSTIC MAX Q GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 35



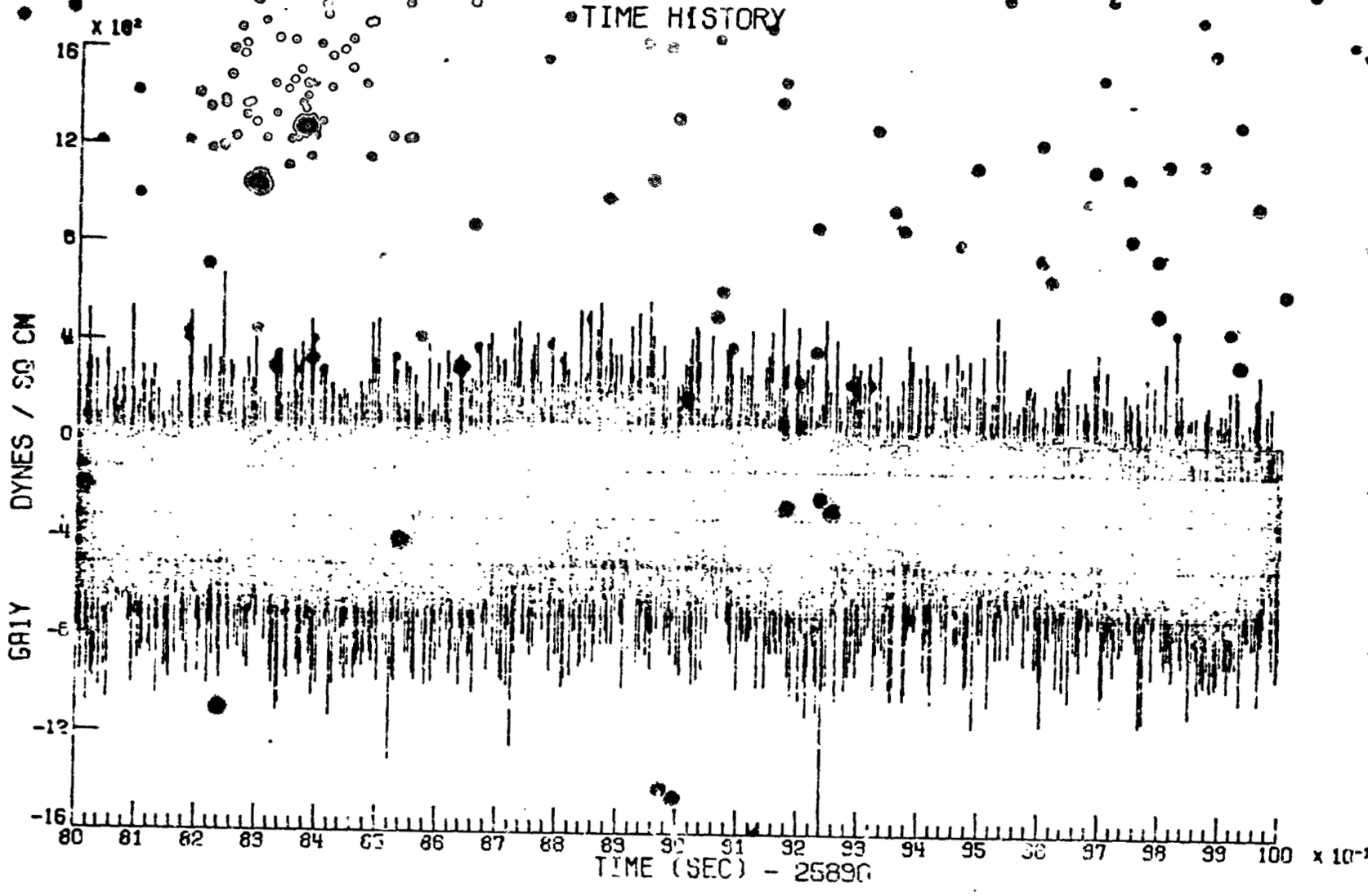
START 25894.000 SEC STOP 25896.000 SEC

OVERALL SOUND PRESSURE LEVEL = 120.87 DB BAND-LIMITED SOUND PRESSURE LEVEL = 120.88 DB

TC-2 ACOUSTIC MAX Q GAIY

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 06/09/75

Figure 35b



MAX = 667.110

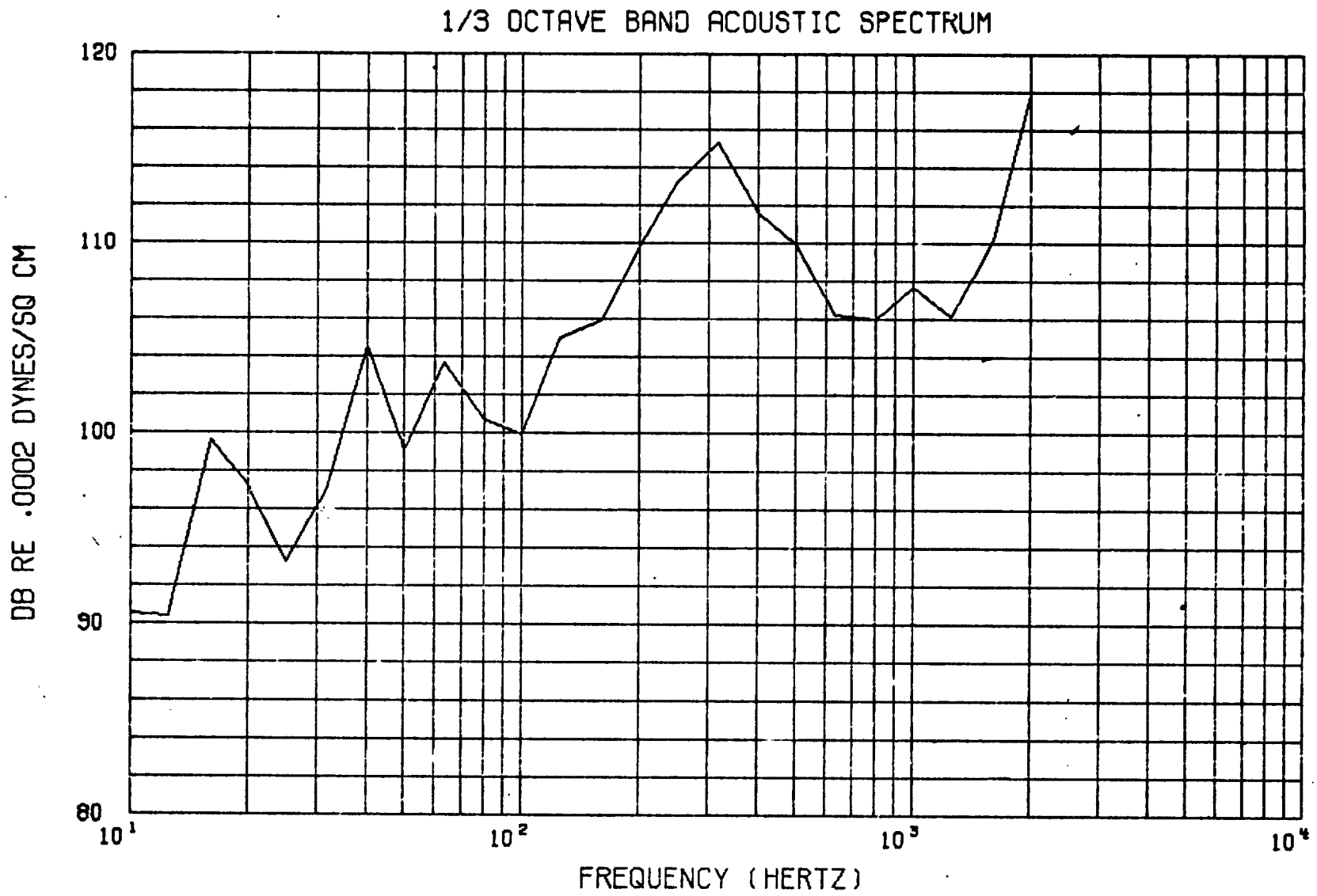
MIN = -1563.229

TC-2 ACOUSTIC

MAX Q

GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM



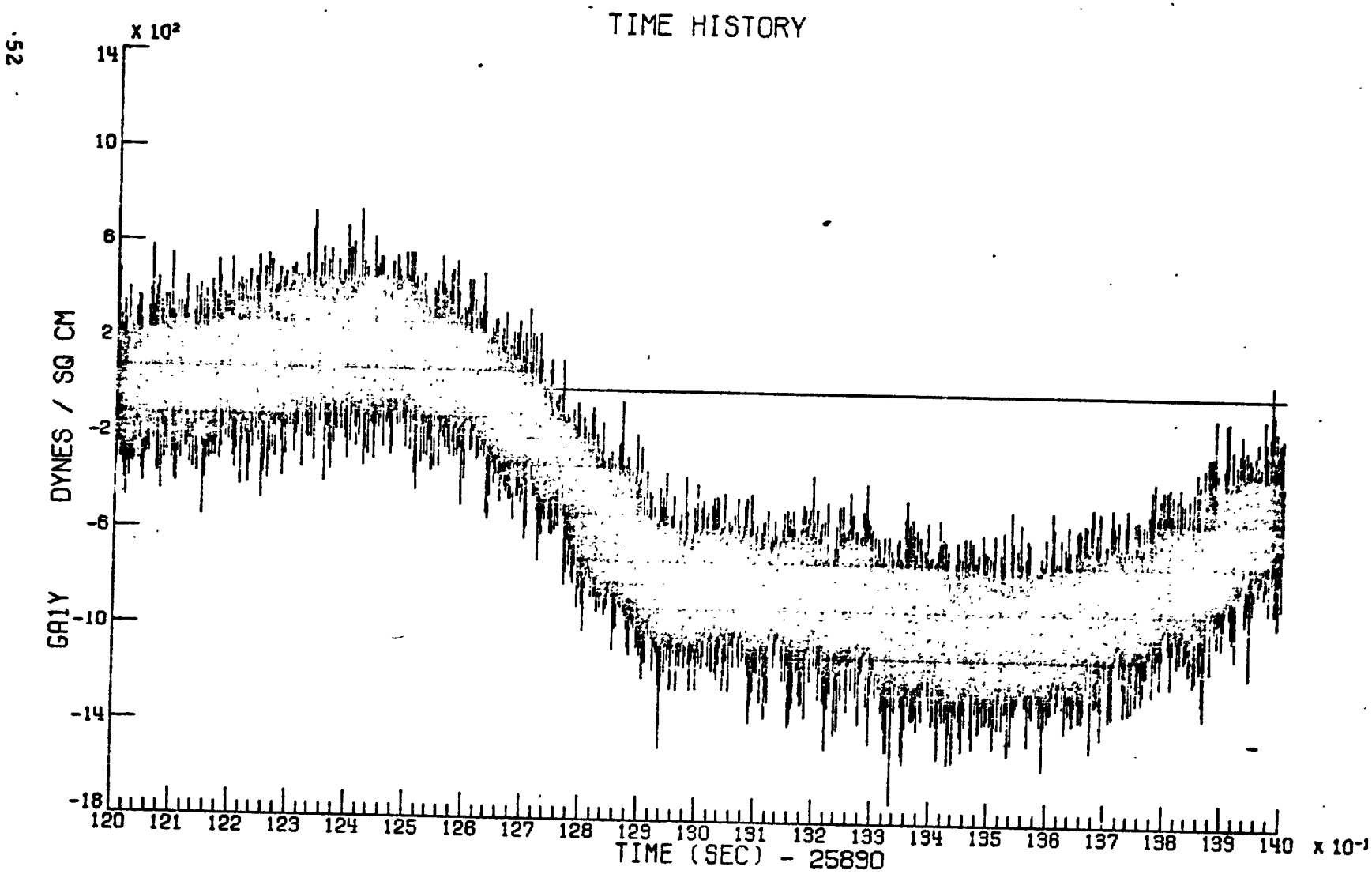
START 25898.000 SEC
OVERALL SOUND PRESSURE LEVEL = 123.02 DB

STOP 25900.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 122.91 DB

TC-2 ACOUSTIC MAX Q GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 36b



MAX = 736.808

MIN = -1712.582

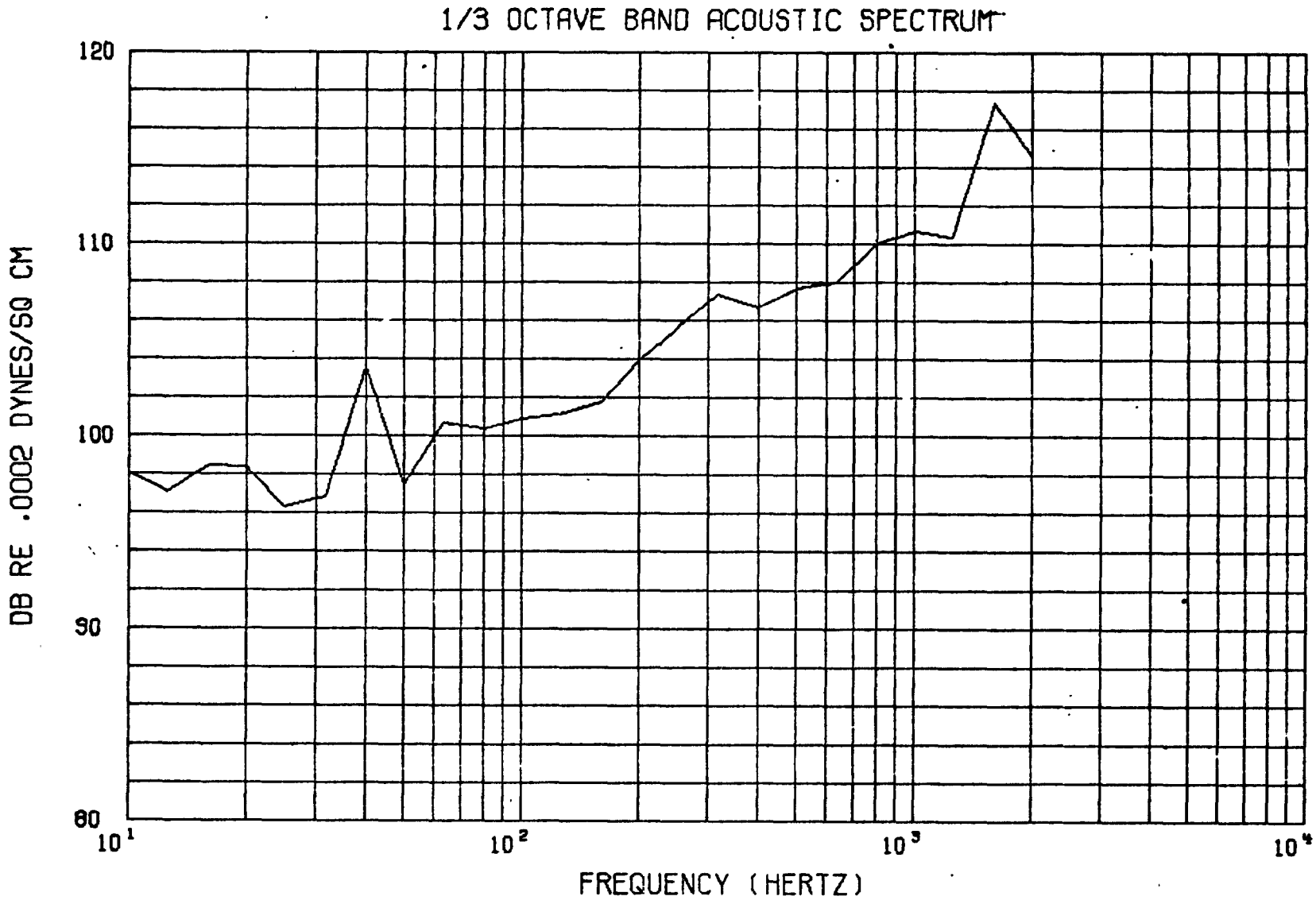
TC-2 ACOUSTIC

MAX Q

GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 37a



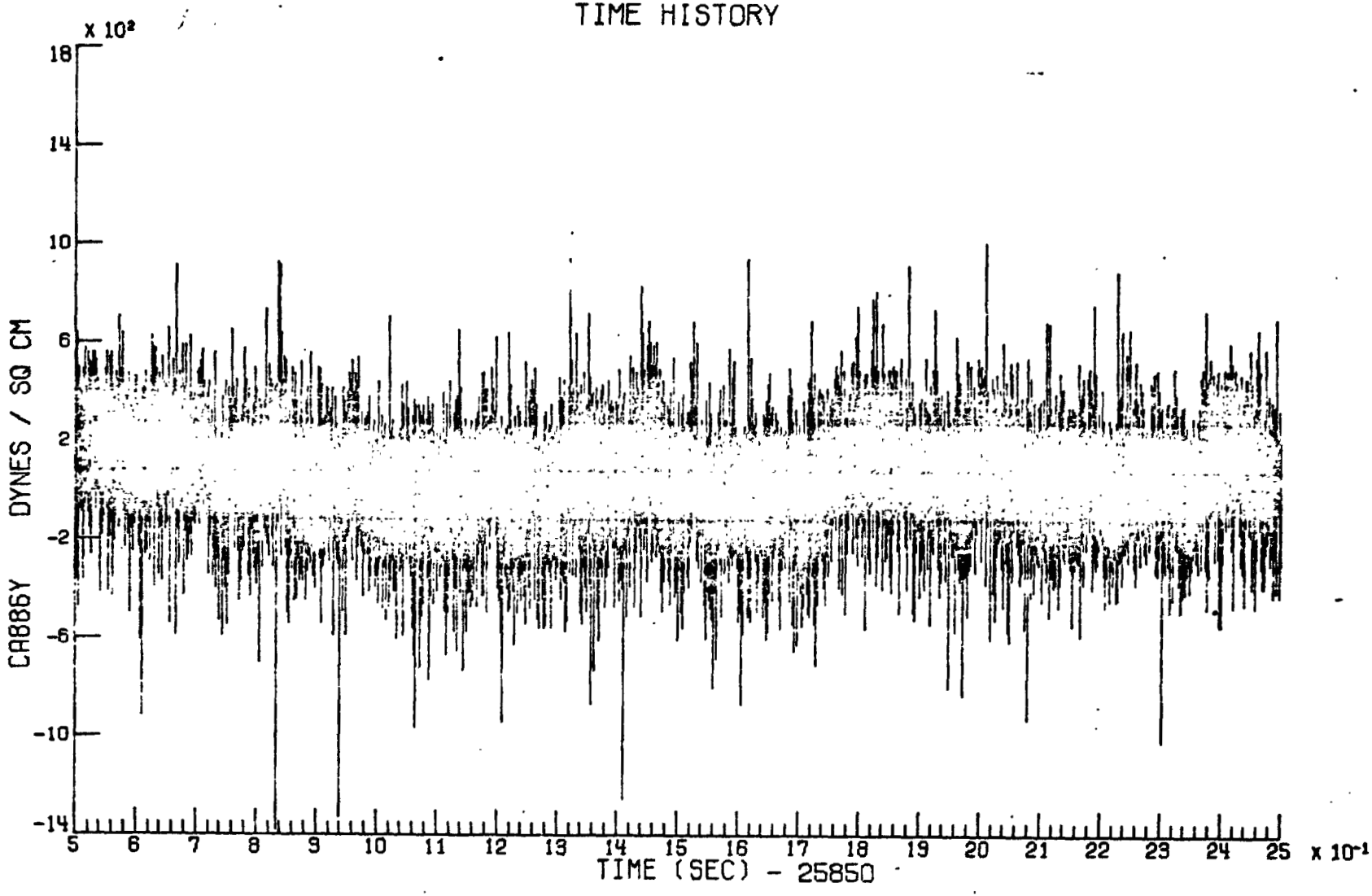
START 25902.000 SEC
OVERALL SOUND PRESSURE LEVEL = 128.03 DB

STOP 25904.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 121.97 DB

TC-2 ACOUSTIC MAX Q GA1Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 37b



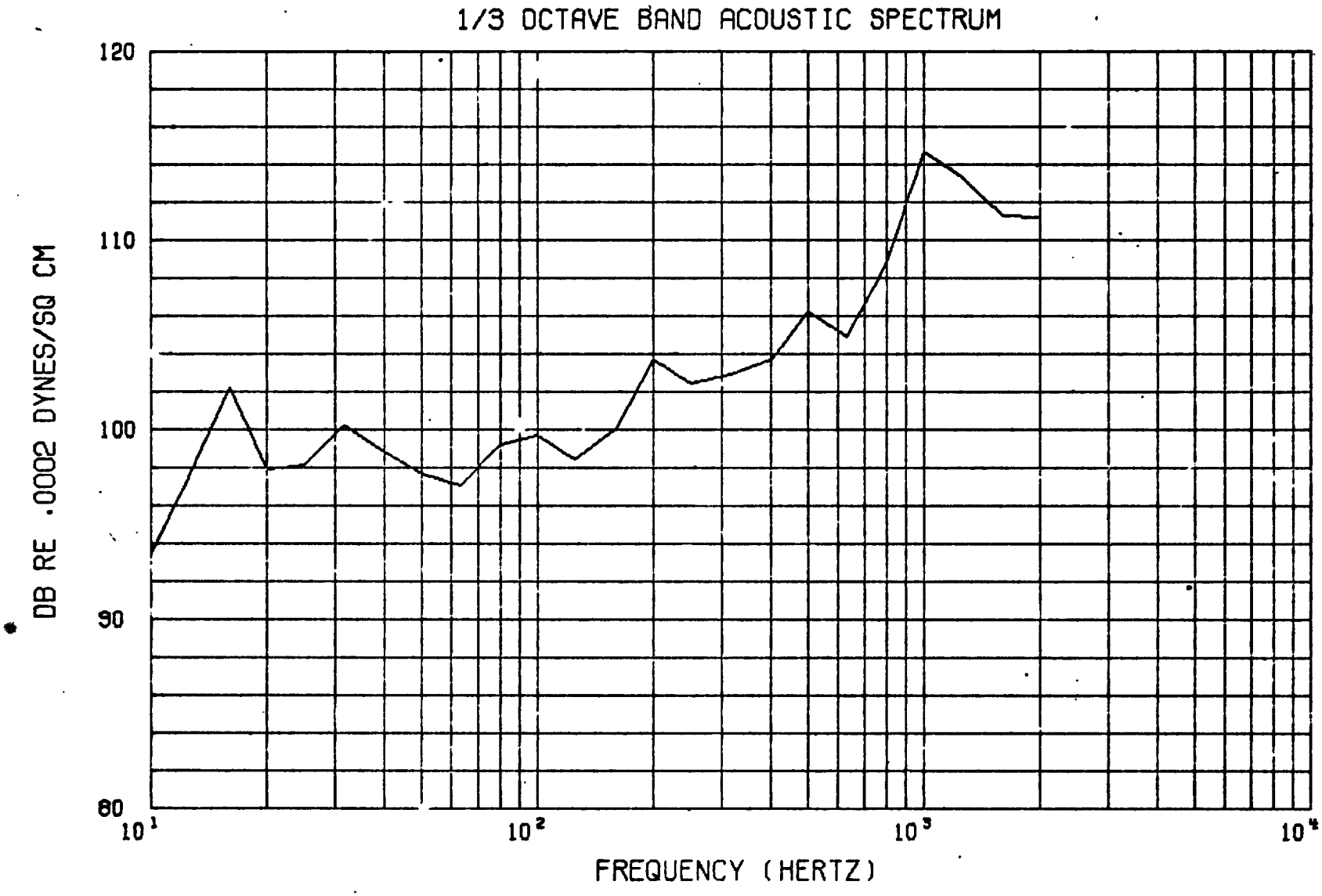
MAX = 1005.644

MIN = -1384.005

TC-2 ACOUSTIC PRE-IGNITION CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 38a



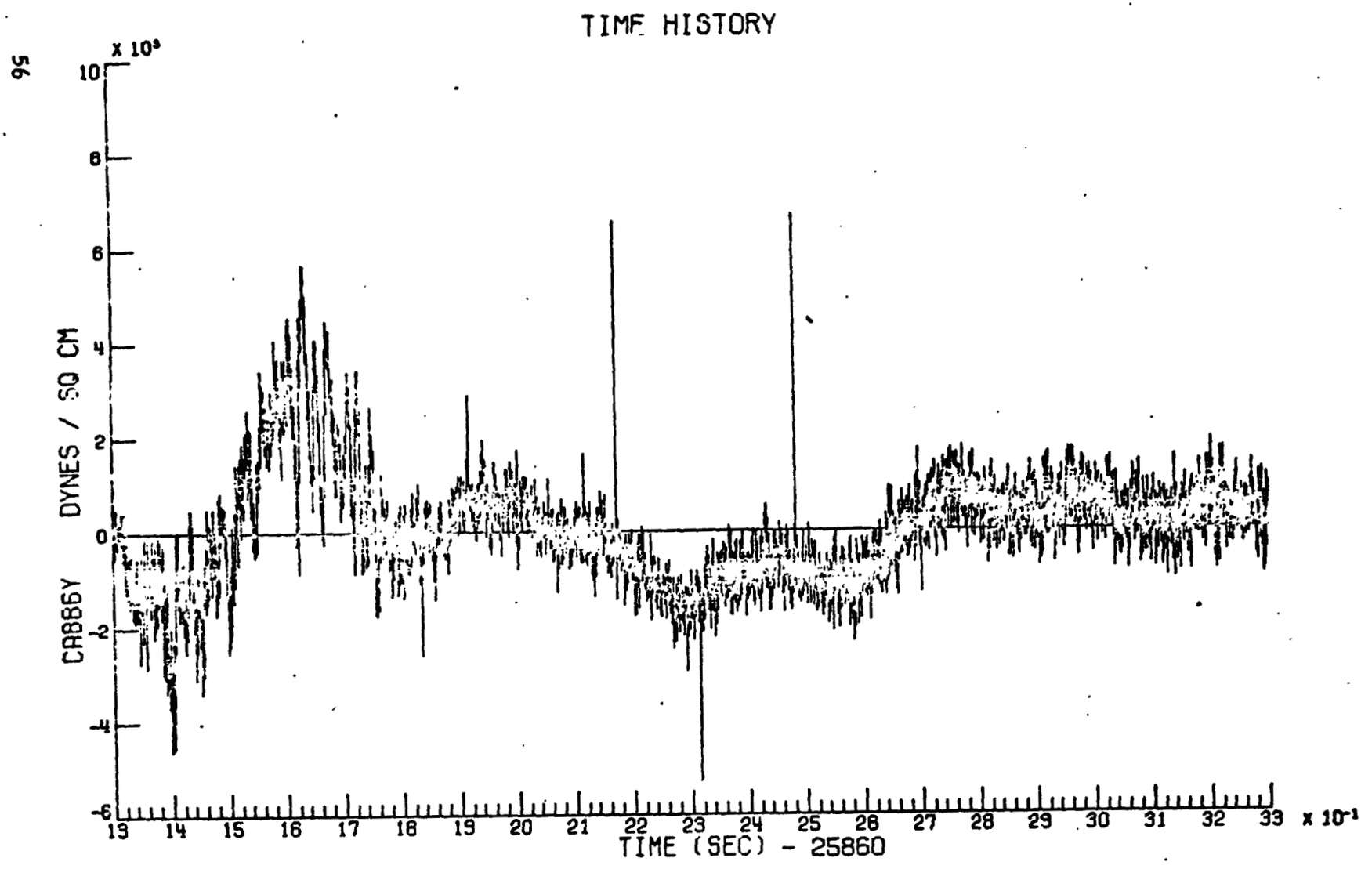
START 25850.500 SEC
OVERALL SOUND PRESSURE LEVEL = 120.80 DB

STOP 25852.500 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 120.47 DB

TC-2 ACOUSTIC PRE-IGNITION CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 38b



MAX = 6671.105

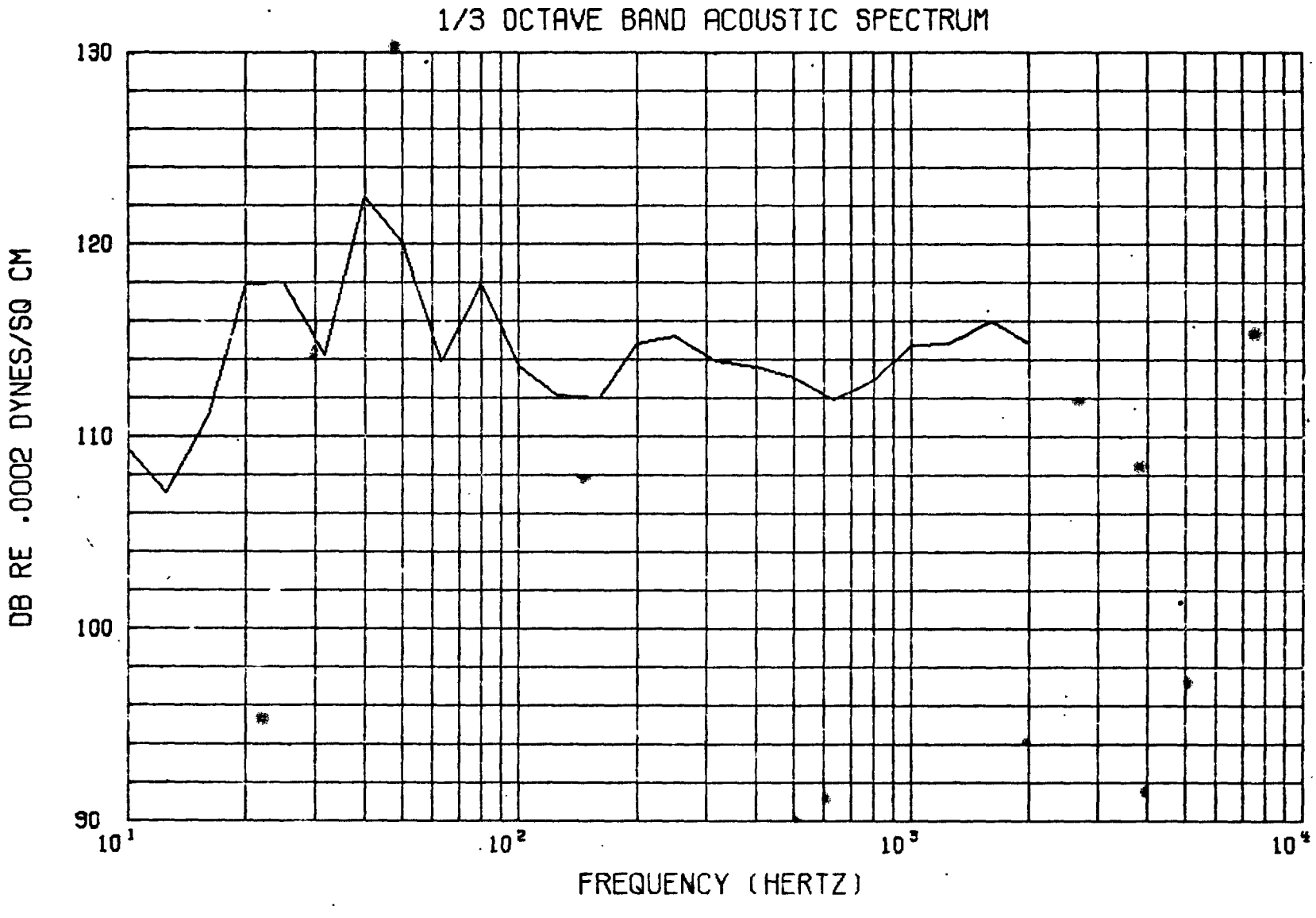
MIN = -5257.229

TC-2 ACOUSTIC

STG 0 IGN / LIFT-OFF CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 39a



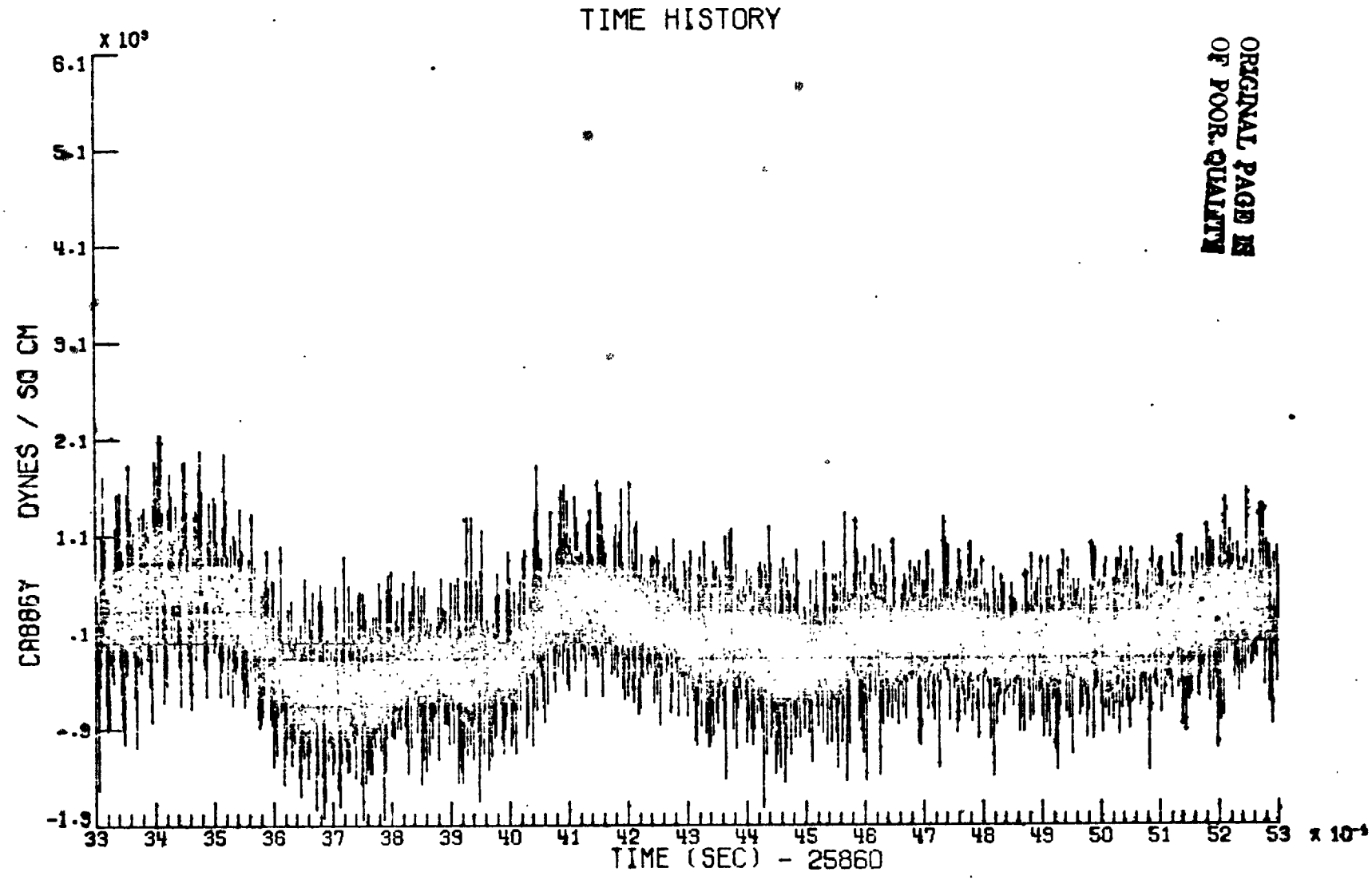
START 25861.300 SEC STOP 25868.300 SEC

OVERALL SOUND PRESSURE LEVEL = 135.33 DB BAND-LIMITED SOUND PRESSURE LEVEL = 129.51 DB

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 34b

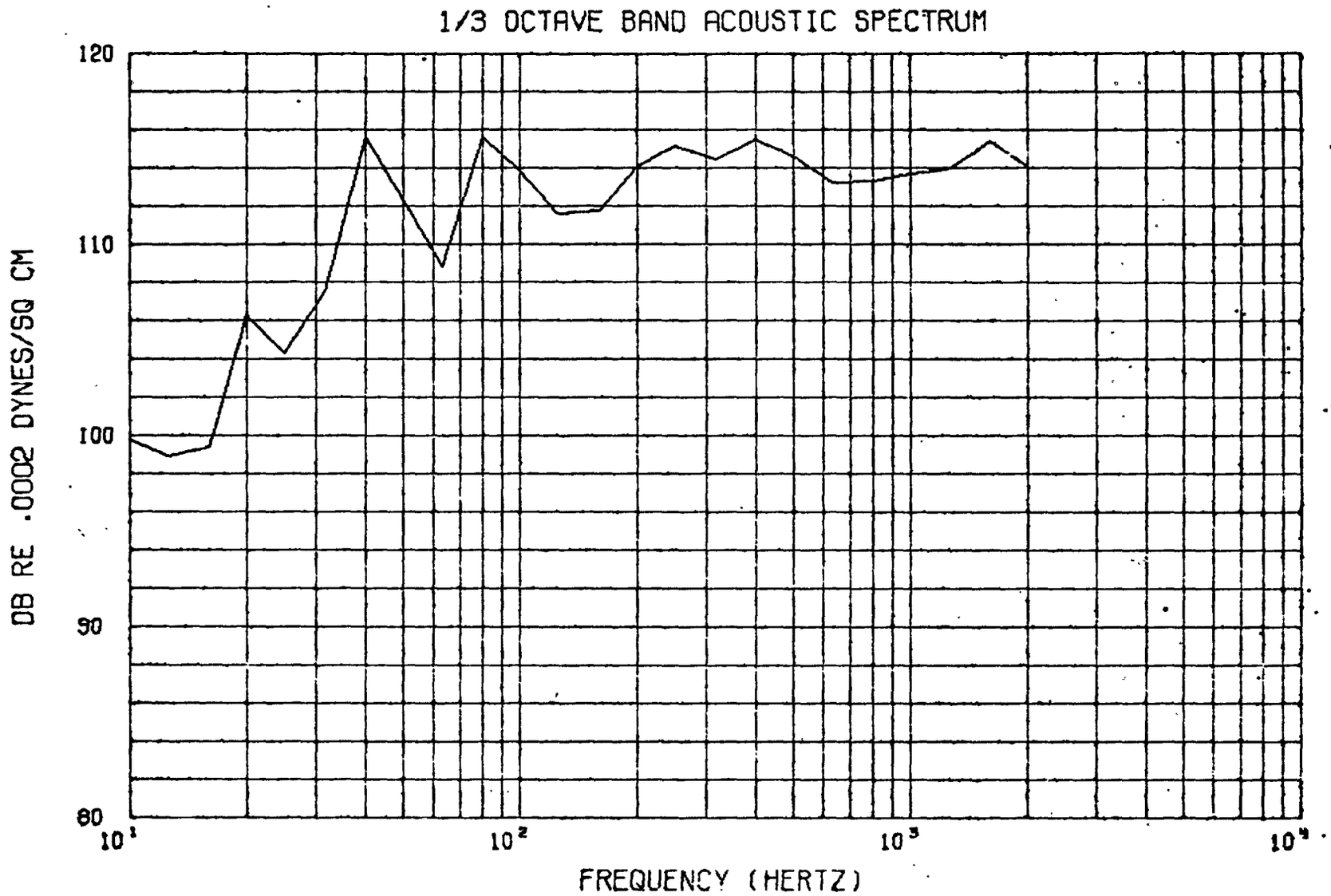


MAX = 2150.684 MIN = -1842.021

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 40a



START 25869.300 SEC
OVERALL SOUND PRESSURE LEVEL = 128.42 DB

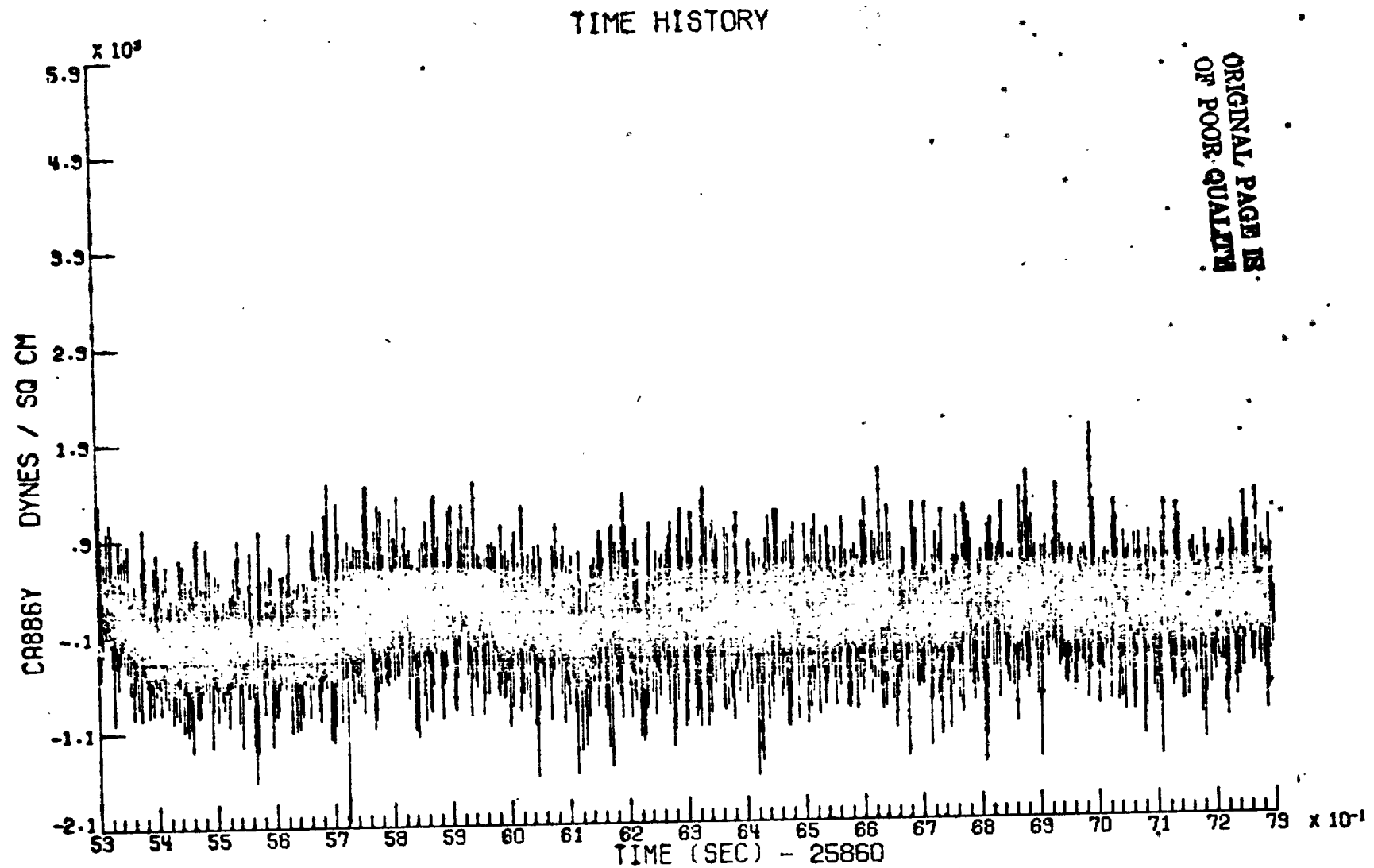
STOP 25865.299 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 126.69 DB

