

COMINCO LTD.

EXPLORATION

WESTERN DISTRICT

NTS: 82 G/5 W

UTEM ELECTROMAGNETIC SURVEY

ON THE

VINE GROUP

Latitude: $49^{\circ}22'N$, Longitude: $115^{\circ}52'W$

Work Performed: June 4 - July 6, 1979

Claims Covered: VINE 2, 3, 23, 24, 26, 27, 28, 29, 31 and 32

Claim Owner and Operator: Cominco Ltd.

Consultant: Dr. Y. Lamontagne, University of Toronto

September, 1979

JULES J. LAJOIE

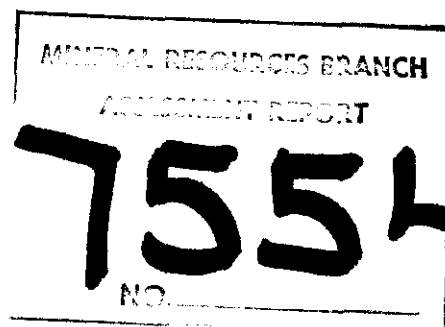


TABLE OF CONTENTS

	<u>PAGE</u>
LIST OF CLAIMS	1
PERSONNEL EMPLOYED	1
INTRODUCTION	2
DESCRIPTION OF THE UTEM SYSTEM	2
FIELD WORK	3
SURVEY LAYOUT AND GRID	3
DATA PRESENTATION.	4
INTERPRETATION.	4
CONCLUSIONS	5
REFERENCES	6
TABLES 1 and 2	7
APPENDIX A - Notes Re: Field Data	8
PLATE 153-79-1 - Location Map.	10
PLATE 153-79-2 - UTEM Compilation Legend	11
PLATE 153-79-3 - UTEM Compilation Map (in envelope)	
DATA SECTIONS	
STATEMENT	
EXHIBIT "A" - Statement of Expenditures	
CERTIFICATION	

COMINCO LTD.

EXPLORATION
NTS: 82 G/45W

WESTERN DISTRICT
August 9, 1979

UTEM ELECTROMAGNETIC SURVEY
ON THE VINE GROUP

LIST OF CLAIMS

<u>CLAIM NAME</u>	<u>RECORD NUMBER</u>	<u>DATE RECORDED</u>
VINE 2	85	Oct. 20, 1977
3	103	Oct. 26, 1977
23	122	Oct. 26, 1977
24	123	Oct. 26, 1977
26	125	Oct. 26, 1977
27	126	Oct. 26, 1977
28	127	Oct. 26, 1977
29	128	Oct. 26, 1977
31	130	Oct. 26, 1977
32	131	Oct. 26, 1977

PERSONNEL EMPLOYED

The geophysical crew consisted of Dr. Yves Lamontagne, consultant, Physics Dept. University of Toronto, Dr. Jules J. Lajoie, research geophysicist, Cominco Ltd., Vancouver, and helper Kevin Fennessey of Cranbrook.

Personnel employed by Cominco during the course of these surveys:

<u>Name</u>	<u>Dates</u>	<u>Address</u>
Dr. Y. Lamontagne	June 1 - July 10	Physics Department University of Toronto
Dr. J.J. Lajoie	June 1 - July 10	409 Granville Street Vancouver, B.C.
Kevin Fennessey	June 5 - July 4)	Kootenay Exploration 2450 Cranbrook Street Cranbrook, B.C.
David Sherrett	June 20 - June 29)	
Allan Atwood	5 days between)	
	June 8 - 19.)	

INTRODUCTION

As shown in the location map (Plate 153-79-1) the survey area is located about twenty kilometres south-southwest of Cranbrook, B.C. and directly west of Moyie Lake. From Cranbrook the survey area may be accessed via Highway 3 and local logging roads as shown on Plate 153-79-3.

The Vine group claims were previously staked by Cominco Ltd., the current owner and operator. The claims are underlain by gently dipping middle Proterozoic clastic sediments of the Aldridge Formation, which is known to host the Sullivan orebody near Kimberley.

This report describes an electromagnetometer survey the objective of which was to locate electrical conductors which may be caused by economic mineralization.

An area of about 19 square kilometres was surveyed on the following Vine claims: 2, 3, 23, 24, 26, 27, 28, 29, 31 and 32. The total line coverage was 47.8 km. The total number of stations was 950. The total wire laid out was 43 km. The total linecutting was 80.29 km.

DESCRIPTION OF THE UTEM SYSTEM

UTEM is an acronym for "University of Toronto Electromagnetometer". The system was developed by Dr. Y. Lamontagne (1975) while he was a graduate student at that university.

The field procedure consists of laying out a large loop of single-strand insulated wire and energizing it with a transmitter powered by a motor generator. The loop is generally square shaped, wherever possible, with sides between 500 metres and 1500 metres long. Survey lines are located outside the loop and are generally oriented perpendicular to the side of the loop. The field procedure is very similar to Turam, a better known electromagnetic surveying technique.

The transmitter loop is energized with saw-tooth current at a carefully controlled frequency (30 Hz for this survey). The receiver, consisting of one sensor coil, associated electronics, and a facility for digital recording on a cassette magnetic tape. The time synchronization between transmitter and receiver is achieved through quartz crystal clocks in both units. Reduction of the data requires that the relative positions of the transmitter loop and receiver stations be known with an accuracy of about 1%.

The receiver sensor coil measures the vertical component of the magnetic field and it responds to the time derivative of the magnetic field. Since the transmitter current waveform is a sawtooth, the receiver will sense a perfect square wave in the absence of geologic conductors. Deviations from a perfect square wave are caused by electrical conductors which may be geologic or cultural in origin.

The UTEM receiver gathers and records 9 channels of data at each station. The later numbered channels (7-8-9) correspond to short time or high frequency while the lower numbered channels (1-2-3) correspond to long time or low frequency. Therefore, poor or weak conductors will respond on channels 9, 8, 7 and 6. Progressively better conductors will give responses on progressively lower numbered channels as well. For example, massive, highly conducting sulphides or graphite will produce a response on all nine channels.

It was mentioned above that the UTEM receiver records data digitally on a cassette. This tape is played back into a minicomputer at the base camp. The minicomputer processes the data and controls the plotting on a small (11"x15") graphics plotter. Data are portrayed as profiles of each of the nine channels, shown for each survey line of each transmitter loop. These profiles, and an interpretive plan are appended to this report.

FIELD WORK

The field work was done in the period of June 1 to July 10, 1979, including mobilization. The field work, data reduction, and report preparation were shared by Dr. J.J. Lajoie, geophysicist for Cominco Ltd., Vancouver and Dr. Y. Lamontagne, post doctoral fellow, University of Toronto. Kevin Fennessy of Cranbrook was the field assistant for the receiver crew. The field crew was supplemented from time to time by helpers from the Kootenay Exploration office in Cranbrook. A cabin at Green Bay Resorts on Moyie Lake was used as a base of operations.

SURVEY LAYOUT AND GRID

The area covered by transmitter loop 1 was the only one in which there were serious noise problems. The noise was caused by a grounded local powerline and telephone line along the road to Monroe Lake. The noise could be mostly overcome by longer averaging during taking of readings. The coverage of that loop area was nevertheless rendered useless for detecting anything but extremely good conductors because of the large anomalies produced by the grounded powerline itself (loop area 870, data sections 1, 2, 3). There were periods of high spheric noise during the course of the survey. Spheric noise is atmospheric fluctuations of the electromagnetic field caused by lightning discharges. Thunderstorms occurred on 3 days. The precision of the data (particularly the early channels) mostly reflect the level of spheric activity, although the noise was reduced by longer averaging.

The area covered extended 7 km in the southwest-northeast direction and 2.4 to 3.4 km in the orthogonal direction. The basic line and station spacings were respectively 500 m and 50 m. A 300 m overlap area was surveyed near the transmitter wire to ensure uniformly deep coverage.

The grid had survey lines oriented at an azimuth of 330° . The transmitter loops were located south of the survey areas, to optimize detection of conductors dipping to the north.

DATA PRESENTATION

The results of the survey are presented in 36 data sections, a compilation map (Plate 153-79-3) in the envelope attached to the back of this report and a UTEM legend (Plate 153-79-2).

The data sections are arranged in order of loop and line numbers and are numbered from 1 to 36. They were produced by the UTEM playback system which was installed at the Moyie Lake cabin. Table 1 gives the cross-reference of loop numbers (as per Plate 153-79-3) to loop area numbers (as per data sections).

The data sections are labeled as to loop numbers, line numbers, frequency, component (vertical magnetic field Hz), station numbers and amplitude scales as explained in the header page to the data sections. The data plotted are "channel 1 reduced" anomalous data. The reduction formulae are:

For channel 1 (latest channel):

$$\% \text{ Ch. 1 anom.} = \frac{(\text{Ch. 1} - \text{Prim.})}{\text{Prim.}} \times 100\%$$

where Prim. is the computed primary vertical magnetic field at the point of measurement.

For other channels (n = 2 to 9);

$$\% \text{ Ch. n anom.} = \frac{(\text{Ch. n} - \text{Ch. 1})}{\text{Ch. 1}}$$

where Ch. 1 is the measured channel 1 intensity at the same station. The plotting symbols are explained in Plate 153-79-2.

INTERPRETATION (See Plate 3 and Data Sections)

The only large local anomalies found in the survey are those caused by the grounded powerline in loop 870 (data sections 1 to 3). No clear anomaly of geological origin lasts later than channel 6. Therefore, no good conductivity responses were obtained on this survey.

There was nevertheless a number of poorer conductors found which are expressed as cross-over anomalies in the UTEM data. These are shown by x's on the interpretation map, the position of the x being the estimated position of the conductor edge. The anomaly shapes in all cases are compatible with interpretation models of dipping plate conductors or narrow current channels.

The interpretation of the four best anomalies was done in more detail. These are numbered by circled figures on Plate 1. The interpretation was done by estimating the decay time t_1 (roughly the time where the anomalous amplitude is approximately one-sixth of the initial value) and strike length L (by comparing the anomaly width and amplitude with graph 4-8 in Lamontagne (1975) and model data of UTEM Research Report No. 1 (Lodha and West, 1976). The formula used to calculate the conductance (σd) is:

$$\sigma d = \frac{10 t_1}{\mu_0 L} \qquad \mu_0 = 4\pi \times 10^{-7}$$

The best conductances found are shown in Table 2. The other anomalies reported on Plate 153-79-3 are apparently caused by poorer conductors with conductances of 2 mhos or less.

The broad regional response found in the area appears to be due to a modestly conductive halfspace, rather than conductive overburden, as expected. By comparison with model results in Lamontagne (1975) the apparent resistivities appear to be in the range of 400 ohm metres to 1000 ohm metres.

CONCLUSIONS

No important conductive target was found in the survey area. Some small local poor conductors were located. Some are expected to be related to geologic structures, particularly conductor 4 which follows a topographic depression. On geophysical merit alone, none of the anomalies warrant further follow up.

Submitted by: Jules Lajoie
Jules J. Lajoie, Ph.D
Research Geophysicist

Endorsed for Release by: John M. Hamilton
John M. Hamilton, P. Eng.
Chief Geologist, Kimberley

JJL/pc1

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- Cranbrook Office (1)
- JJL (1)

REFERENCES

- Lamontagne, Y., 1975; Applications of wideband, time-domain EM measurements in mineral exploration: Doctoral thesis, University of Toronto.
- Lodha, G.S., and G.F. West, 1976; A comparison of the response of some wideband EM systems to a deep conducting plate: in Wideband Time Domain EM Project, Research Report No. 1, Geophysics Lab, Physics Department, University of Toronto.

TABLE 1.

Transmitter Loop # on Plate 1	Loop Area Label on Data Sections	No. of Lines
1	870	3
2	871	3
3	872	3
4	873	3
5	874	4
6	875	2
7	876	3
8	877	3
9	878	3
10	880	3
11	881	3
12	882	3
		<u>36</u> lines

NOTES:

1. The "loop area" covered with each transmitter loop is located to the north of each transmitter loop to a distance of approximately 1300 m.
2. Total survey length = 47.8 line km - 950 stations.
3. Total wire laid out = 43 km.

TABLE 2.

Anomaly	Position	"Loop Area(s)"	DS#	Conduct- ance	Estimated L	Comments
(1)	40W/725N	872	9	10 mhos	300m	Vertical vein?
(2)	30W/1125N	872	7	5 mhos	400m	Possible shallow dip N.
		874	16			
(3)	45W/1640N	876	19	4 mhos	800m	
(4)	15W/1475N	874	13	1-2 mhos	1500m?	Best anomaly on L 15W.

APPENDIX A

Notes referenced on UTEM plots by crosses (+)

<u>Loop Number</u>	<u>Loop Area</u>	<u>Line</u>	
2	871	1500W	South shore of Munroe Lake at 540N. Line is not cut from north side of lake to tie line 1000N.
2	871	2500W	The shift in Ch. 1 between 950N and 1000N is due to chainage errors in the () 100 m jog in line 2500W at tie line 1000N.
4	873	OW	Picket 2200 is missing. Therefore stations shown on UTEM plot from 2200N to 2300N are actual chainage rather than picket labels.
5	874	1500W	The shift in Ch.1 is due to a chainage error.
5	874	2000W	The Ch.1 variations are due to pickets north of tie line 2000N being unlabelled on this line. It turned out the four pickets were directional pickets only and were unchained.
5	874	2500W	Picket 1350N is missing. The station labels on this UTEM DS correspond to picket labels.
7	876	4500W	The high Ch. 1 values near the loop are due to uncertainty in location of loop front.
		5500	The slight -0.5% Ch. 2 negative caused by intermittent transmitter protection. Transmitter readjusted for other lines.
9	878	1000W	In the field, all pickets on this line are labelled from 1000N to 1900N whereas they should have been labelled 2000N to 2900N, as shown on this plot.

<u>Loop Number</u>	<u>Loop Area</u>	<u>Line</u>
--------------------	------------------	-------------

9	878	0W
10	880	4000W
12	882	6500W
12	882	6000W

The rise in Ch. 1 at station 2800N is due to a lost picket and so the station location was estimated.

Picket 2200N is missing. Stations 2300N to 3350N are picket labels and 50 metres should be subtracted from these labels to obtain true chainages.

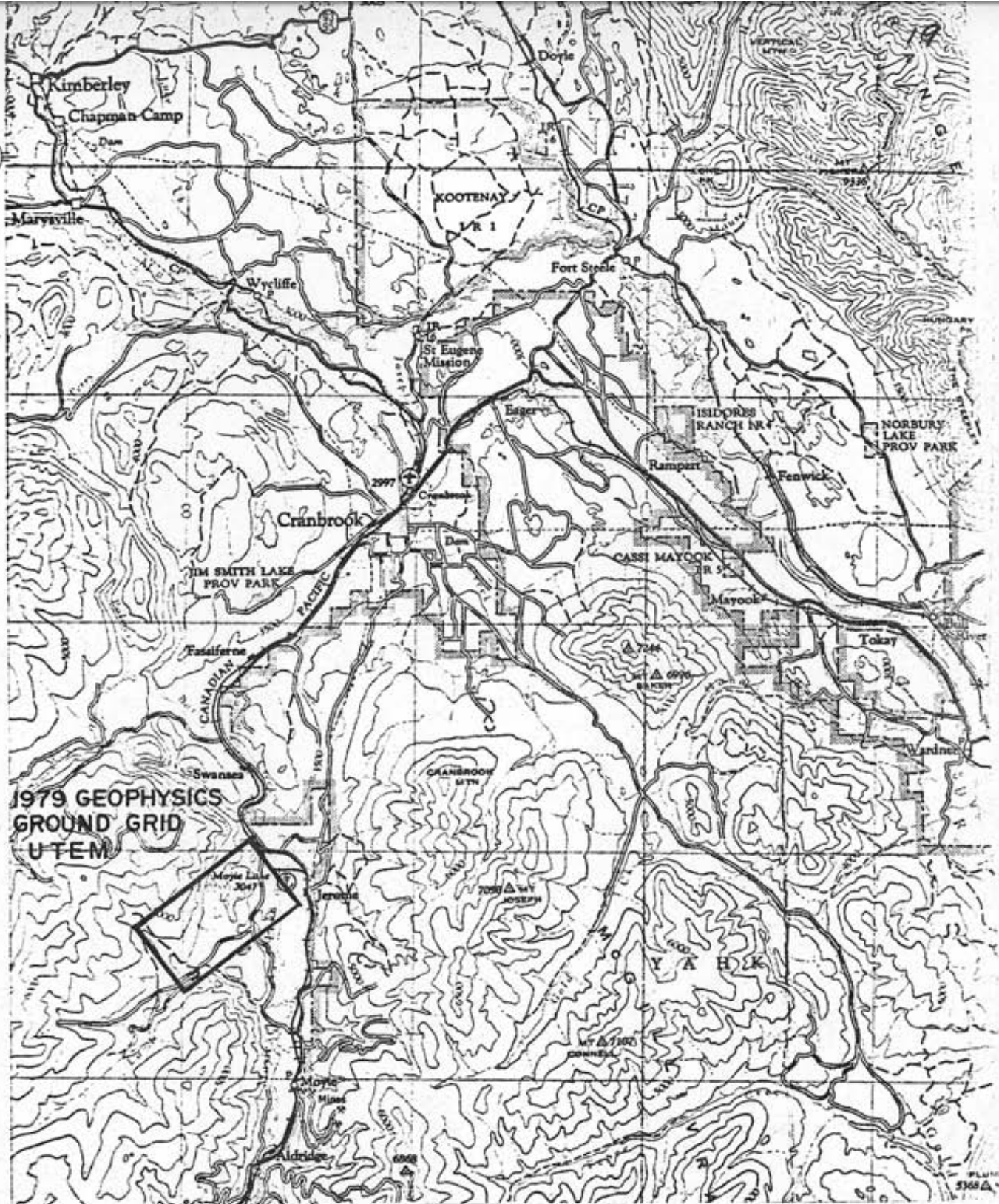
In the field pickets have been mislabeled. The sequence in the field is 2400N-2450N-2500N-2450N-2500N-2550N-etc. The stations shown on the plot are actual chainages however.