TC-2 ACOUSTIC

STG 0 IGN / LIFT-OFF CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 40b



MAX = 1981.416

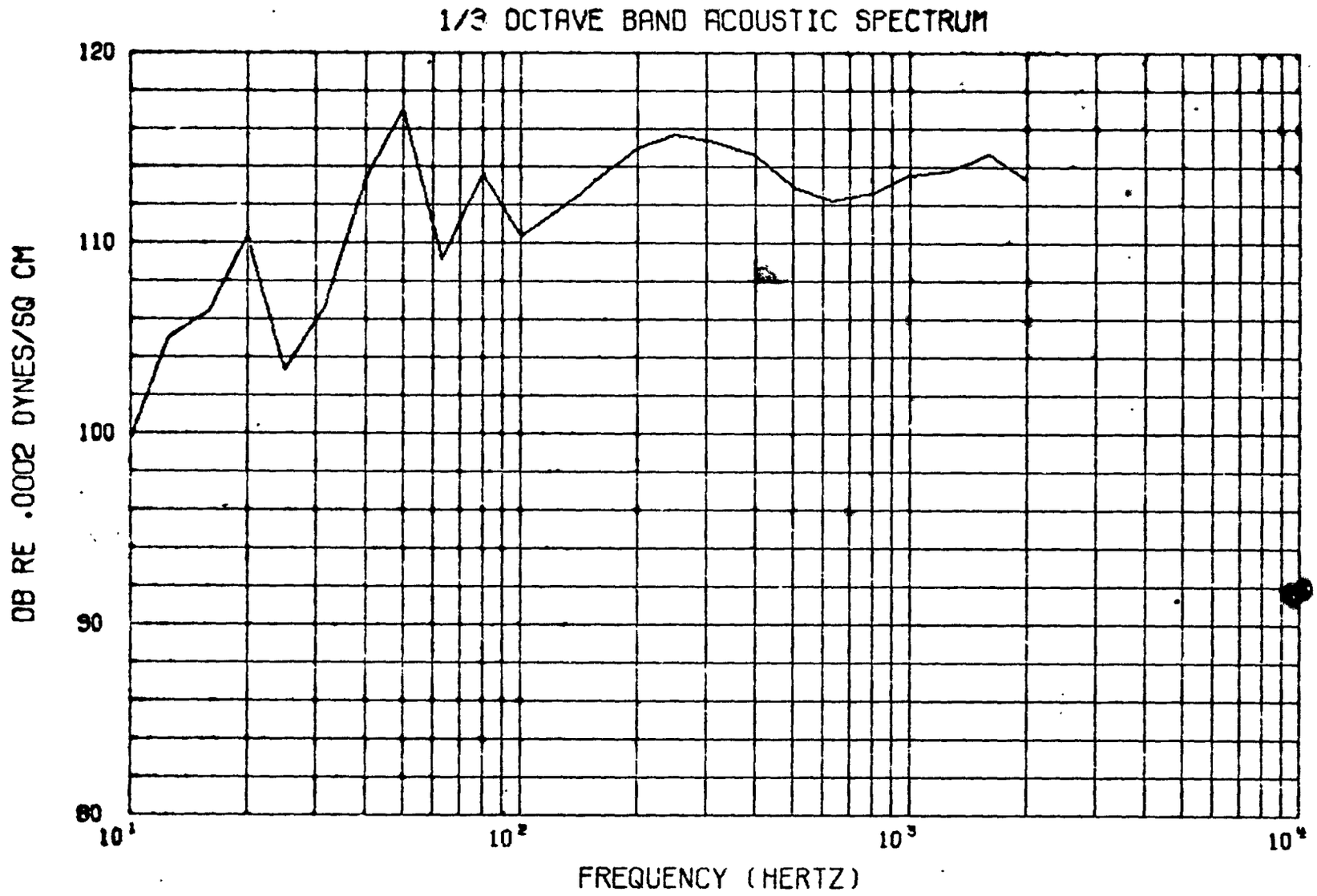
MIN = -2031.202

TC-2 ACOUSTIC

STG 0 IGN / LIFT-OFF CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 41a



START 2586[illegible]5.300 SEC
OVERALL SOUND PRESSURE LEVEL = 126.88 DB

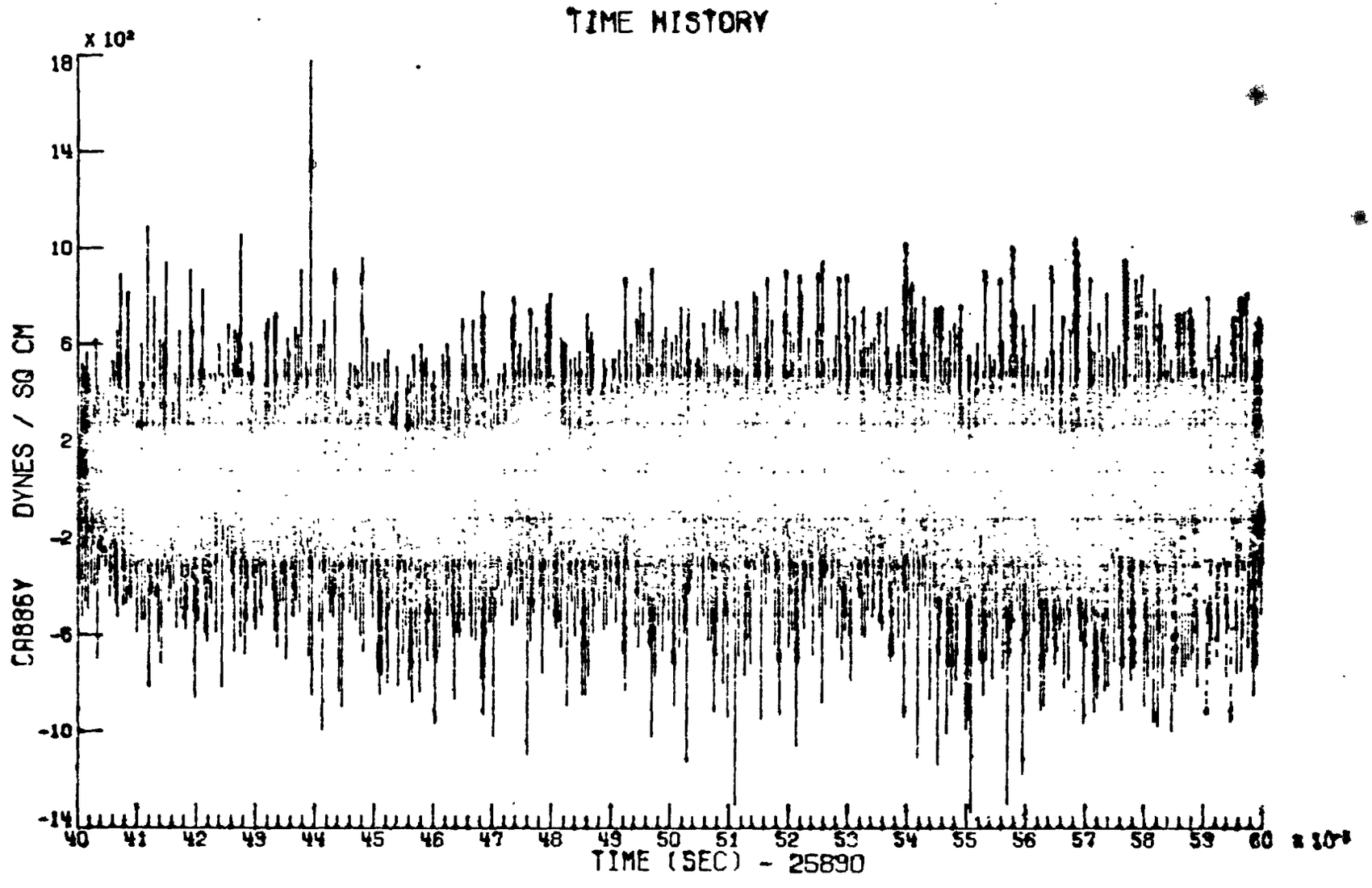
STOP 2586[illegible]7.299 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 126.[illegible] DB

TC-2 ACOUSTIC

STG 0 IGN / LIFT-OFF CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 41b

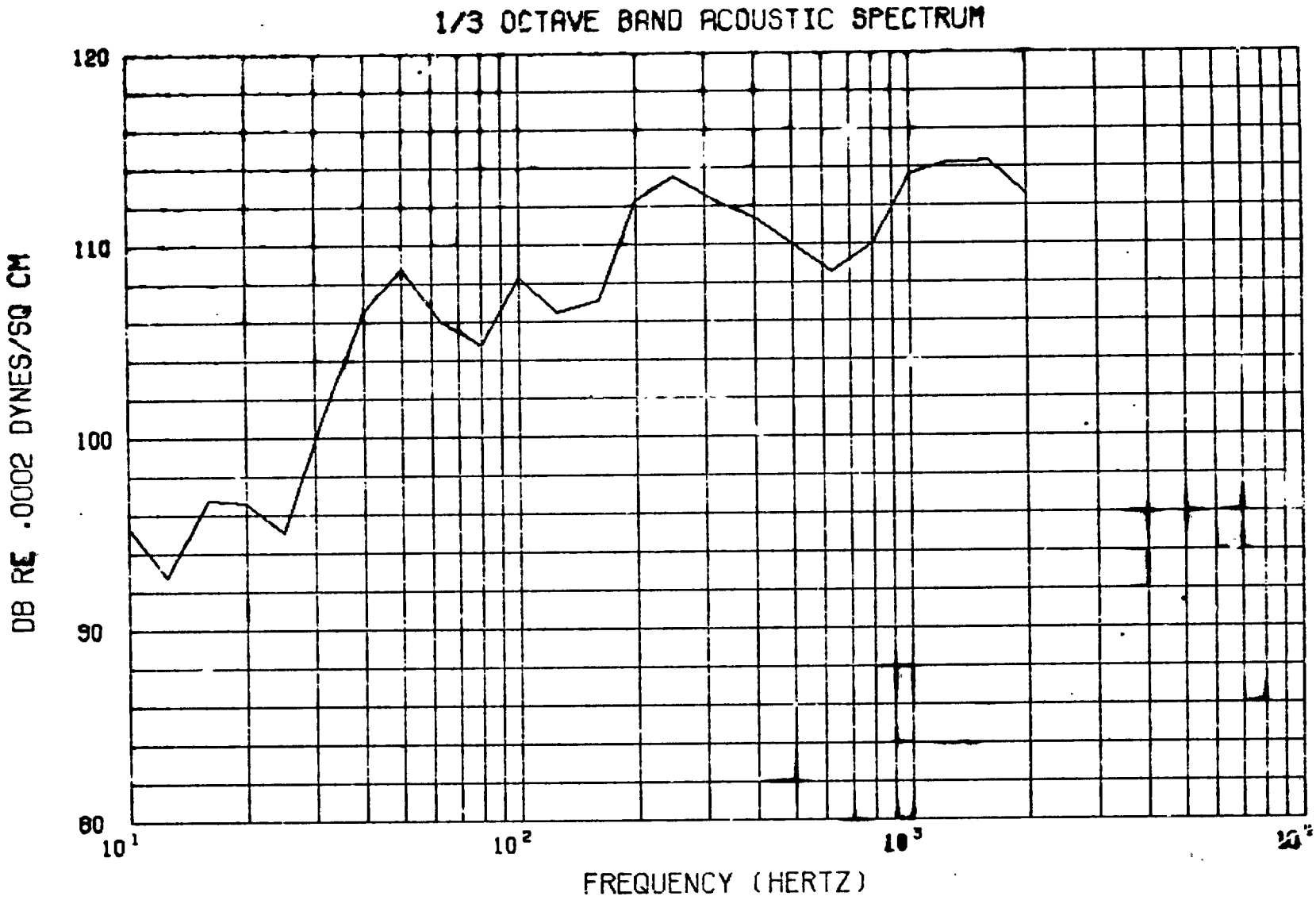


MAX = 1772.323 MIN = -1334.221

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 42a



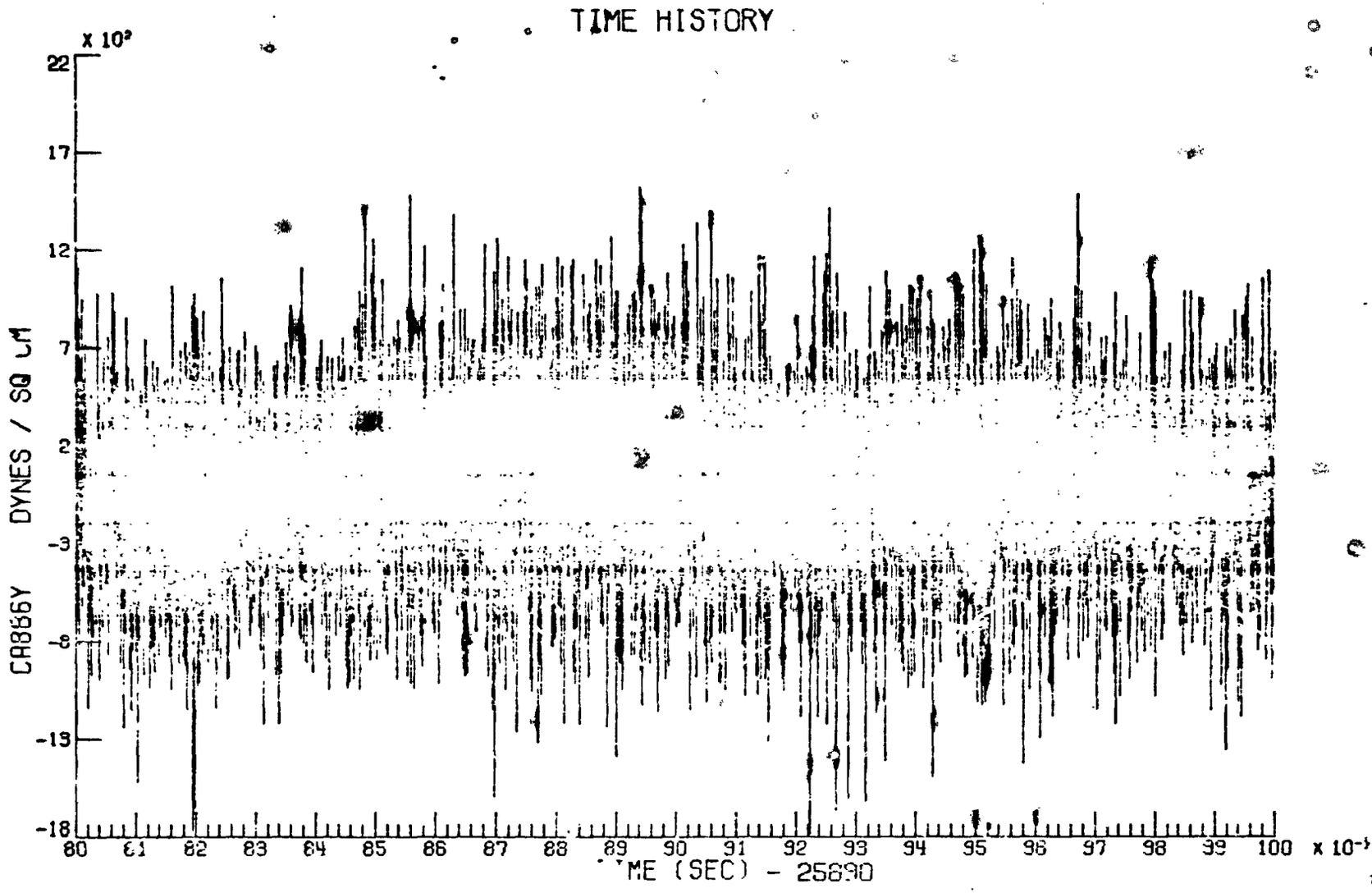
START 25894.000 SEC
STOP 25896.000 SEC

OVERALL SOUND PRESSURE LEVEL = 123.66 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 123.61 DB

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 42b

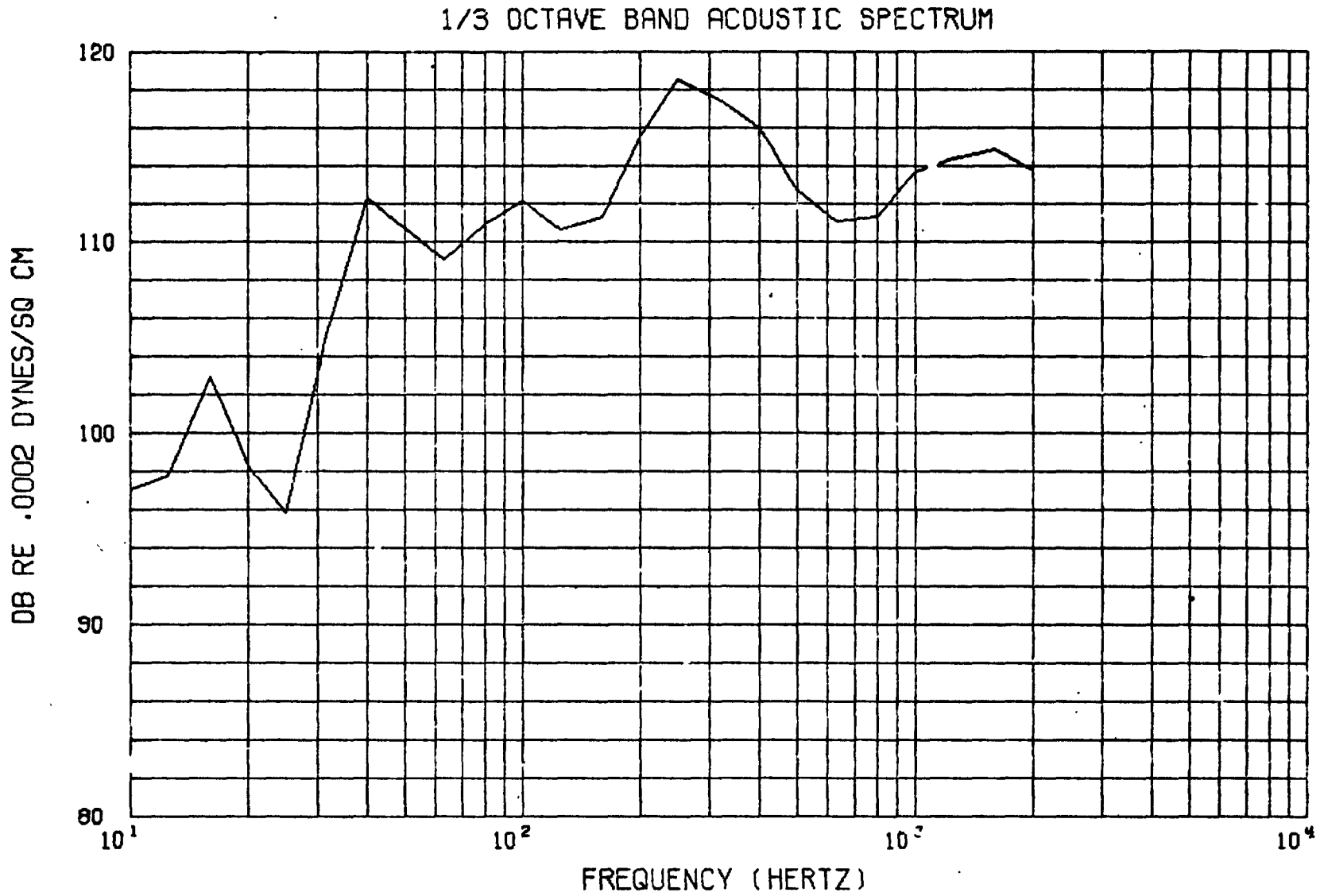


MAX = 1513.494 MIN = -1782.280

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/73

Figure 43a



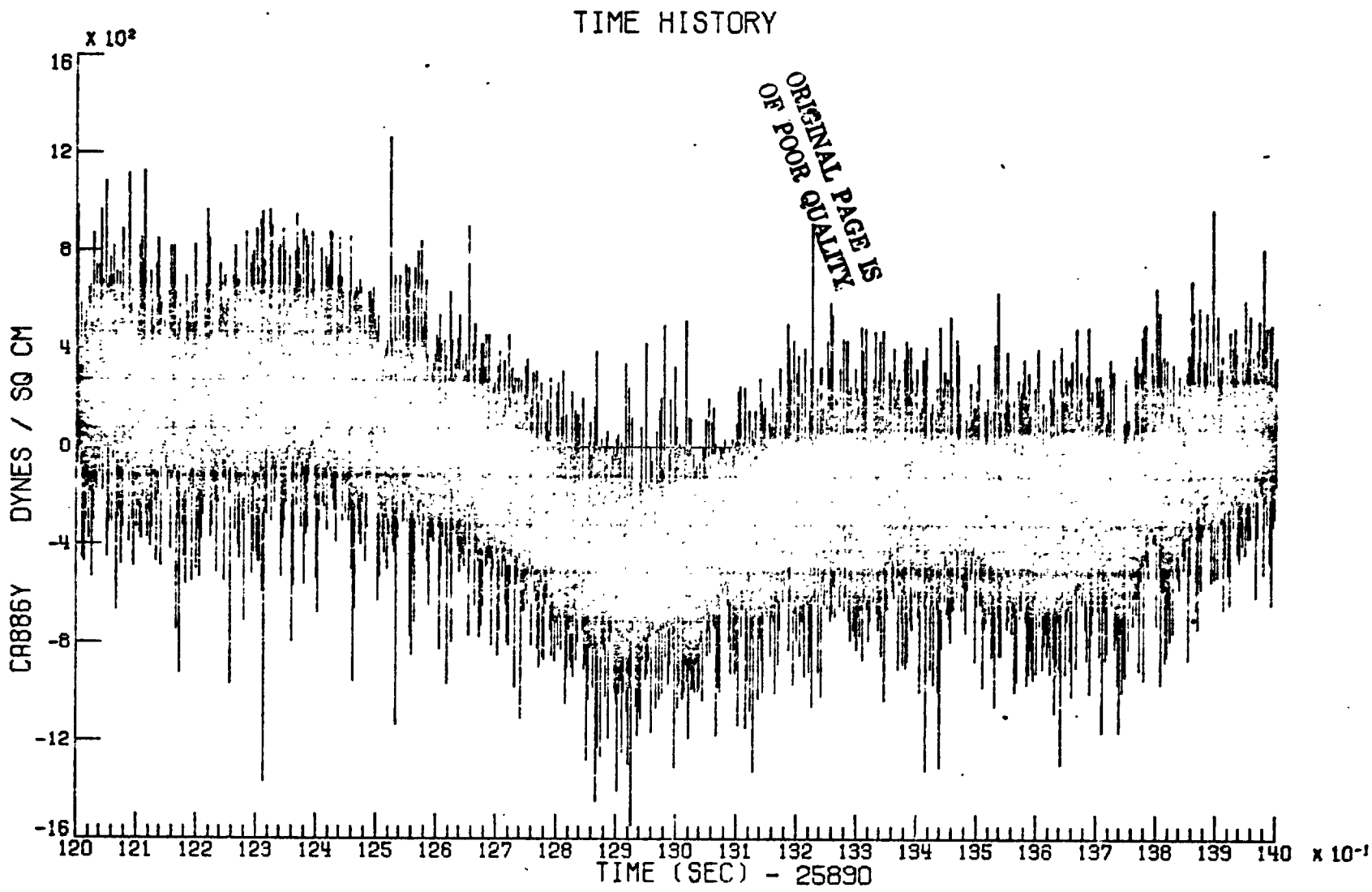
START 25898.000 SEC STOP 25900.000 SEC

OVERALL SOUND PRESSURE LEVEL = 126.61 DB BAND-LIMITED SOUND PRESSURE LEVEL = 126.54 DB

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 43b

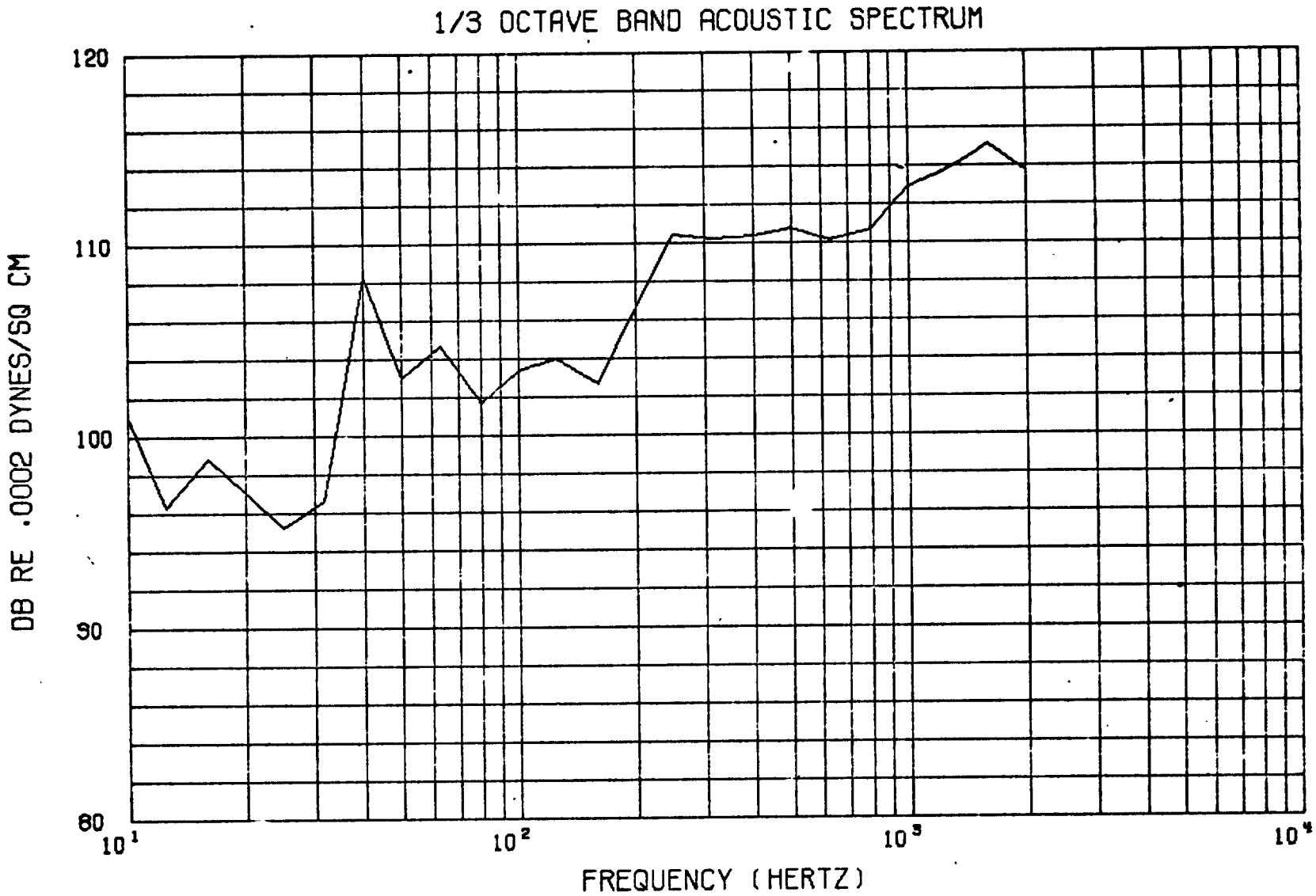


MAX = 1264.523 MIN = -1543.315

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 44a



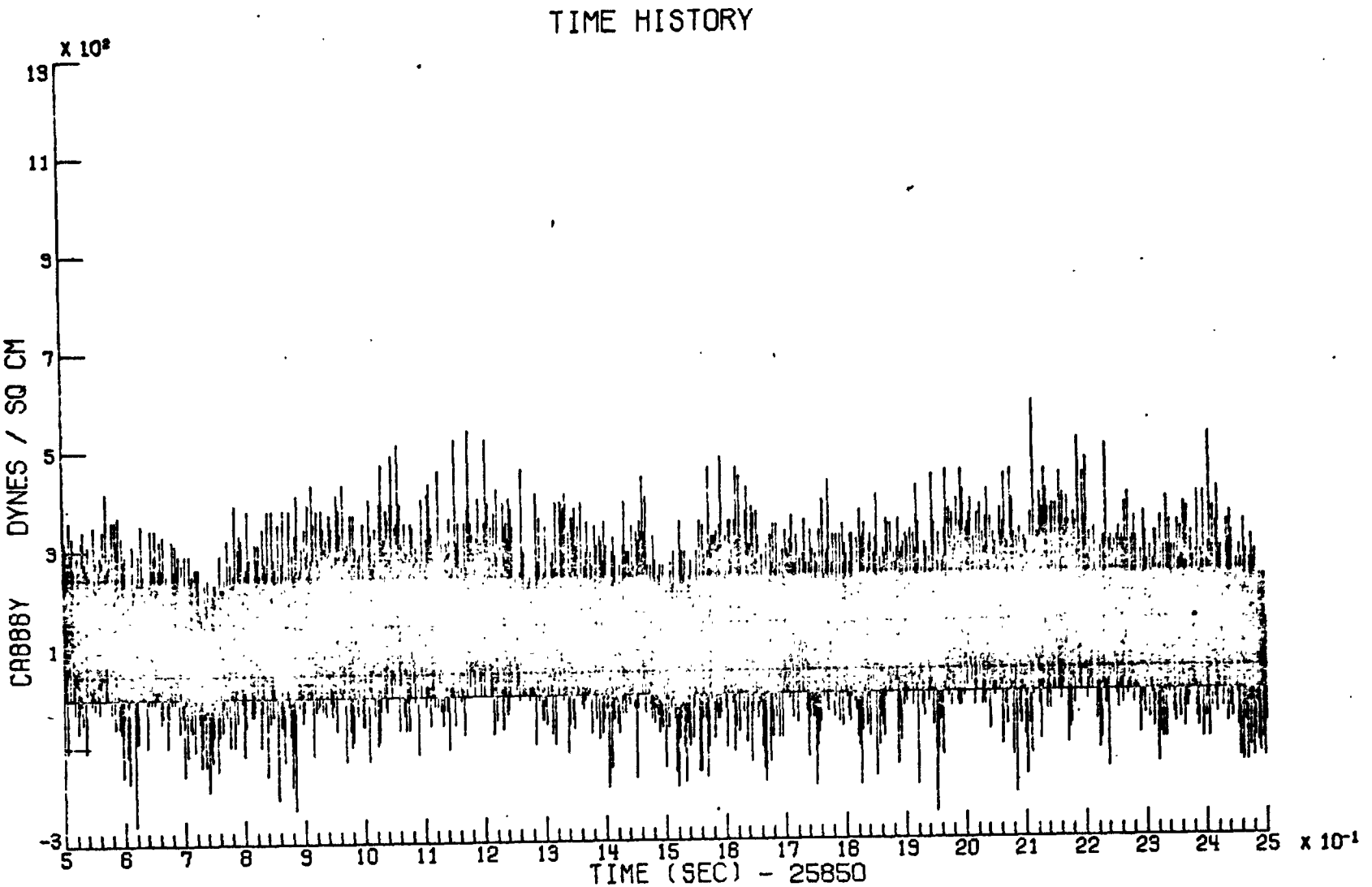
START 25902.000 SEC
OVERALL SOUND PRESSURE LEVEL = 125.03 DB