At 2050N, the picket was down on the road and the station location had to be estimated.

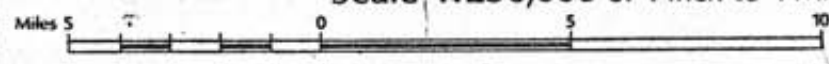
In the field, picket 2500N is missing. The labels shown on the plot are actual chainages, however.

Transmitter wire broken by mean old grizzly.

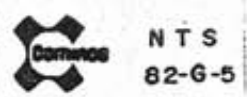
Field work ended here, July 4, 1979.



Scale 1:250,000 or 1 Inch to 4 Miles



VINE PROPERTY



Drawn by:		Traced by:	
Revised by	Date	Revised by	Date

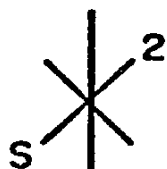
LOCATION MAP
FORT STEELE M. D., B.C.

Scale: 1:250,000 Date: AUG 1979 Plate: 153-79-1

LEGEND
UTEM COMPILATION MAP

11

SYMBOL	CHANNEL	MEAN DELAY TIME	
		15 Hz	30 Hz
	1	25.6 ms	12.8 ms
/	2	12.8	6.4
\	3	6.4	3.2
□	4	3.2	1.6
Σ	5	1.6	0.8
Δ	6	0.8	0.4
7	7	0.4	0.2
8	8	0.2	0.1
Δ	9	0.1	0.05
◇	10	0.05	

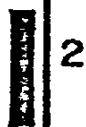


Axis of a cross-over anomaly. The number indicates the latest anomalous channel.

Depth indicated by: S - Shallow (< 30m)
M - Moderate (30-75m)
D - Deep (> 75m)



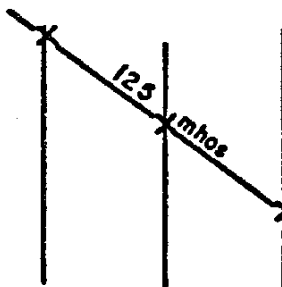
Axis of reversed cross-over anomaly produced when a small conductor dips at less than 70° towards the transmitter. In normal cross-over the positive response is towards the transmitter; reversed one, it is away from the transmitter.



Indicates a negative anomaly of width shown by the dash. The latest anomalous channel is shown. Can sometimes be confused with the negative part of a cross-over anomaly.



Outline of a transmitter loop.



Conductor axis located by cross-over anomalies with a conductance determination. The conductance is the interpreted conductivity x thickness of the conductor in mhos (same as Siemens).

Only the principal cross-overs are indicated in Plate 1.

DATA SECTIONS

(1 to 36)

ORDINATE: Amplitude scale is given in %.

ABSCISSA: Station or picket numbers in metres.

LEGEND: The legend to data section #1 is explained as follows:

VINE 79: Survey area and year

LP 1: Loop number

30.50 Hz: Base frequency of the transmitter

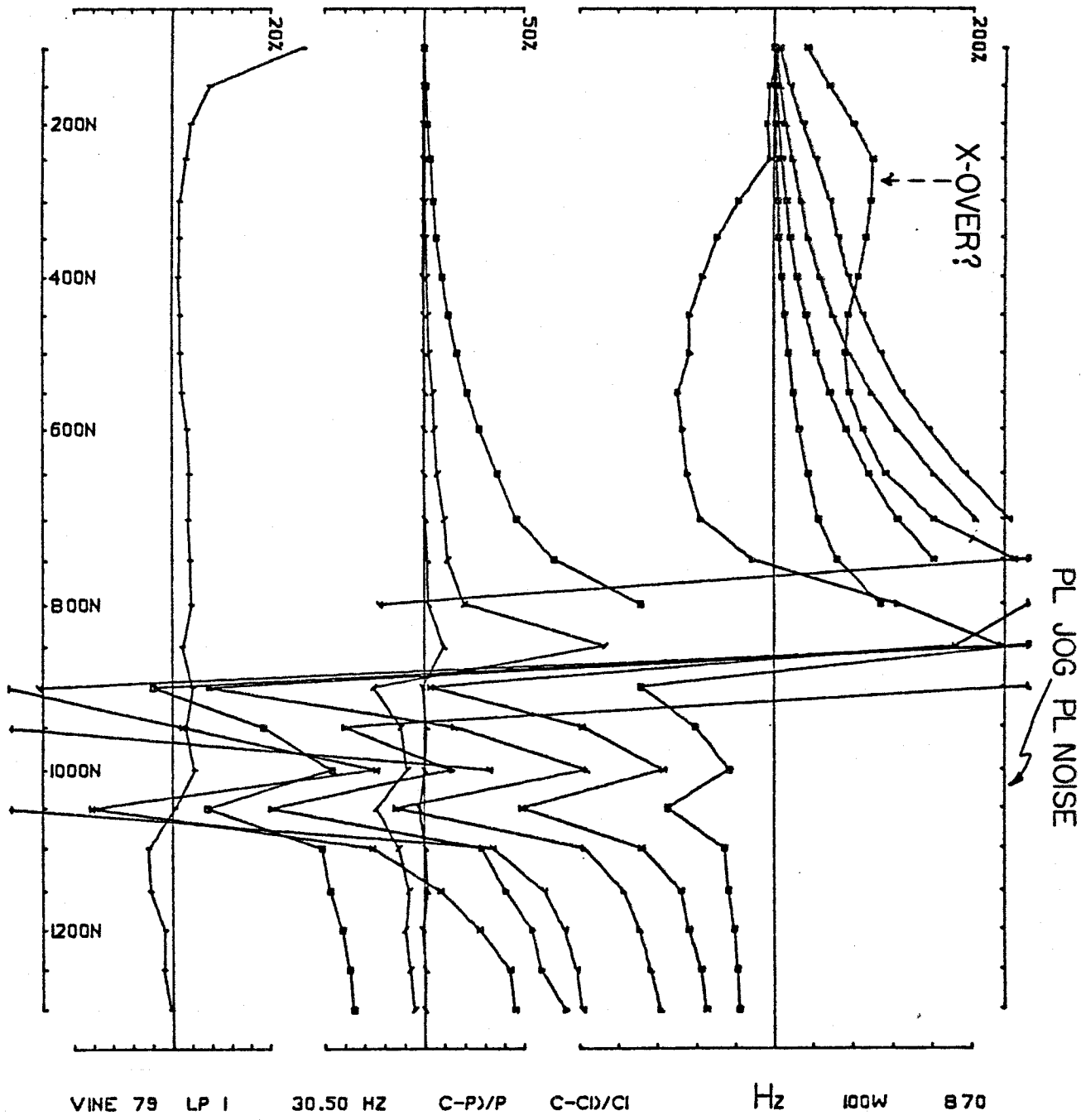
(C-P)/P: Channel 1 reduction as explained in the section on "Data Presentation"

(C-C1)/C1: Reduction for channels 2 to 9 as explained in the section on "Data Presentation"

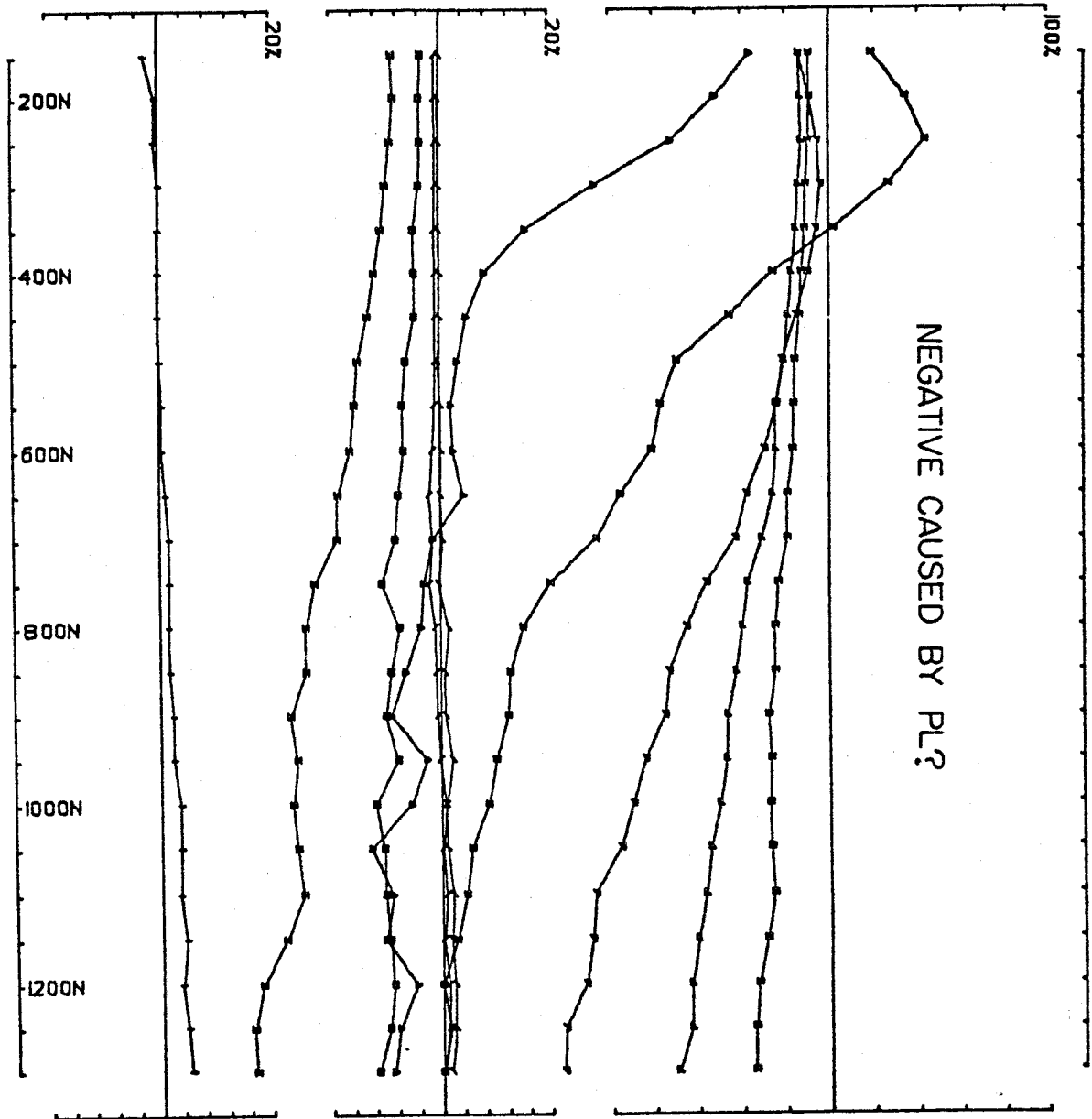
Hz: Denotes the vertical (z) component of the magnetic (H) field