STOP 25904.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 122.87 DB

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 44b



MAX = 587.390

MIN = -258.849

TC-2 ACOUSTIC

PRE-IGNITION

CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 45a

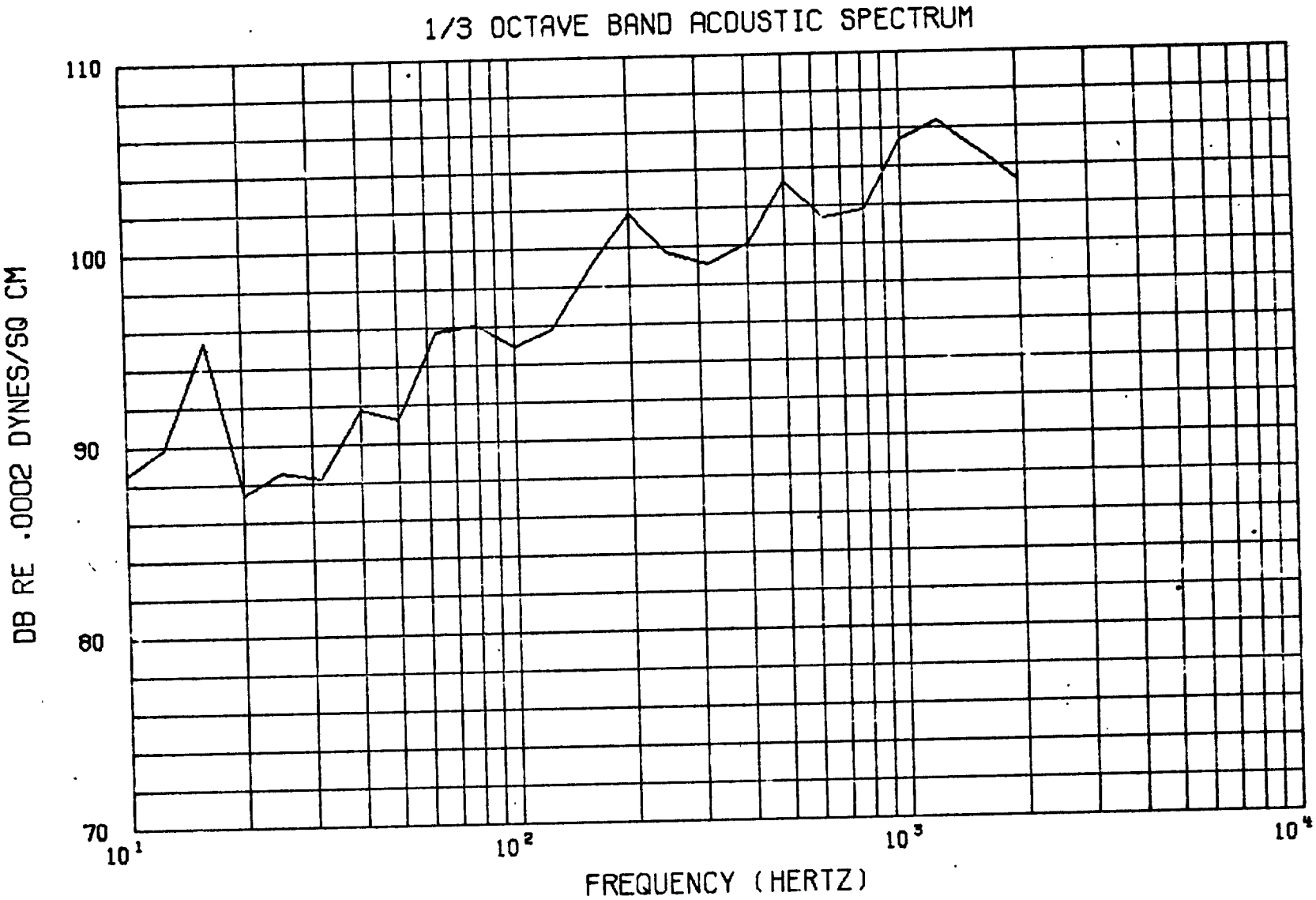
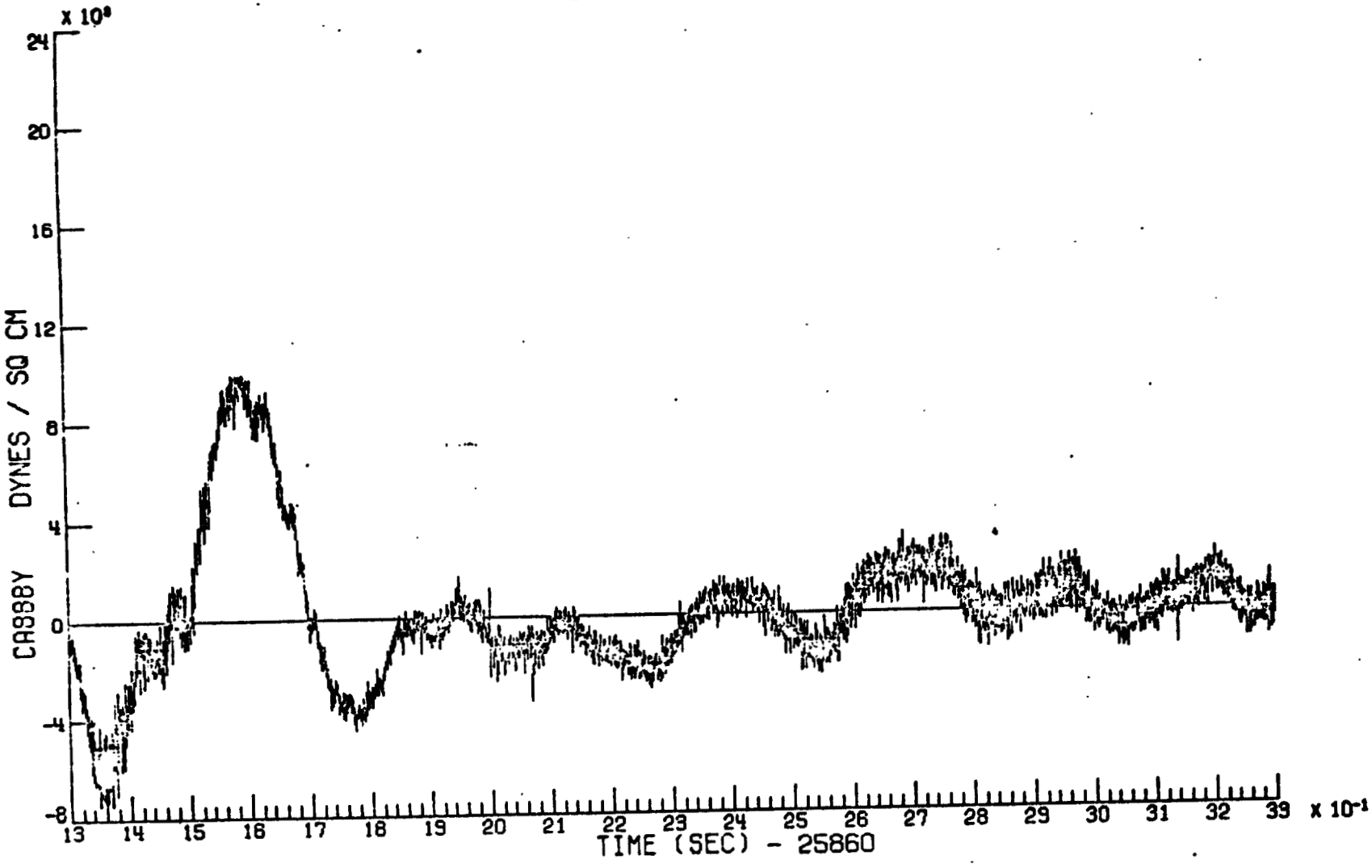

1/3 OCTAVE BAND ACOUSTIC SPECTRUM
110
100
90
80
70
DB RE .0002 DYNES/SQ CM
10^1
10^2
10^3
10^4
FREQUENCY (HERTZ)
START 25850.500 SEC
STOP 25852.500 SEC
OVERALL SOUND PRESSURE LEVEL = 114.29 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 114.05 DB
TC-2 ACOUSTIC
PRE-IGNITION
CA888Y
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 45b

TIME HISTORY

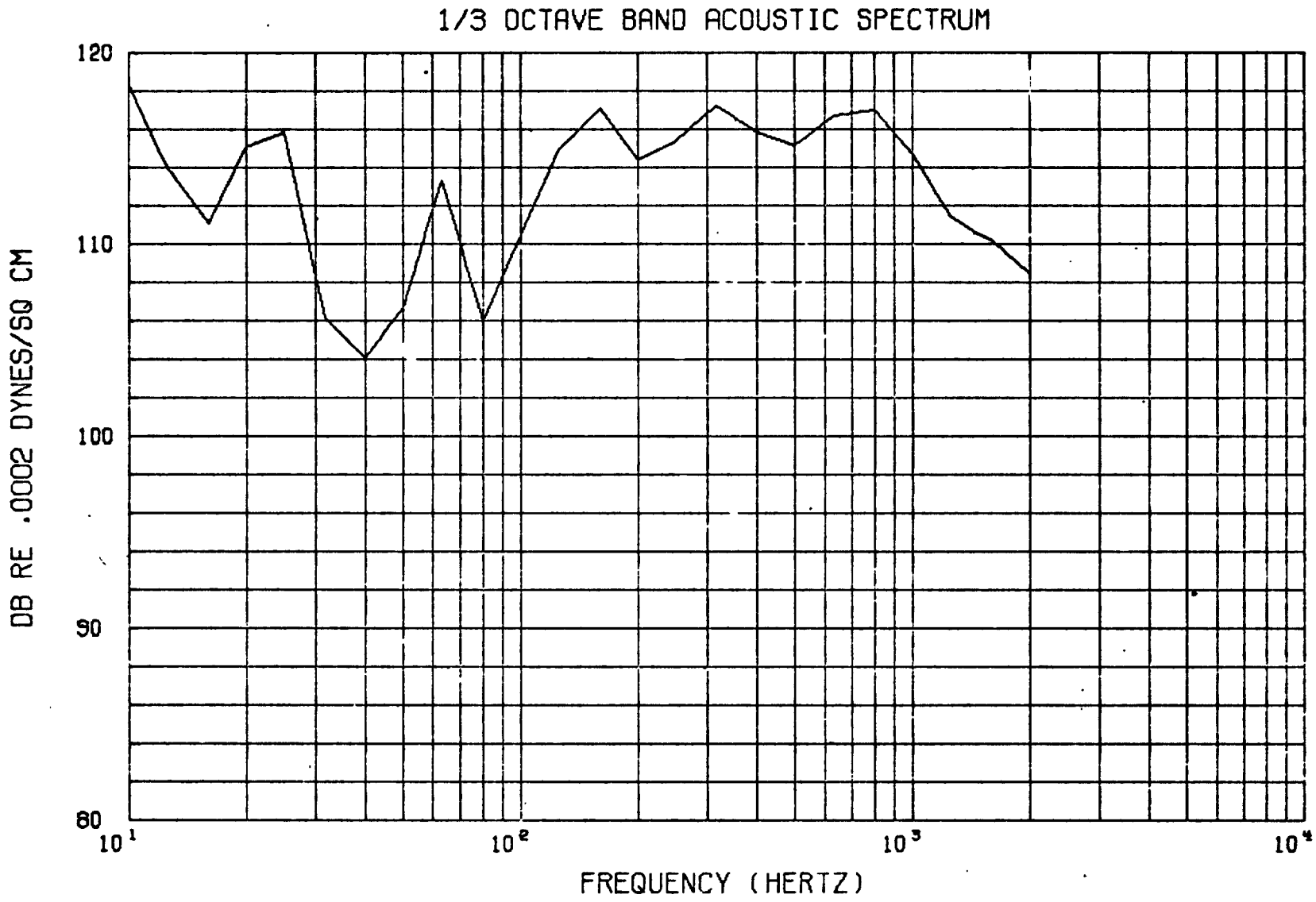


MAX = 9915.943 MIN = -7646.028

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 46a



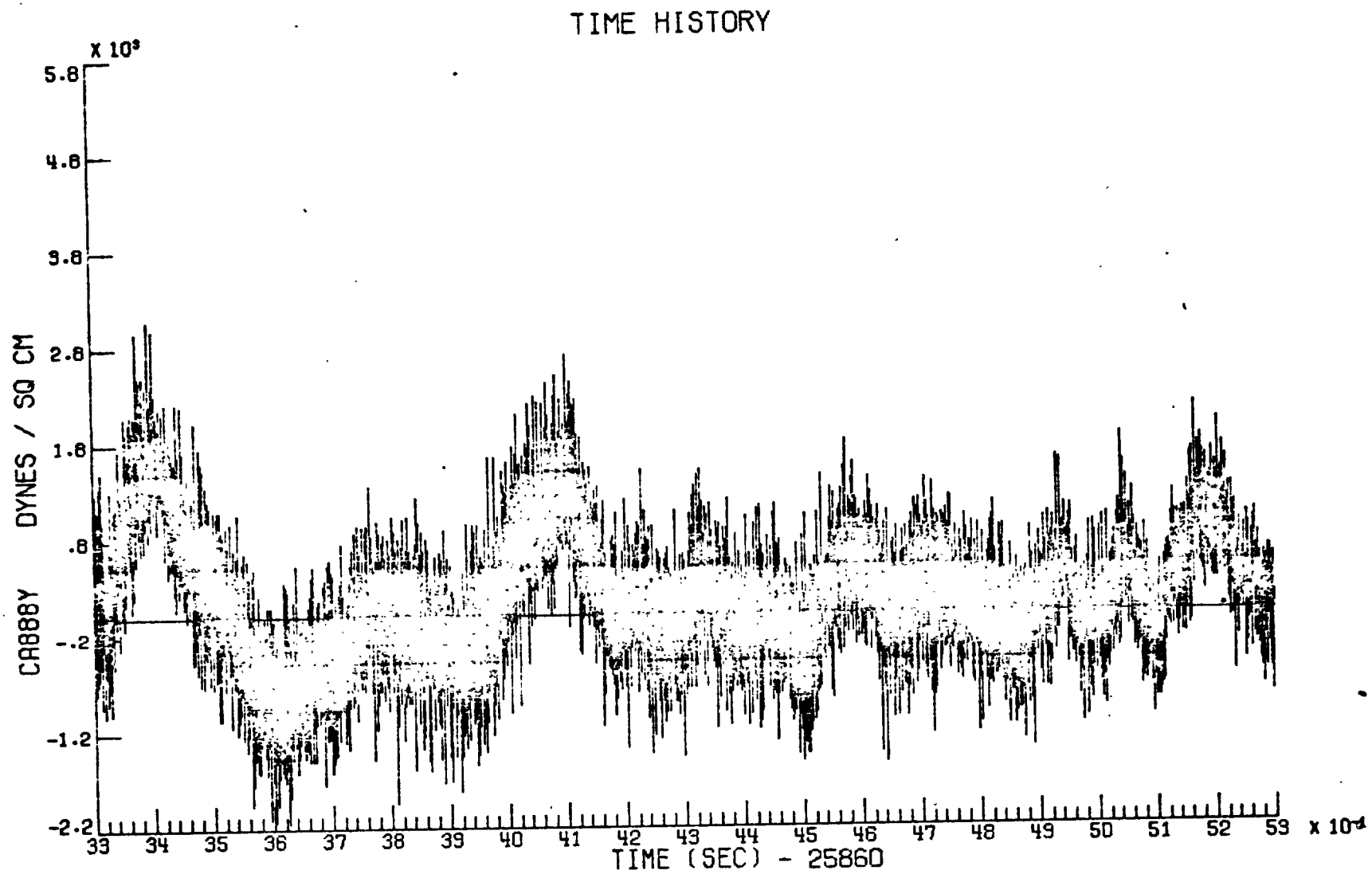
START 25861.300 SEC STOP 25863.300 SEC

OVERALL SOUND PRESSURE LEVEL = 142.42 DB BAND-LIMITED SOUND PRESSURE LEVEL = 126.13 DB

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 46b



MAX = 3076.331

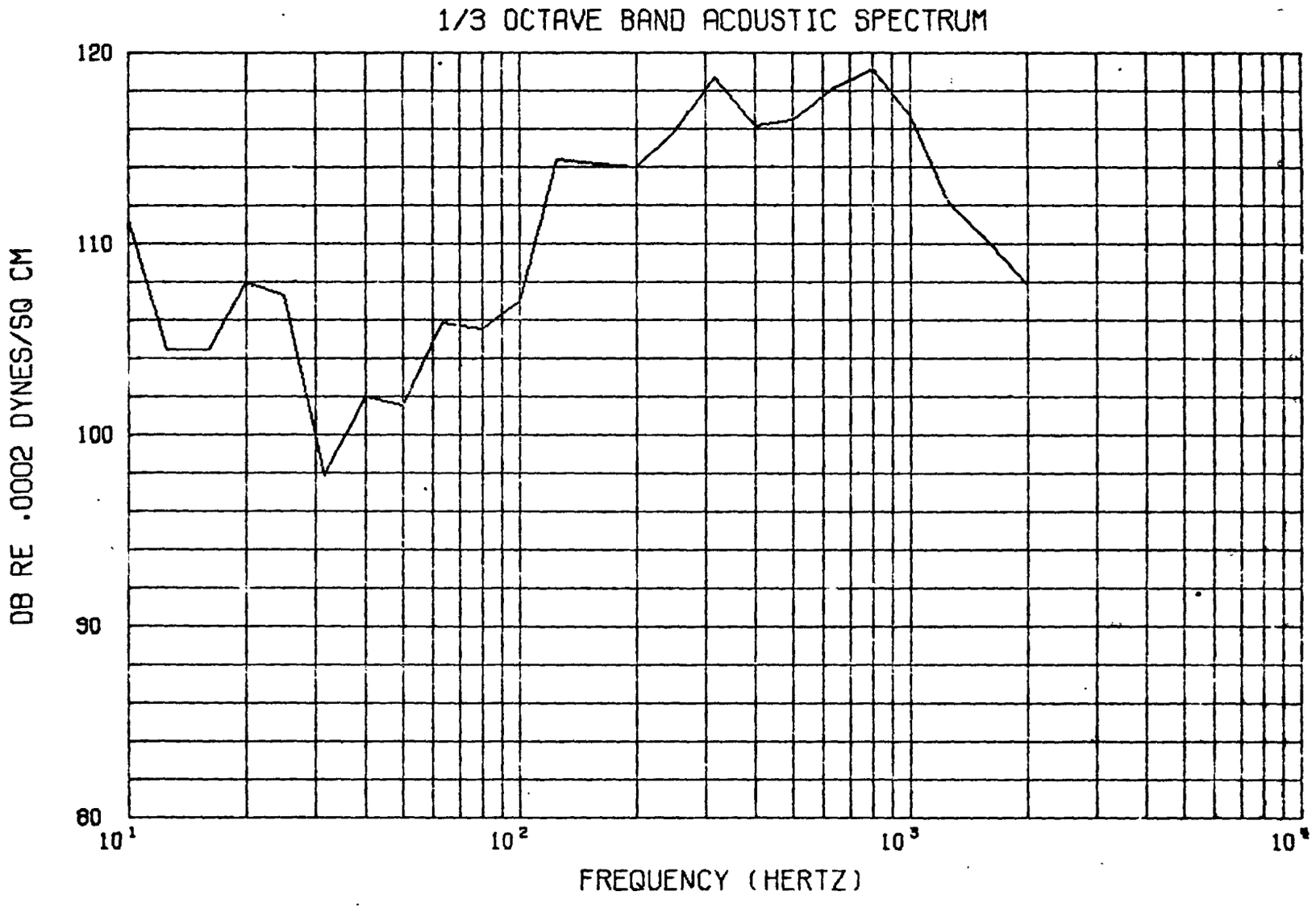
MIN = -2140.489

TC-2 ACOUSTIC

STG 0 IGN / LIFT-OFF CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 47a



START 25863.300 SEC STOP 25865.299 SEC

OVERALL SOUND PRESSURE LEVEL = 130.90 DB BAND-LIMITED SOUND PRESSURE LEVEL = 127.40 DB

TC-2 ACOUSTIC STG 0 IGN / LIFT-OFF CA88Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 47b

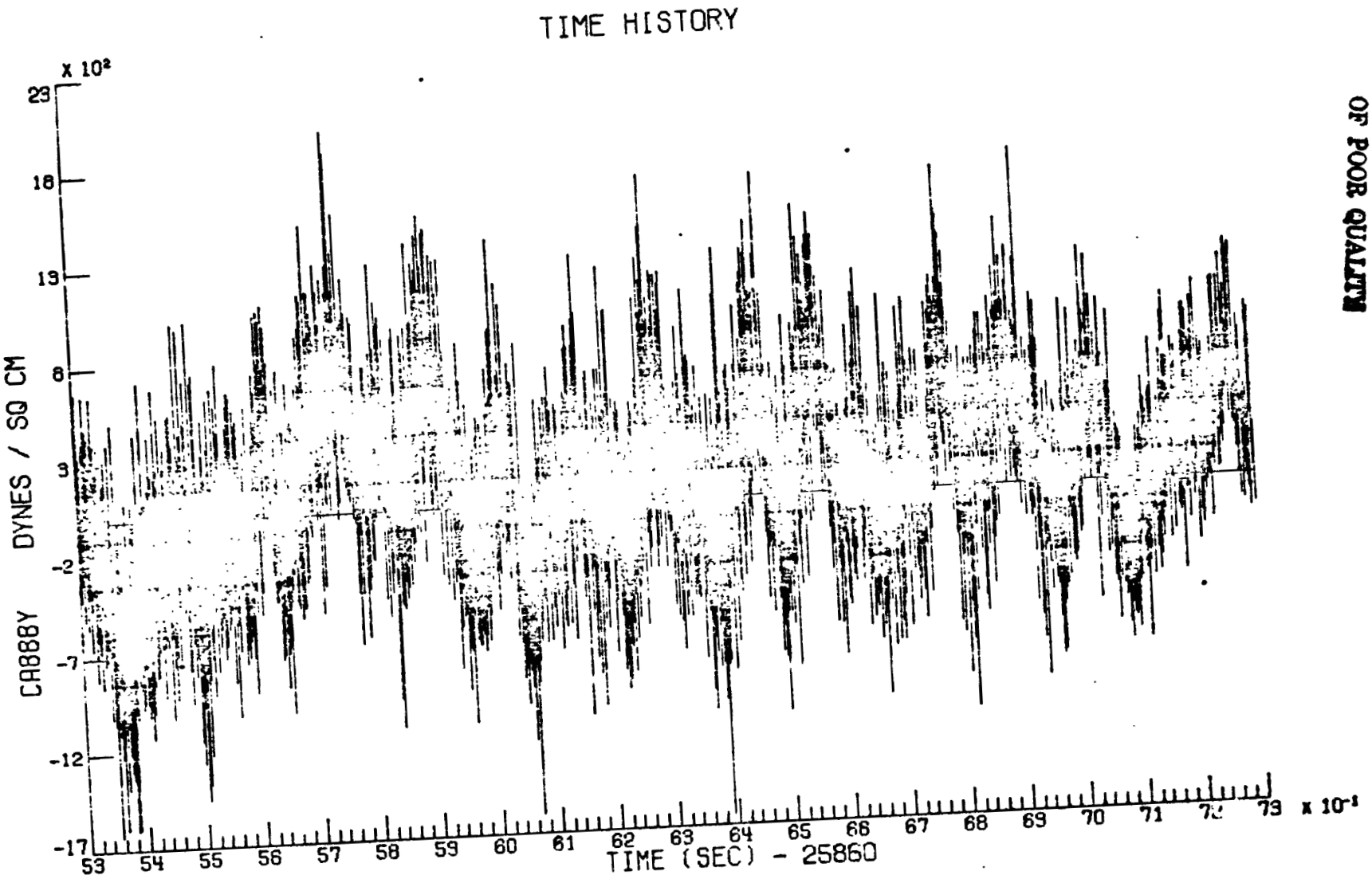
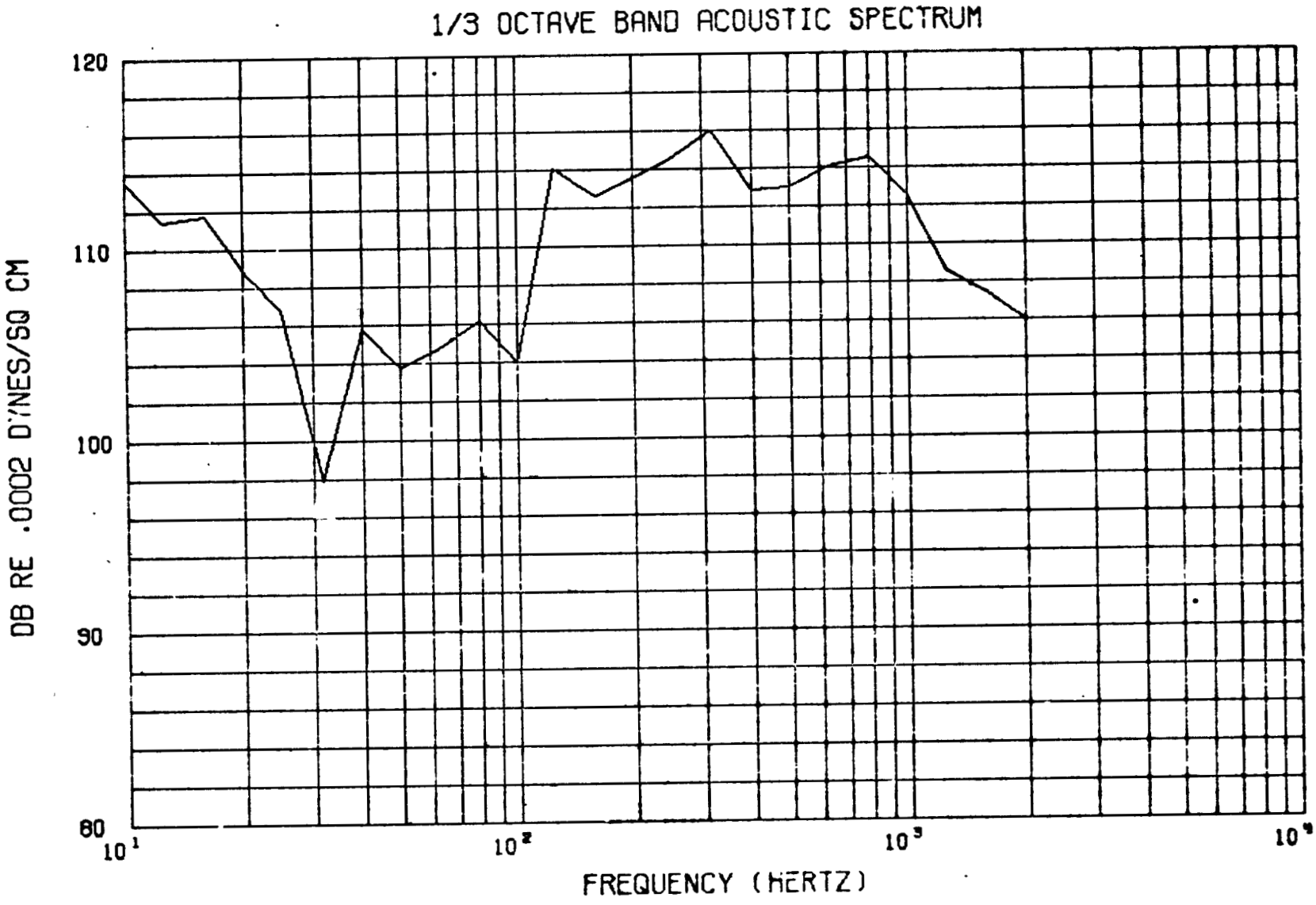


Figure 48a



START 25865.300 SEC
OVERALL SOUND PRESSURE LEVEL = 127.24 DB

STOP 25867.299 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 125.35 DB

TC-2 ACOUSTIC

STG 0 IGN / LIFT-OFF CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 48b

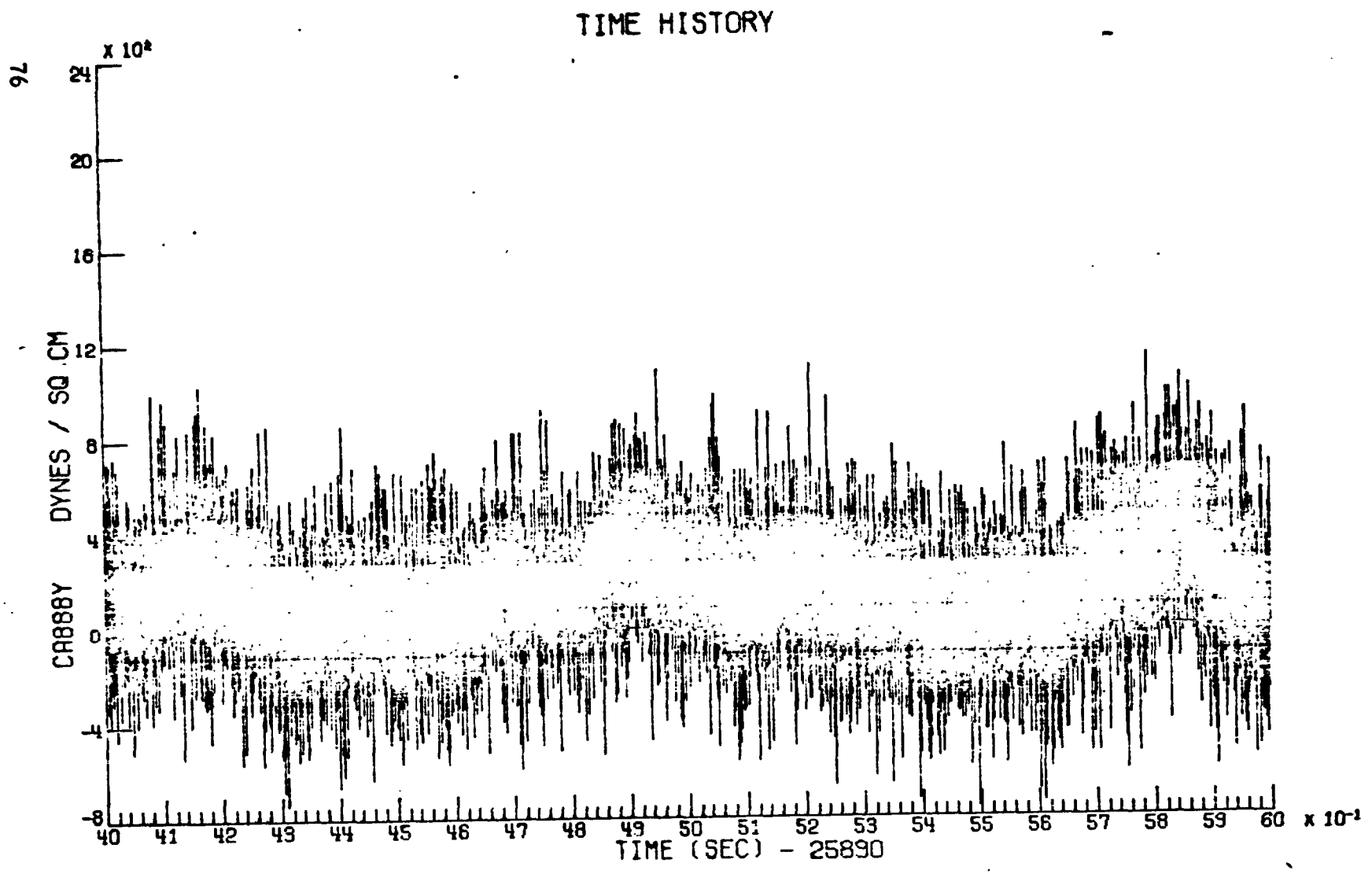
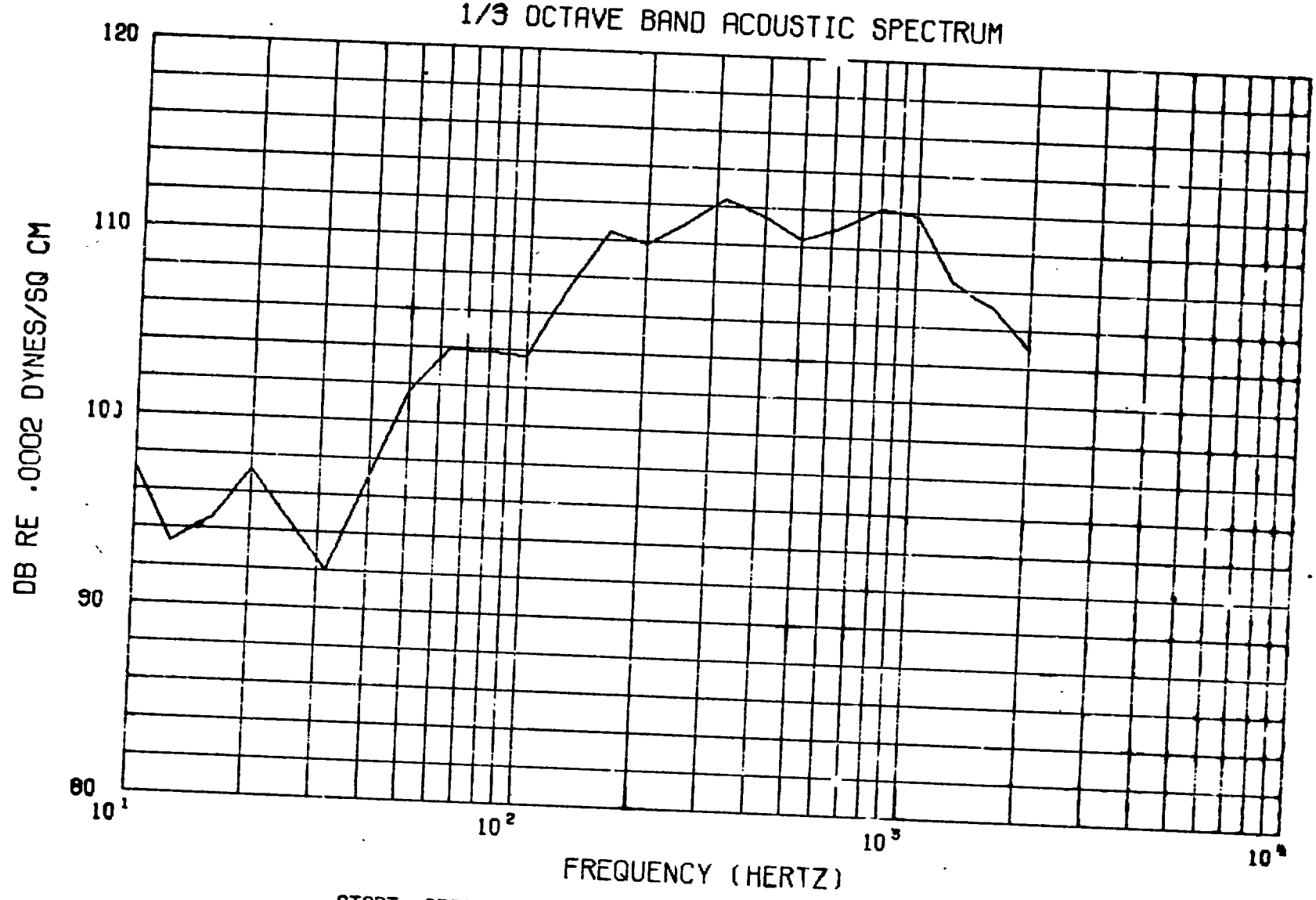

TIME HISTORY
X 10²
24
20
16
12
8
4
0
-4
-8
CA888Y DYNES / SQ.CM
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 x 10⁻¹
TIME (SEC) - 25890
MAX = 1134.957
MIN = -756.638
TC-2 ACOUSTIC
MAX Q
CA888Y
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 49a