100W: The line number

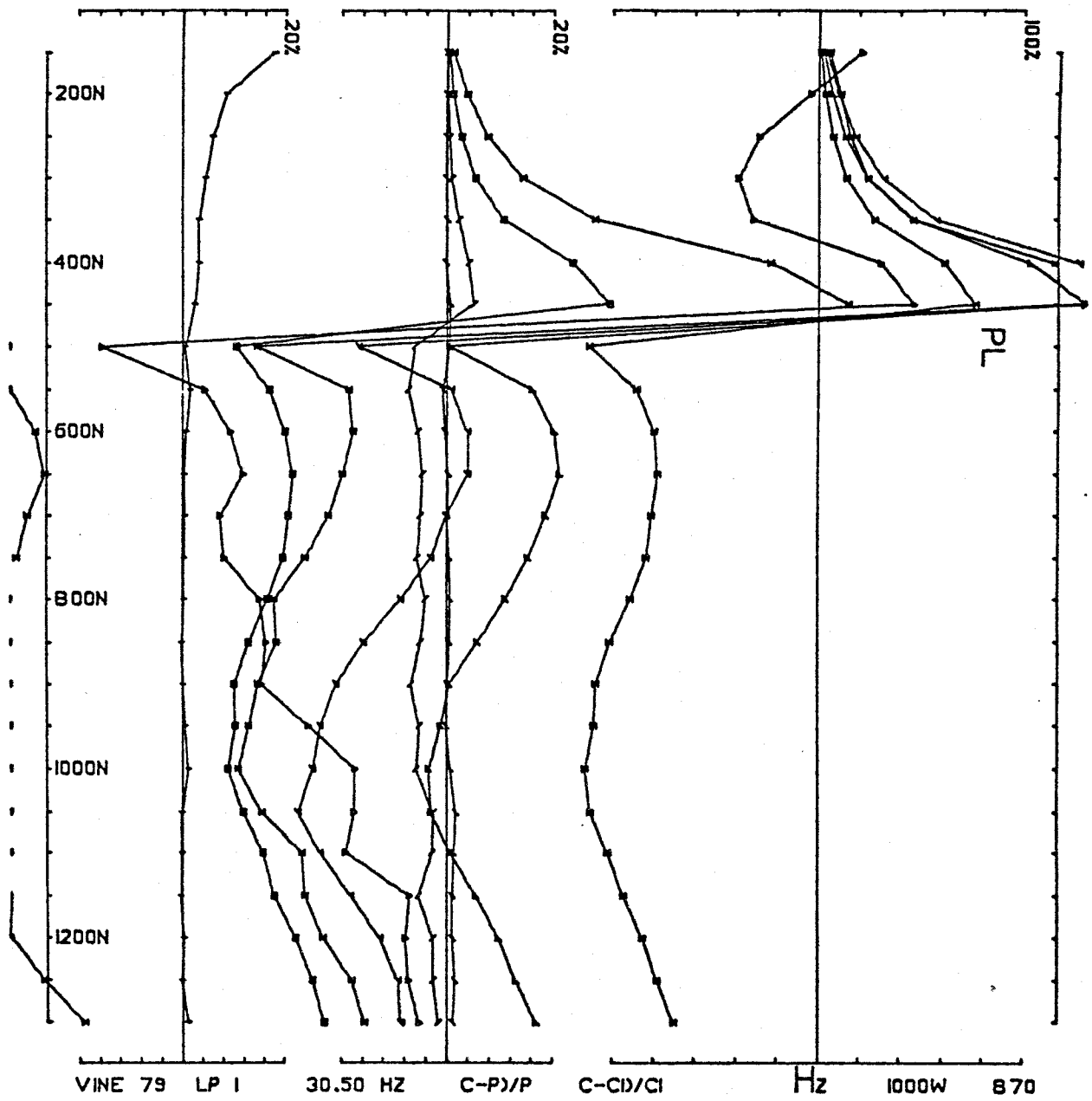
870: The loop area number

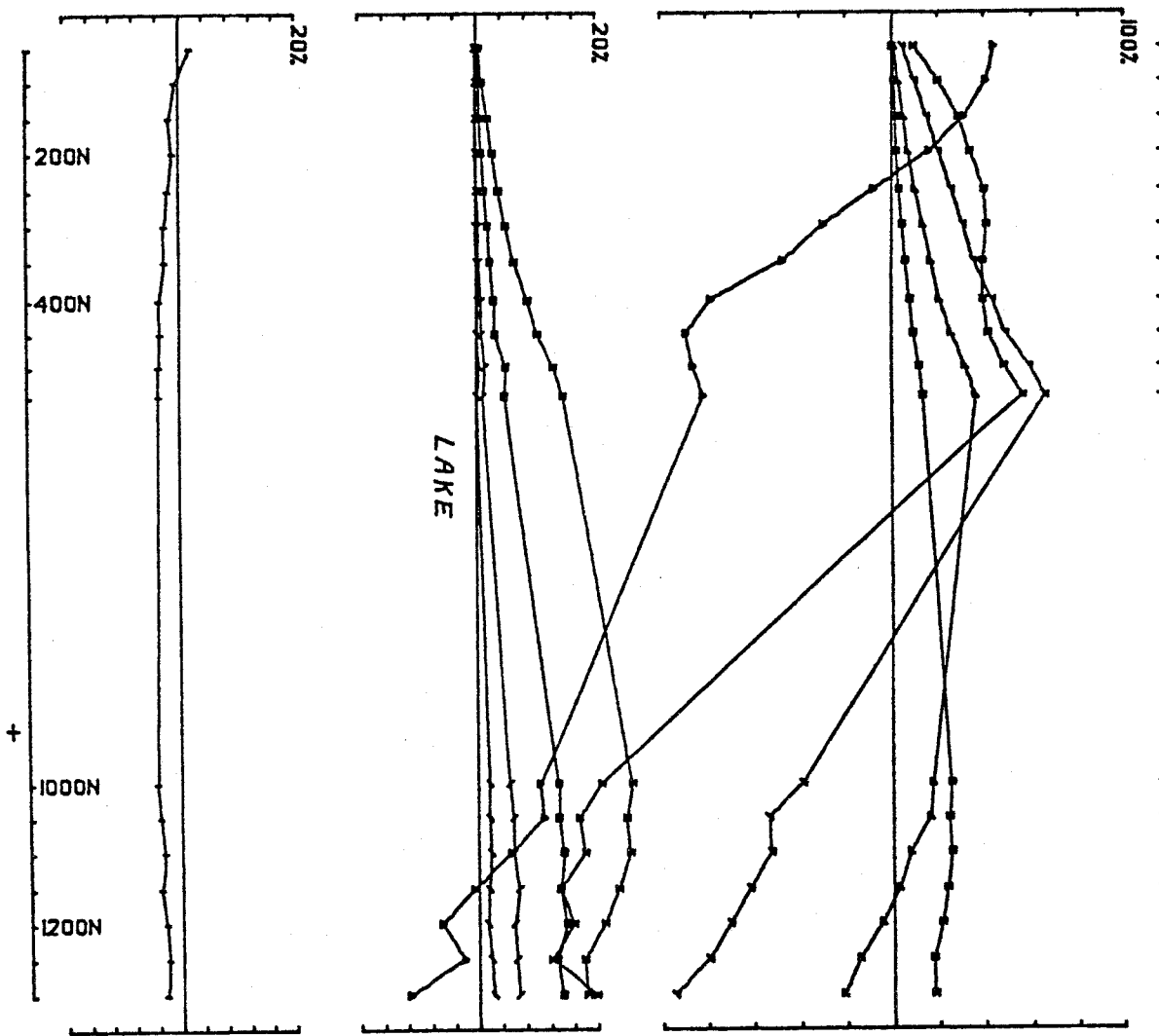


VINE 79 LP I 30.50 HZ C-P)/P C-CI)/CI Hz 100W 870

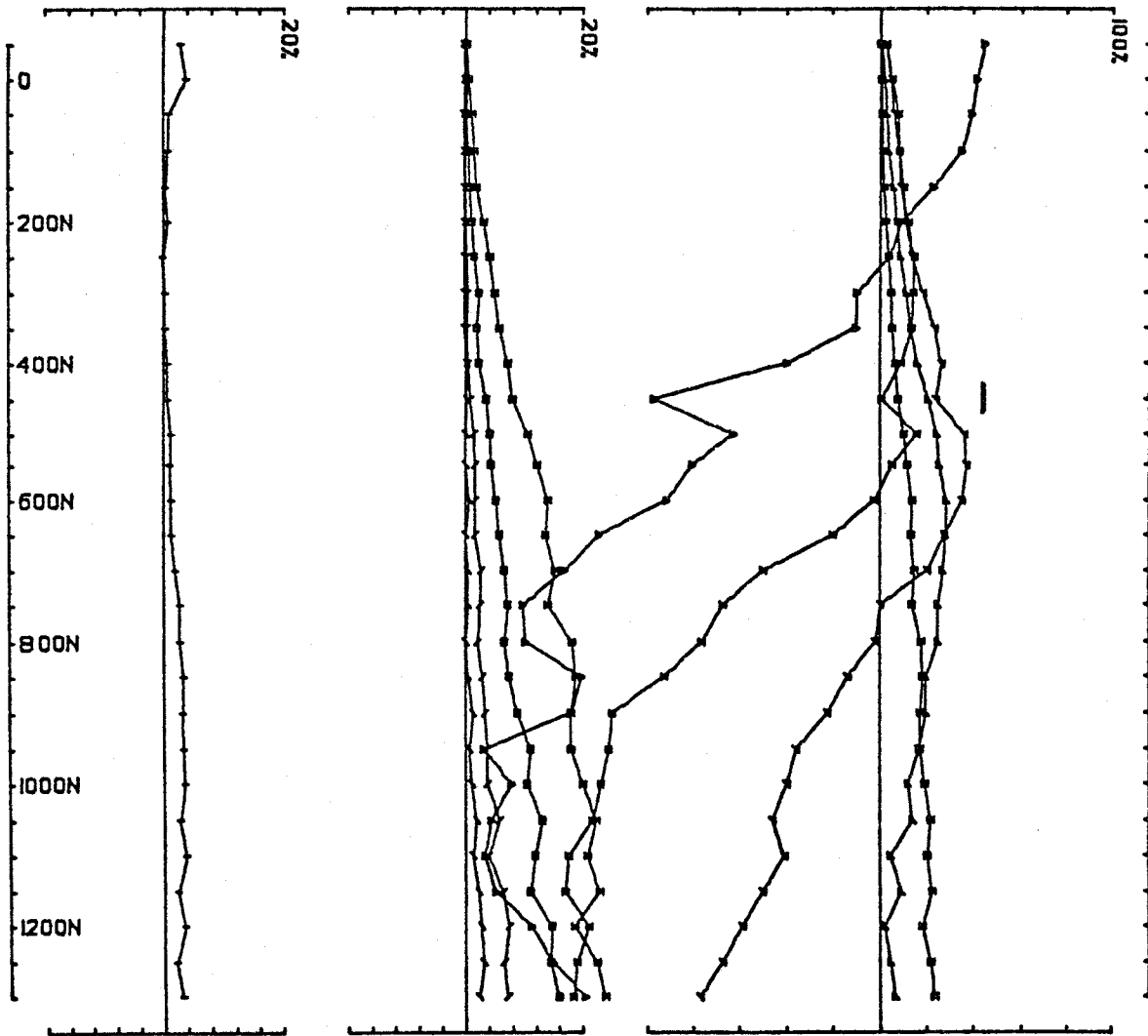


VINE 79 LP 1 30.50 HZ C-P)/P C-CI)/CI Hz 500W 870

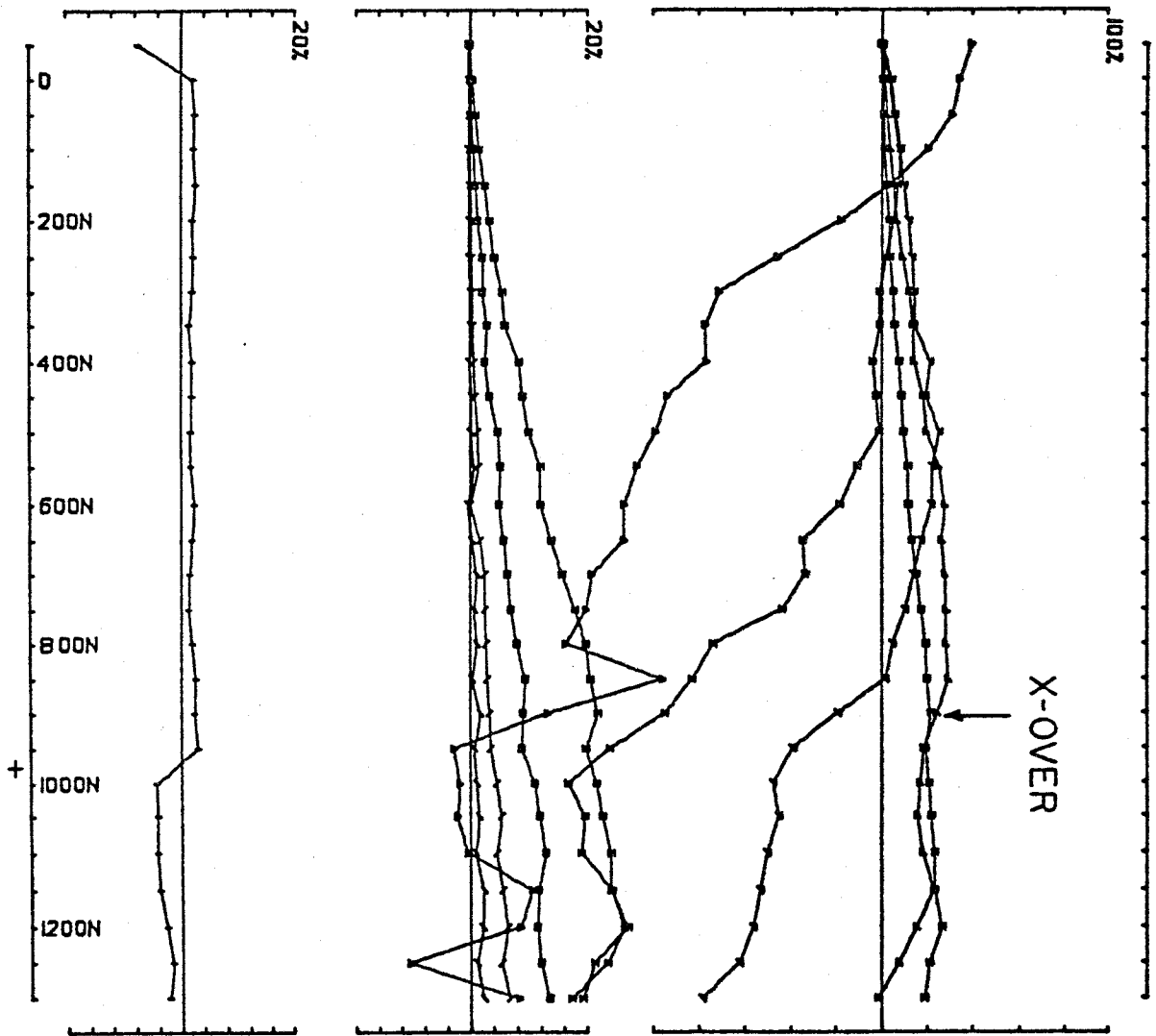




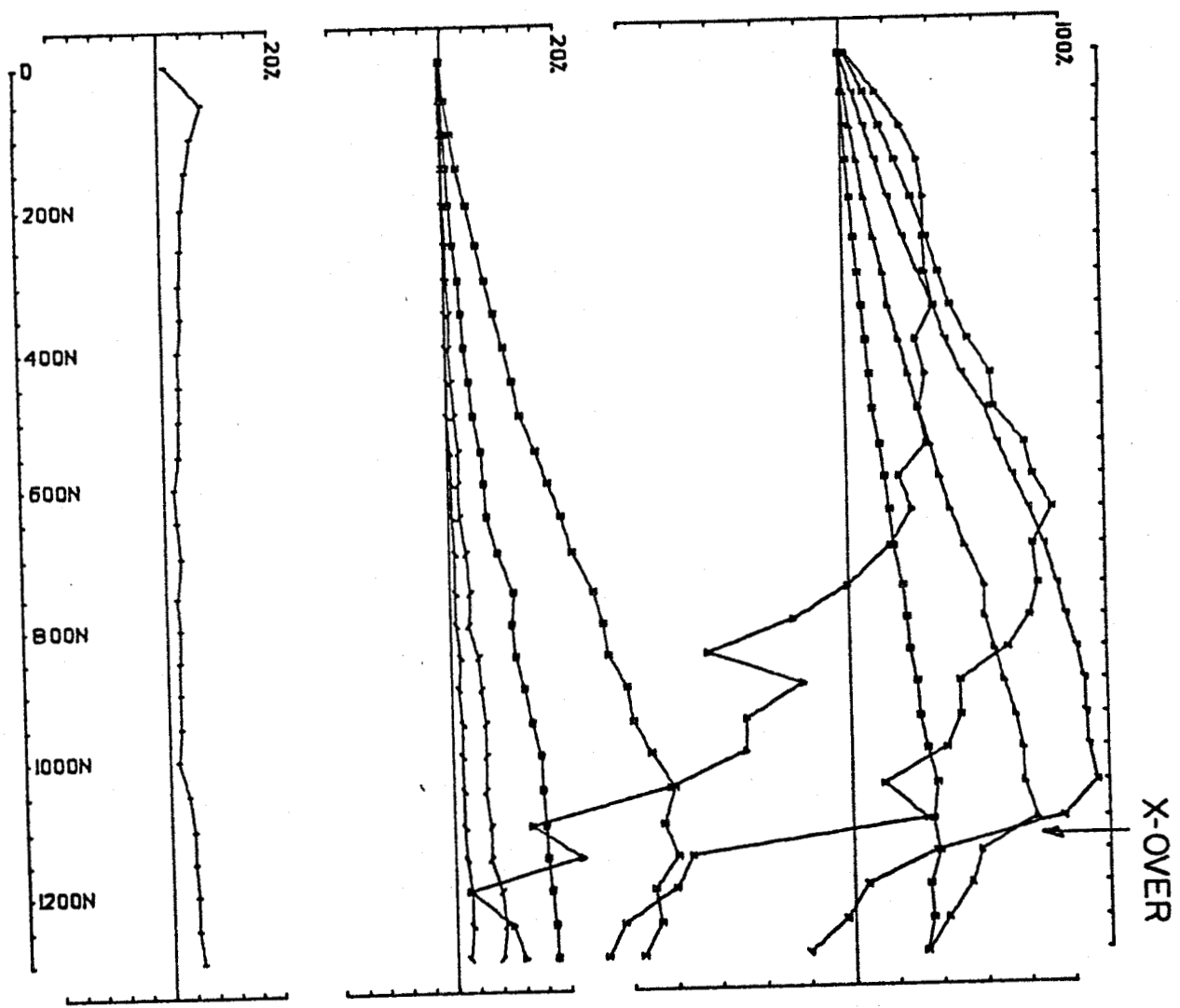
VINE 79 LP 2 30.50 HZ C-P)/P C-CD)/CI Hz 1500W 871