START 25894.000 SEC
OVERALL SOUND PRESSURE LEVEL = 122.43 DB

STOP 25898.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 121.82 DB

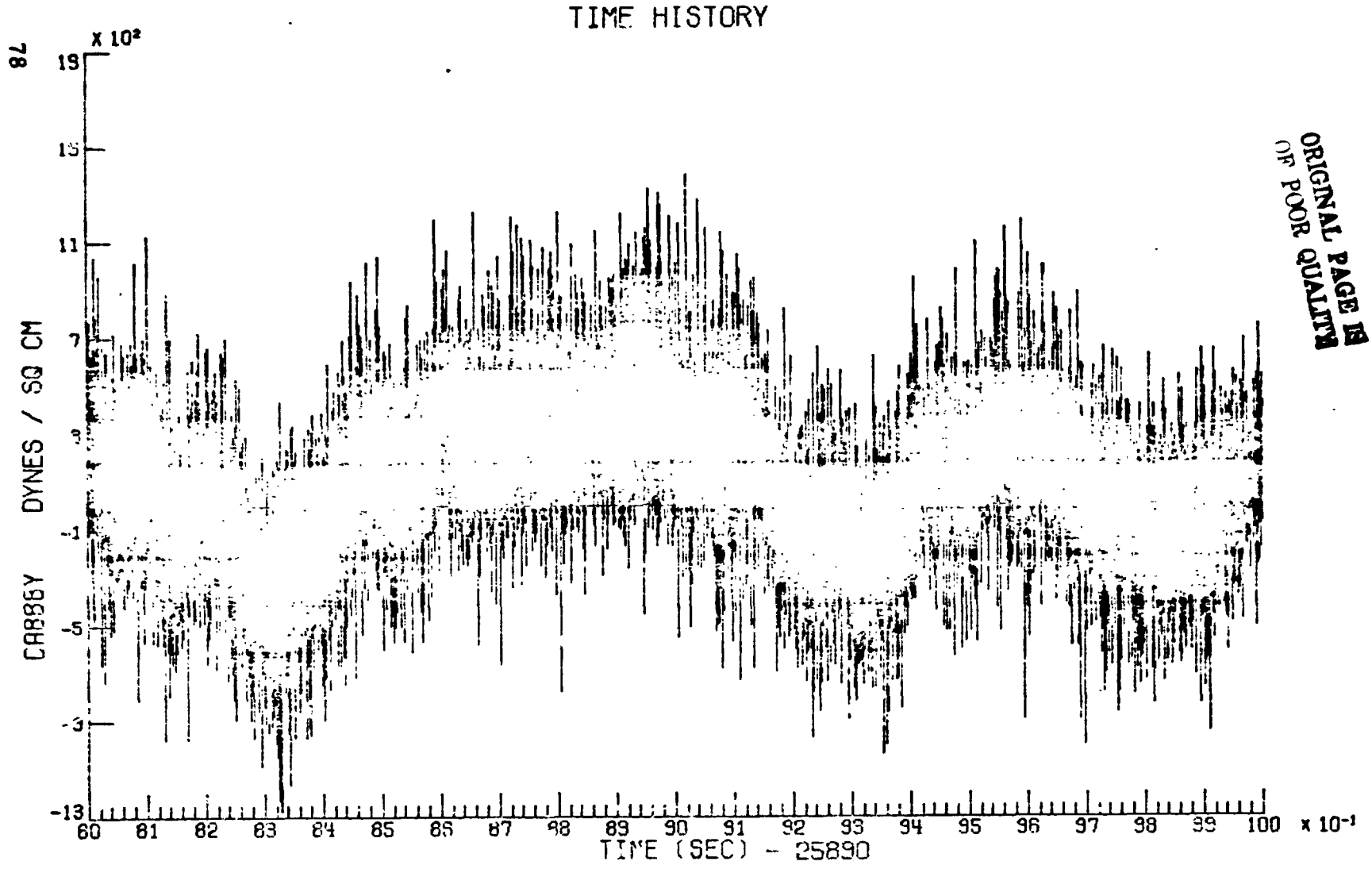
TC-2 ACOUSTIC

MAX Q

CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 49b

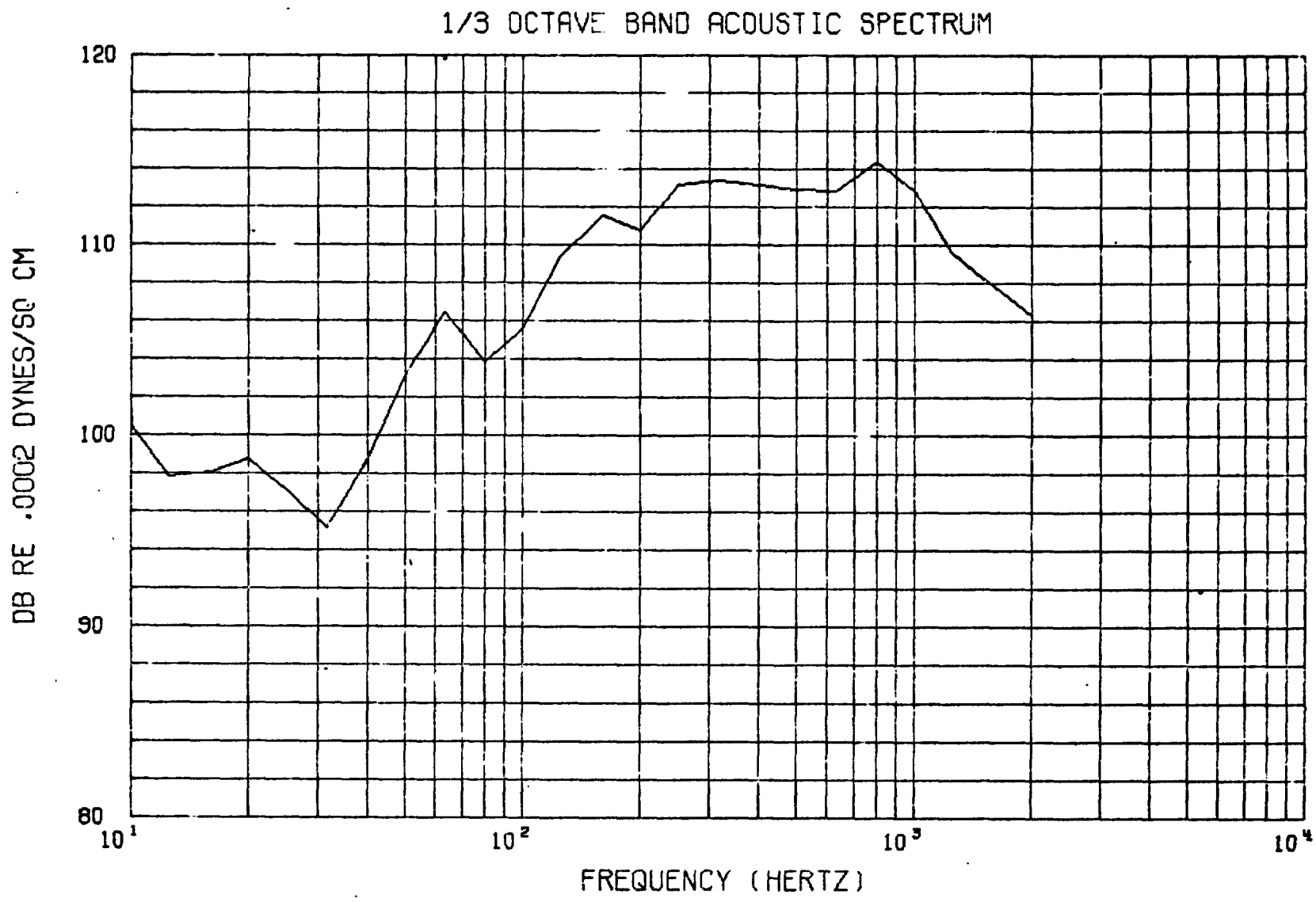


MAX = 1373.895 MIN = -1274.338

TC-2 ACOUSTIC MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 50a



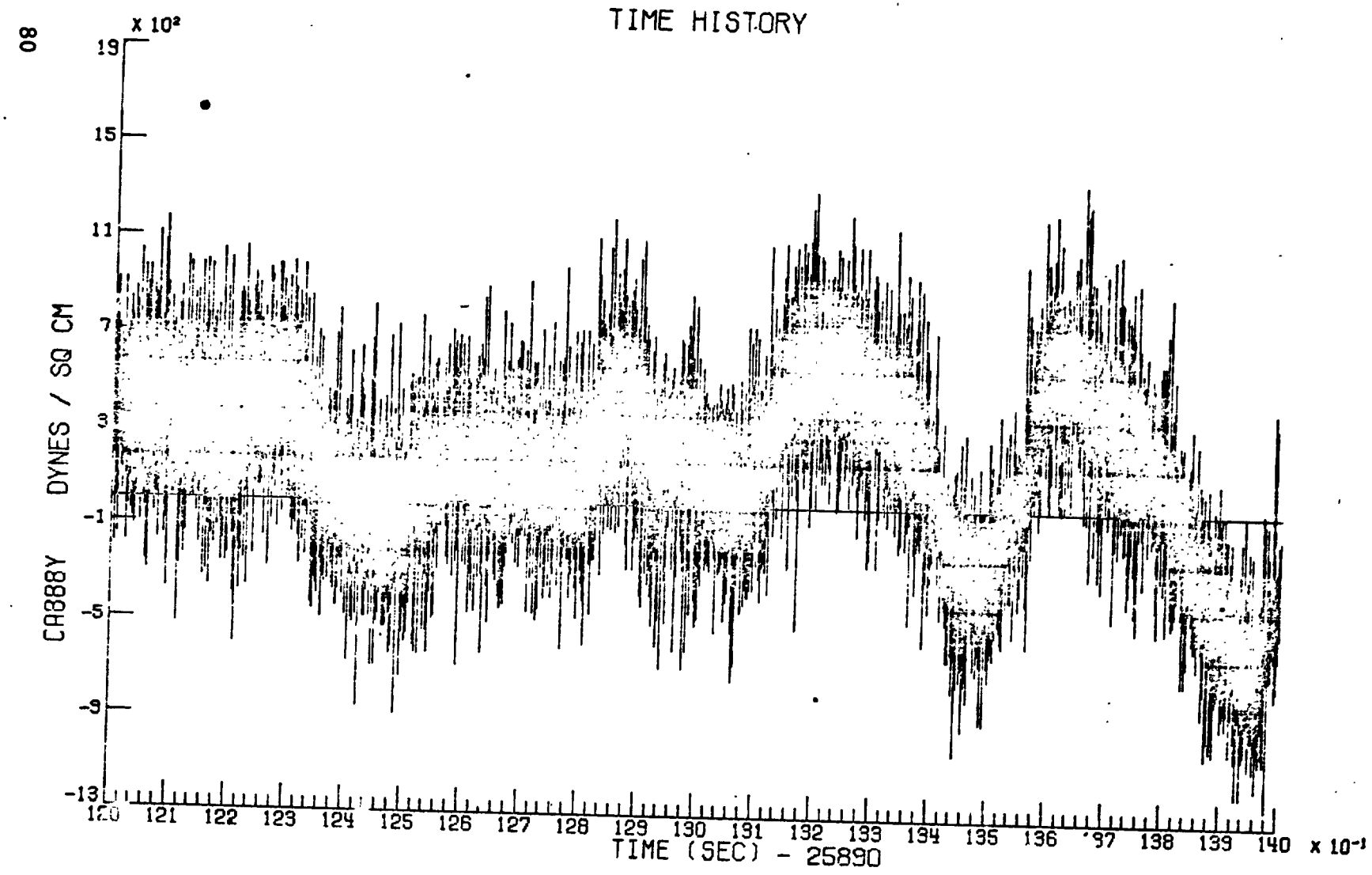
START 25898.000 SEC STOP 25900.000 SEC

OVERALL SOUND PRESSURE LEVEL = 125.20 DB BAND-LIMITED SOUND PRESSURE LEVEL = 123.43 DB

TC-2 ACOUSTIC MAX Q CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 50b



MAX = 1363.940

MIN = -1224.559

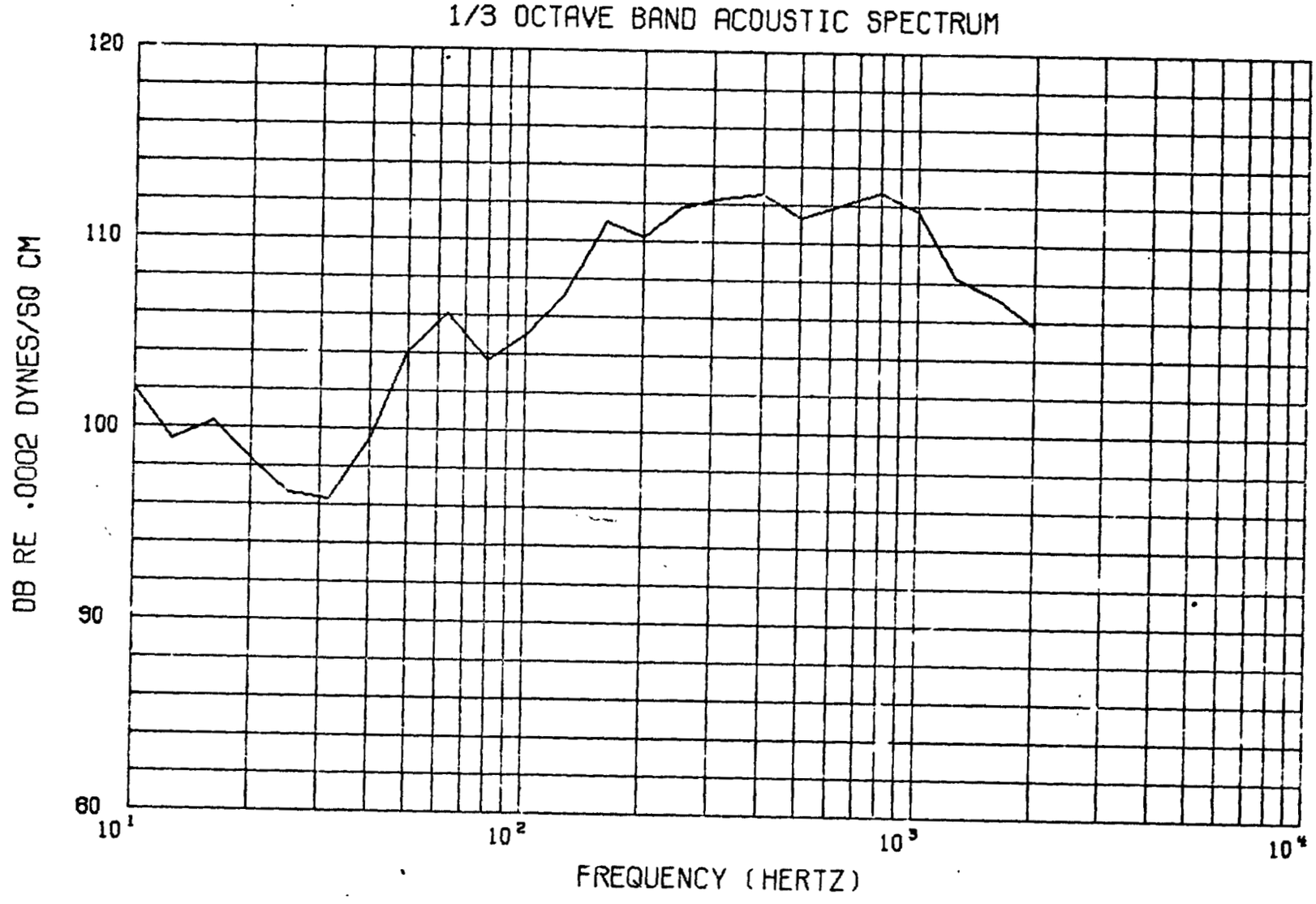
TC-2 ACOUSTIC

MAX Q

.CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 51a



START 25902.000 SEC
OVERALL SOUND PRESSURE LEVEL = 125.75 DB

STOP 25904.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 122.41 DB

TC-2 ACOUSTIC MAX Q CA888Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/07/75

Figure 51b

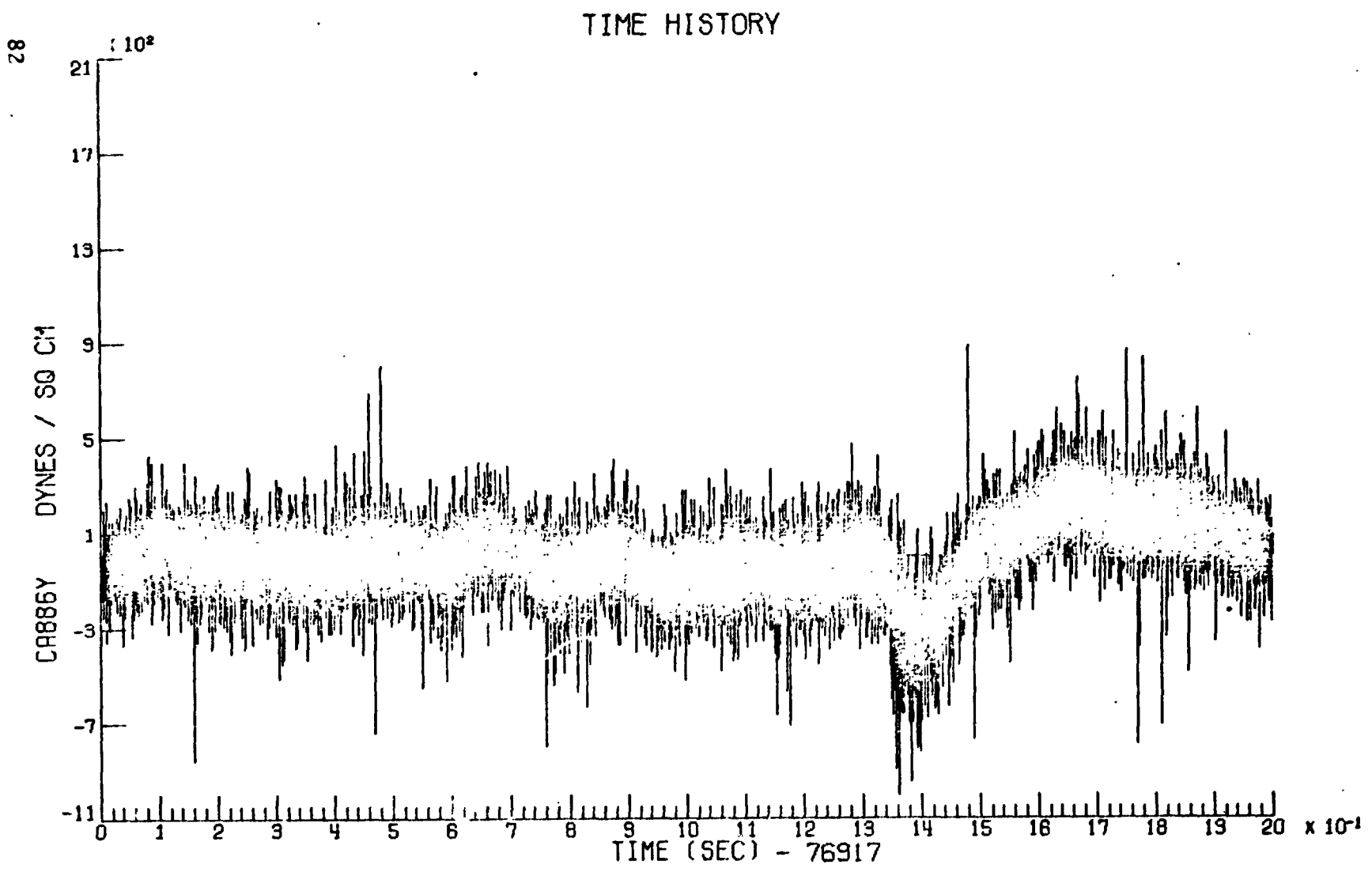
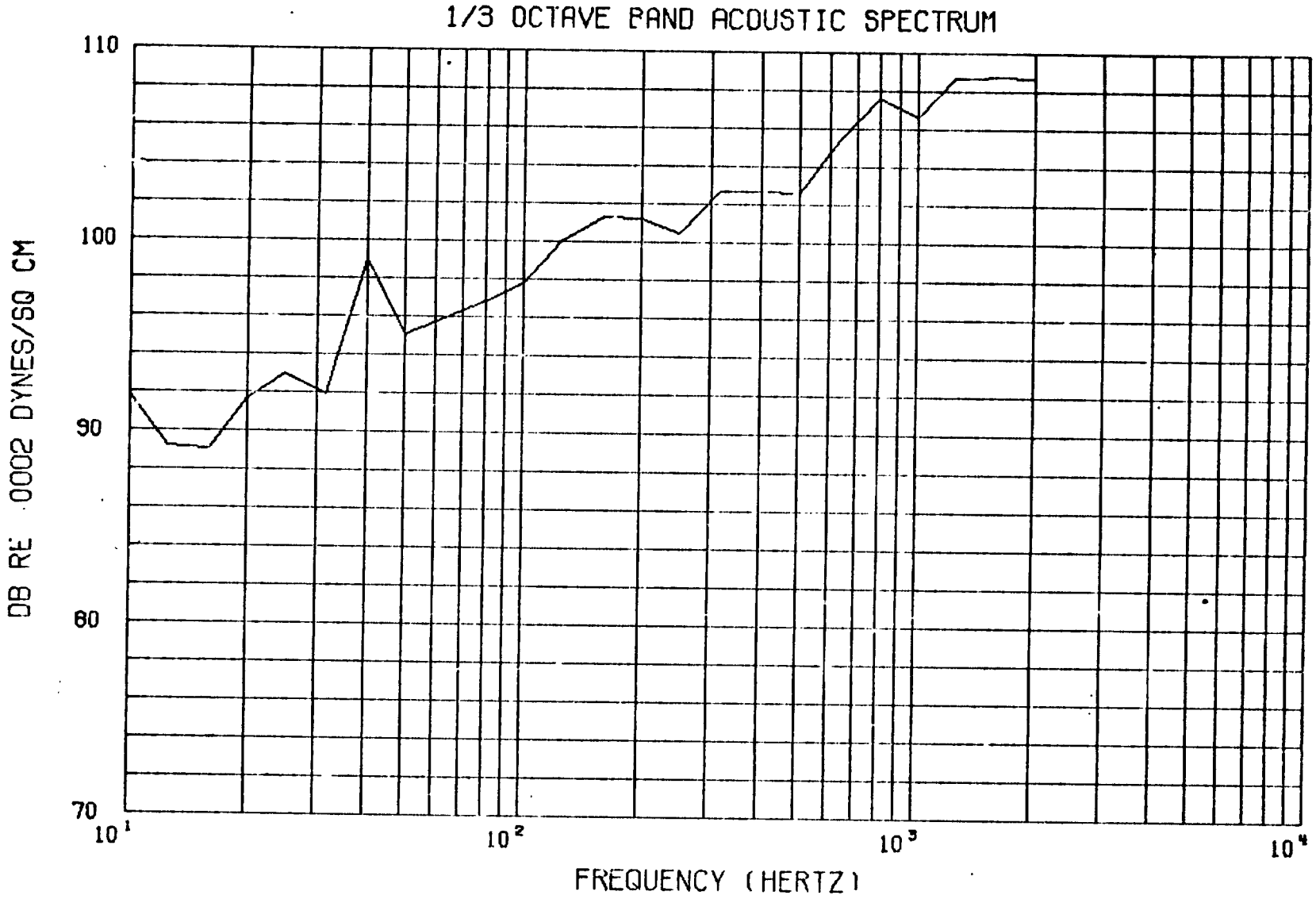

TIME HISTORY
28
X 10²
21
17
13
9
5
1
-3
-7
-11
CA886Y DYNES / SQ CM
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 x 10⁻¹
TIME (SEC) - 76917
MAX = 883.899
MIN = -1003.076
VIKING A FLT (CIF)
PRE-IGNITION
CA886Y
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 52a



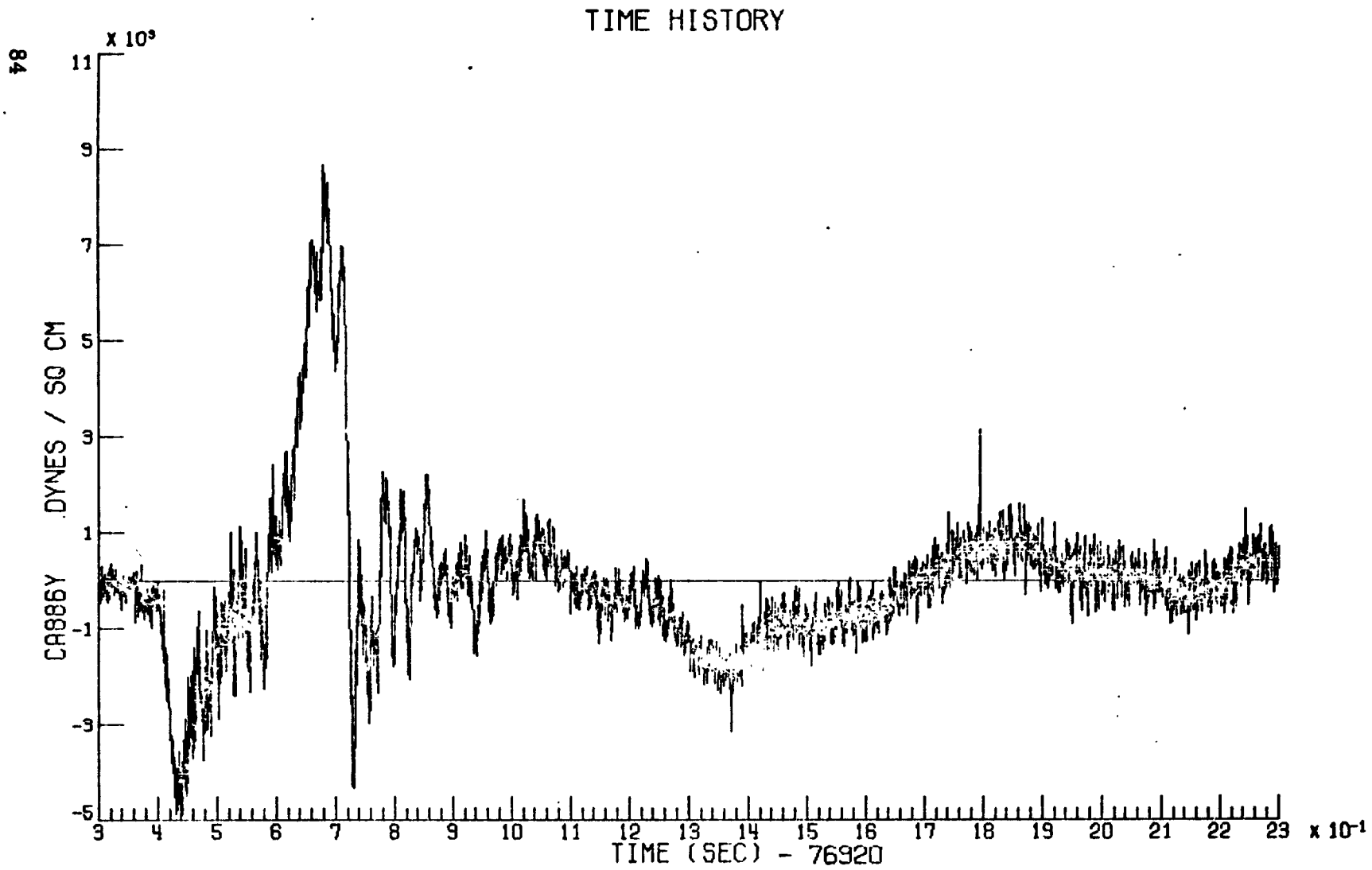
START 76917.000 SEC
OVERALL SOUND PRESSURE LEVEL = 118.93 DB

STOP 76919.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 116.98 DB

VIKING A FLT (CIF) PRE-IGNITION CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 52b



MAX = 8660.225 MIN = -4975.657

VIKING A FLT (CIF) STAGE 0 IGN CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 53a

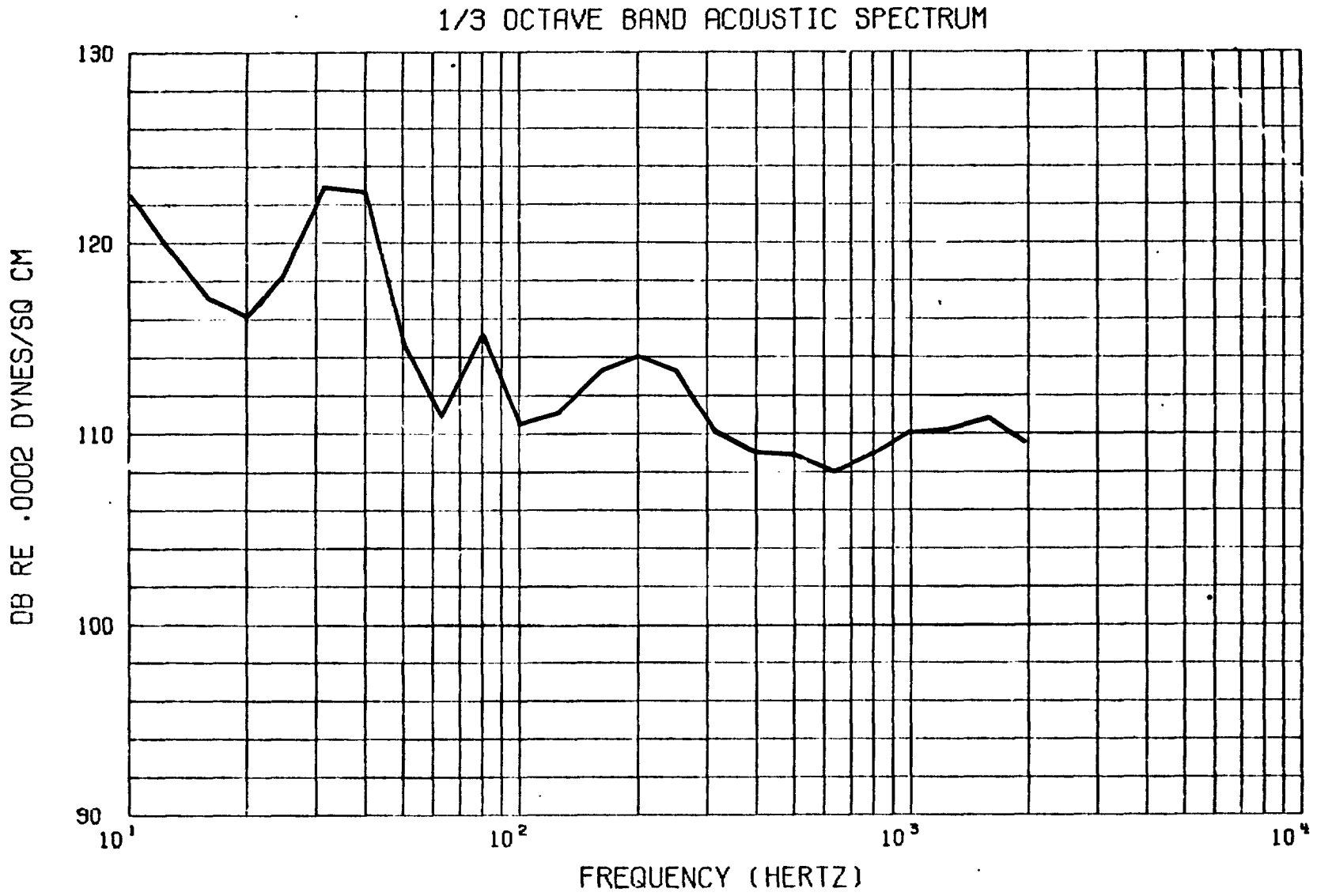
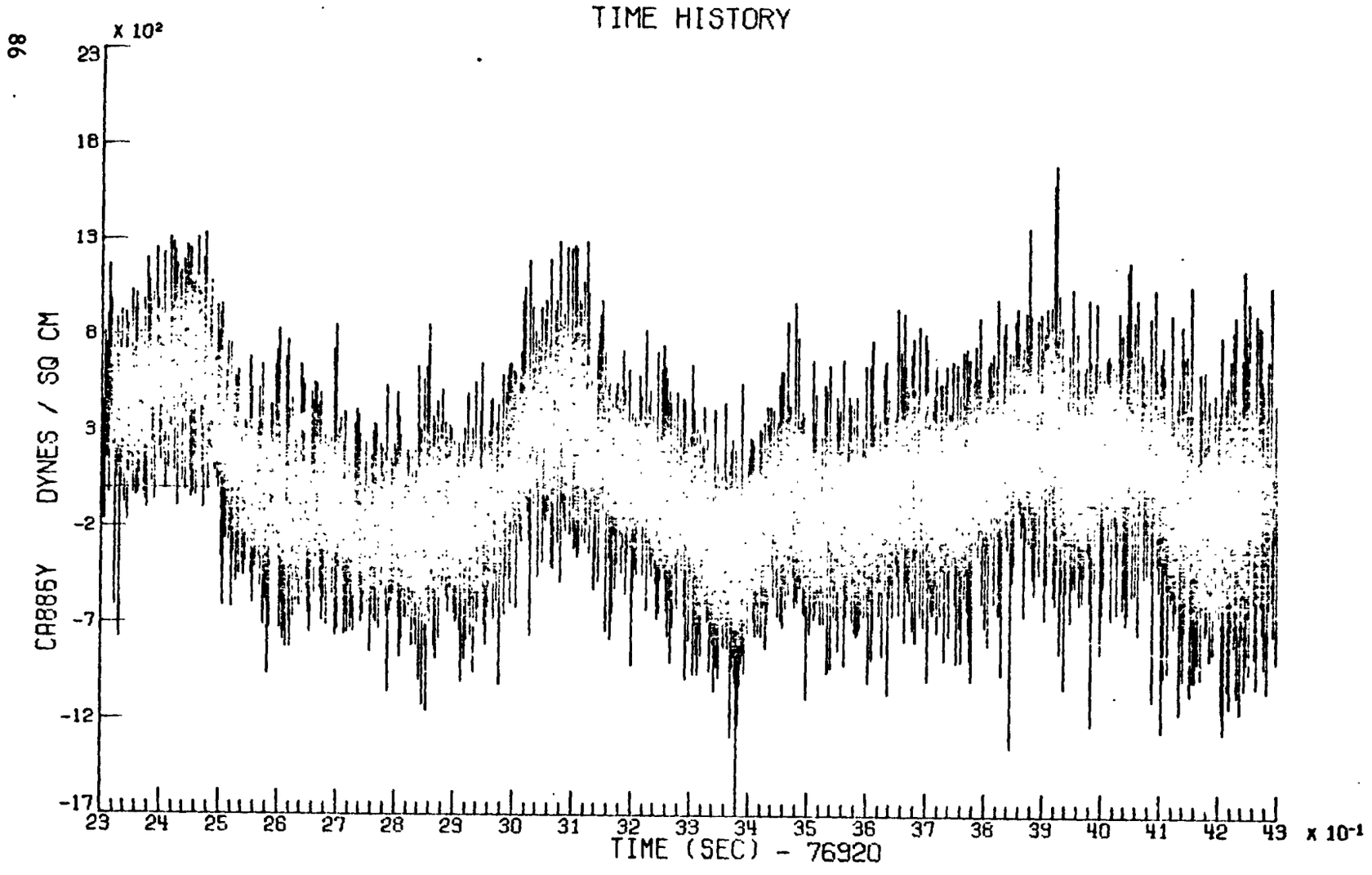

1/3 OCTAVE BAND ACOUSTIC SPECTRUM
130
120
110
100
90
DB RE .0002 DYNES/SQ CM
10^1
10^2
10^3
10^4
FREQUENCY (HERTZ)
START 76920.300 SEC
STOP 76922.300 SEC
OVERALL SOUND PRESSURE LEVEL = 136.10 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 130.28 DB
VIKING A FLT (CIF)
STAGE 0 IGN
CA886Y
NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 53b



MAX = 1698.278

MIN = -1638.689

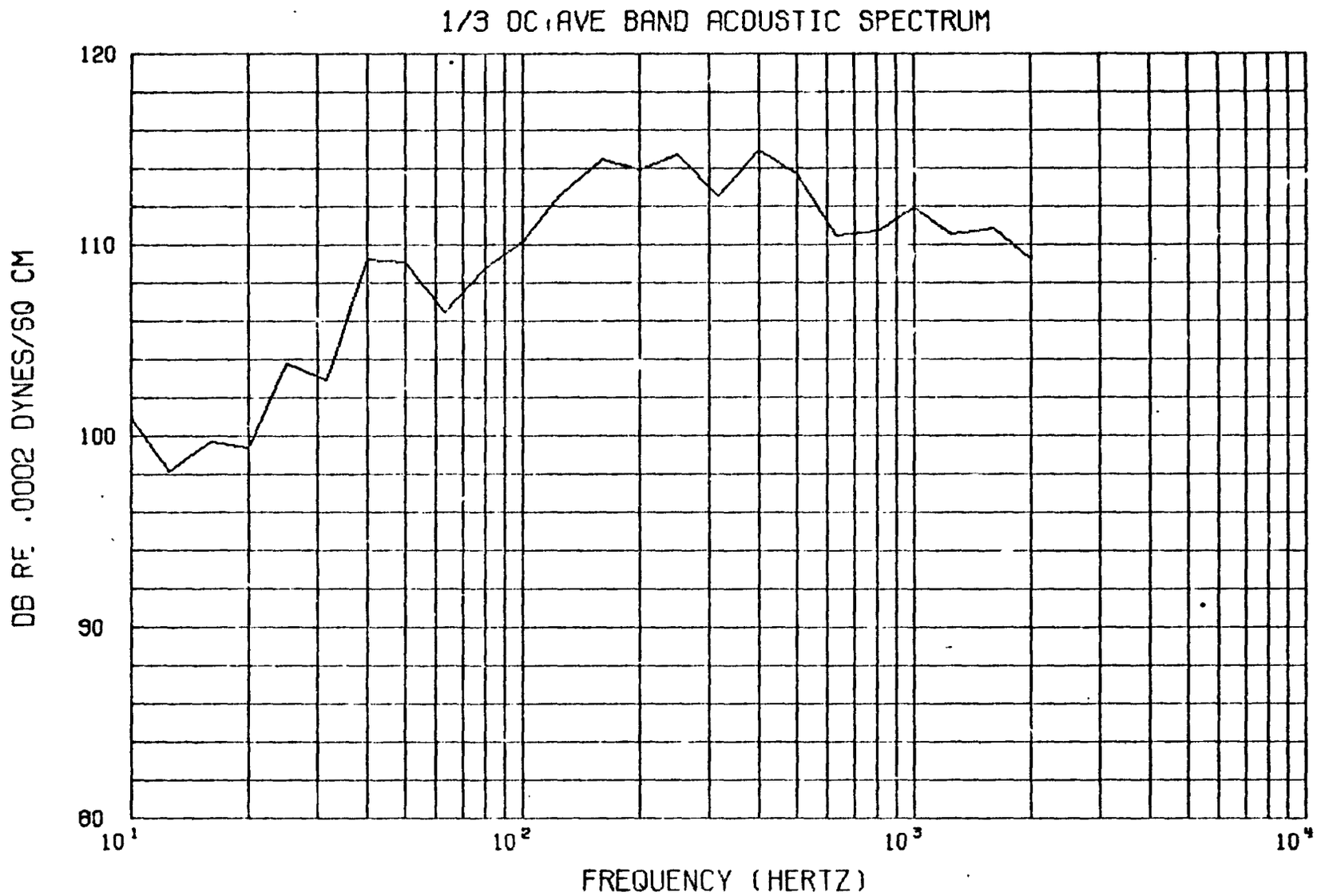
VIKING A FLT (CIF)