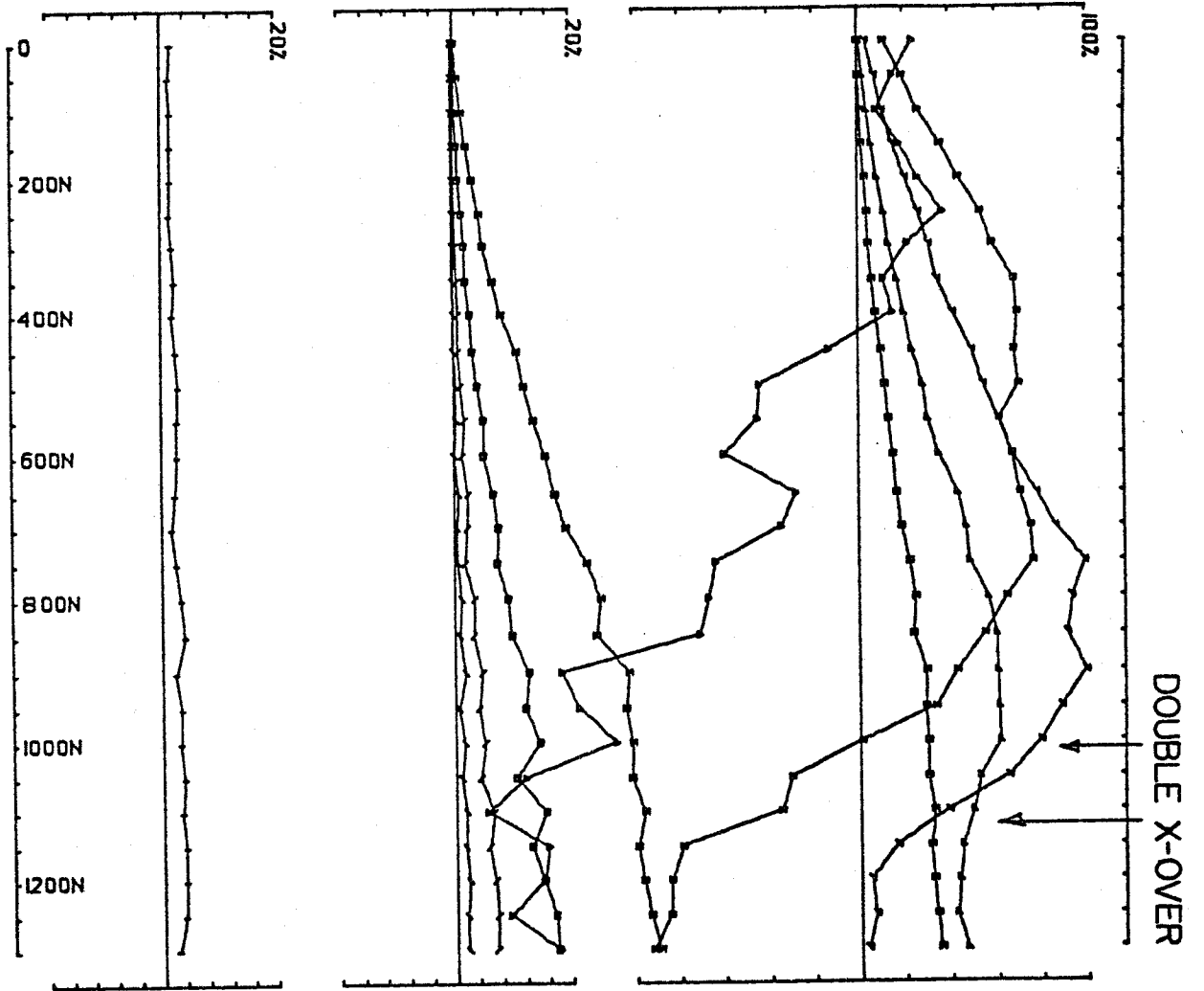
VINE 79 LP 2 30.50 HZ C-P)/P C-CI)/CI Hz 2000W 871