STAGE O IGN

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 54a



START 76922.300 SEC STOP 76924.298 SEC

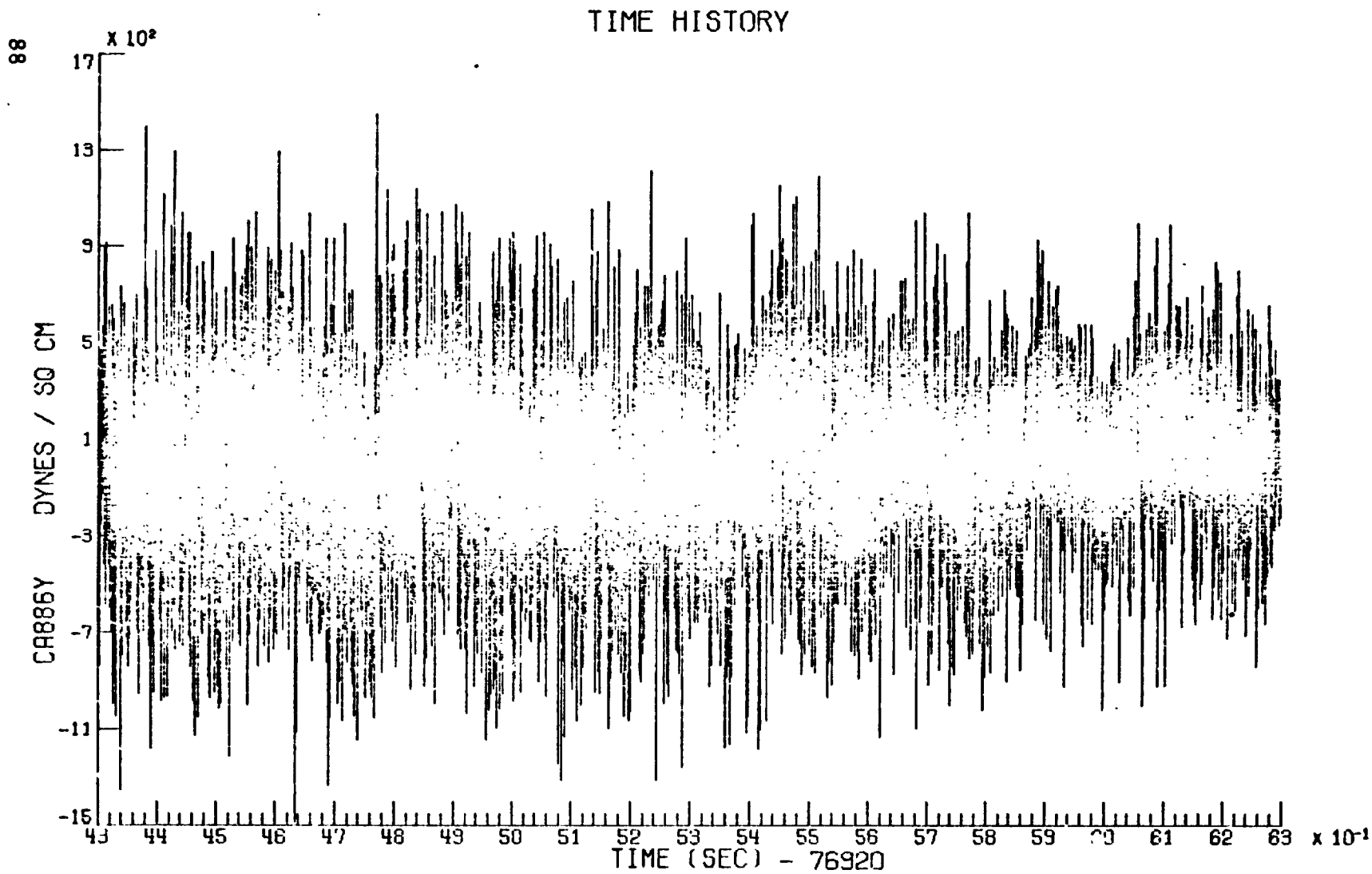
OVERALL SOUND PRESSURE LEVEL = 126.32 DB BAND-LIMITED SOUND PRESSURE LEVEL = 124.62 DB

87

VIKING A FLT (CIF) STAGE O IGN CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 54b

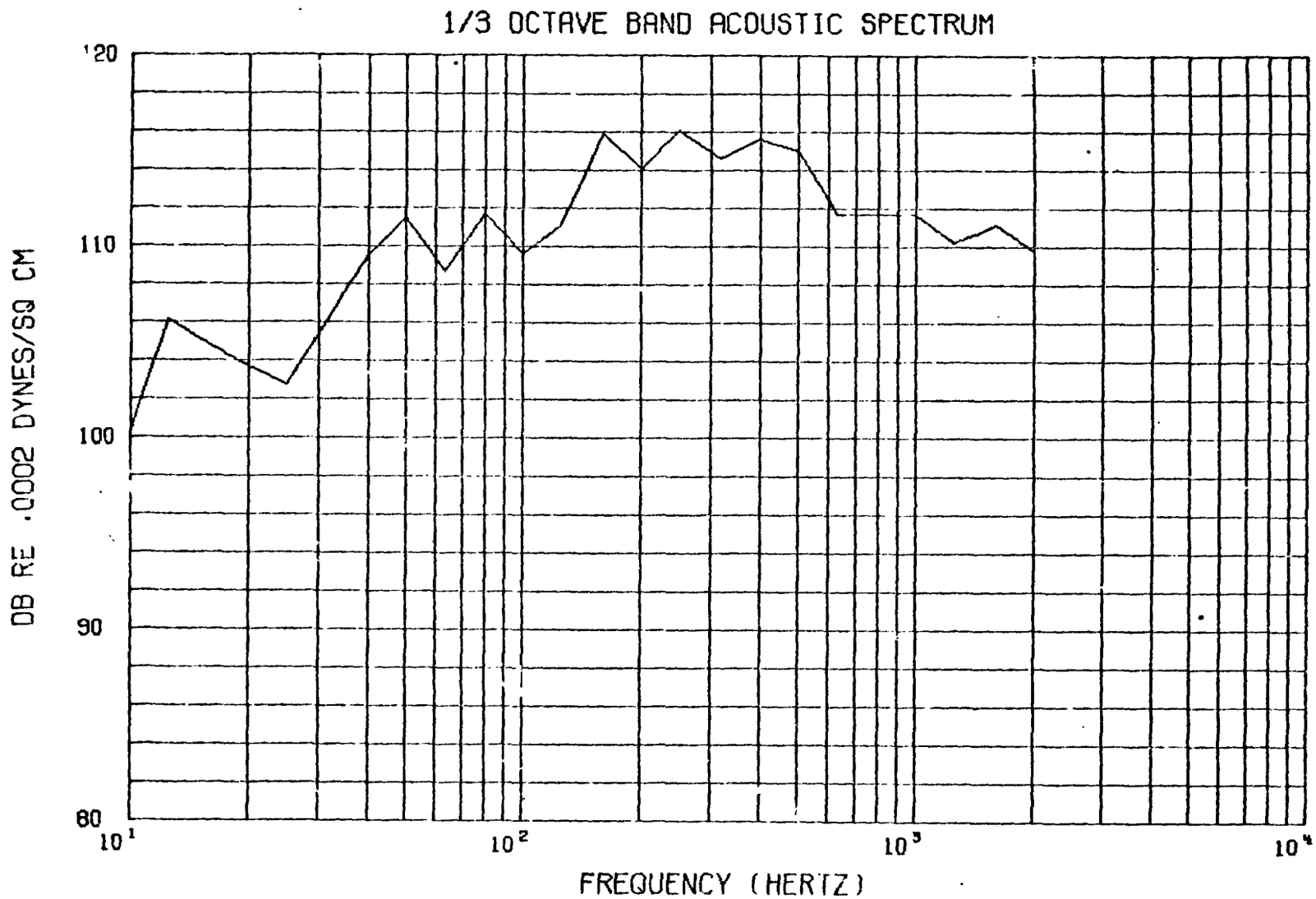


MAX = 1449.991 MIN = -1489.717

VIKING A FLT (CIF) STAGE 0 IGN CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 06/21/75

Figure 55a



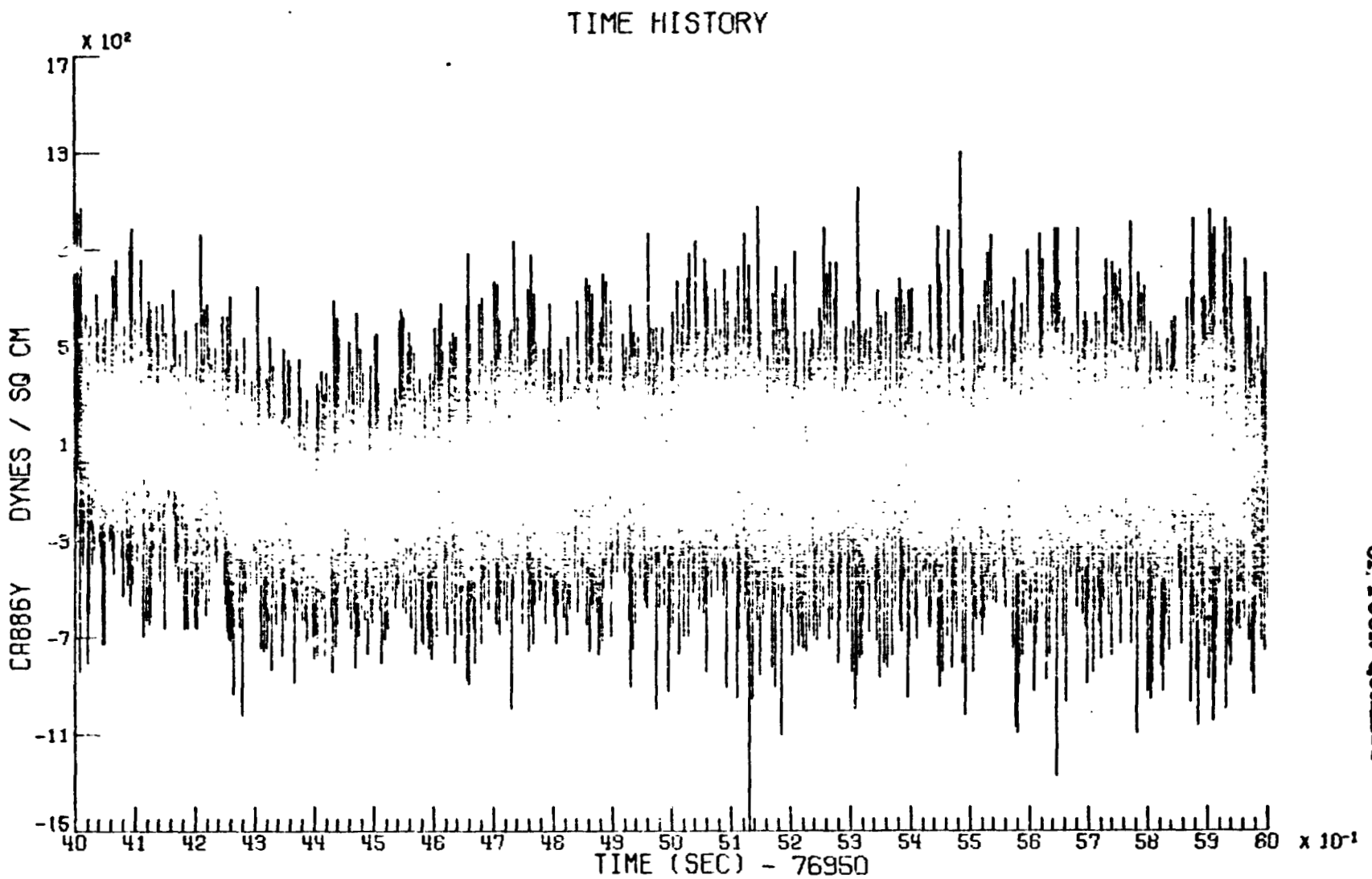
START 76924.300 SEC STOP 76928.299 SEC

OVERALL SOUND PRESSURE LEVEL = 125.74 DB BAND-LIMITED SOUND PRESSURE LEVEL = 125.60 DB

VIKING A FLT (CIF) STAGE O IGN CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 06/21/75

Figure 55b



MAX = 1301.020 MIN = -1499.649

VIKING A FLT (CIF) MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 56a

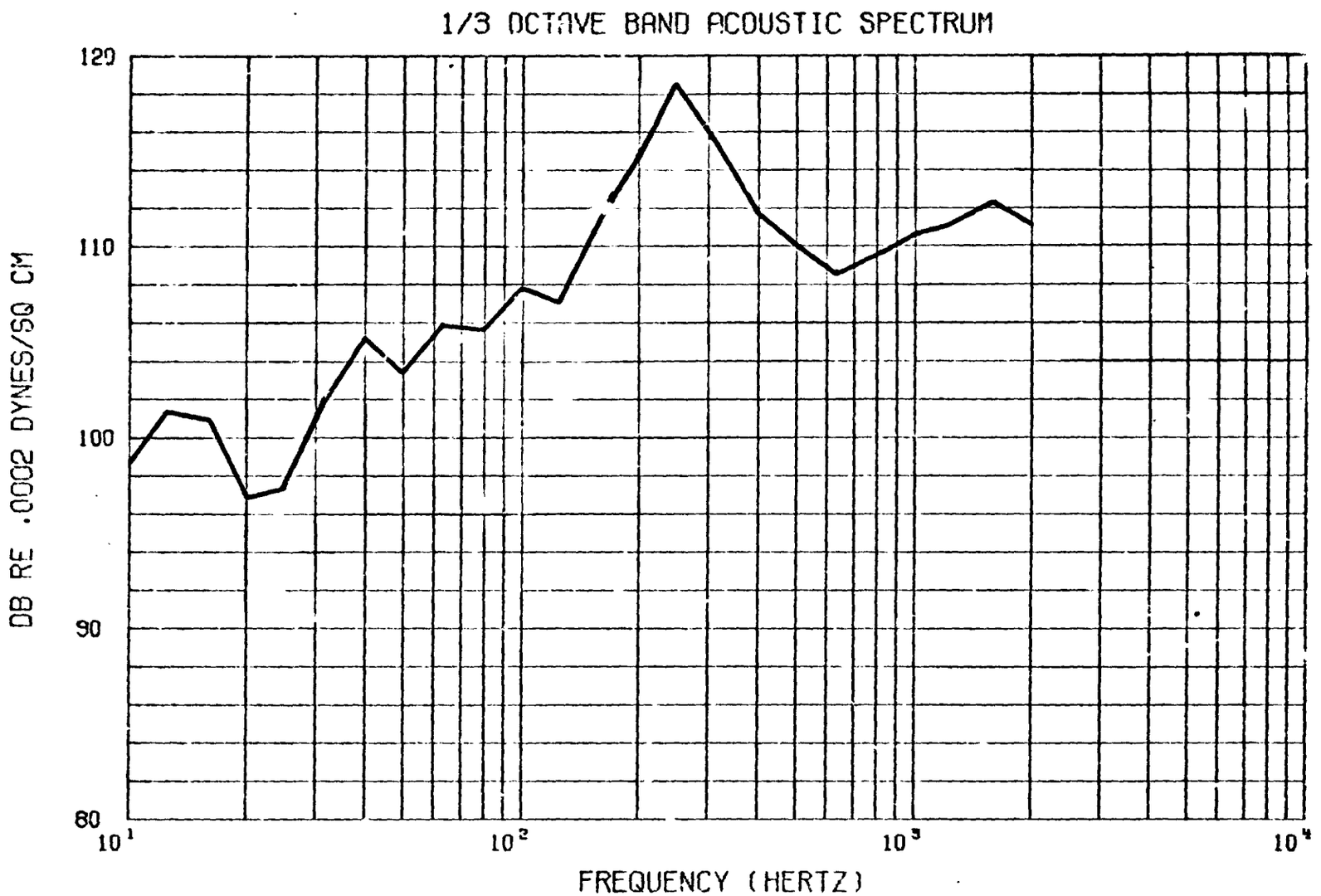
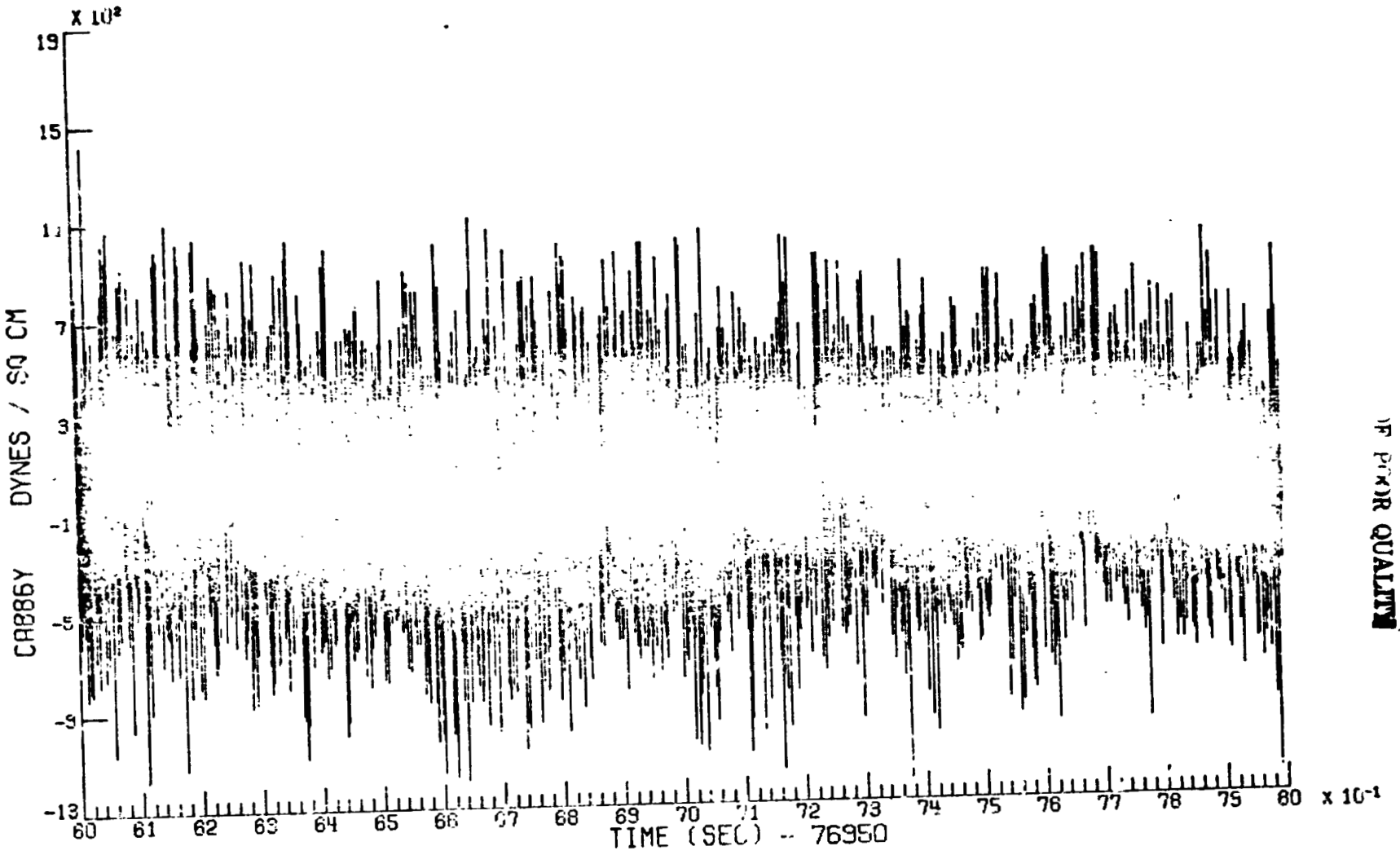

1/3 OCTAVE BAND ACOUSTIC SPECTRUM
120
110
100
90
80
DB RE .0002 DYNES/SQ CM
10^1
10^2
10^3
10^4
FREQUENCY (HERTZ)
START 76954.000 SEC
STOP 76956.000 SEC
OVERALL SOUND PRESSURE LEVEL = 124.50 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 124.34 DB
VIKING A FLT (CIF)
MAX Q
CA886Y
NASA-LANGLEY STRUCTURES DYNAMICS 08/21/75

Figure 56b

TIME HISTORY



MAX = 1420.197

MIN = -1211.637

VIKING A FLT (CIF)

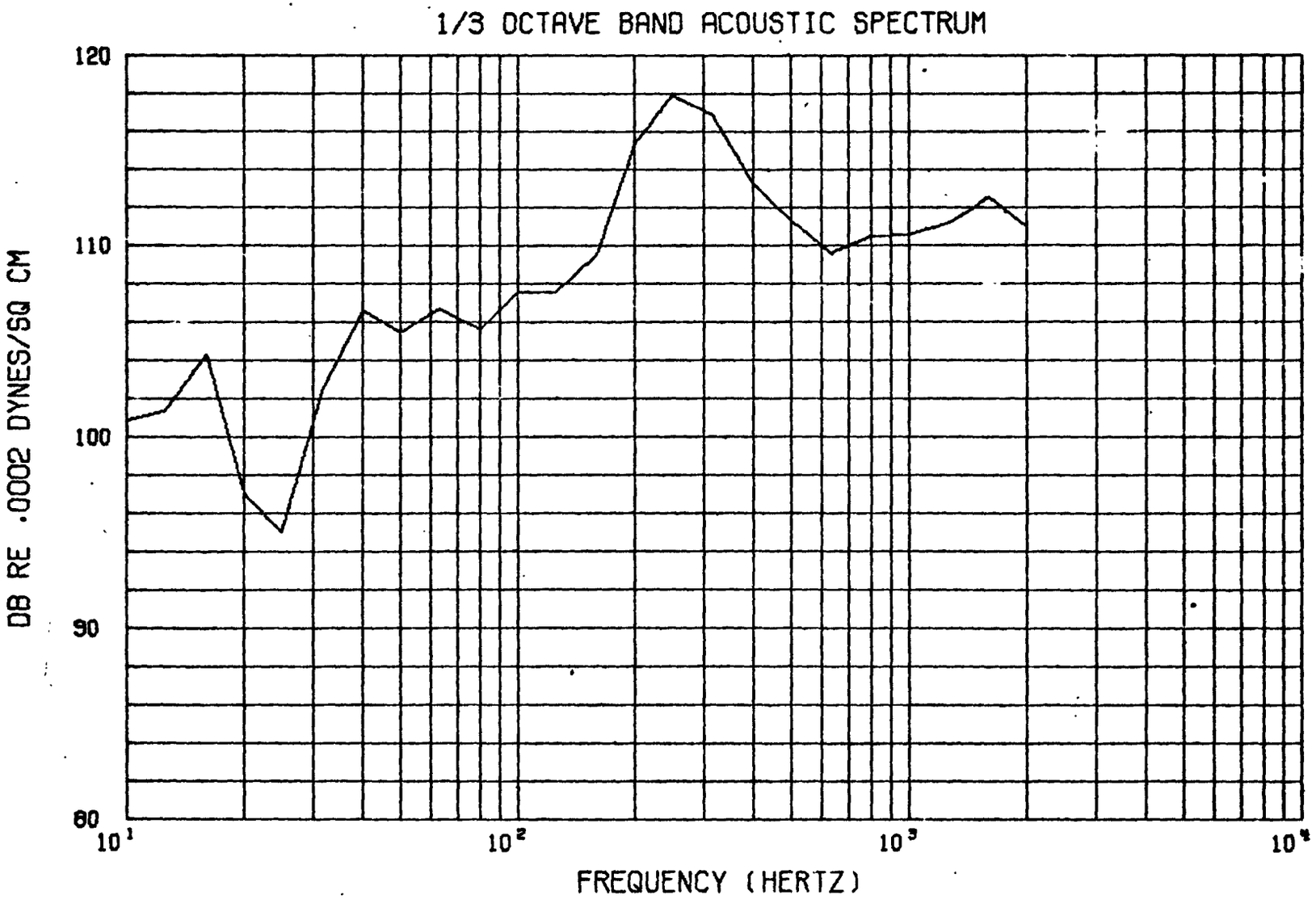
MAX Q

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/22/75

Figure 57a

C-2



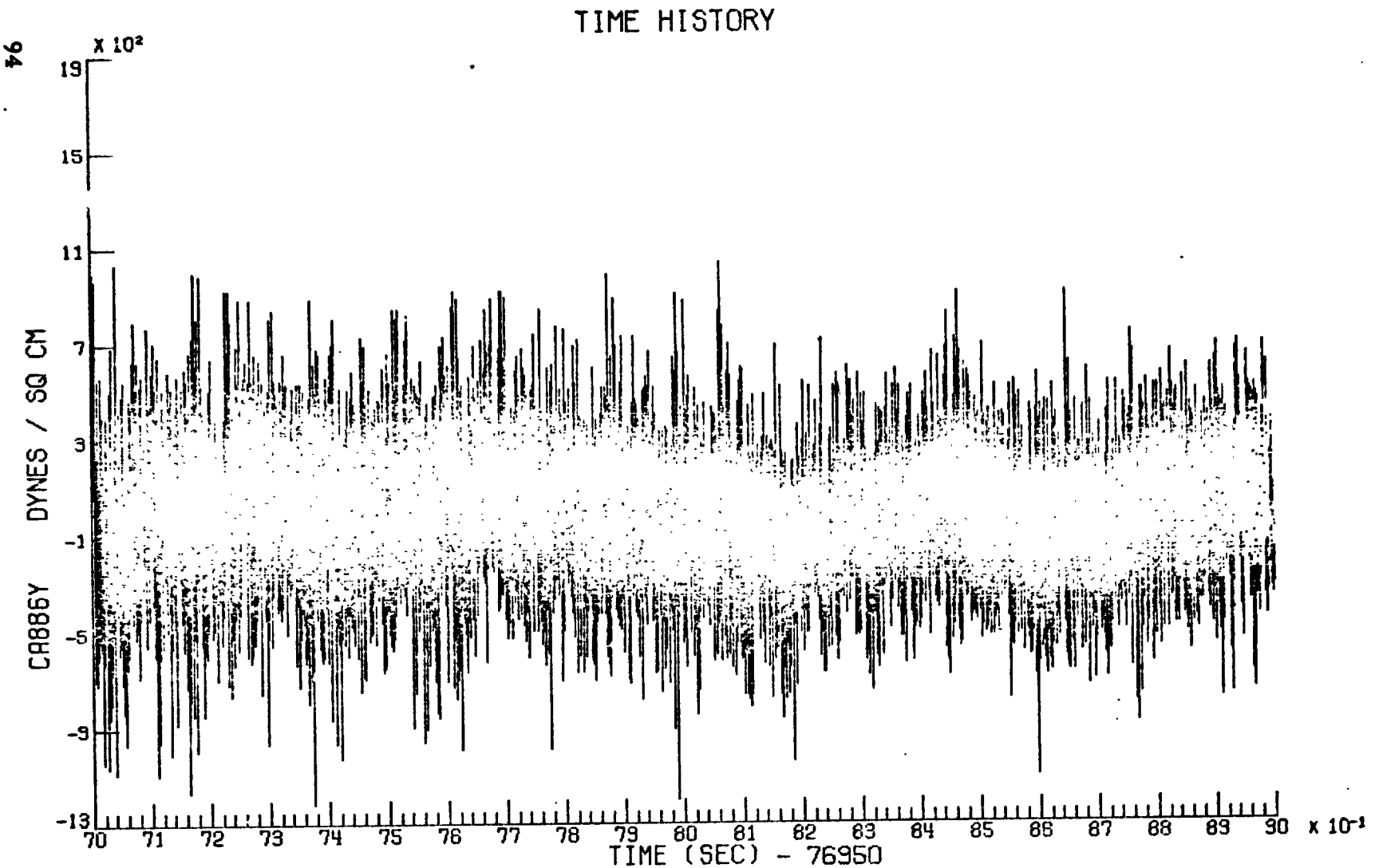
START 76956.000 SEC
STOP 76958.000 SEC

OVERALL SOUND PRESSURE LEVEL = 124.83 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 124.76 DB

VIKING A FLT (CIF) MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/22/75

Figure 57b

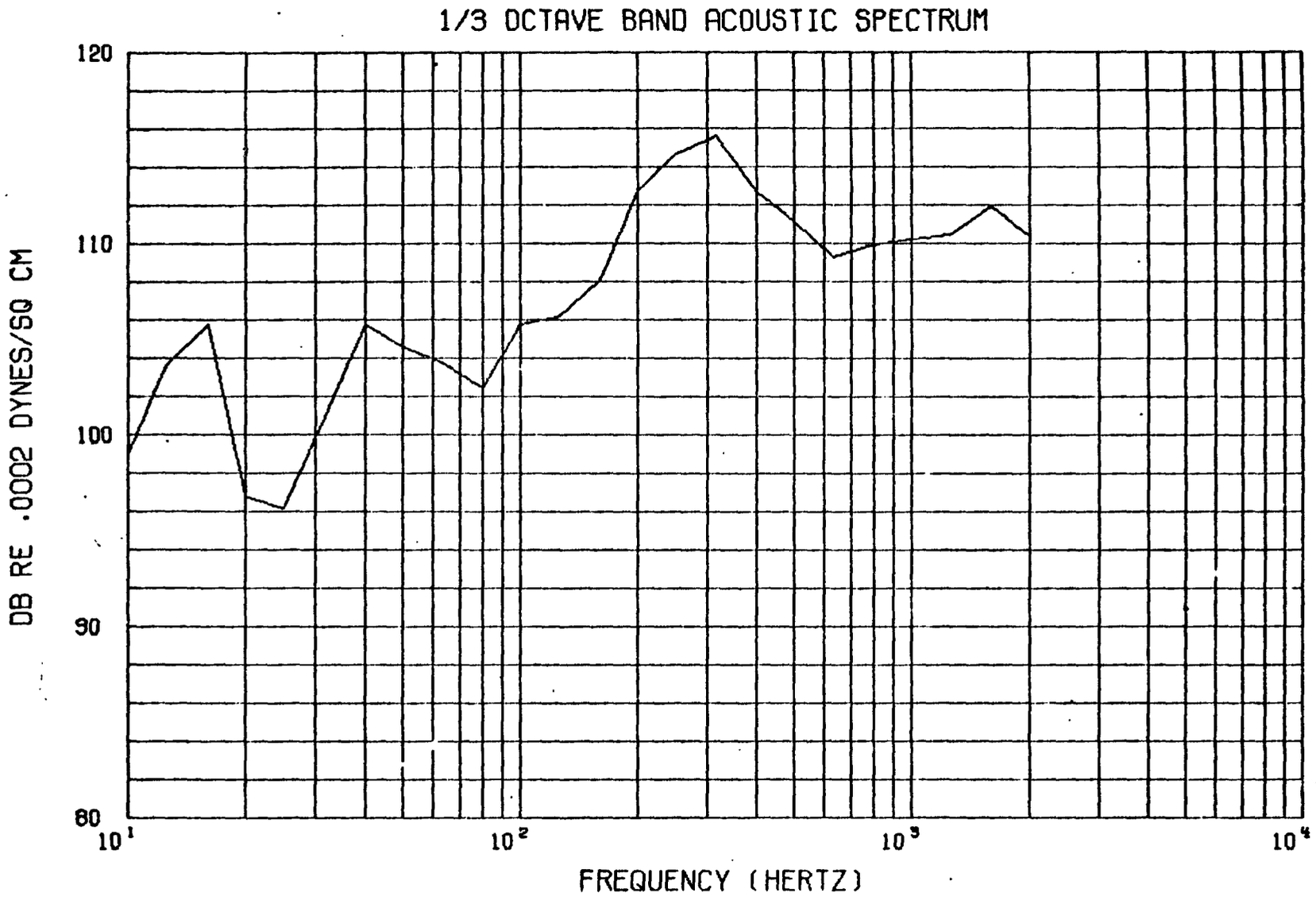


MAX = 1032.870 MIN = -1211.637

VIKING A FLT (CIF) MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 58a



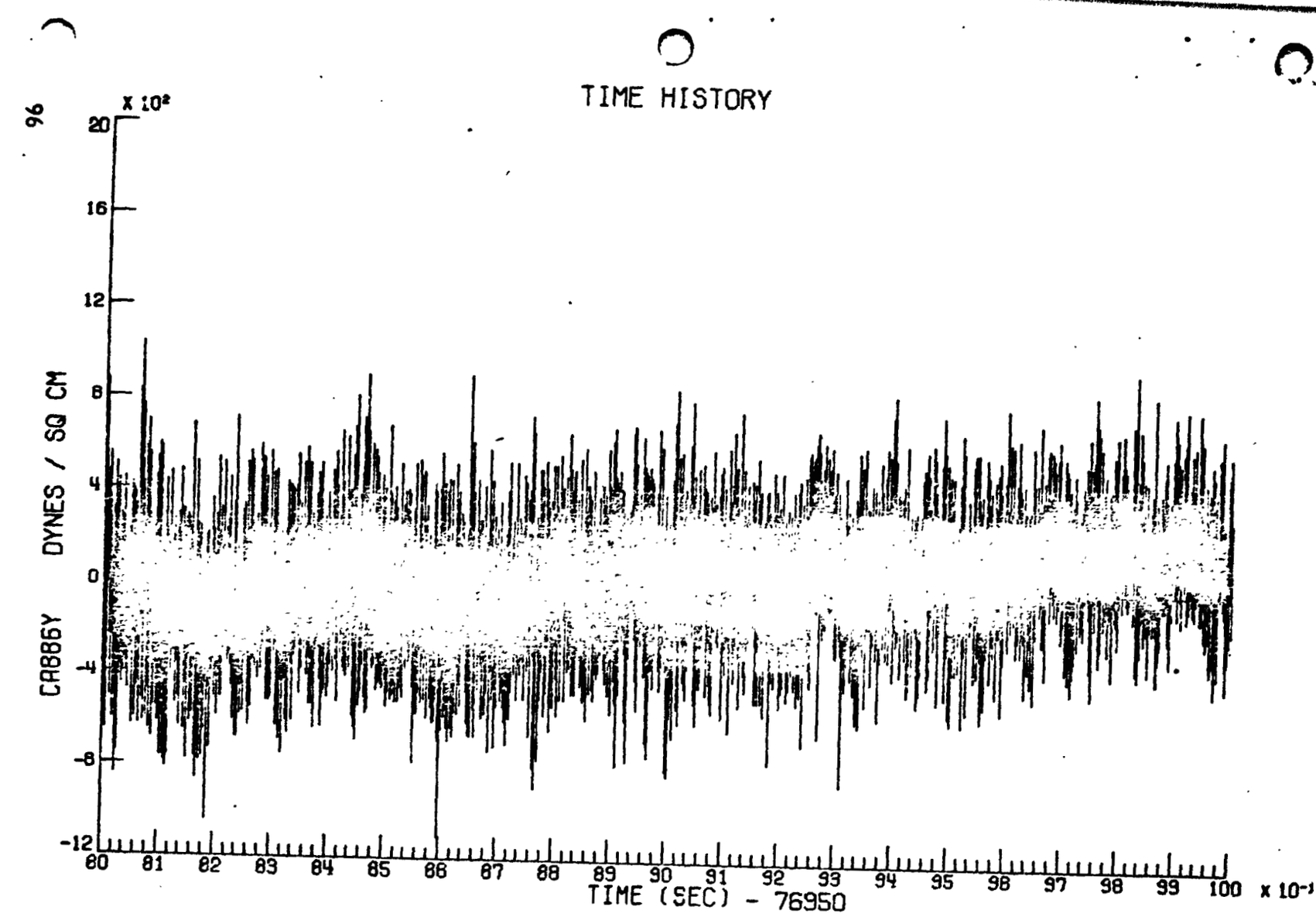
START 76957.000 SEC STOP 76959.000 SEC

OVERALL SOUND PRESSURE LEVEL = 123.52 DB BAND-LIMITED SOUND PRESSURE LEVEL = 123.37 DB

VIKING A FLT (CIF) MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 58b



MAX = 1032.870

MIN = -1102.391

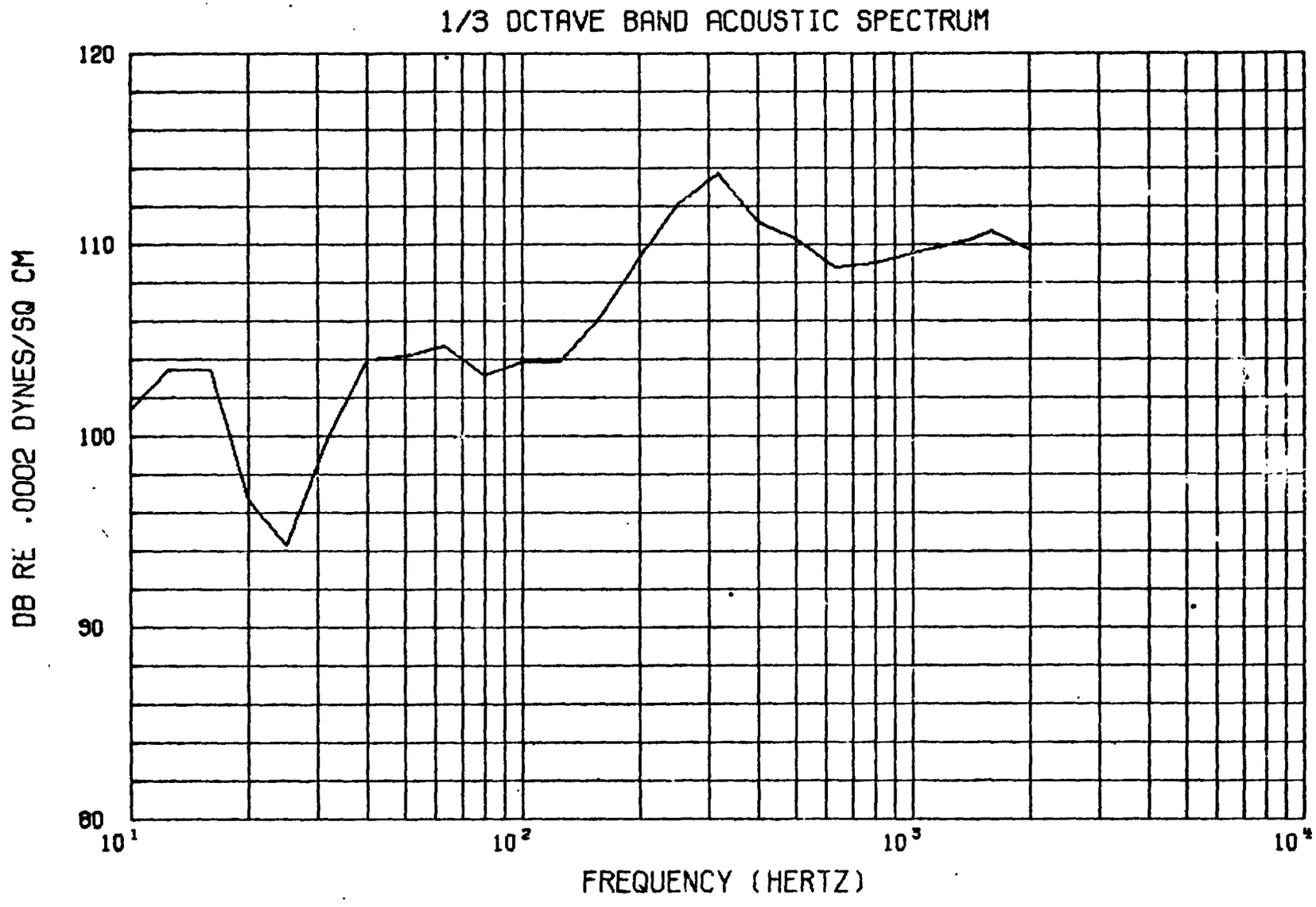
VIKING A FLT (CIF)

MAX Q

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/22/75

Figure 59a



START 76958.000 SEC
STOP 76959.999 SEC

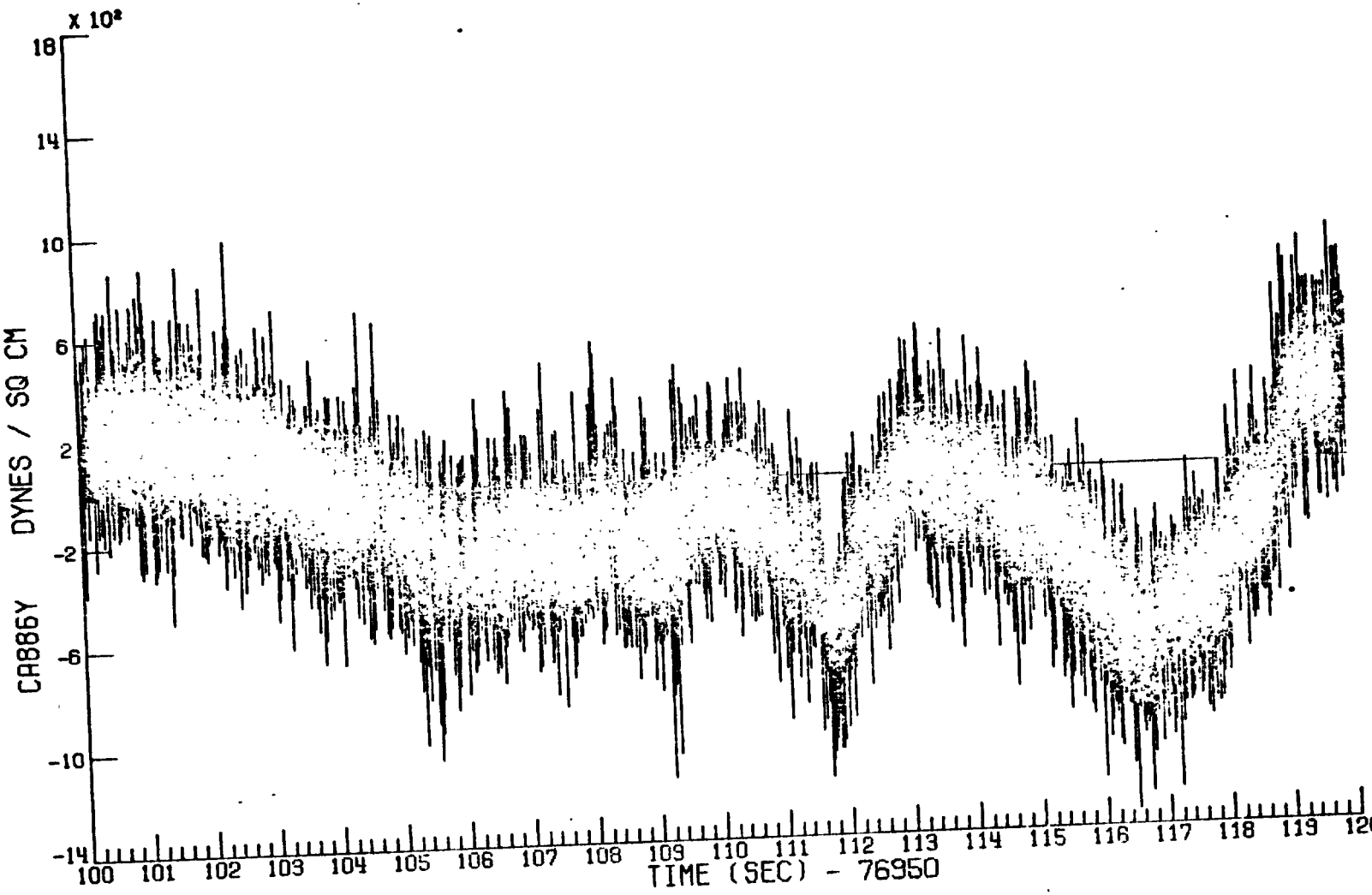
OVERALL SOUND PRESSURE LEVEL = 122.48 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 121.86 DB

VIKING A FLT (CIF) MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/22/75

Figure 59b

TIME HISTORY



MAX = 983.213

MIN = -1340.745

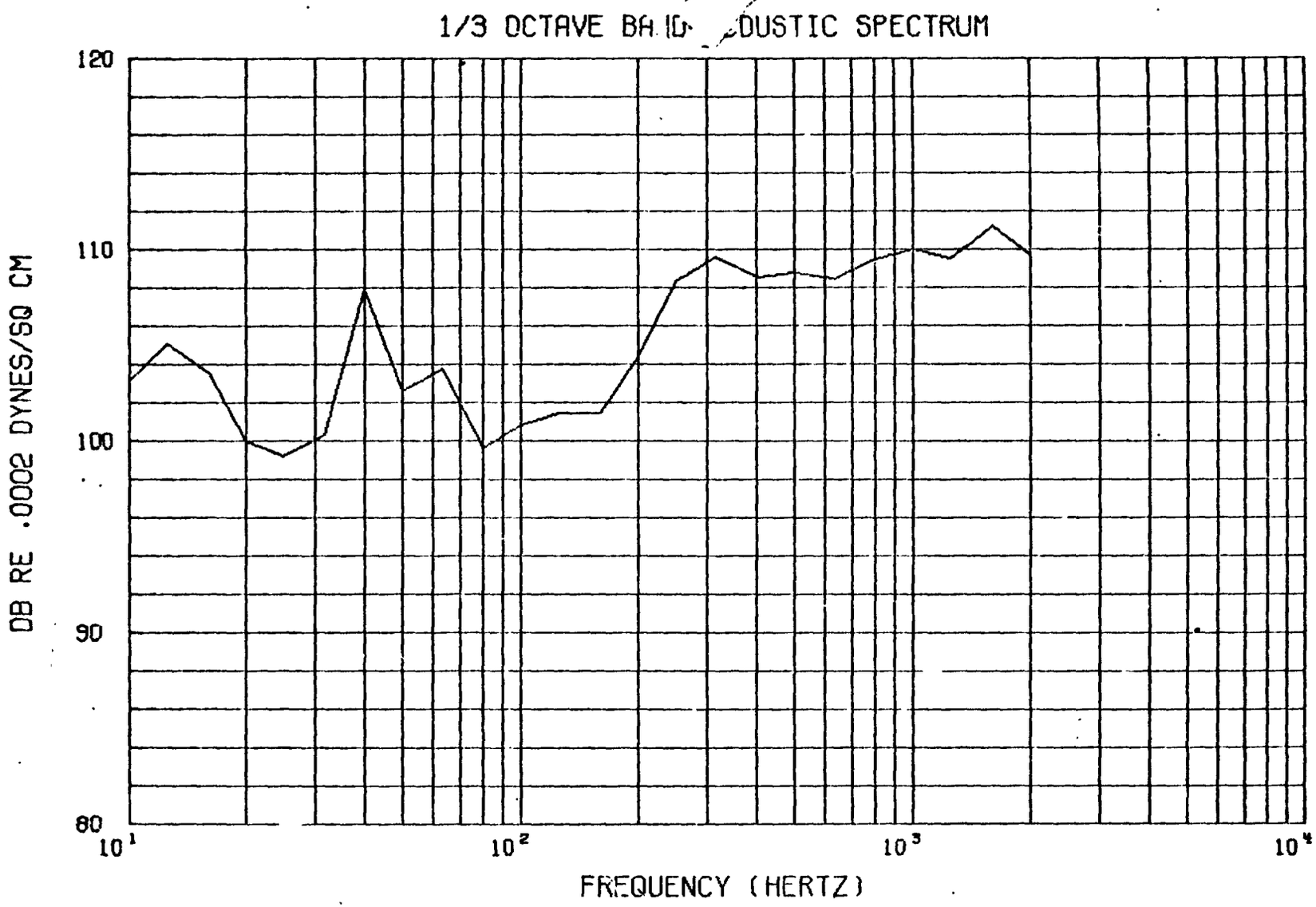
VIKING A FLT (CIF)

MAX Q

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 08/21/75

Figure 60a



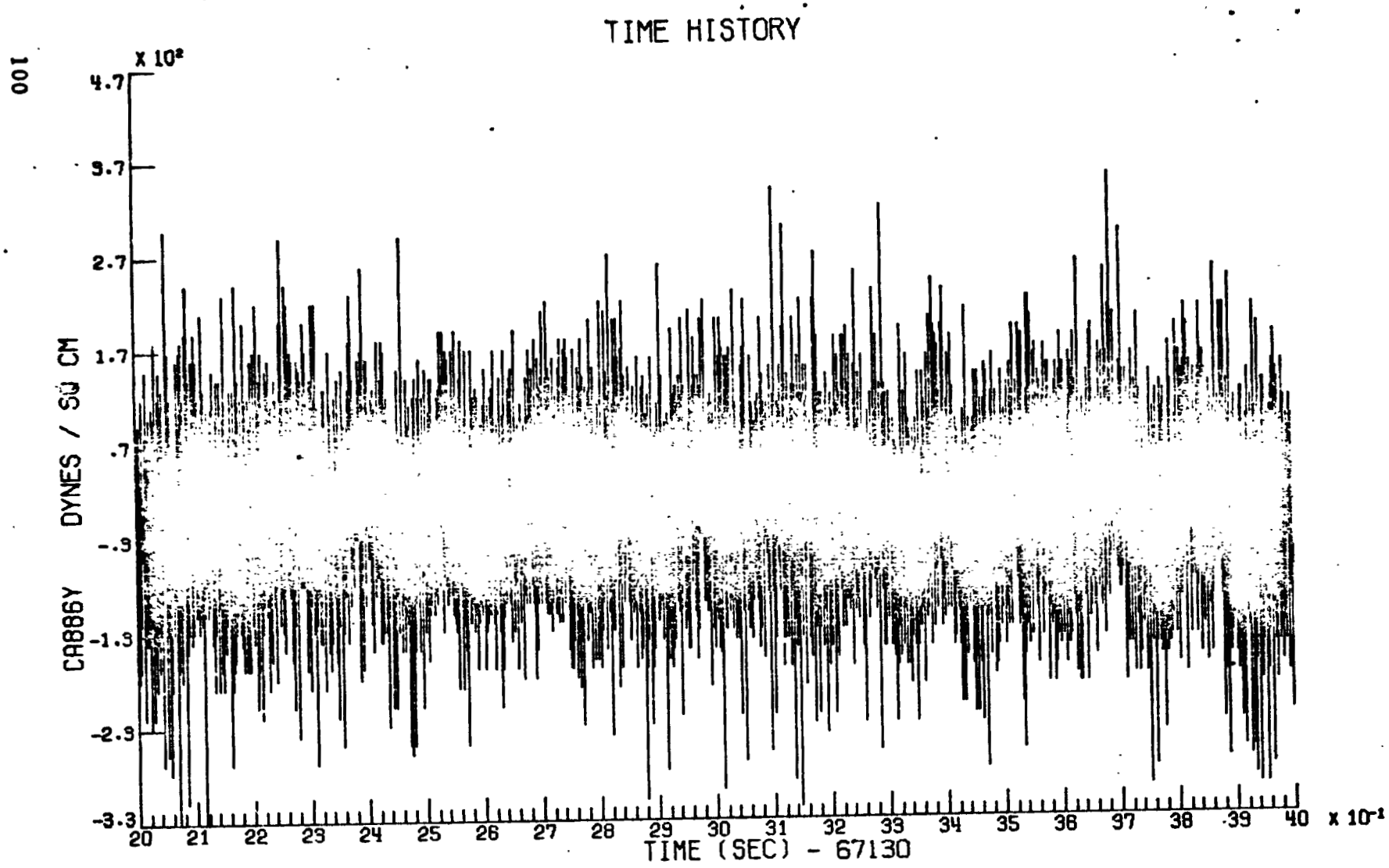
START 76960.000 SEC STOP 76962.000 SEC

OVERALL SOUND PRESSURE LEVEL = 124.33 DB BAND-LIMITED SOUND PRESSURE LEVEL = 120.67 DB

VIKING A FLT (CIF) MAX Q CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM . 08/21/75

Figure 60b



MAX = 347.909

MIN = -328.029

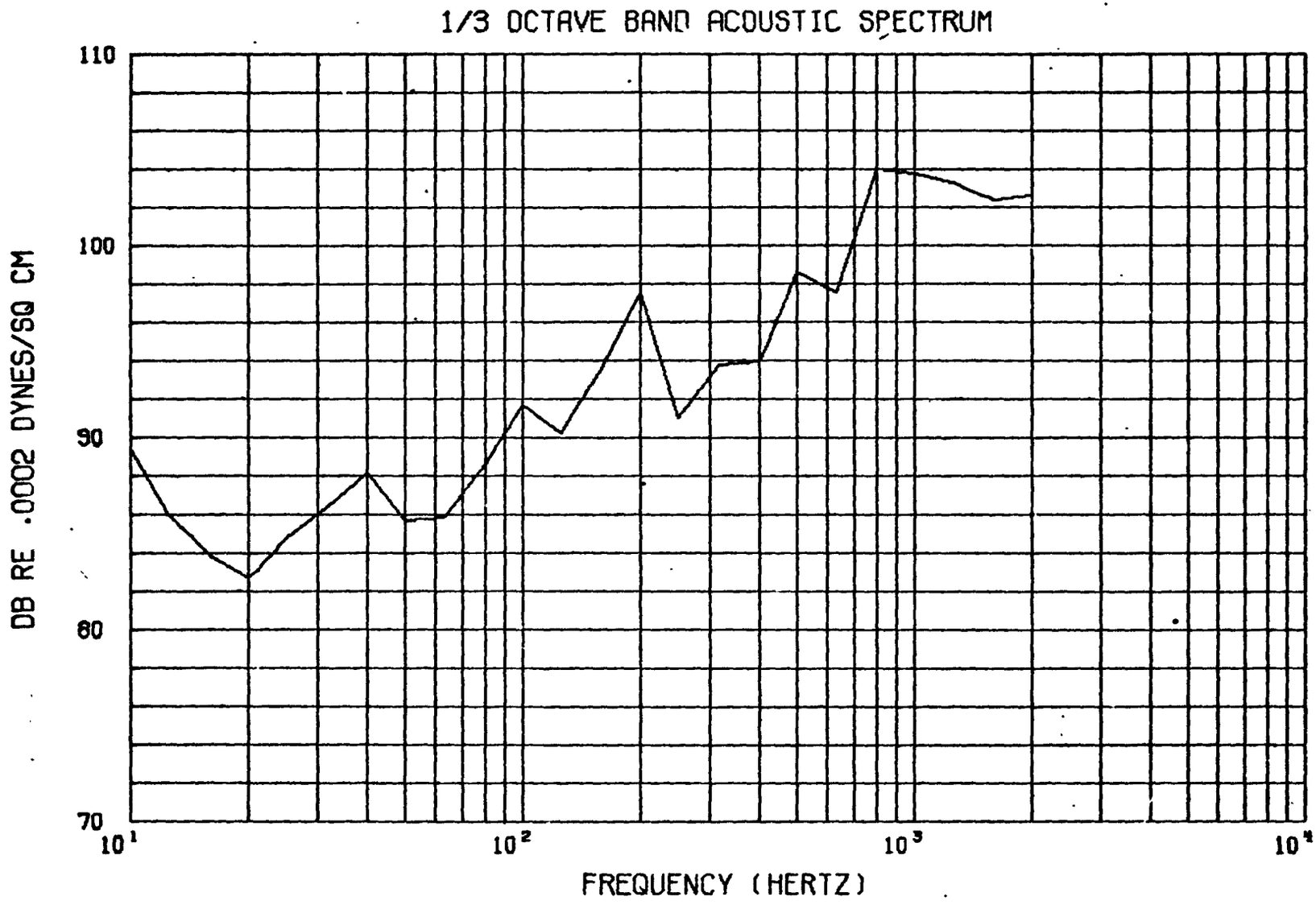
VIKING B FLT (CIF)

PRE-IGNITION

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 6la



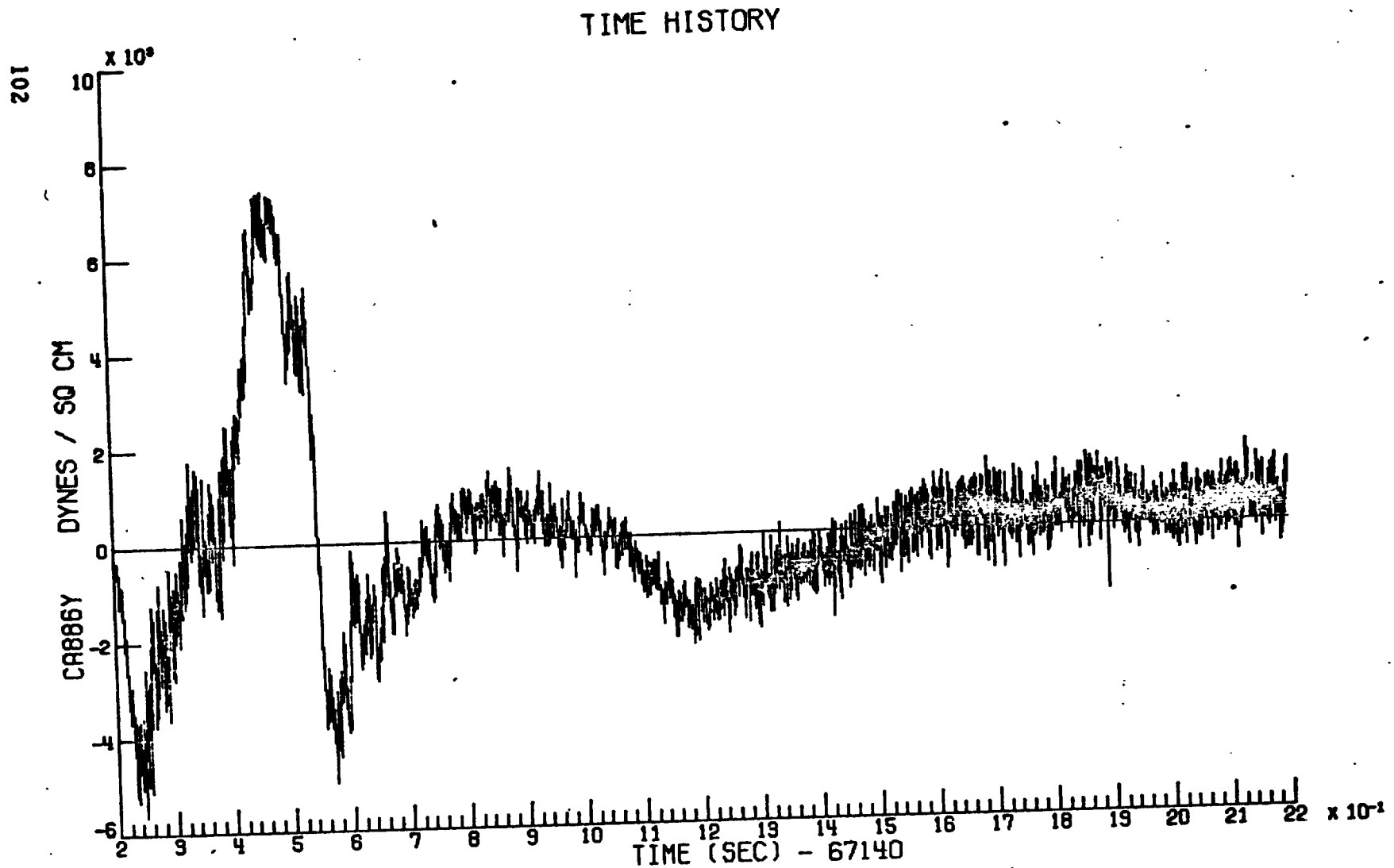
START 67132.000 SEC STOP 67134.000 SEC

OVERALL SOUND PRESSURE LEVEL = 111.61 DB BAND-LIMITED SOUND PRESSURE LEVEL = 111.46 DB

VIKING B FLT (CIF) PRE-IGNITION CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 61b



MAX = 7395.568

MIN = -5636.138

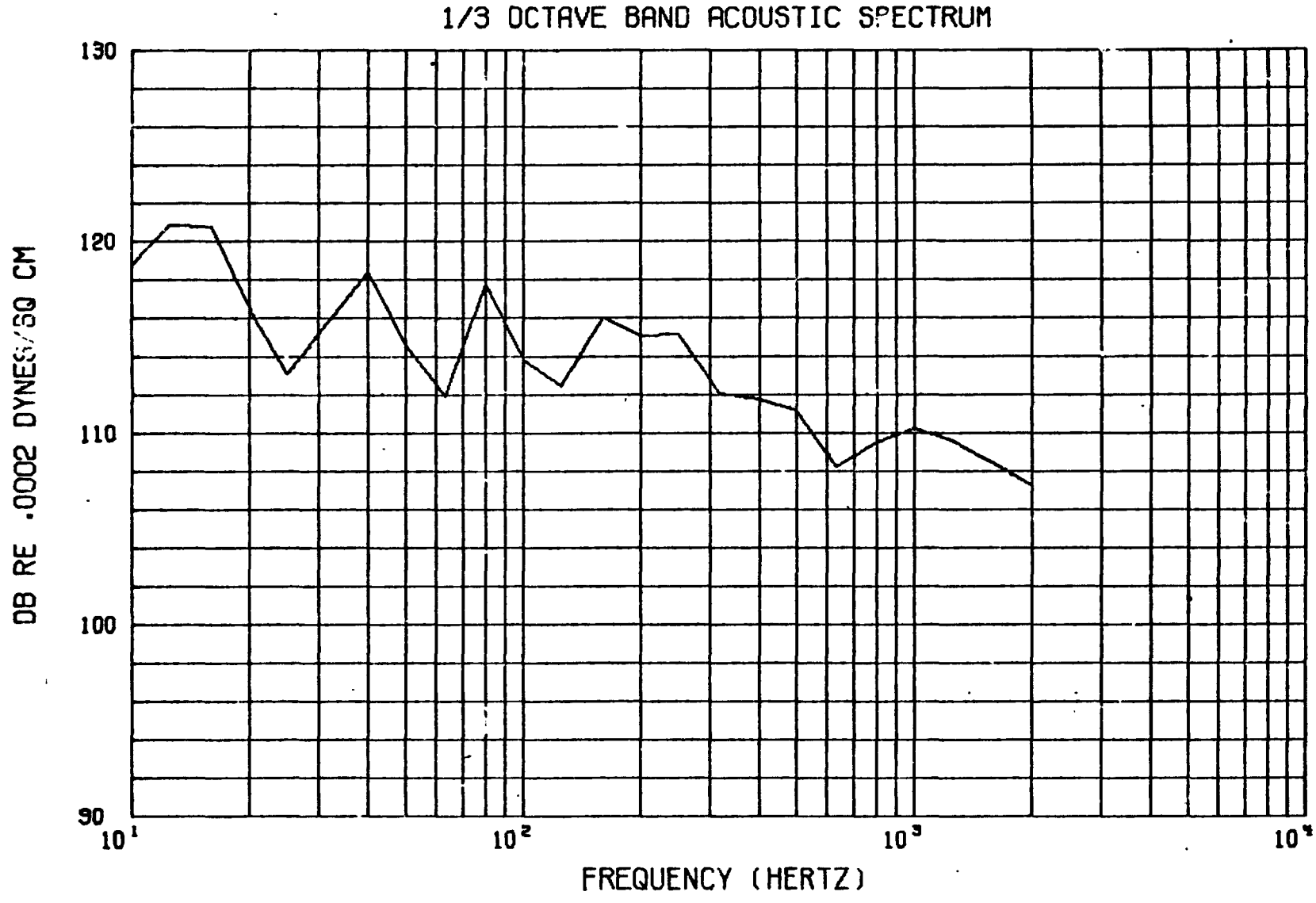
VIKING B FLT (CIF)

STAGE 0 IGN - 1

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 62a



START 67140.200 SEC STOP 67142.200 SEC

OVERALL SOUND PRESSURE LEVEL = 138.88 DB BAND-LIMITED SOUND PRESSURE LEVEL = [illegible] 18 DB

VIKING B FLT (CIF) STAGE O IGN - 1 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 62b

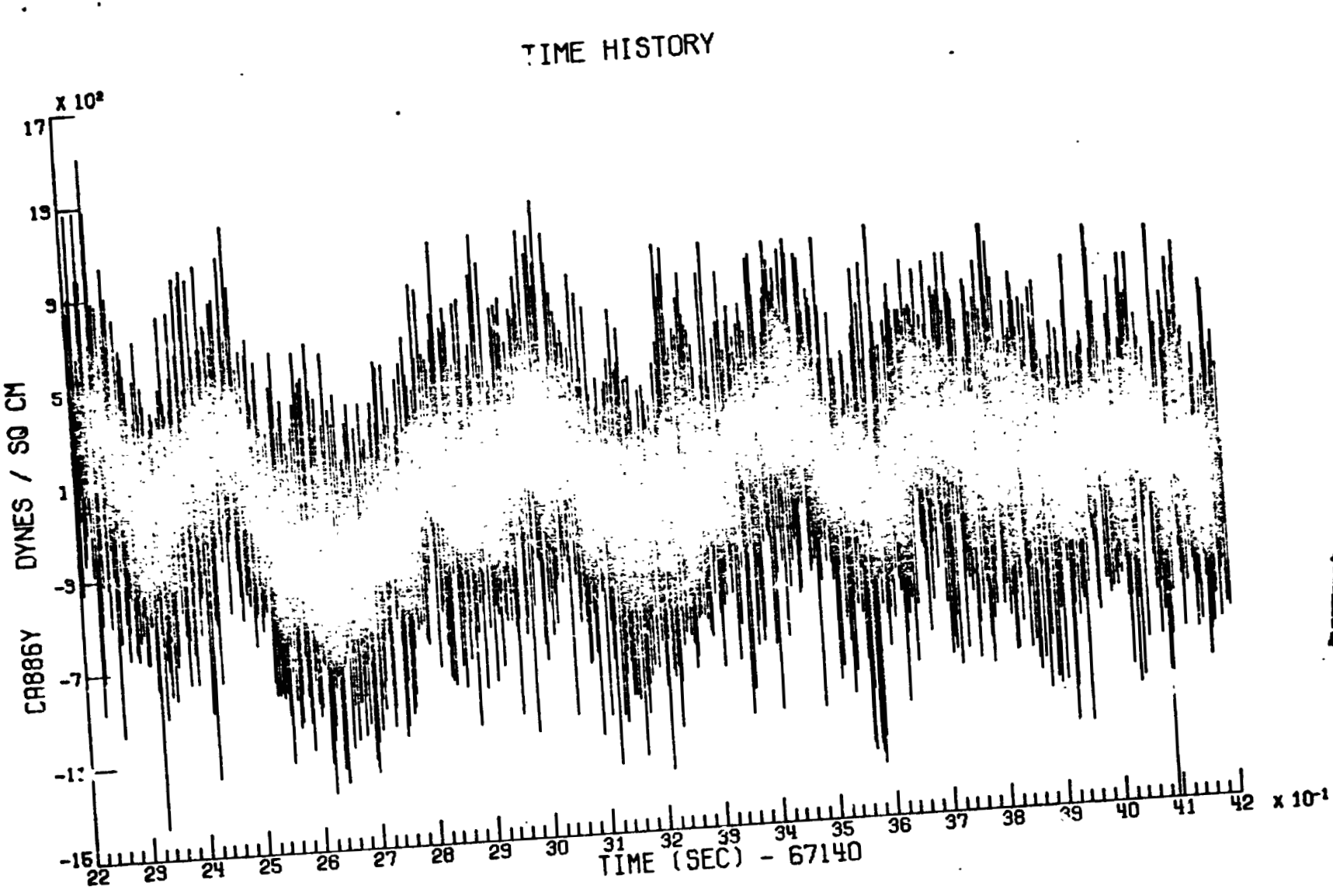
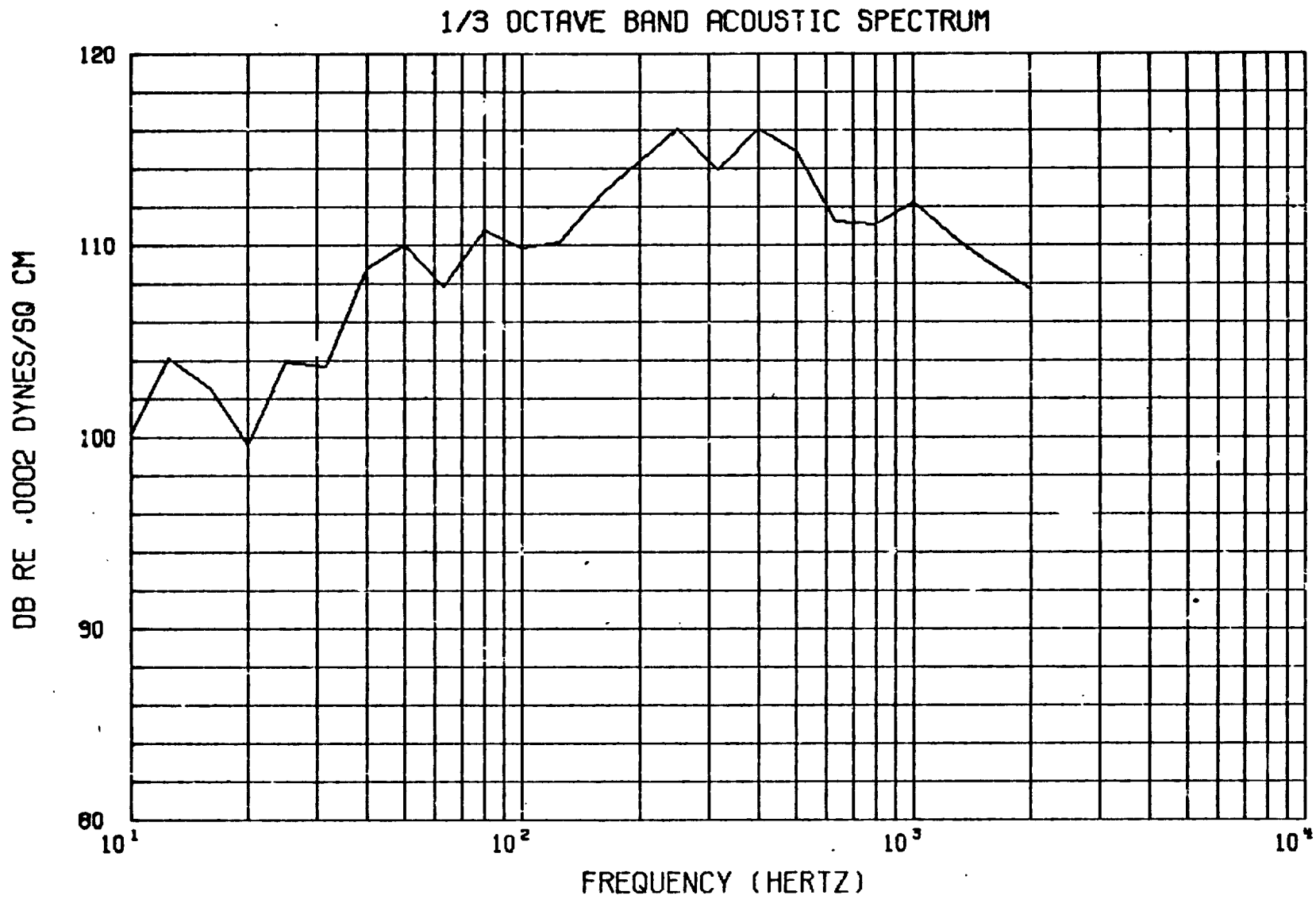


Figure 63a



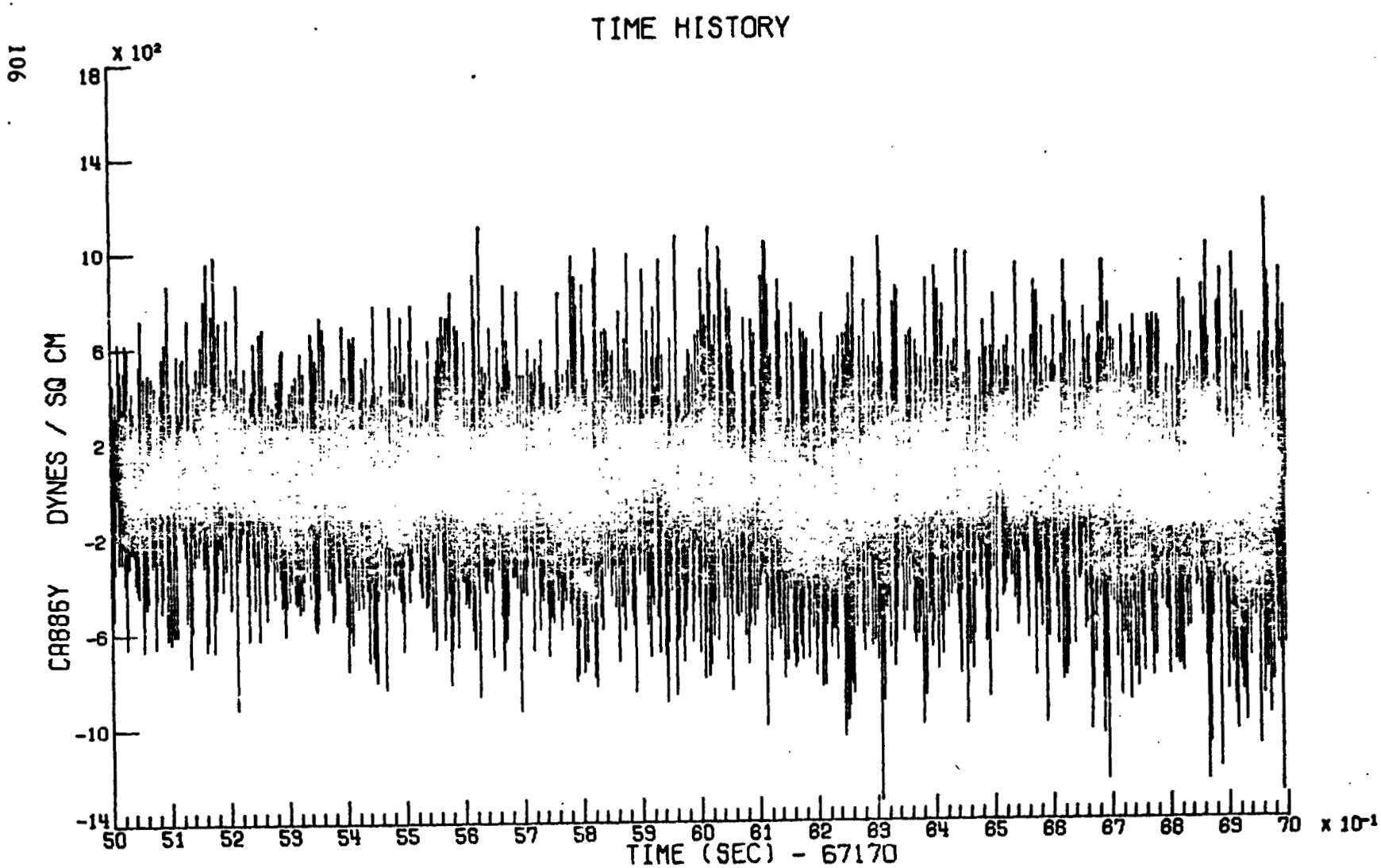
START 67142.200 SEC
OVERALL SOUND PRESSURE LEVEL = 125.74 DB

STOP 67144.199 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 125.01 DB

VIKING B FLT (CIF) STAGE 0 IGN - 2 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 63b