VINE 79 LP 2 30.50 HZ C-P)/P C-CI)/CI Hz 2500W B7I



VINE 79 LP 3 30.50 HZ C-P)/P C-CI)/CI Hz 3000W 872



VINE 79 LP 3

30.50 HZ

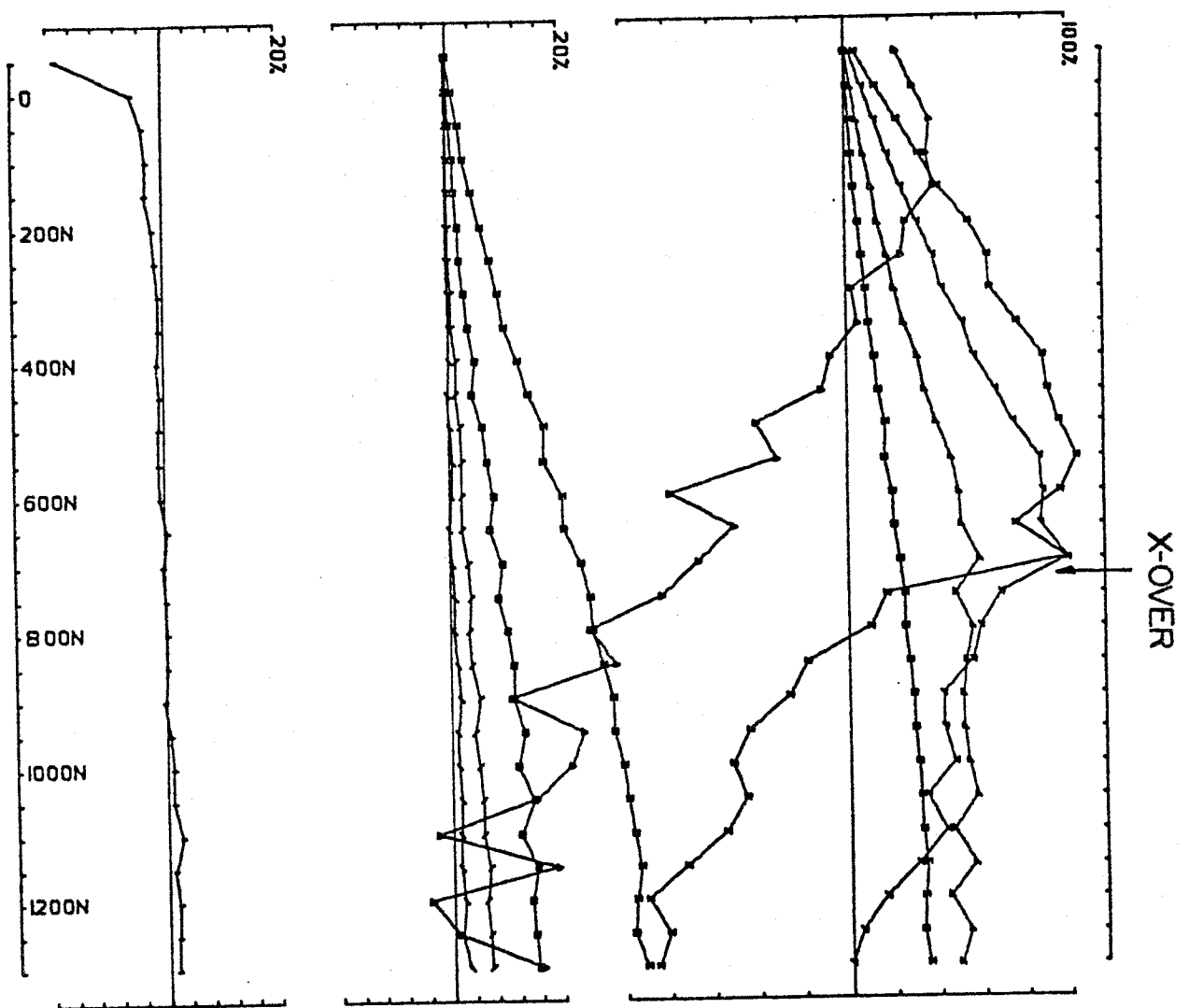
C-P)/P

C-CI)/CI

Hz

3500W

B72



VINE 79 LP 3

30.50 HZ

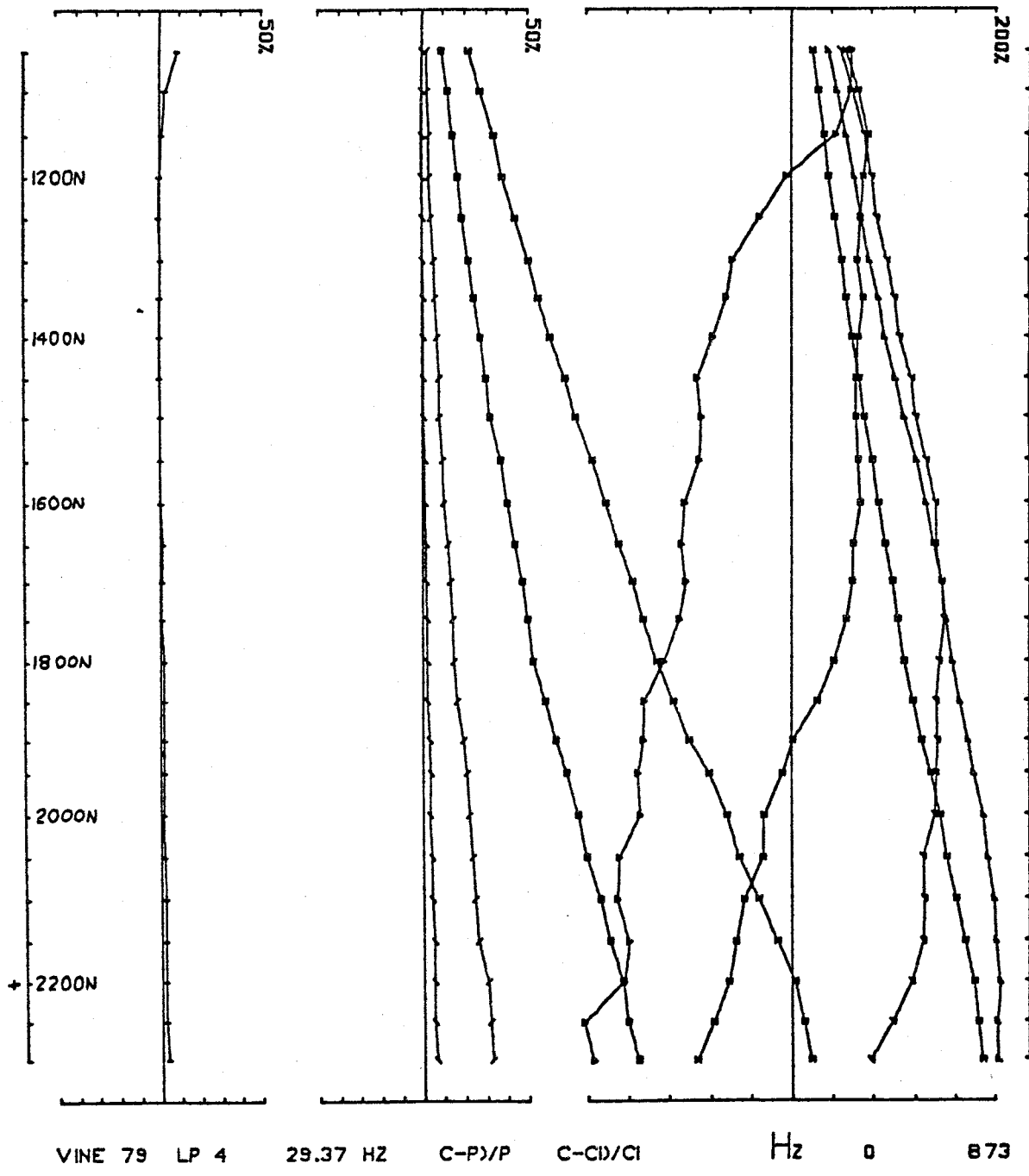
C-P)/P

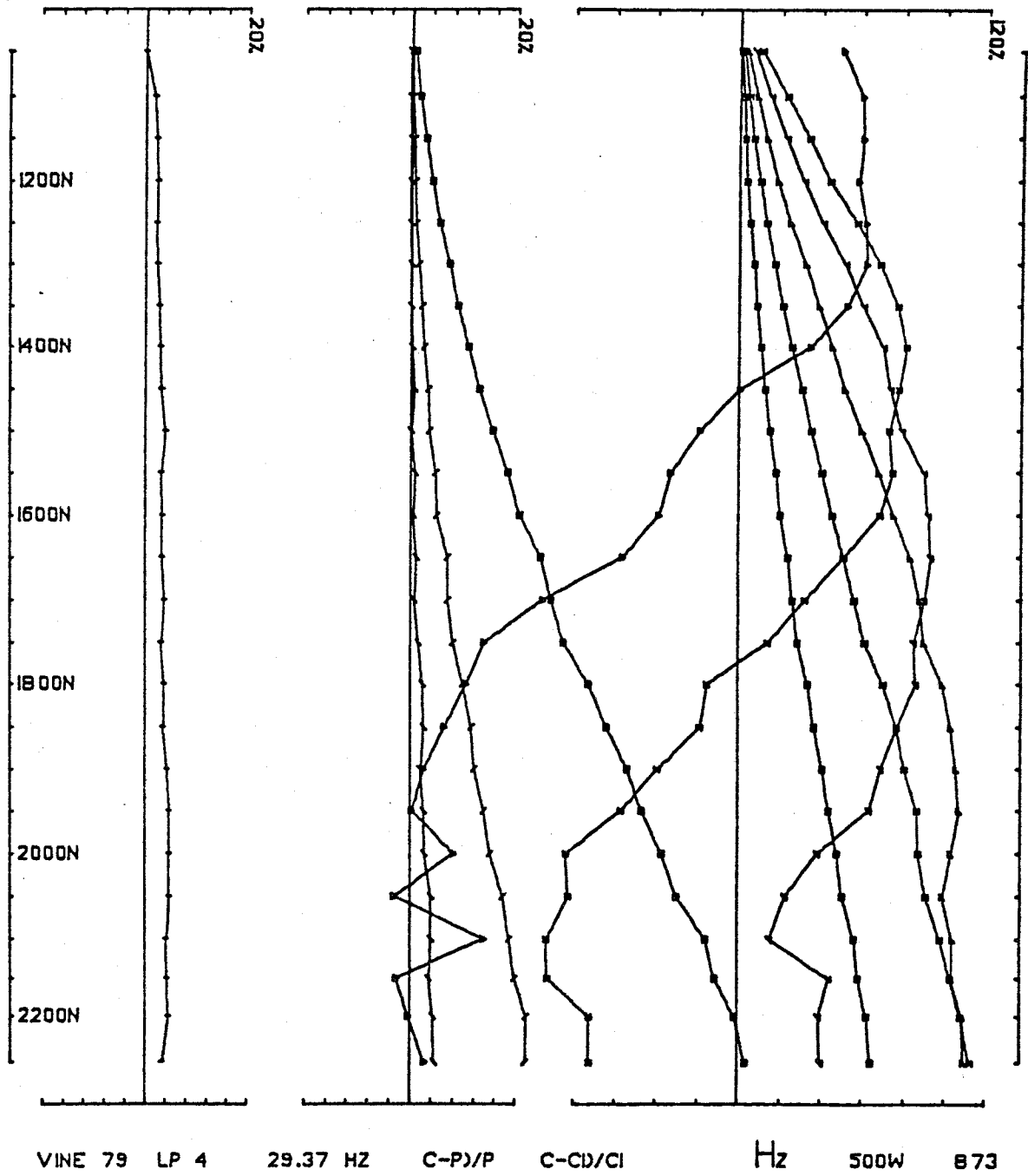
C-CI)/CI

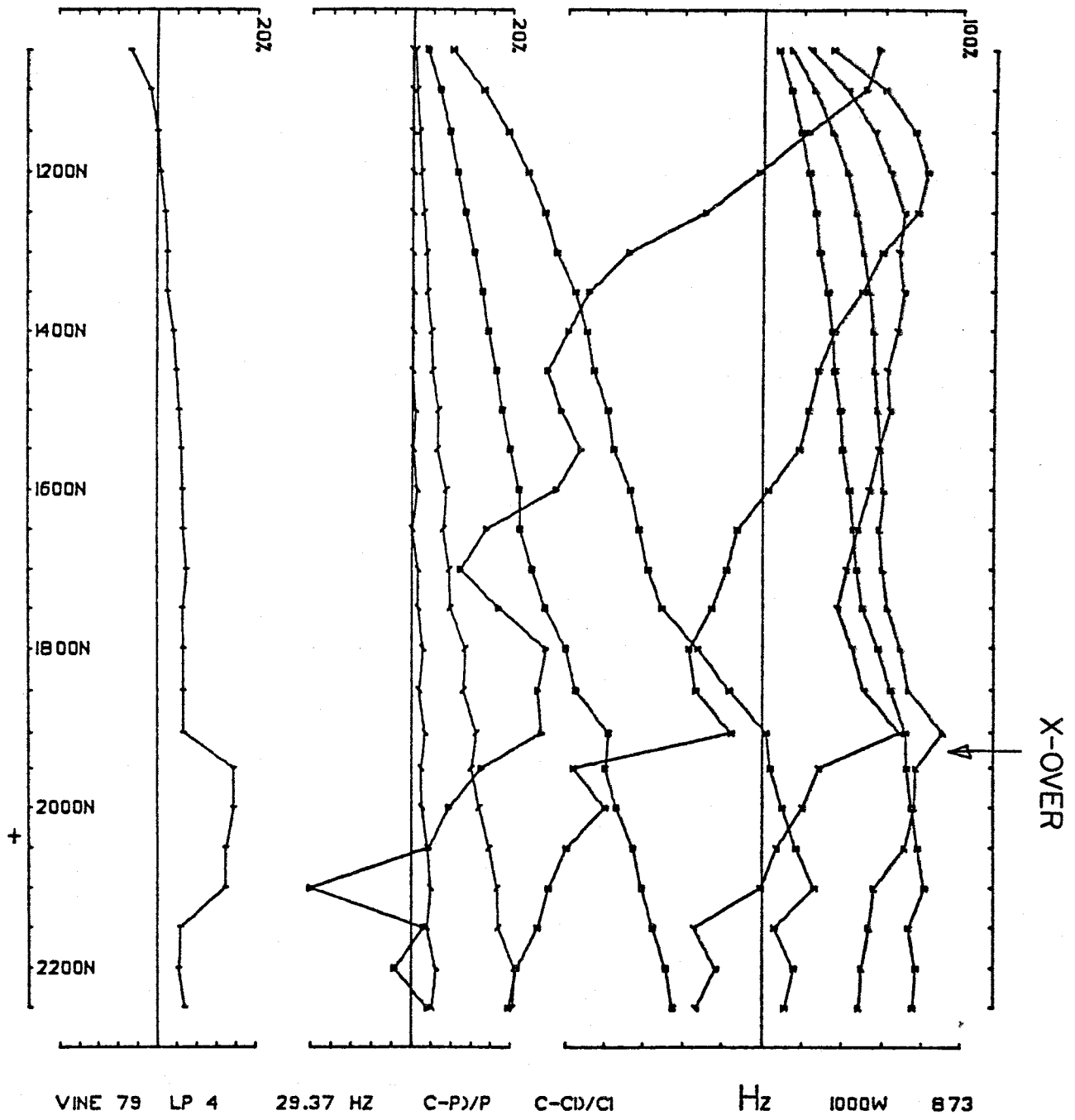
Hz

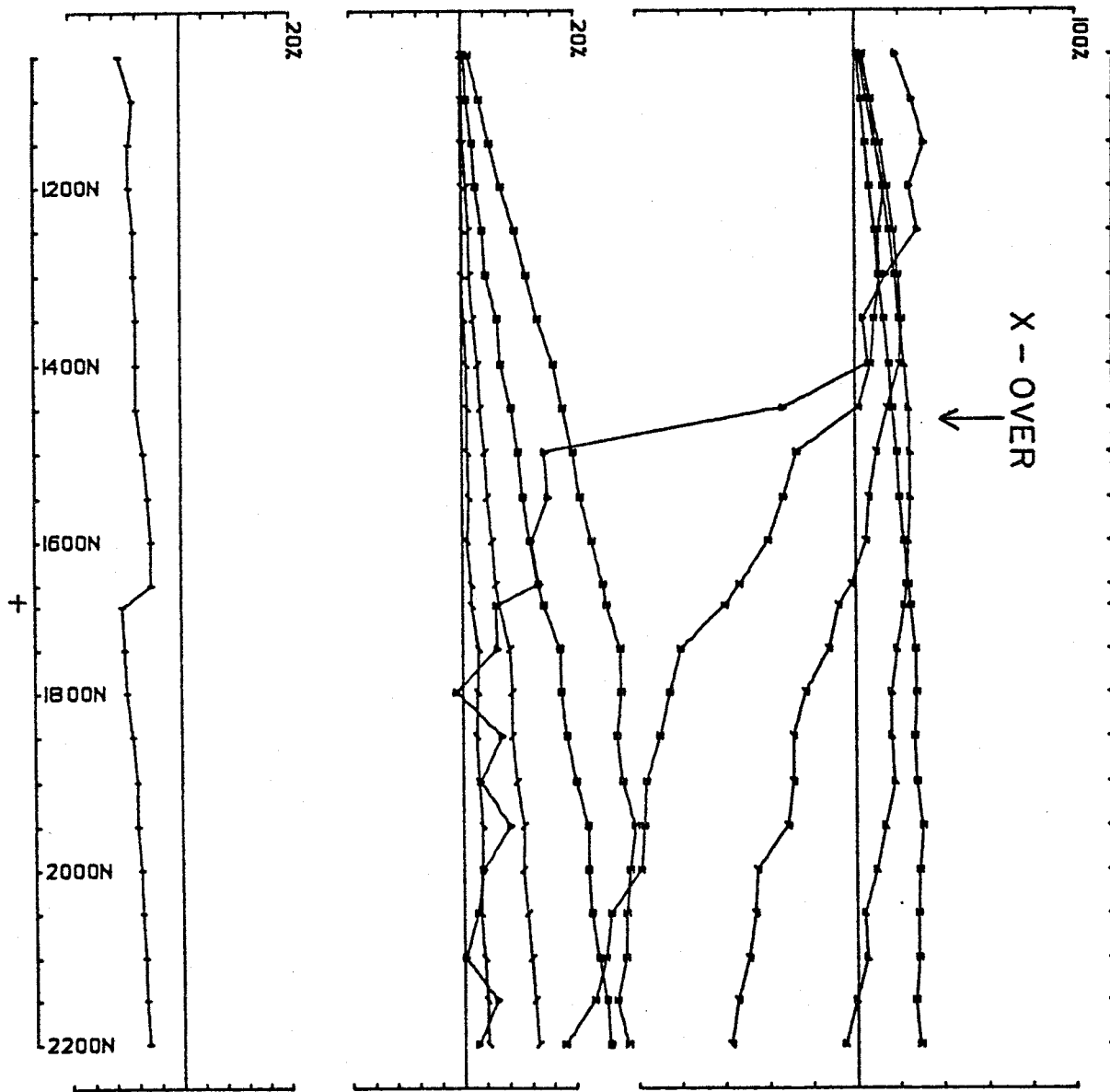
4000W