MAX = 1182.893

MIN = -1312.116

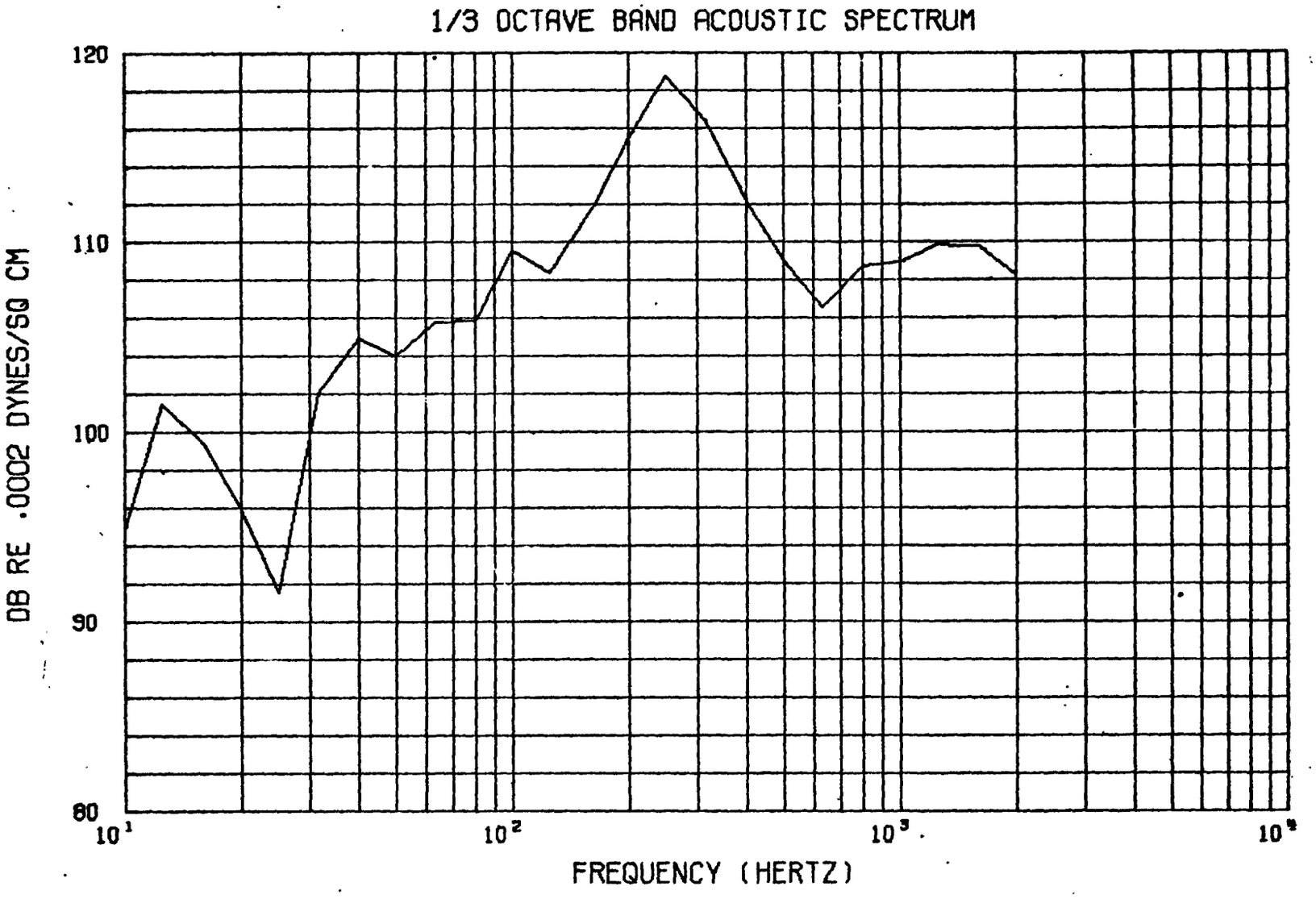
VIKING B FLT (CIF)

MAX Q - 1

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 64a



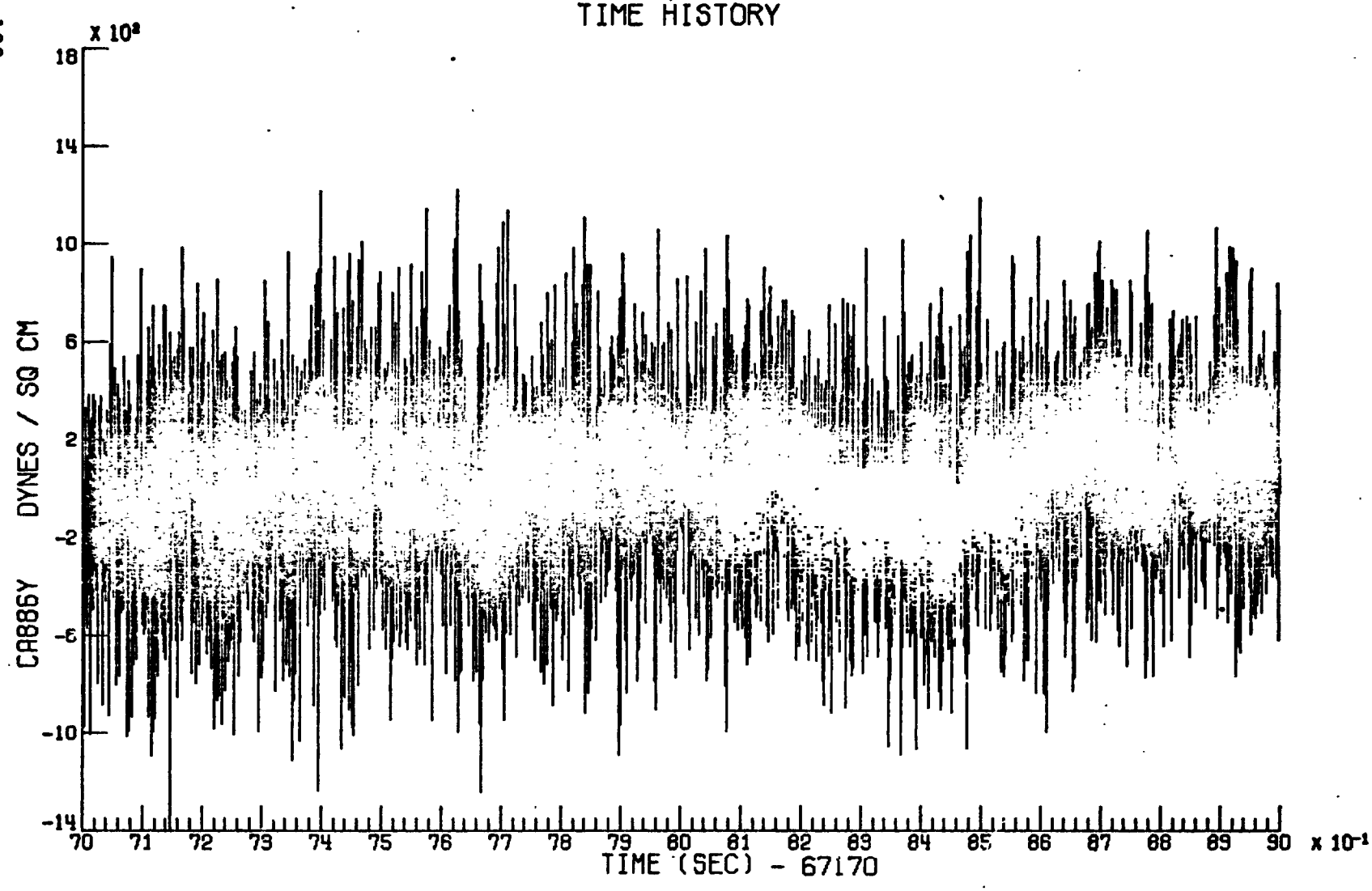
START 67175.000 SEC
OVERALL SOUND PRESSURE LEVEL = 124.41 DB

STOP 67177.000 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 124.34 DB

VIKING B FLT (CIF) MAX Q - 1 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 64b

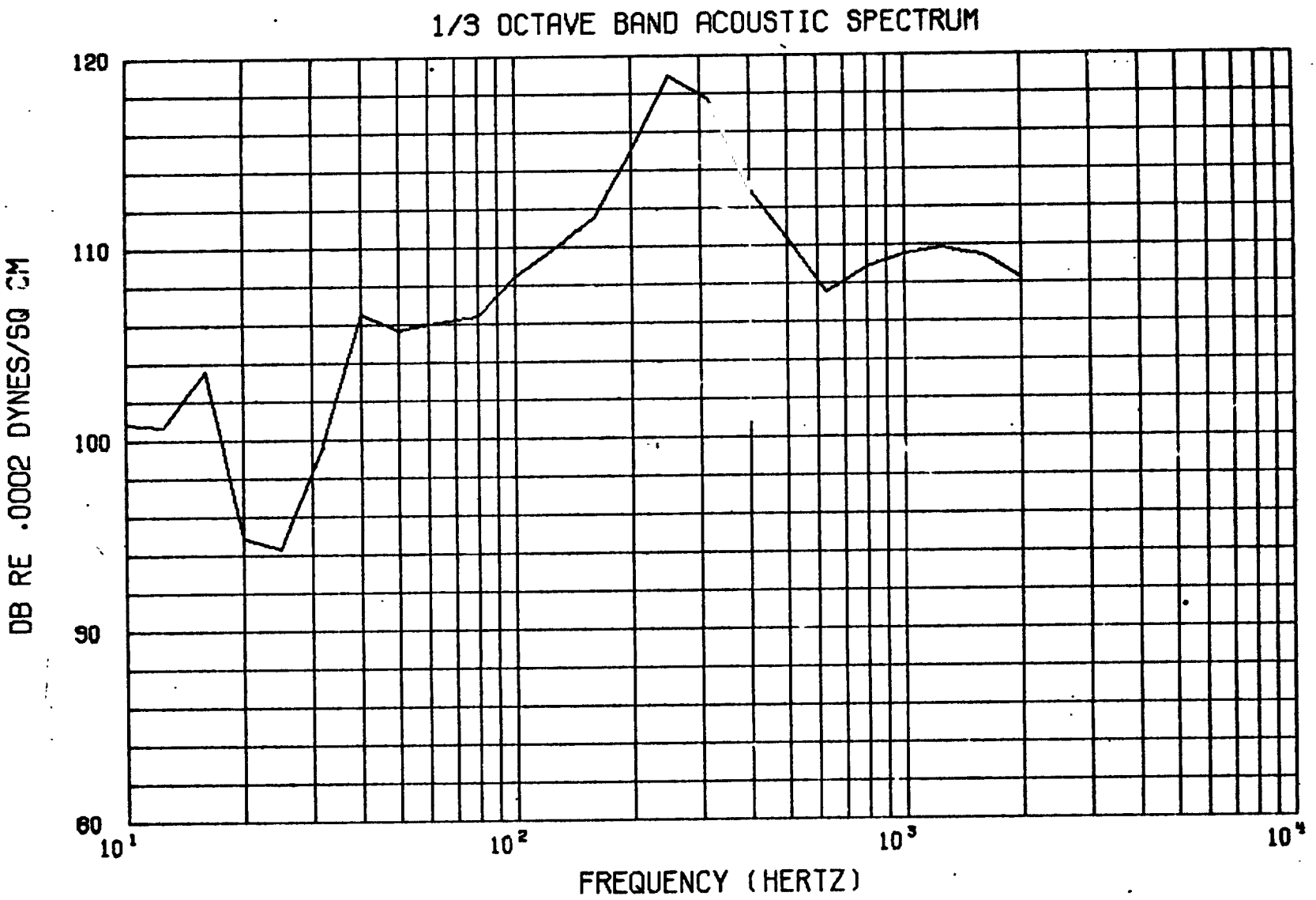


MAX = 1222.654 MIN = -1391.639

VIKING B FLT (CIF) MAX Q - 1.5 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 65a



START 67177.000 SEC
OVERALL SOUND PRESSURE LEVEL = 124.95 DB

STOP 67178.999 SEC
BAND-LIMITED SOUND PRESSURE LEVEL = 124.76 DB

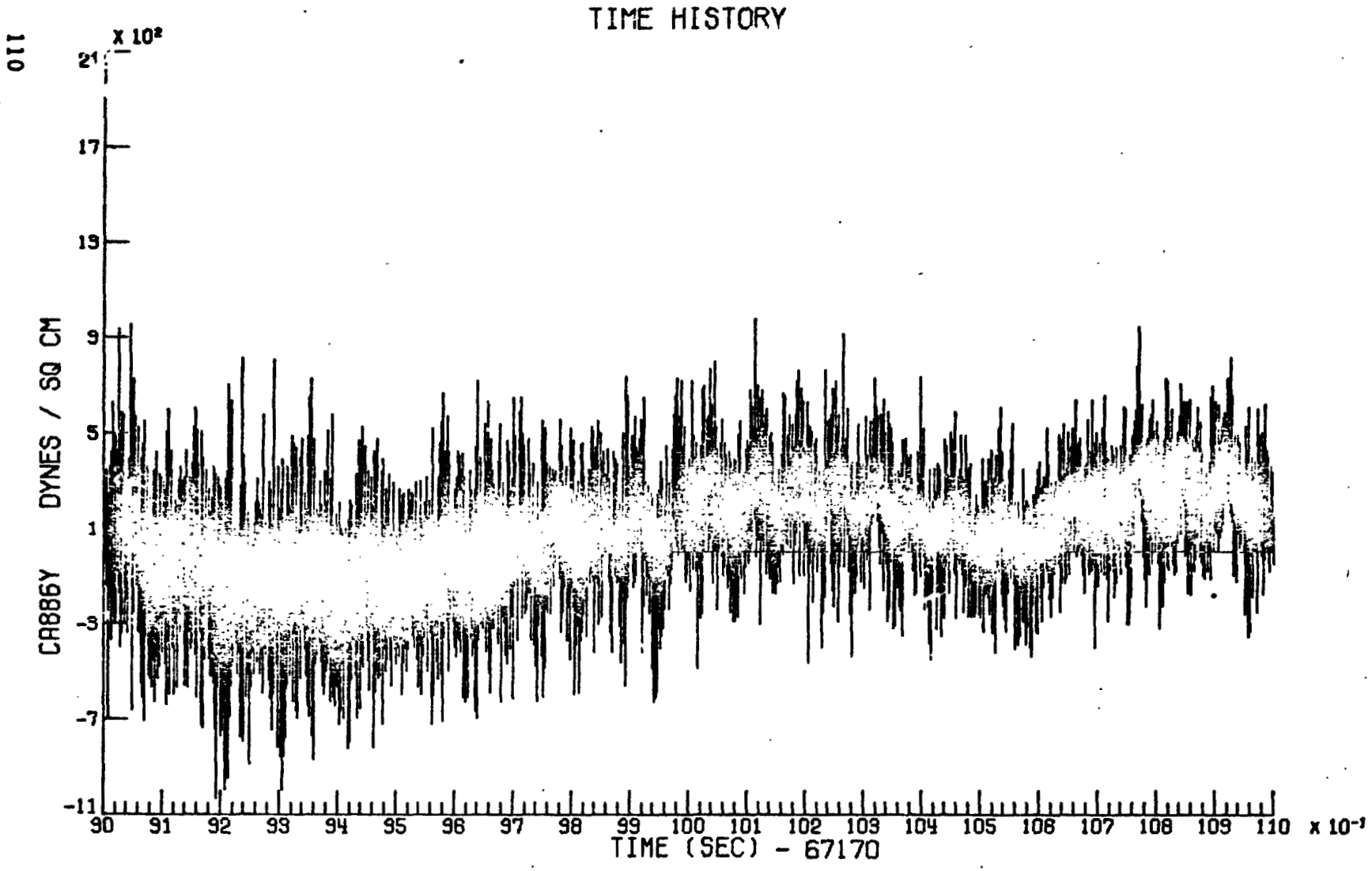
VIKING B FLT (CIF)

MAX Q - 1.5

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM .09/22/75

Figure 65b

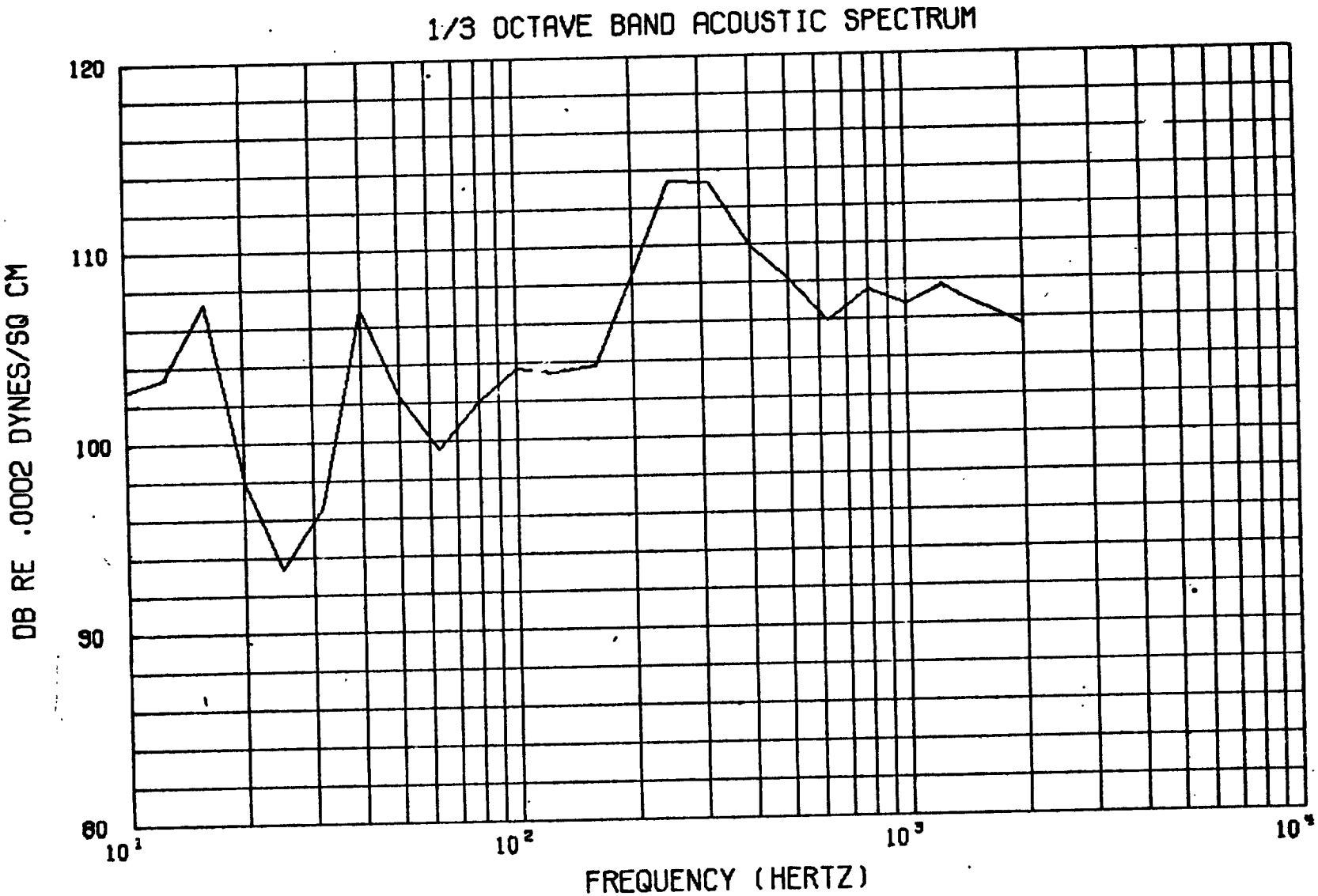


MAX = 974.147 MIN = -1033.789

VIKING B FLT (CIF) MAX Q - 2 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 66a



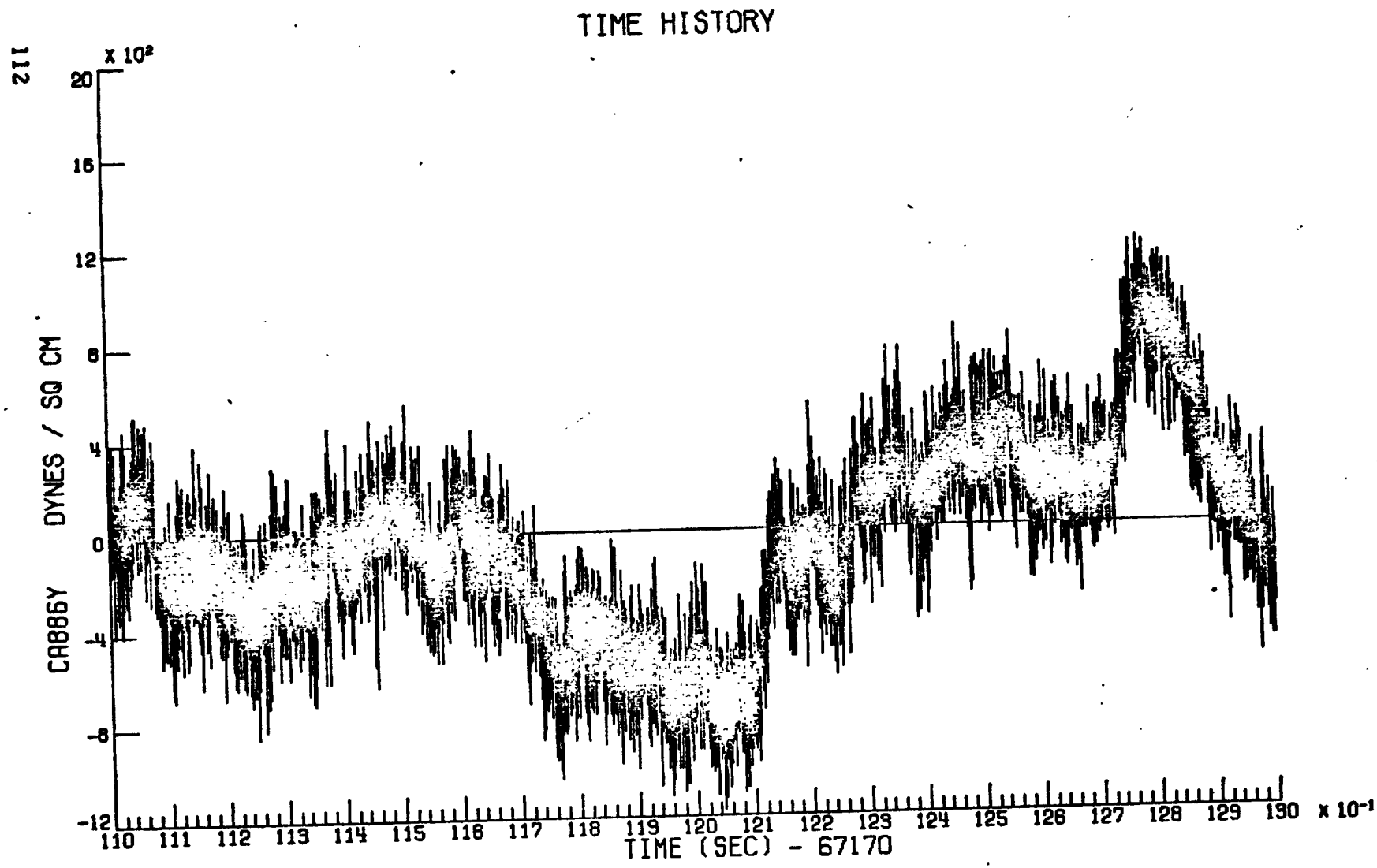
START 67179.000 SEC
STOP 67180.999 SEC

OVERALL SOUND PRESSURE LEVEL = 122.22 DB
BAND-LIMITED SOUND PRESSURE LEVEL = 120.84 DB

VIKING B FLT (CIF)
MAX Q - 2
CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 66b



MAX = 1202.773

MIN = -1172.953

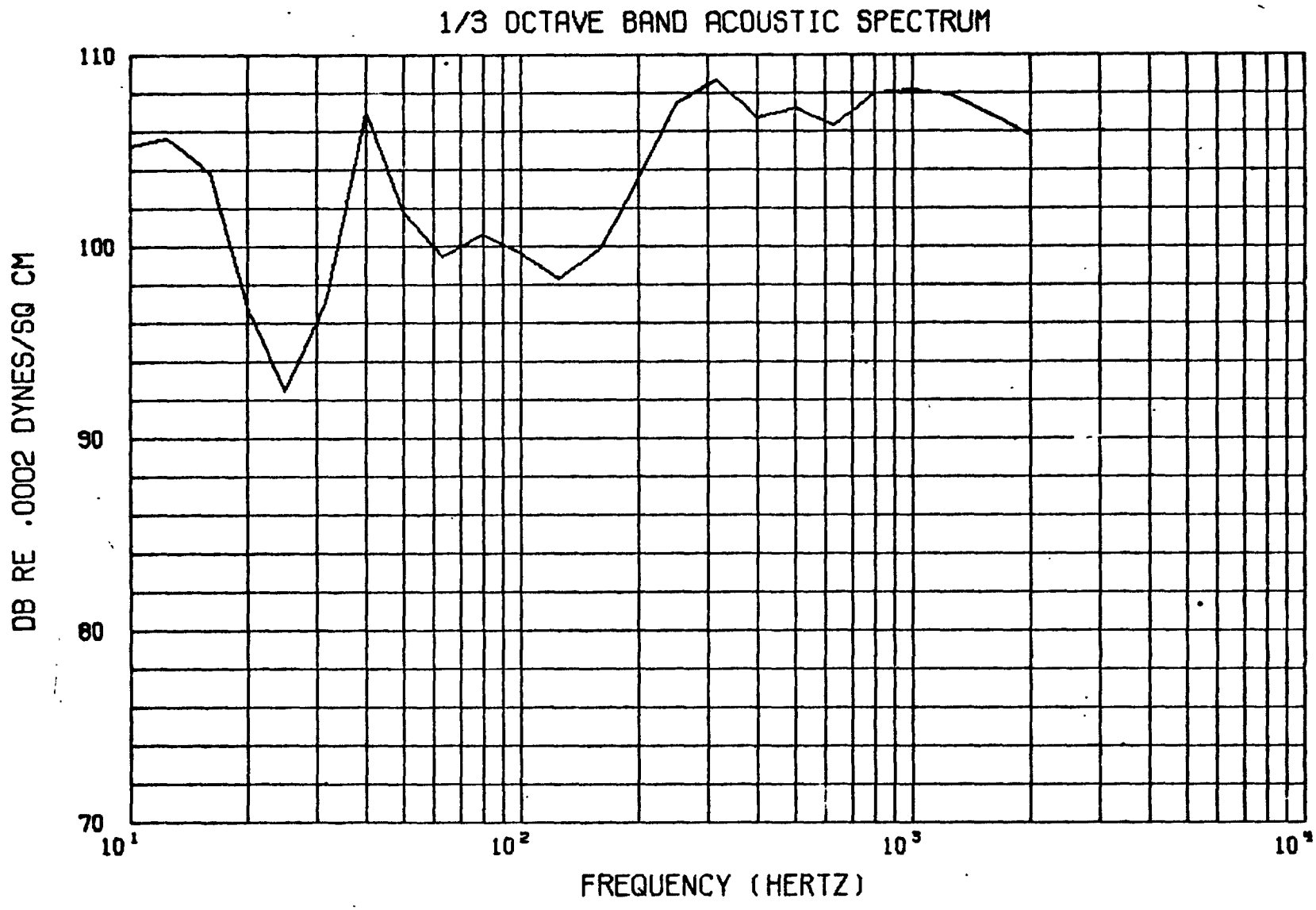
VIKING B FLT (CIF)

MAX Q - 2.5

CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 67a



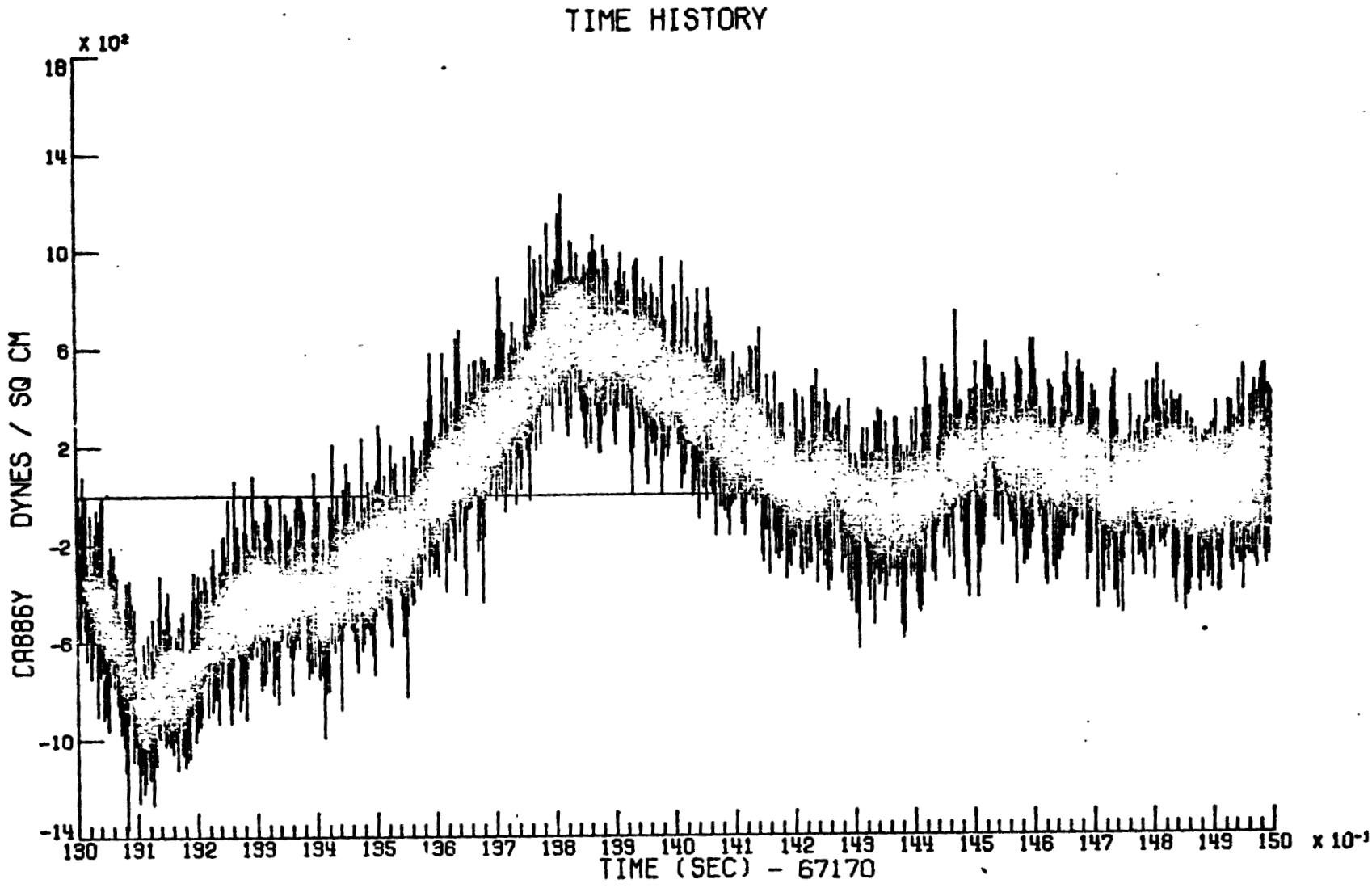
START 67181.000 SEC STOP 67182.999 SEC

OVERALL SOUND PRESSURE LEVEL = 126.05 DB BAND-LIMITED SOUND PRESSURE LEVEL = 118.96 DB

VIKING B FLT (CIF) MAX Q - 2.5 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 67b

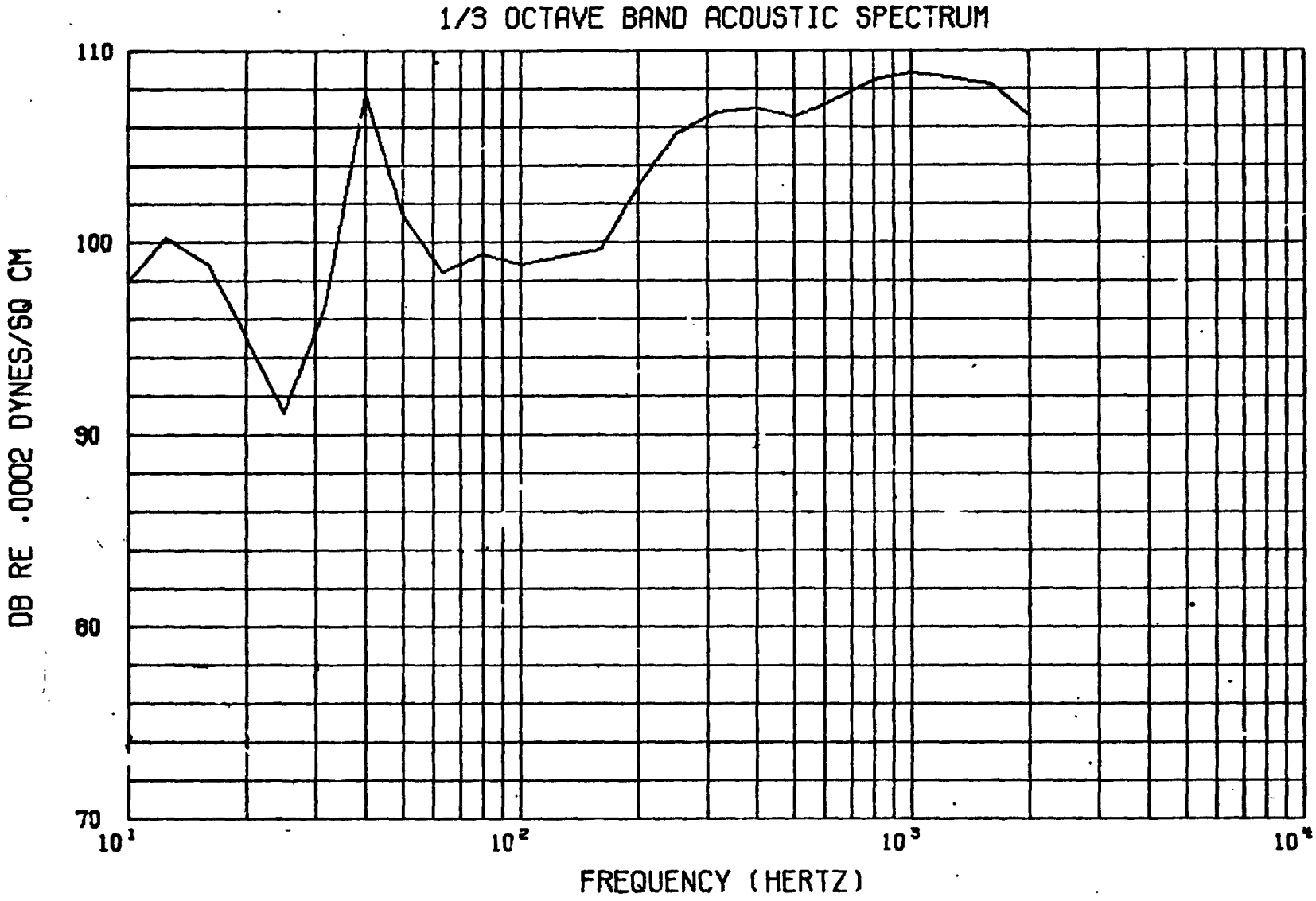


MAX = 1222.654 MIN = -1361.818

VIKING B FLT (CIF) MAX Q - 3 CA886Y

NASA-LANGLEY SIGNAL ANALYSIS PROGRAM 09/22/75

Figure 68a



START 67183.000 SEC STOP 67184.999 SEC

OVERALL SOUND PRESSURE LEVEL = 126.19 DB BAND-LIMITED SOUND PRESSURE LEVEL = 118.65 DB

VIKING B FLT (CIF) MAX Q - 3 CA886Y

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Figure 68b

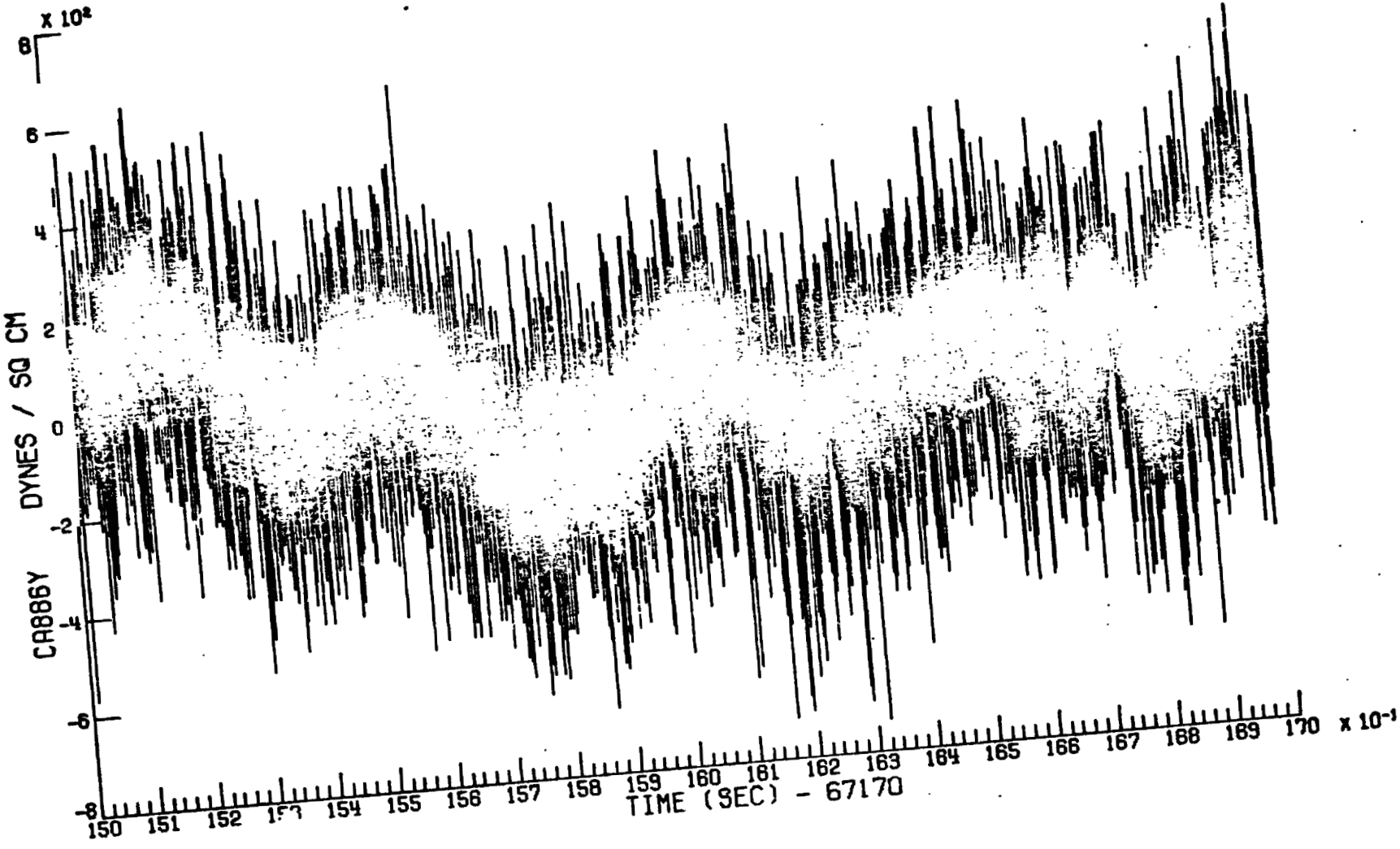
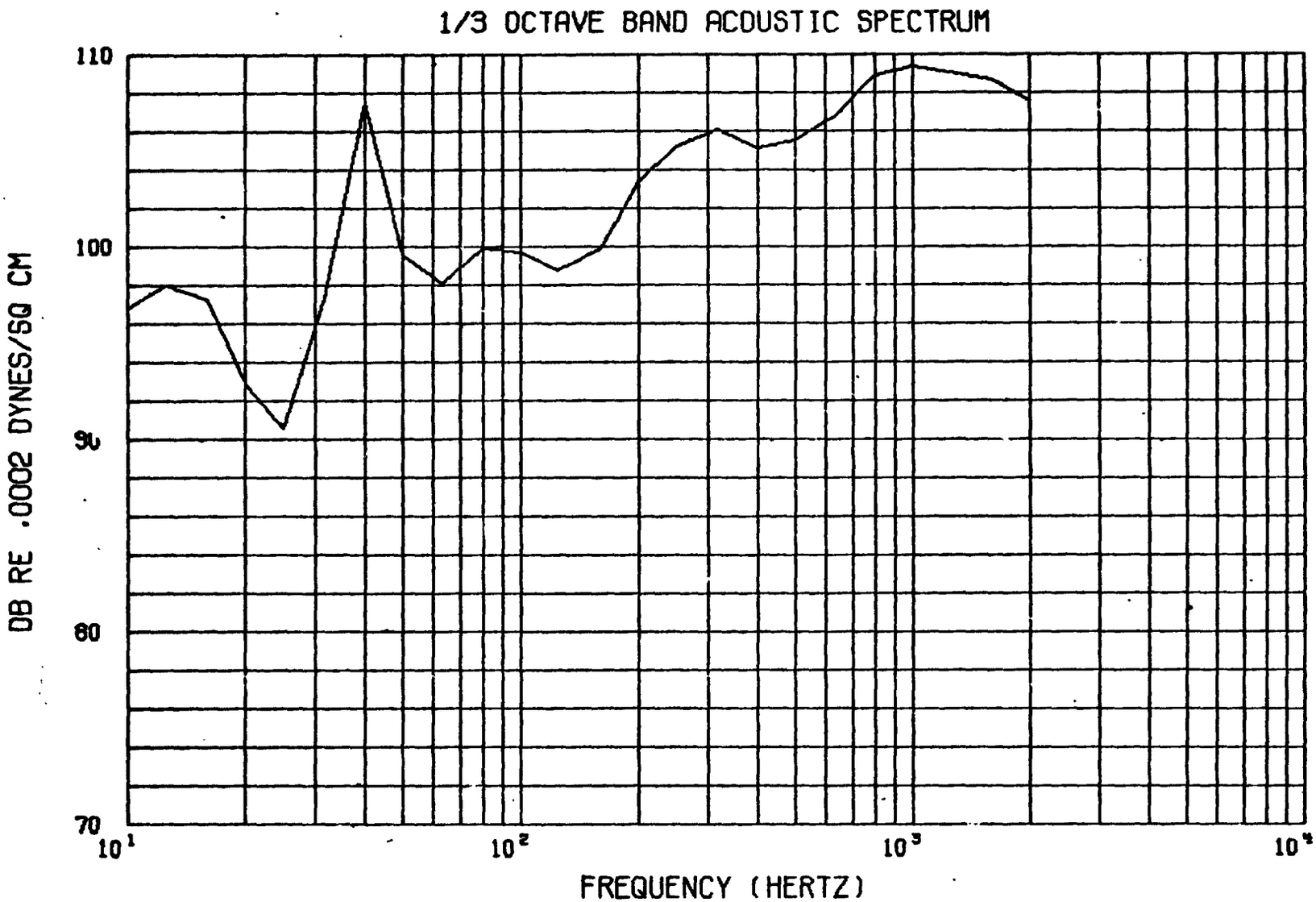


Figure 69a



START 67185.000 SEC STOP 67188.999 SEC

OVERALL SOUND PRESSURE LEVEL = 119.52 DB BAND-LIMITED SOUND PRESSURE LEVEL = 118.59 DB

VIKING B FLT (CIF) MAX Q - 3.5 CA886Y

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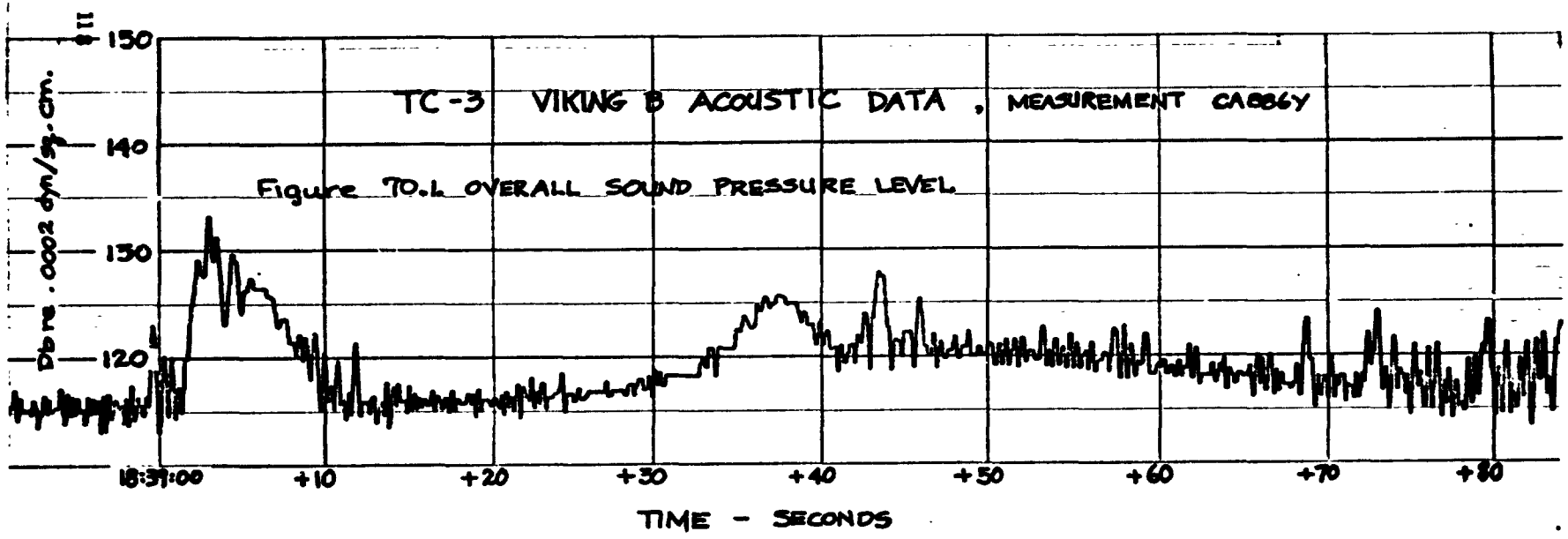
Figure 69b


TC-3 VIKING B ACOUSTIC DATA, MEASUREMENT CA886Y
Figure 70.1 OVERALL SOUND PRESSURE LEVEL
Db re .0002 dyn/sq.cm.
150
140
130
120
18:31:00
+10
+20
+30
+40
+50
+60
+70
+80
TIME - SECONDS

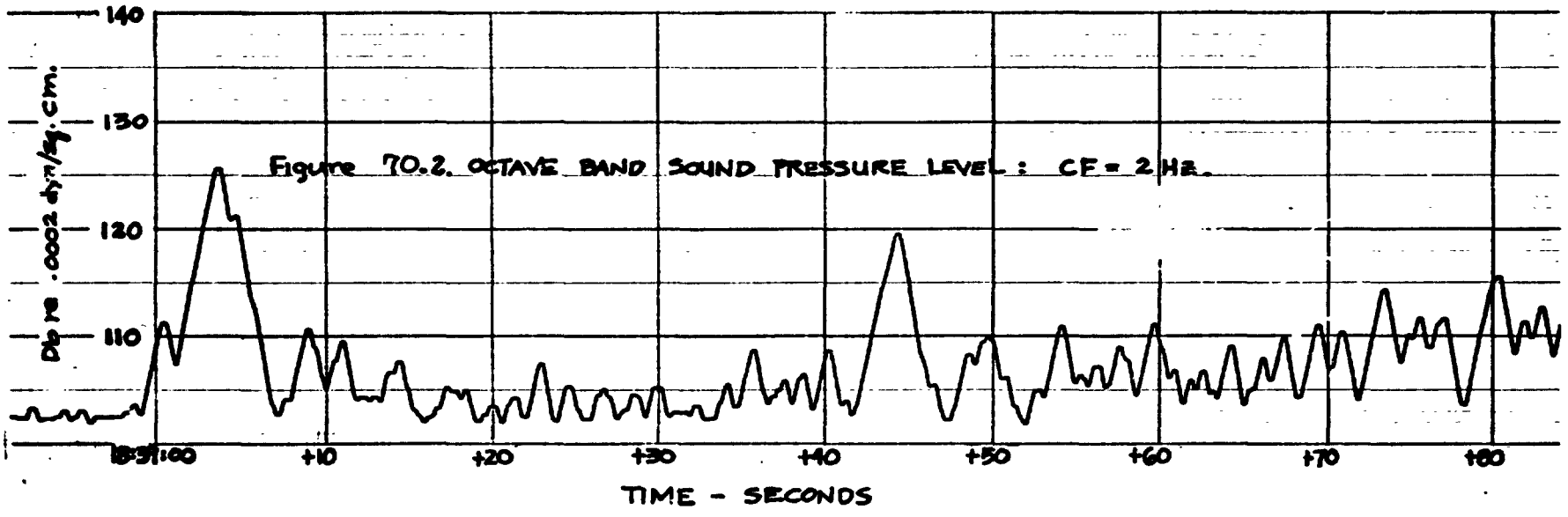


Figure 70.2. OCTAVE BAND SOUND PRESSURE LEVEL: CF = 2 Hz.
Db re .0002 dyn/sq.cm.
140
130
120
110
18:31:00
+10
+20
+30
+40
+50
+60
+70
+80
TIME - SECONDS

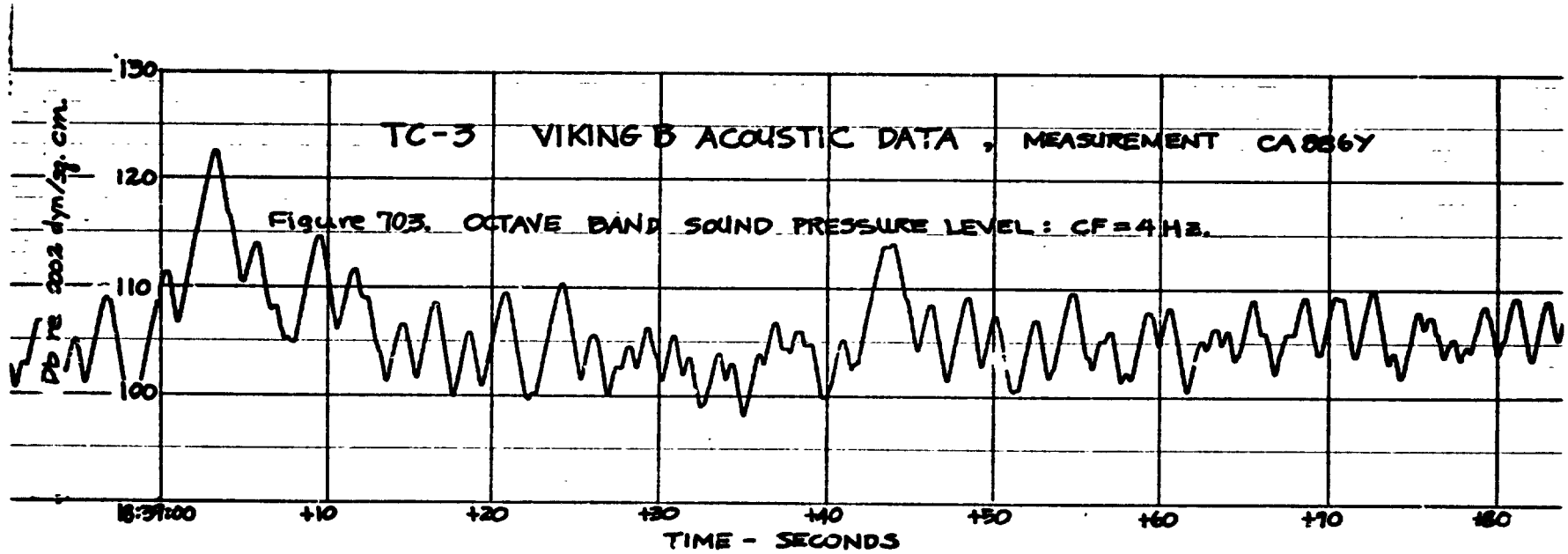


Figure 703. OCTAVE BAND SOUND PRESSURE LEVEL: CF=4 Hz.

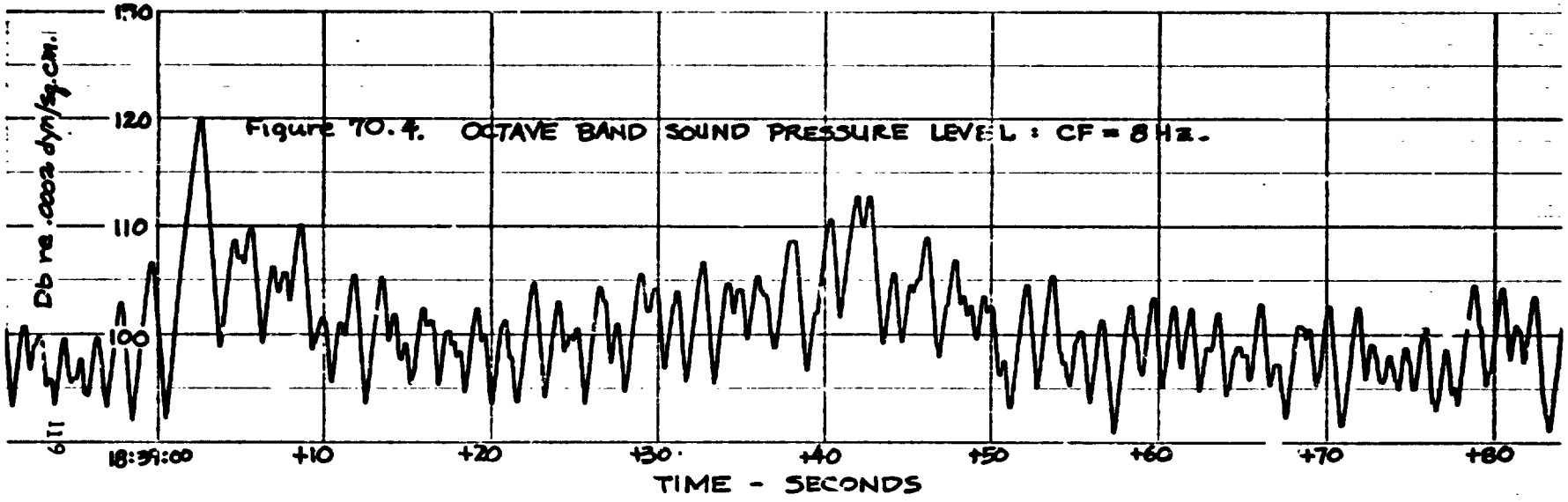


Figure 70.4. OCTAVE BAND SOUND PRESSURE LEVEL: CF = 8 Hz.

TC-3 VIKING B ACOUSTIC DATA, MEASUREMENT CA036Y

Figure 70.5. OCTAVE BAND SOUND PRESSURE LEVEL : CF = 16 HZ

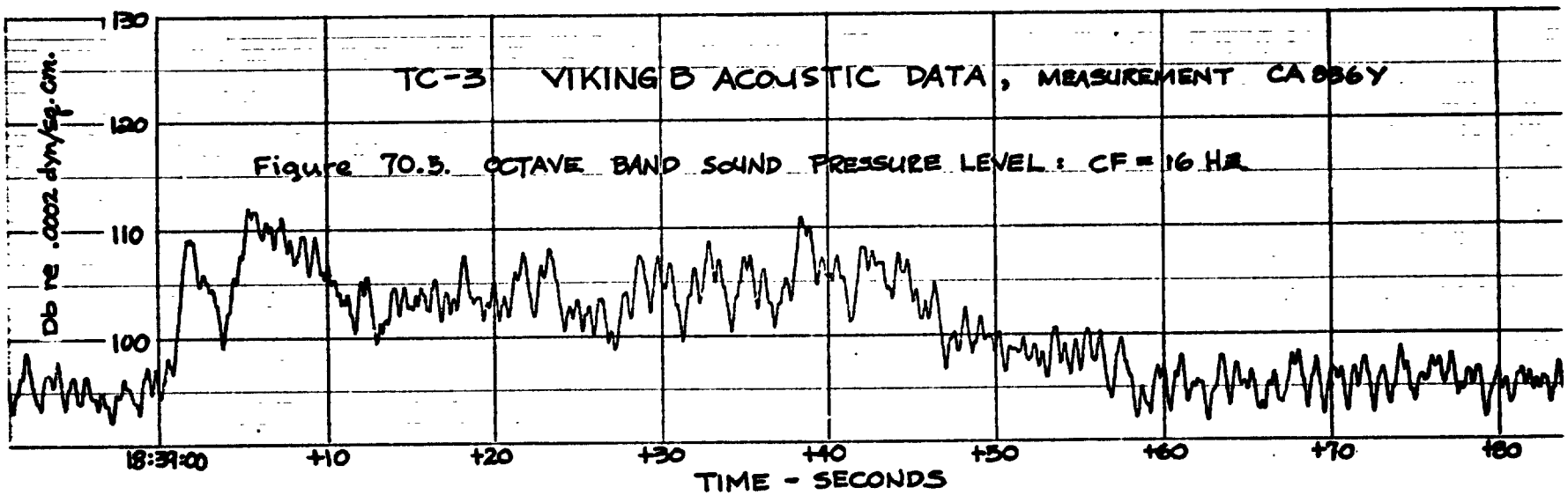
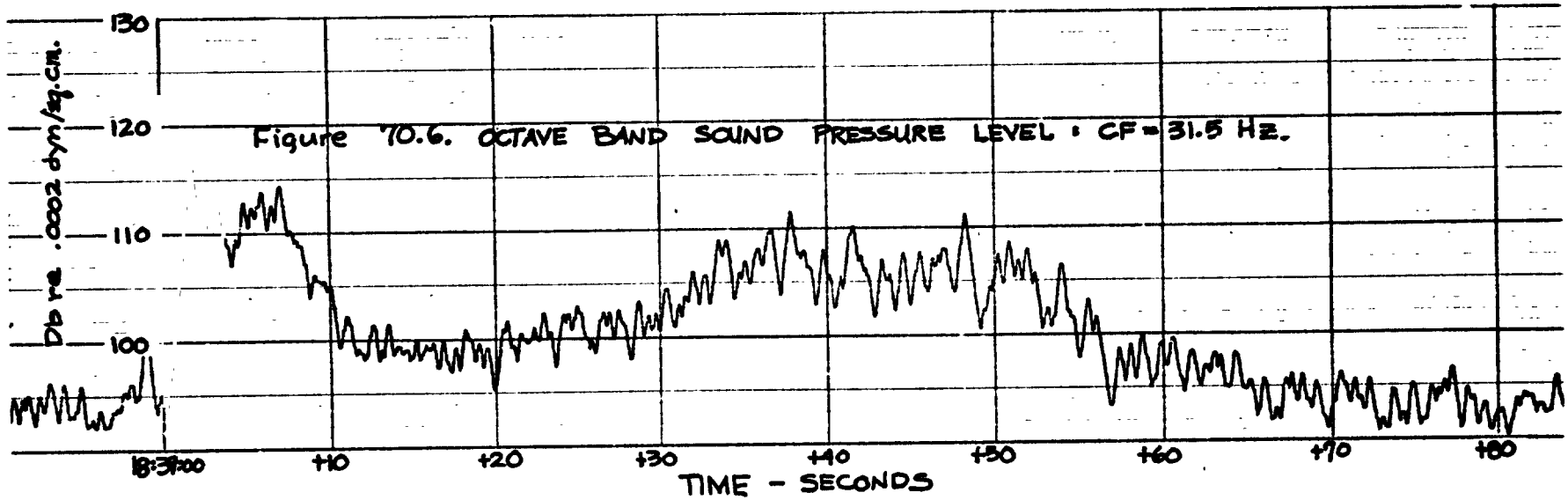
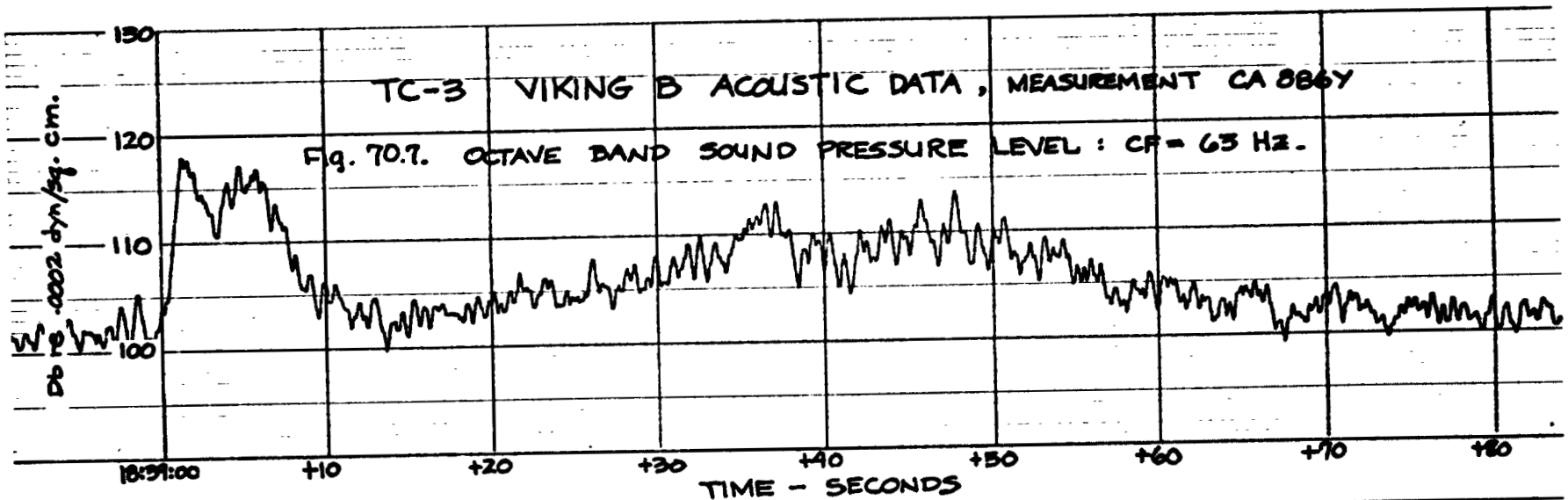


Figure 70.6. OCTAVE BAND SOUND PRESSURE LEVEL : CF = 31.5 HZ.




TC-3 VIKING B ACOUSTIC DATA, MEASUREMENT CA 886Y
Fig. 70.7. OCTAVE BAND SOUND PRESSURE LEVEL : CF = 63 Hz.
130
120
110
100
Db re .0002 dyn/sq. cm.
18:39:00
+10
+20
+30
+40
+50
+60
+70
+80
TIME - SECONDS

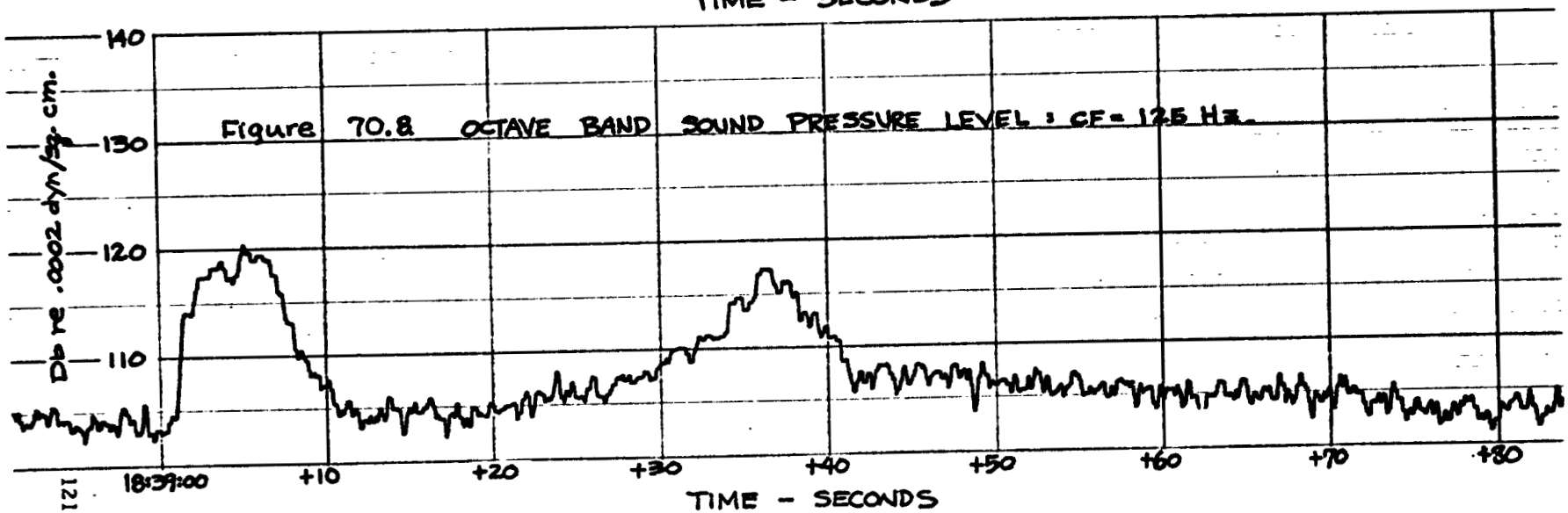


Figure 70.8 OCTAVE BAND SOUND PRESSURE LEVEL : CF = 125 Hz.
140
130
120
110
Db re .0002 dyn/sq. cm.
18:39:00
+10
+20
+30
+40
+50
+60
+70
+80
TIME - SECONDS

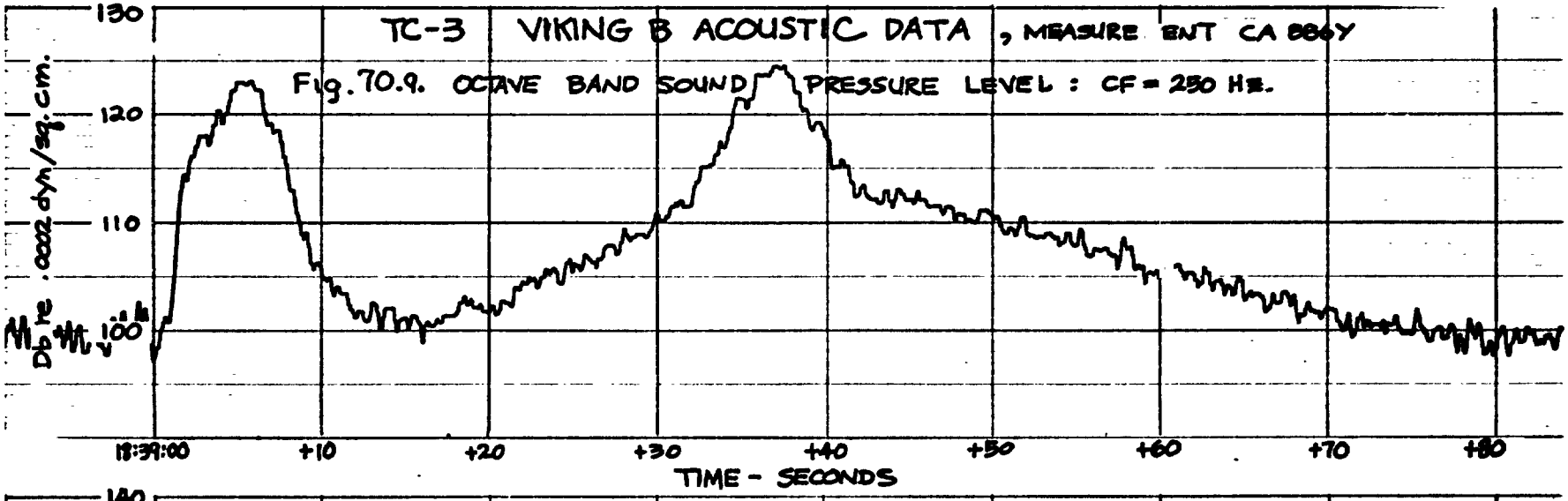


Fig. 70.9. OCTAVE BAND SOUND PRESSURE LEVEL : CF = 250 HZ.

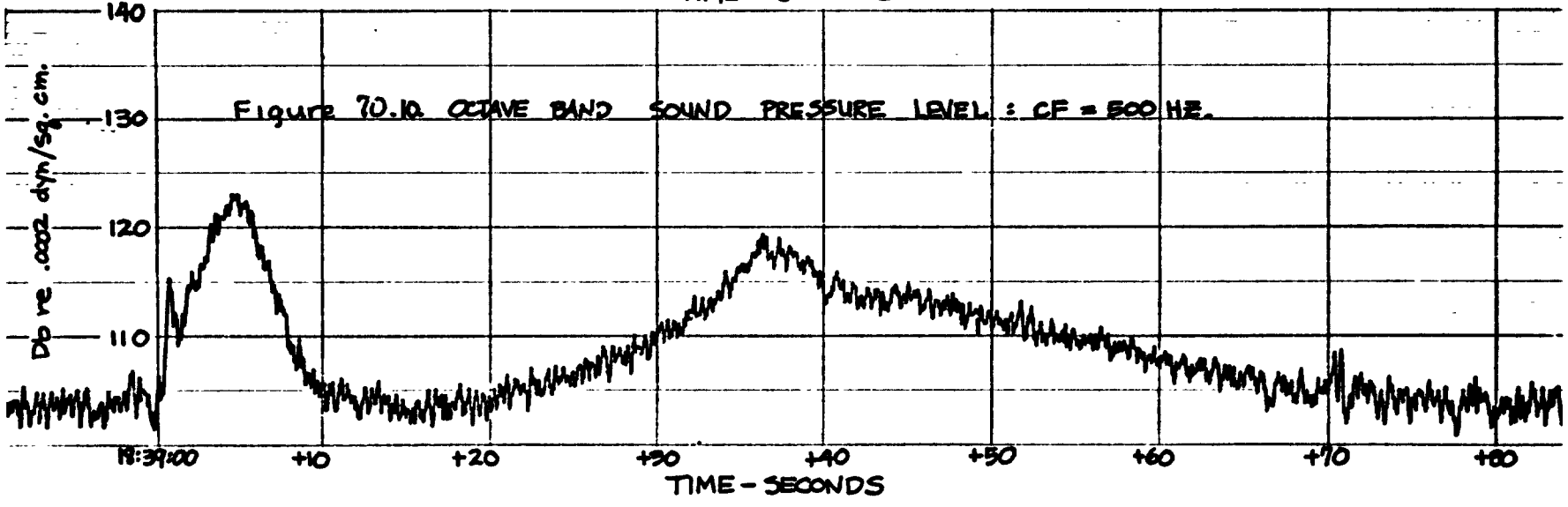


Figure 70.10 OCTAVE BAND SOUND PRESSURE LEVEL : CF = 500 HZ.

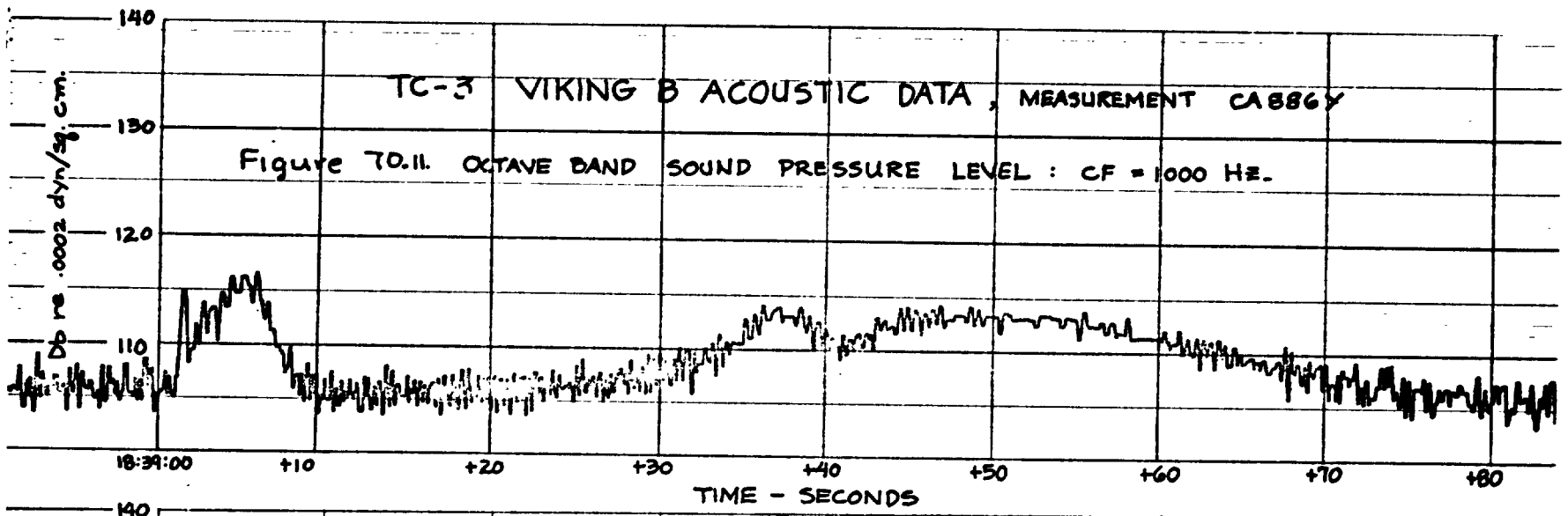


Figure 70.11. OCTAVE BAND SOUND PRESSURE LEVEL : CF = 1000 HZ.

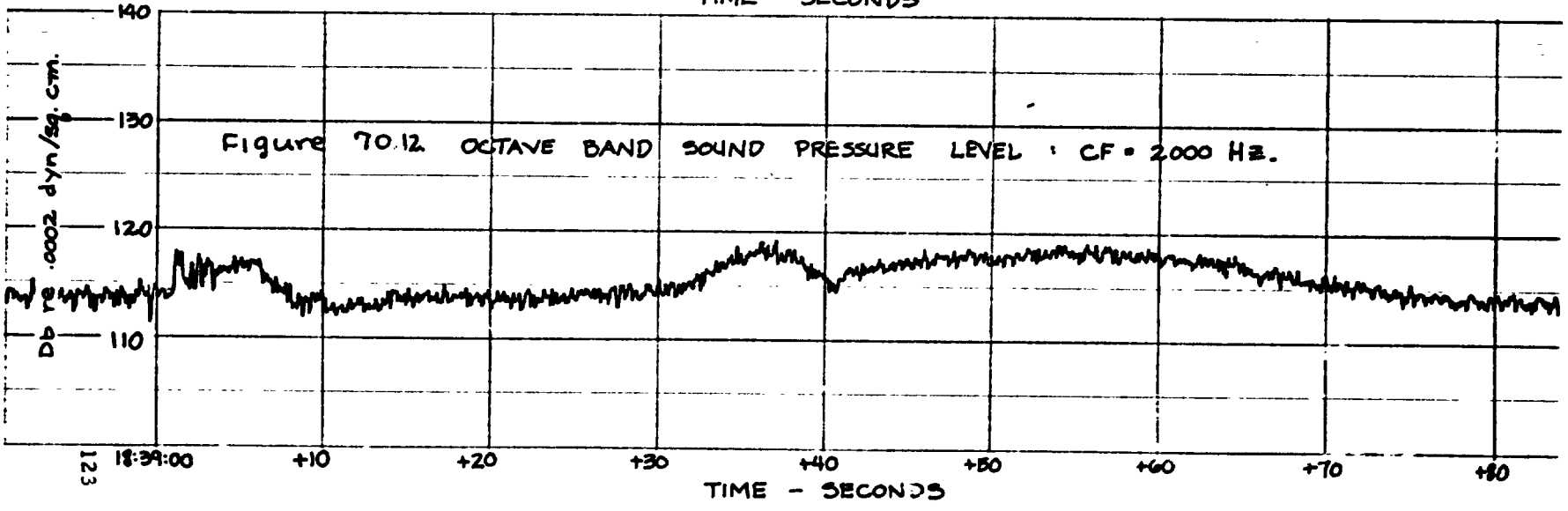


Figure 70.12. OCTAVE BAND SOUND PRESSURE LEVEL : CF = 2000 HZ.