B72









VINE 79 LP 5

30.50 HZ

C-P)/P

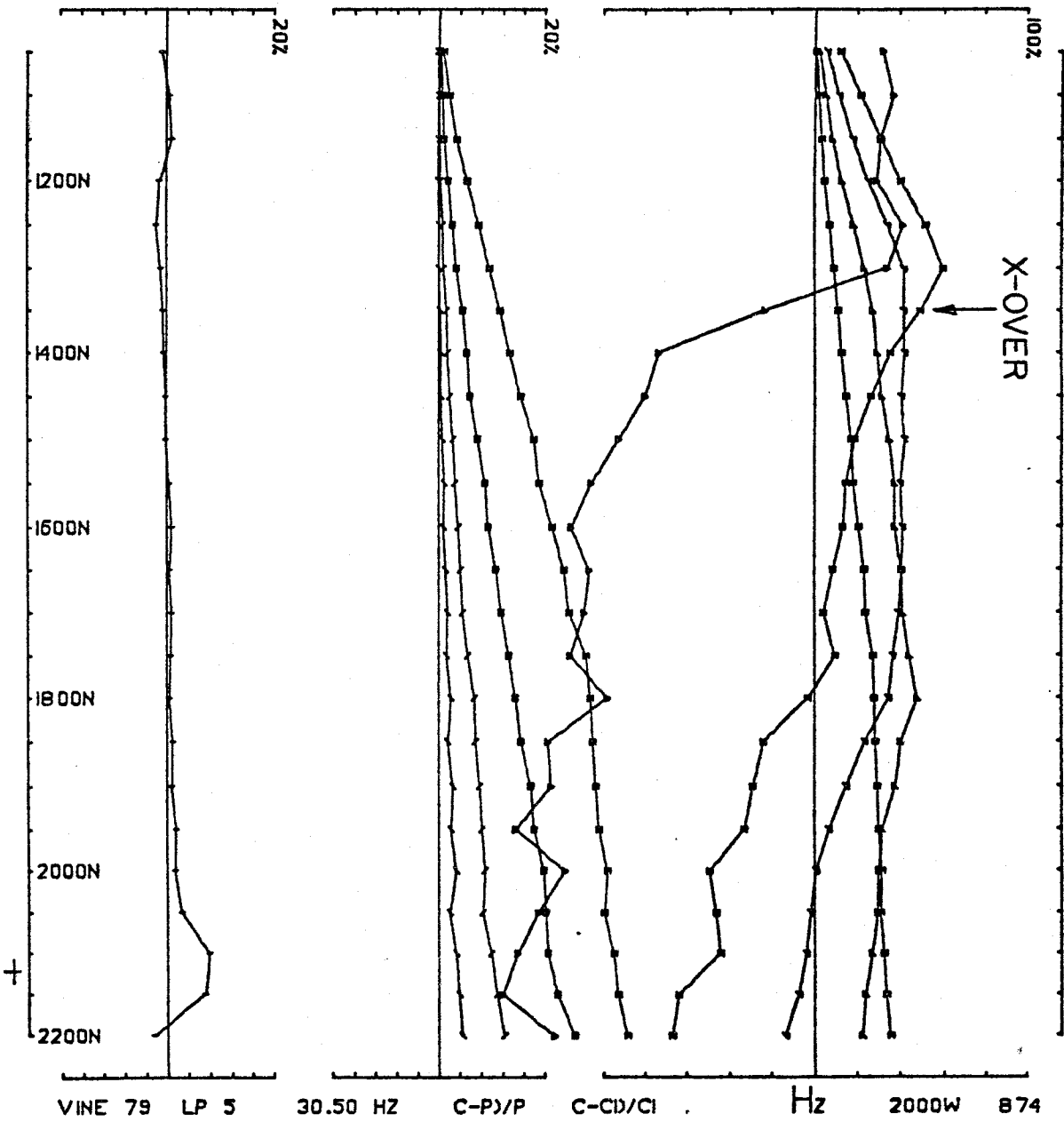
C-CI)/CI

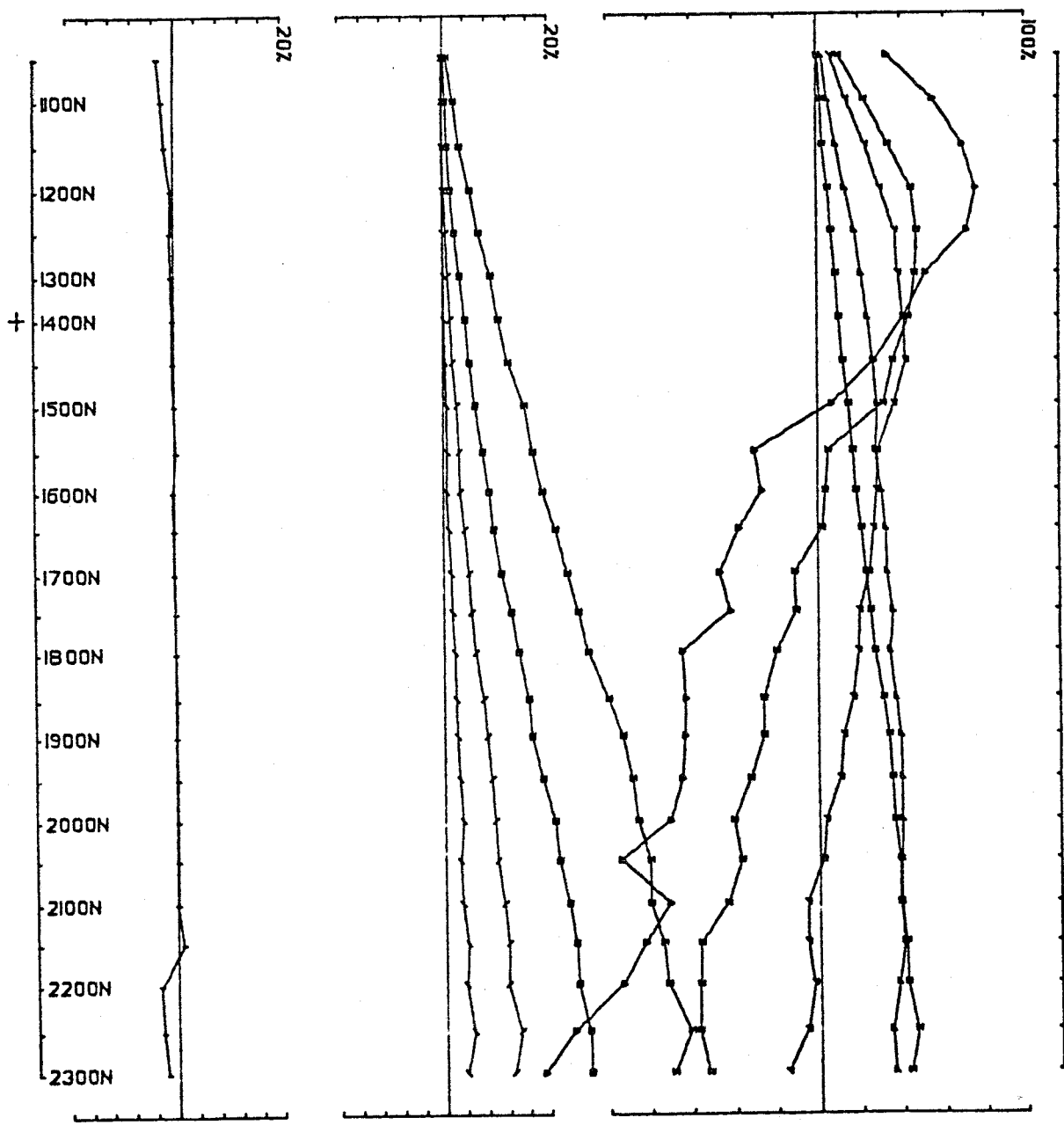
Hz

1500W

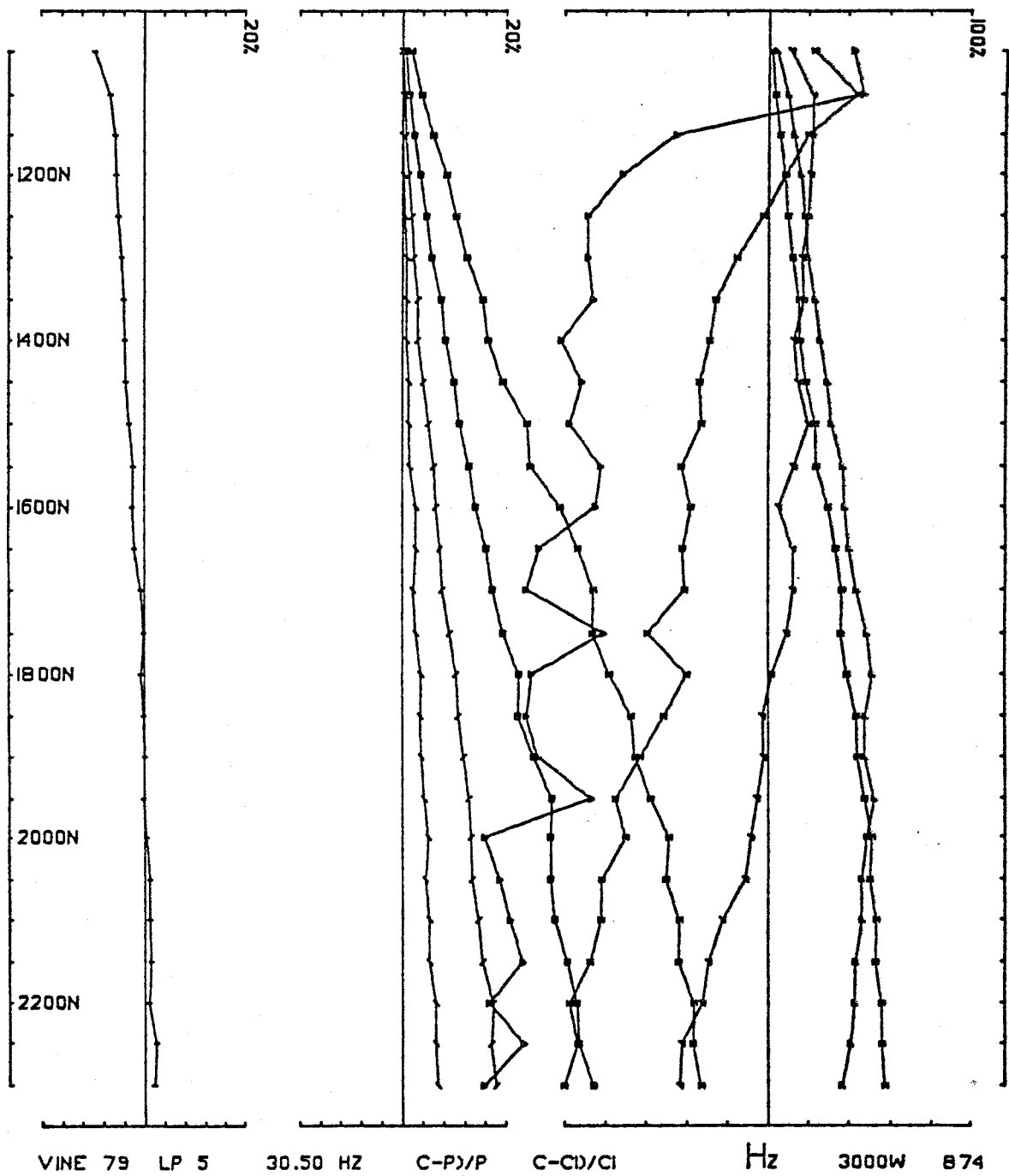
874

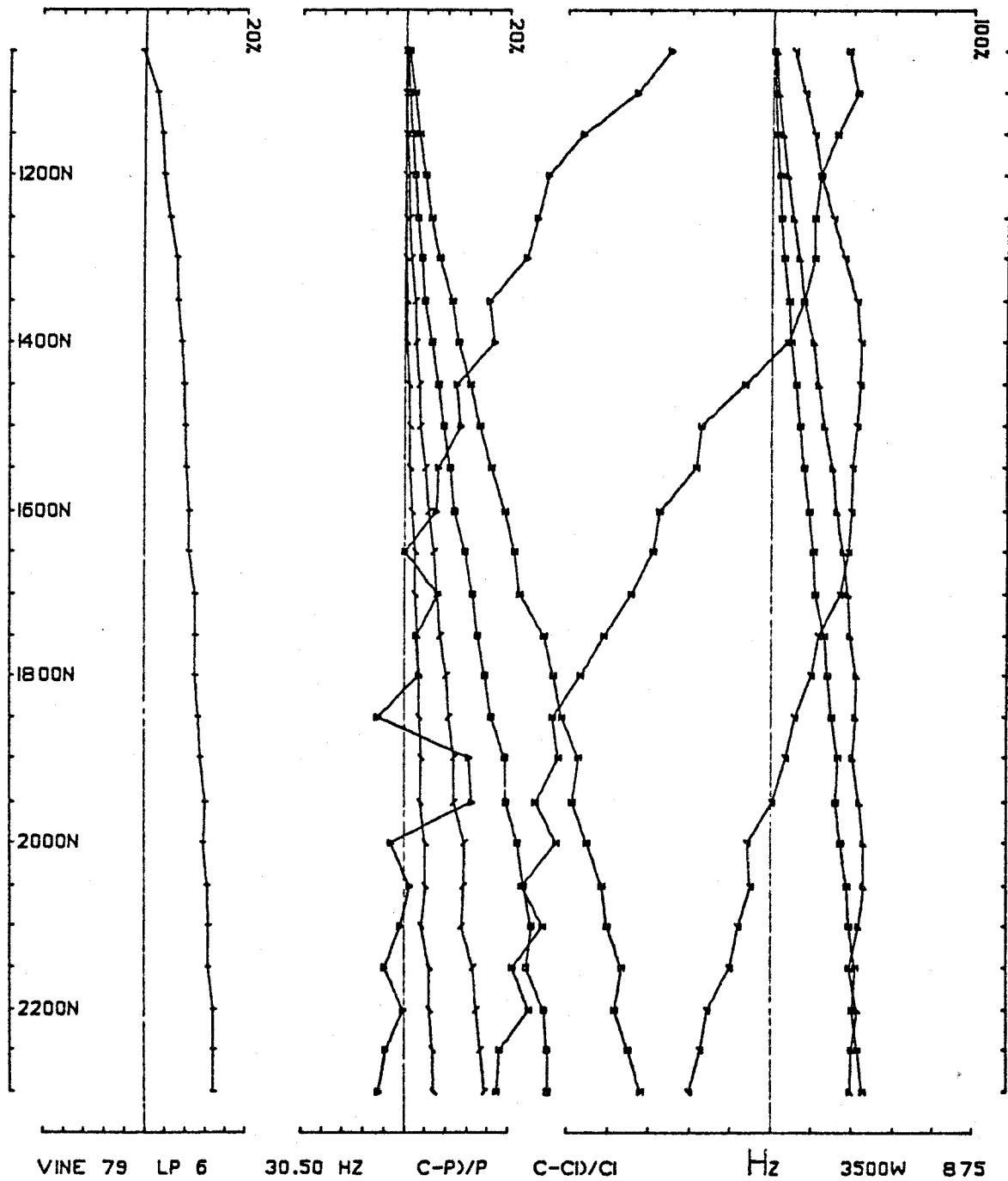
D.S.13

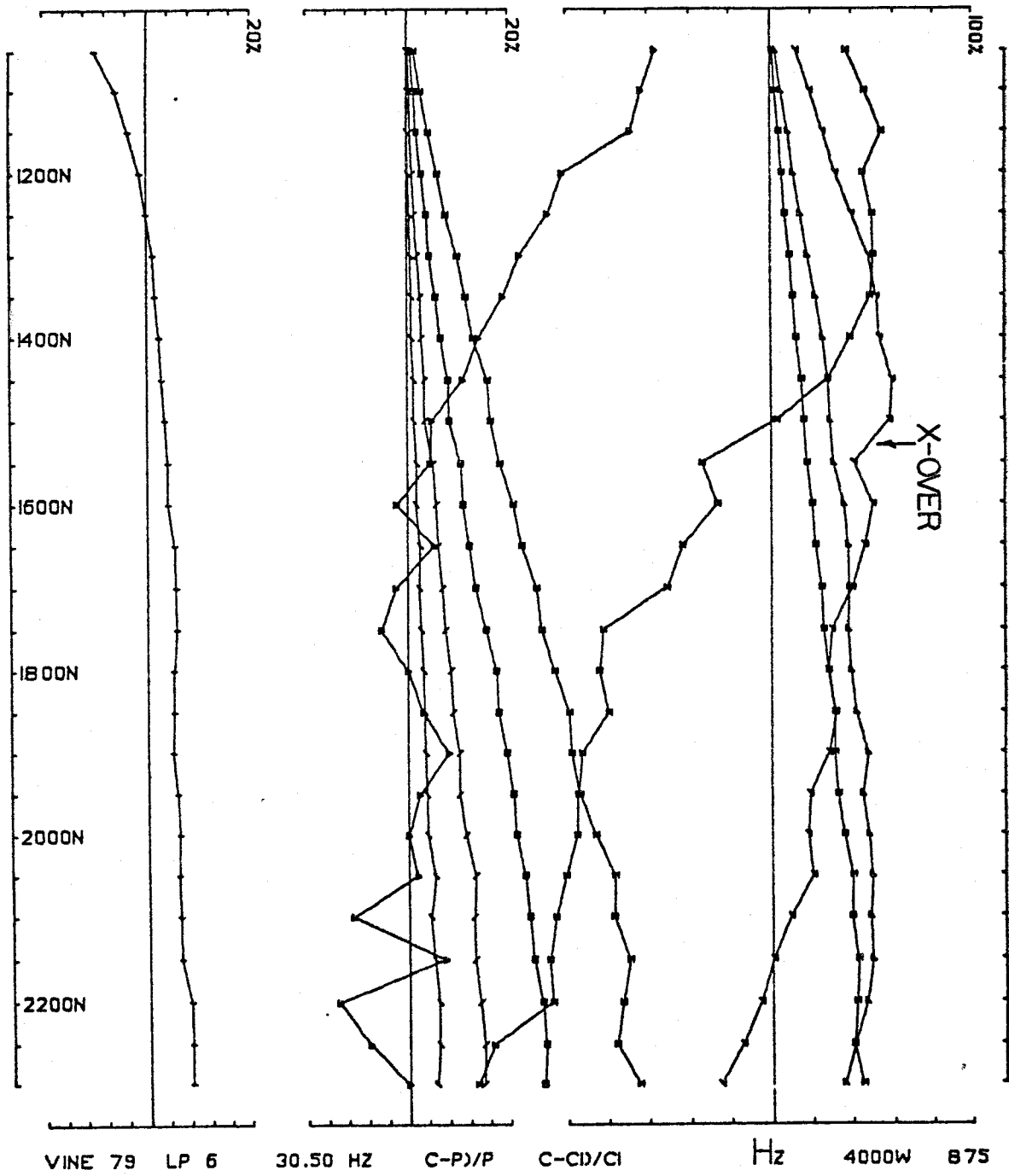


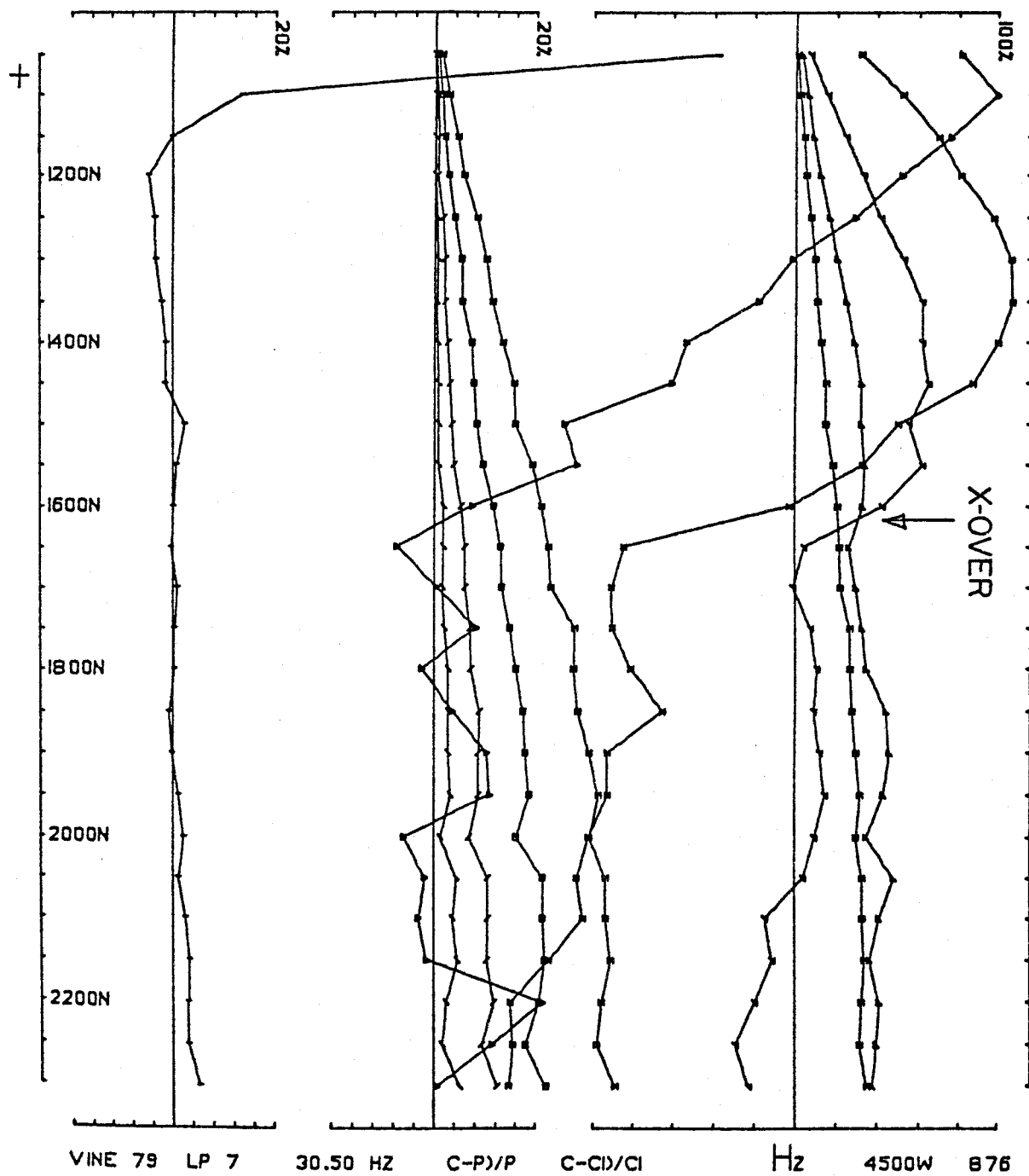


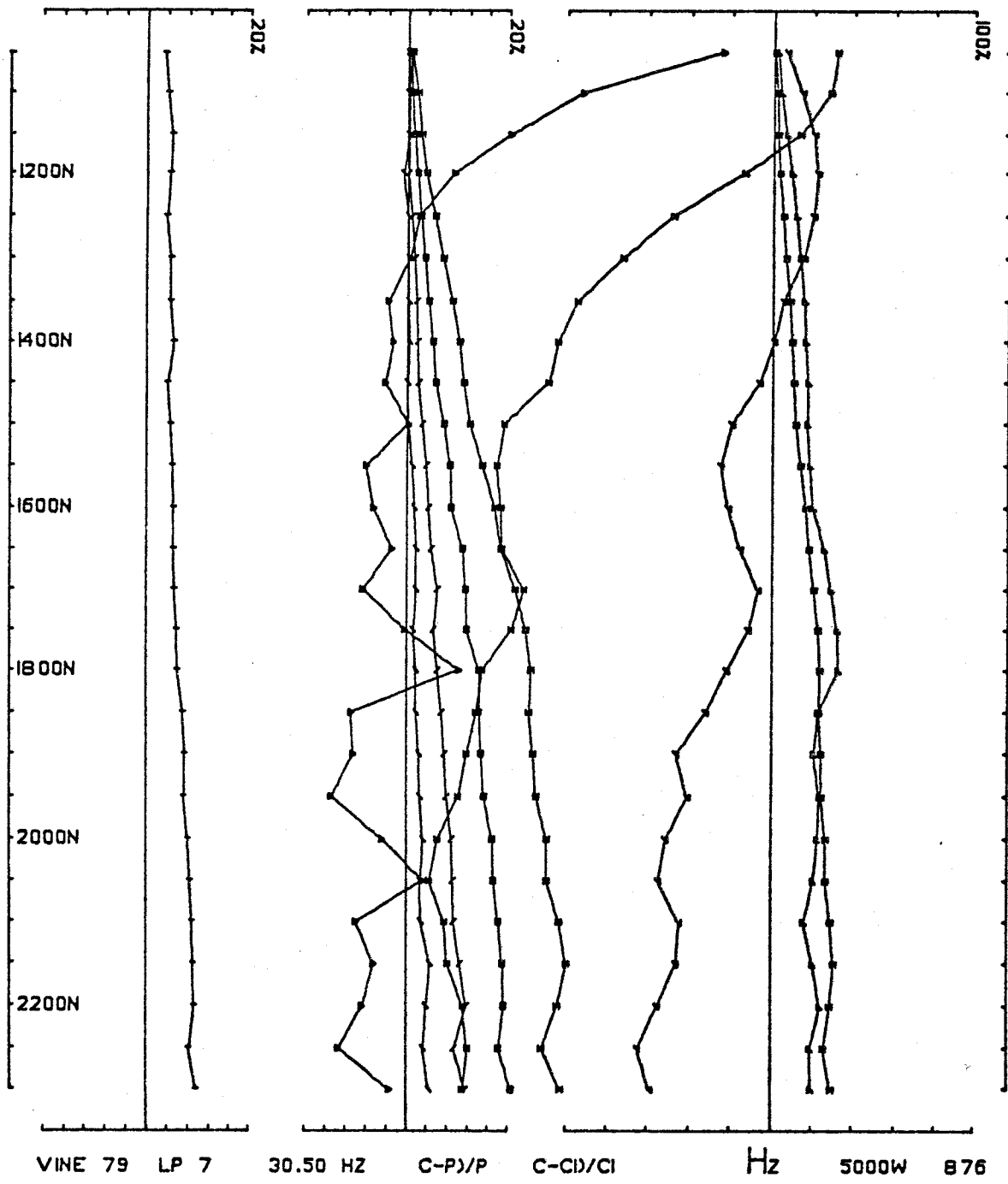
VINE 79 LP 5 30.50 HZ C-P)/P C-(C)/CI Hz 2500W 874

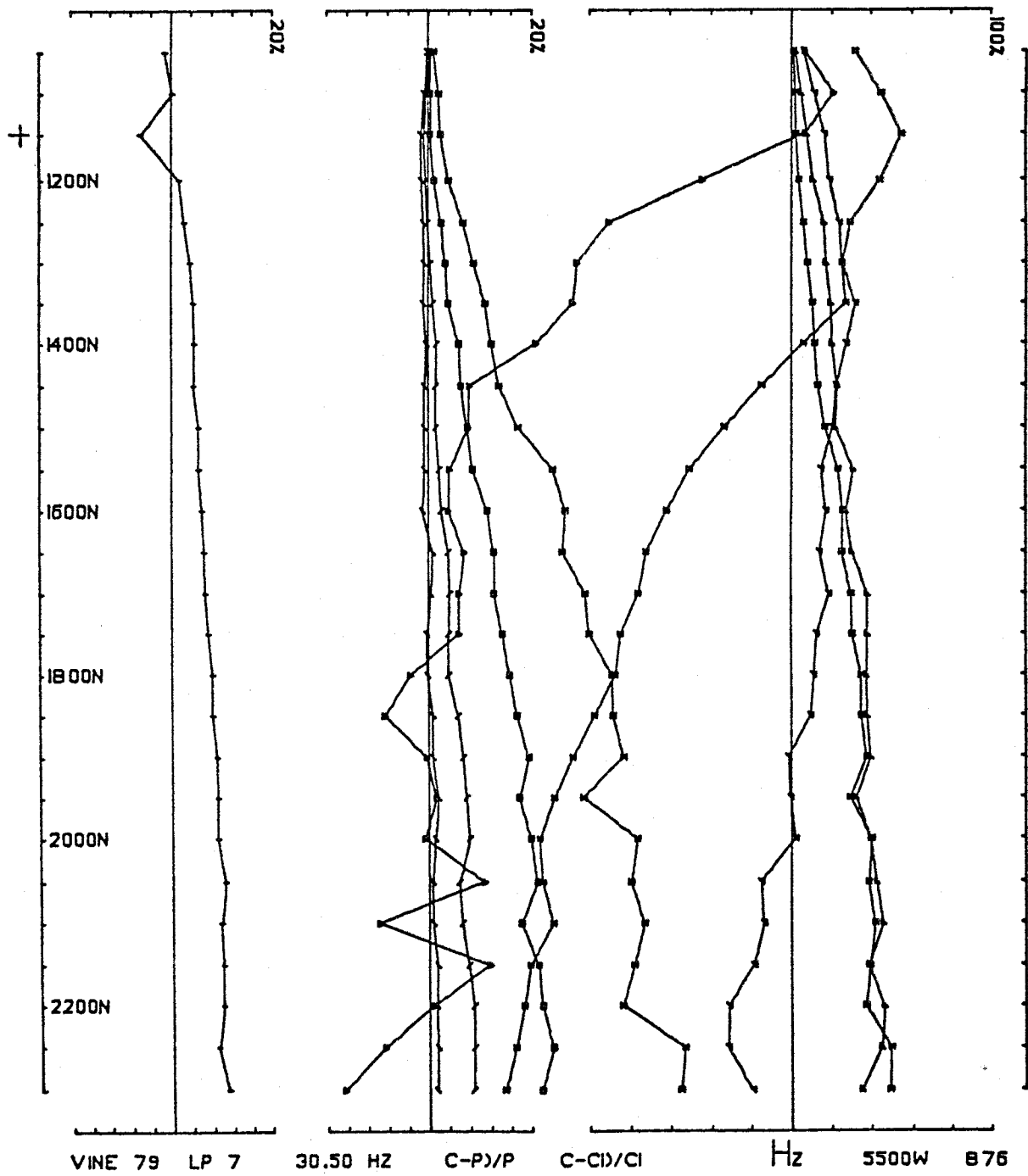


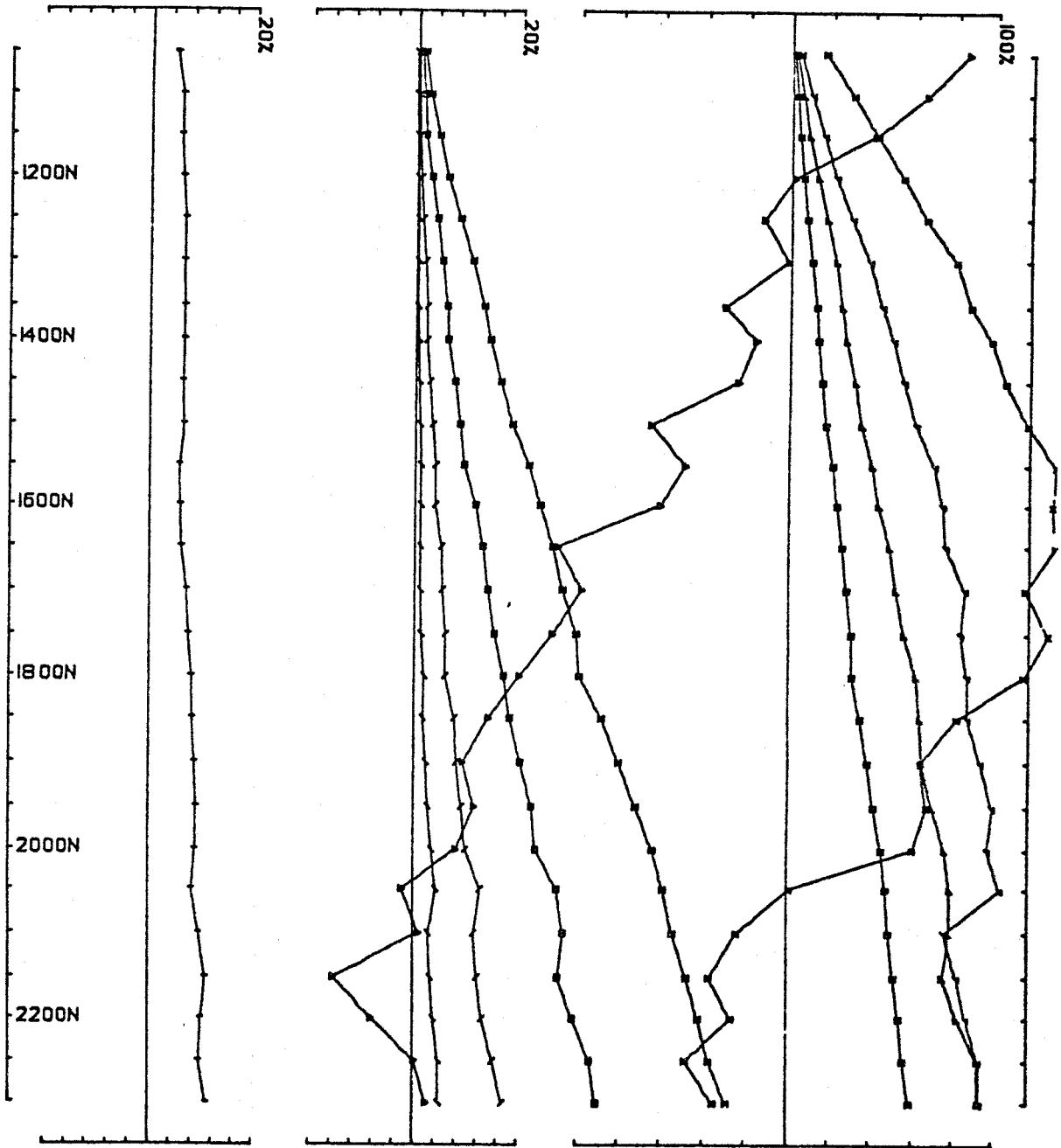




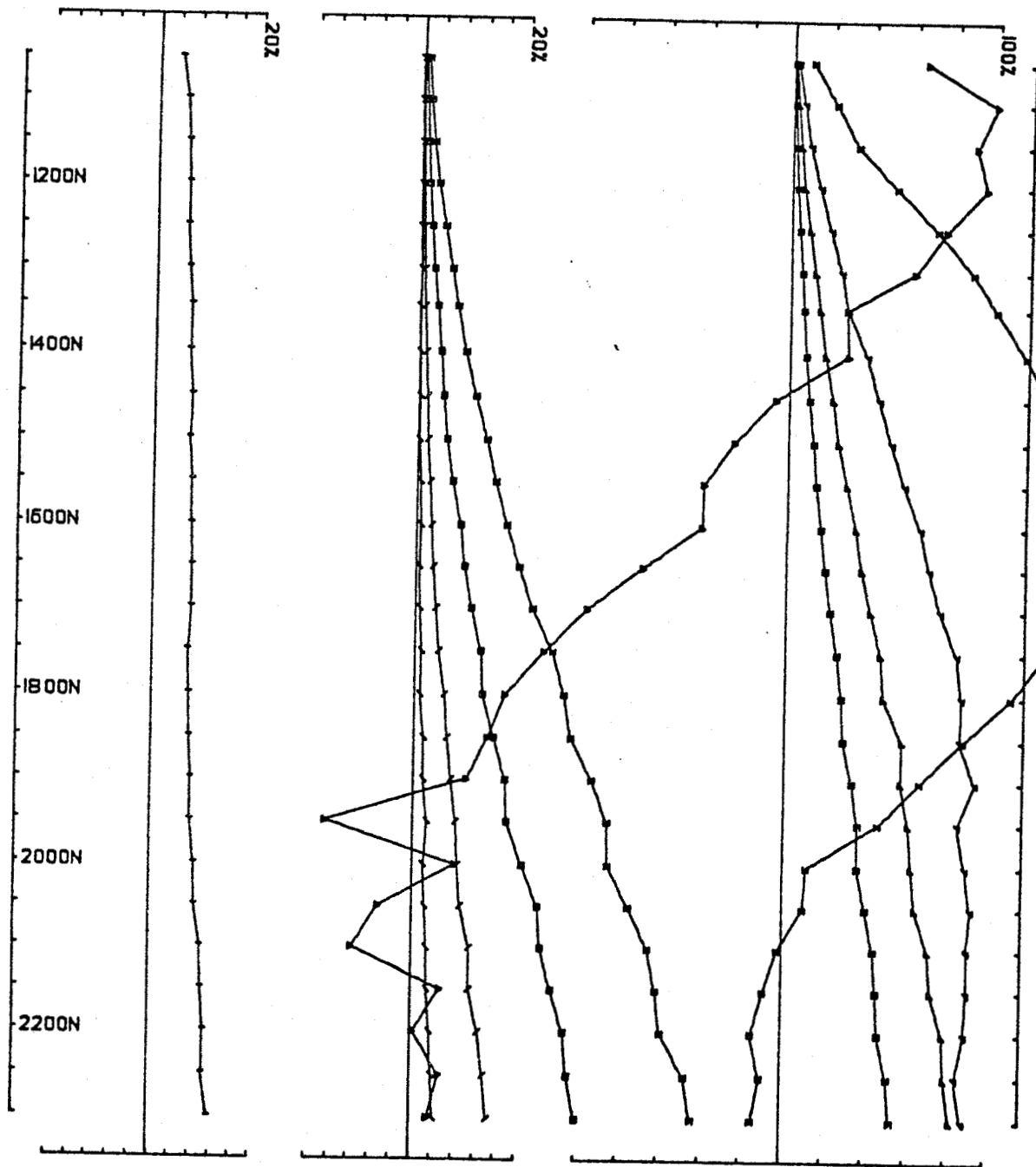




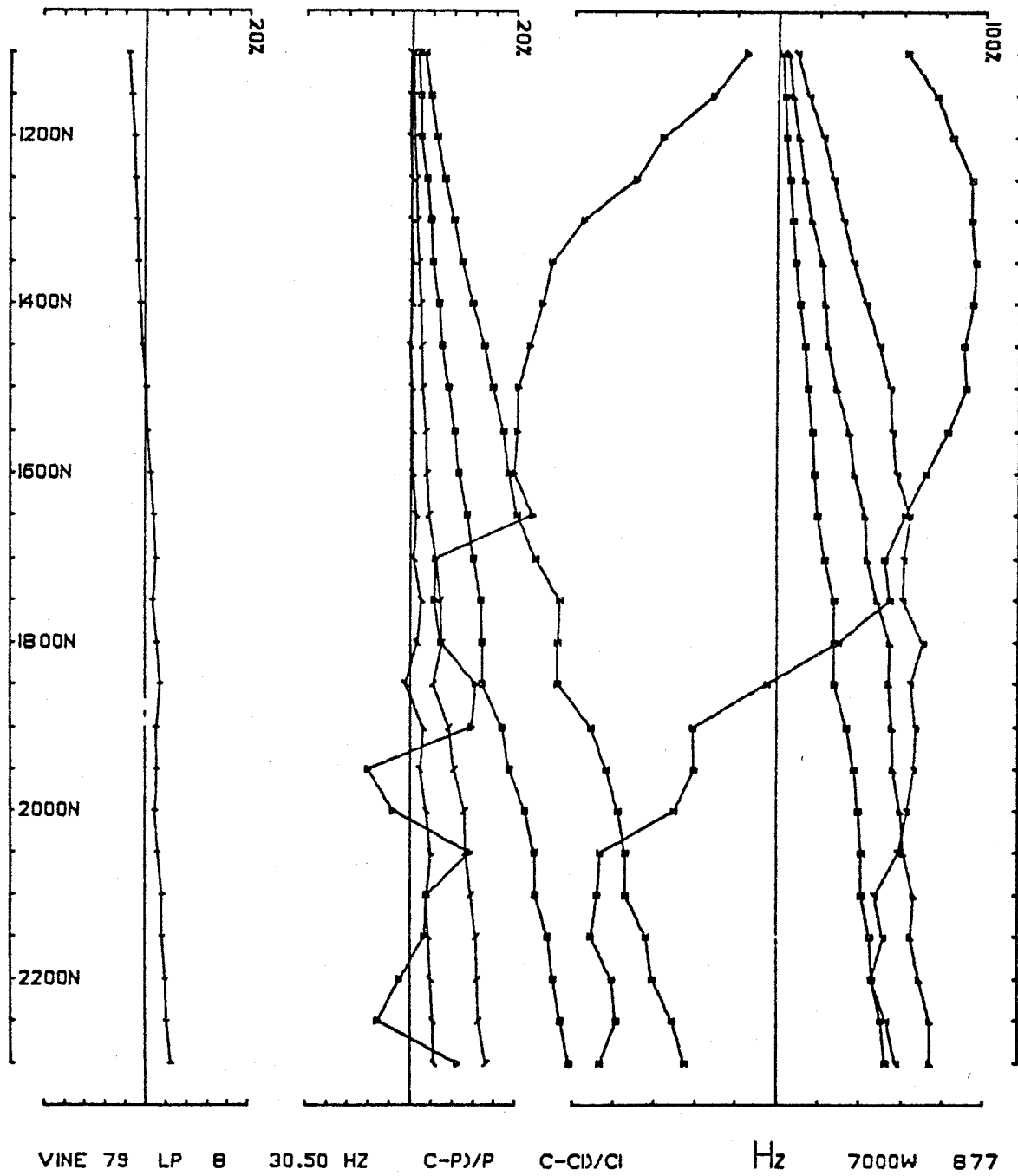


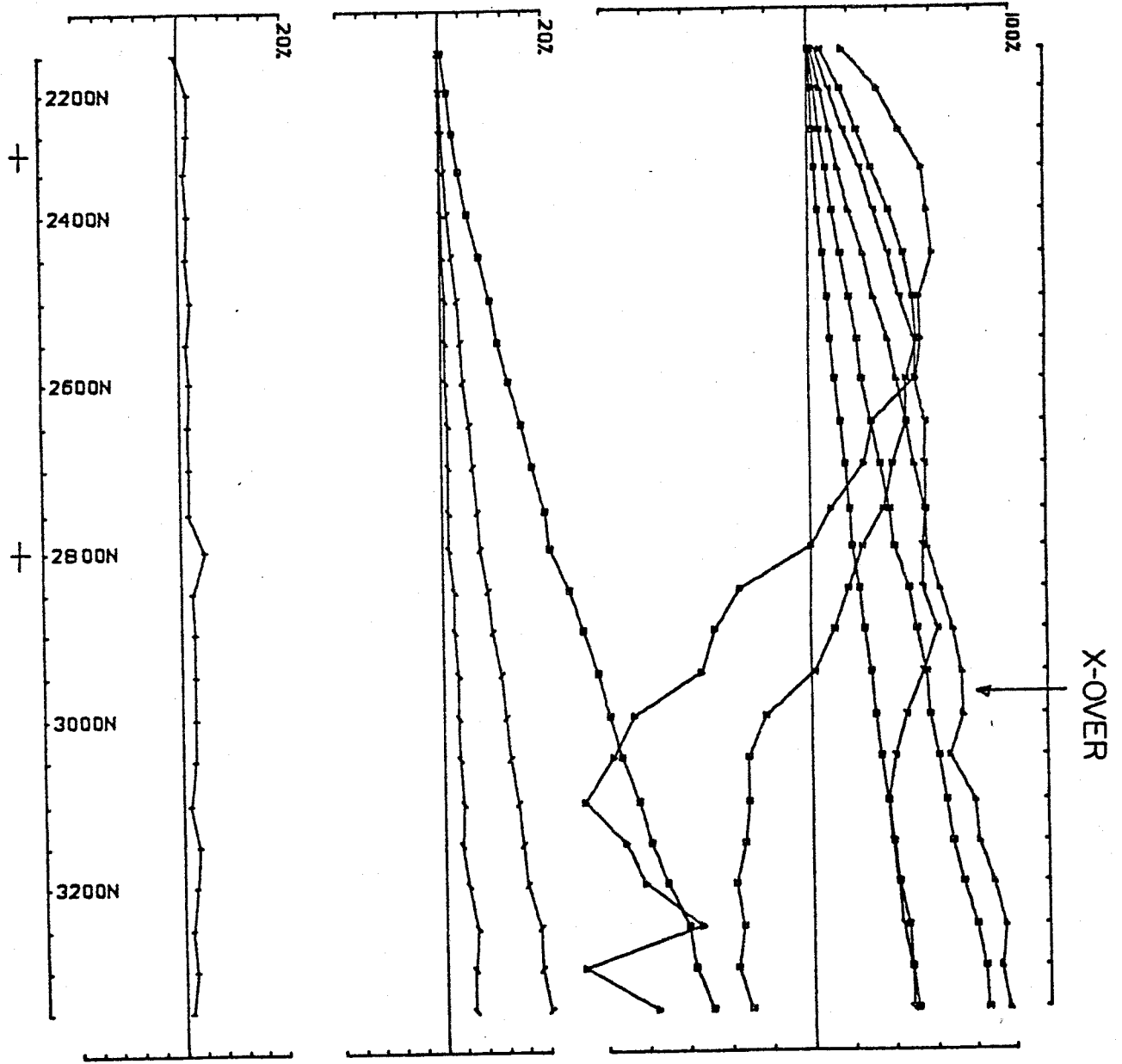


VINE 79 LP B 30.50 HZ C-P)/P C-CI)/CI Hz 6000W B77

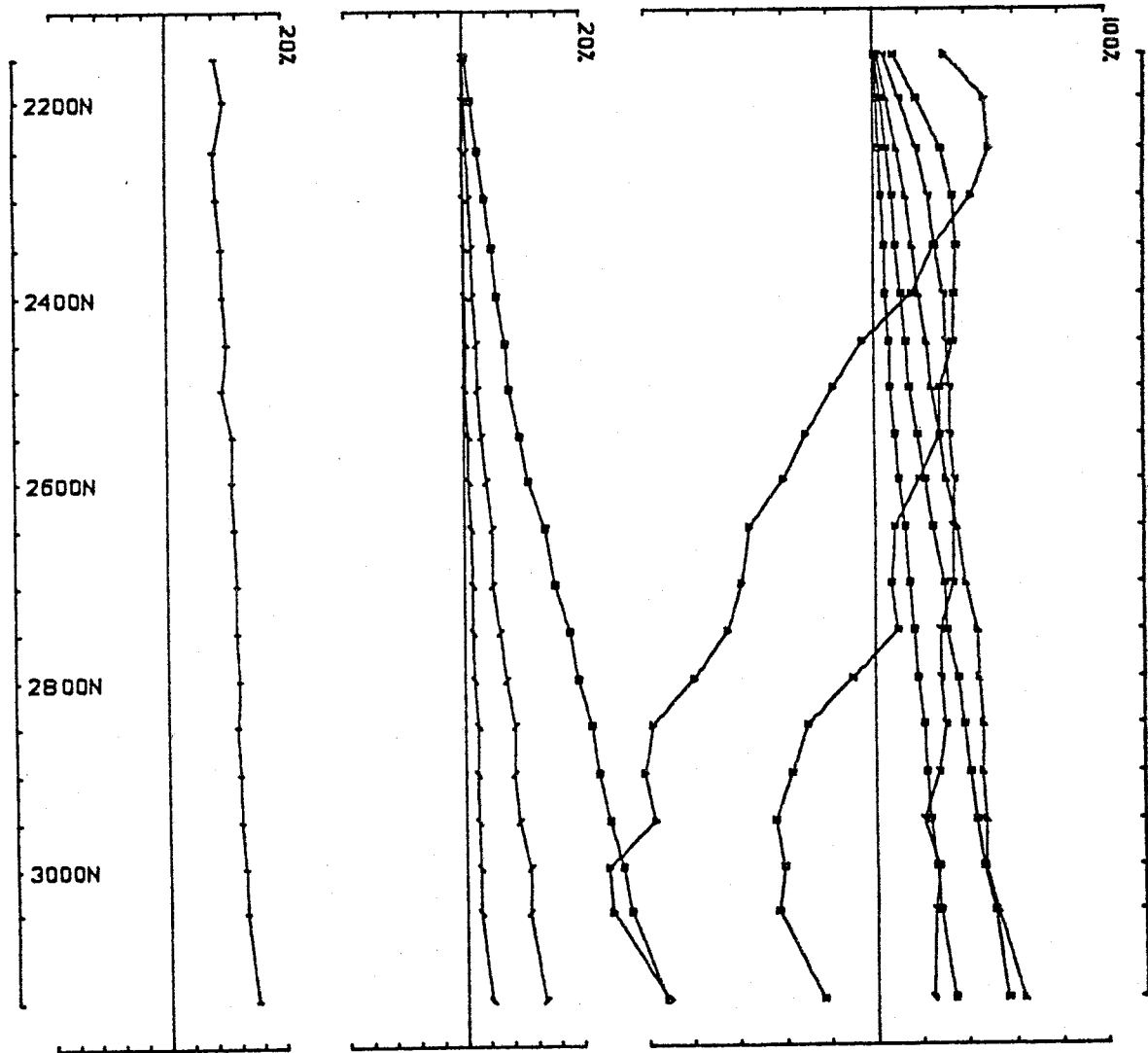


VINE 79 LP 8 30.50 HZ C-P)/P C-Cl)/Cl Hz 6500W 877





VINE 79 LP 9 30.50 HZ C-P)/P C-CI)/CI Hz .0 87B



VINE 79

LP 9

30.50 HZ

C-P)/P

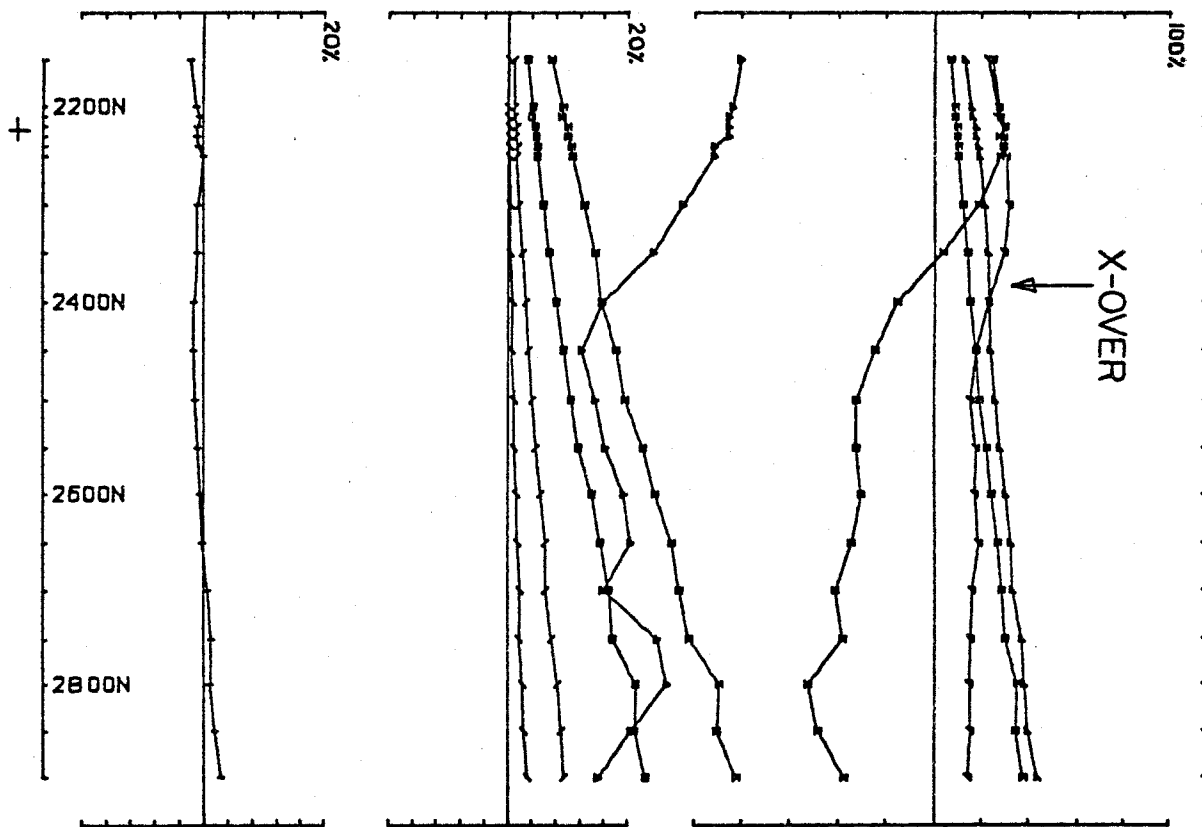
C-CD/CI

Hz

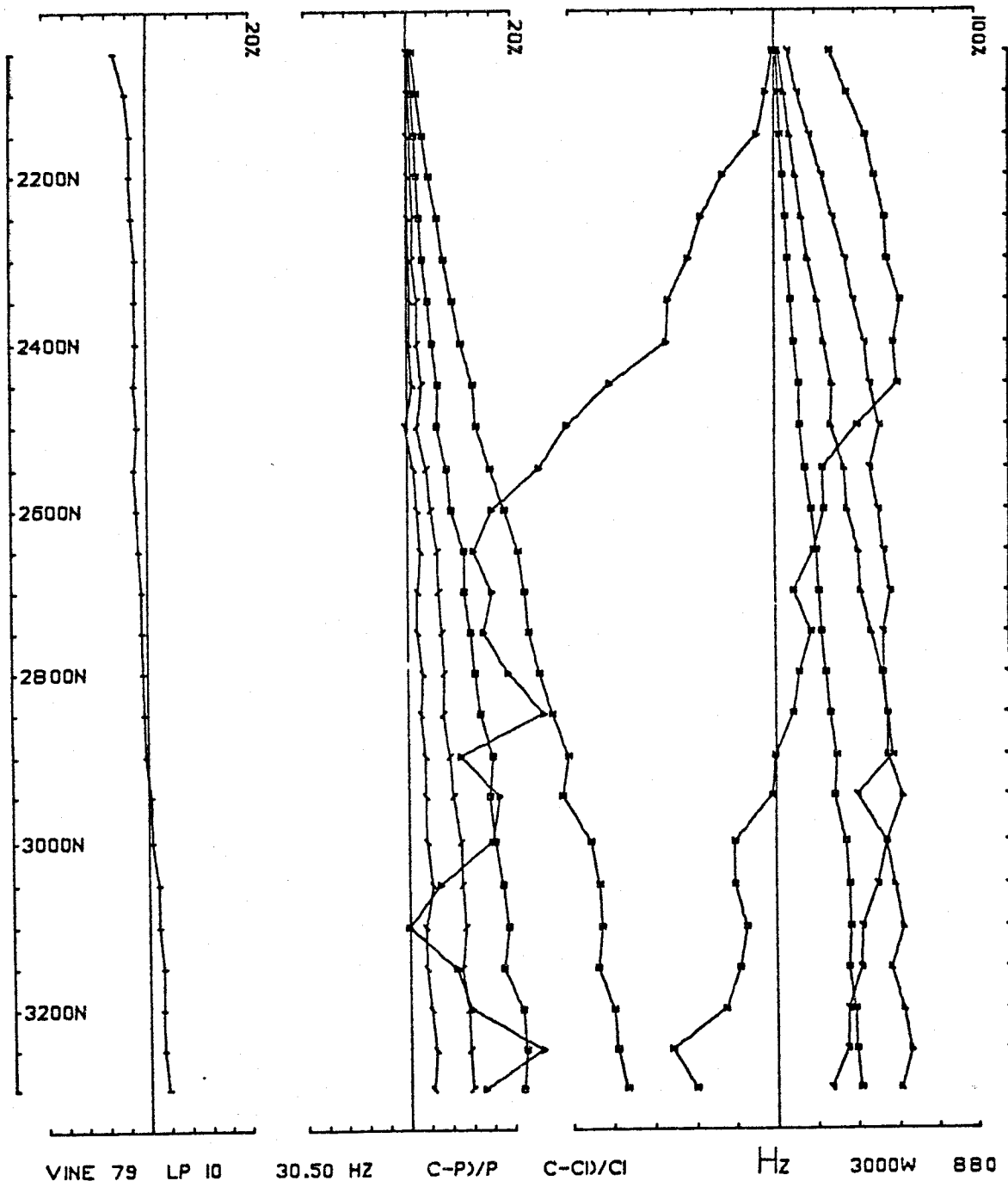
500W

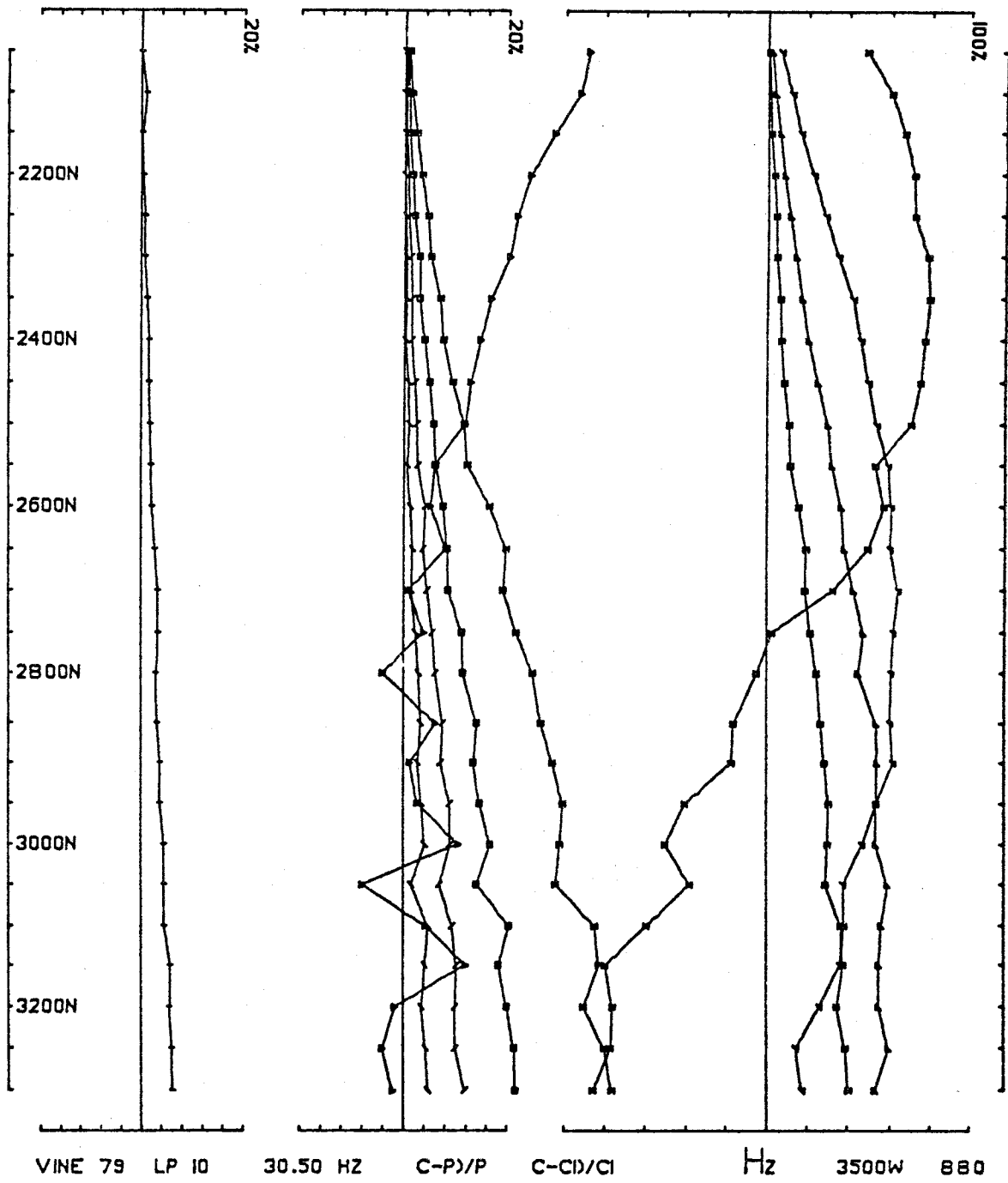
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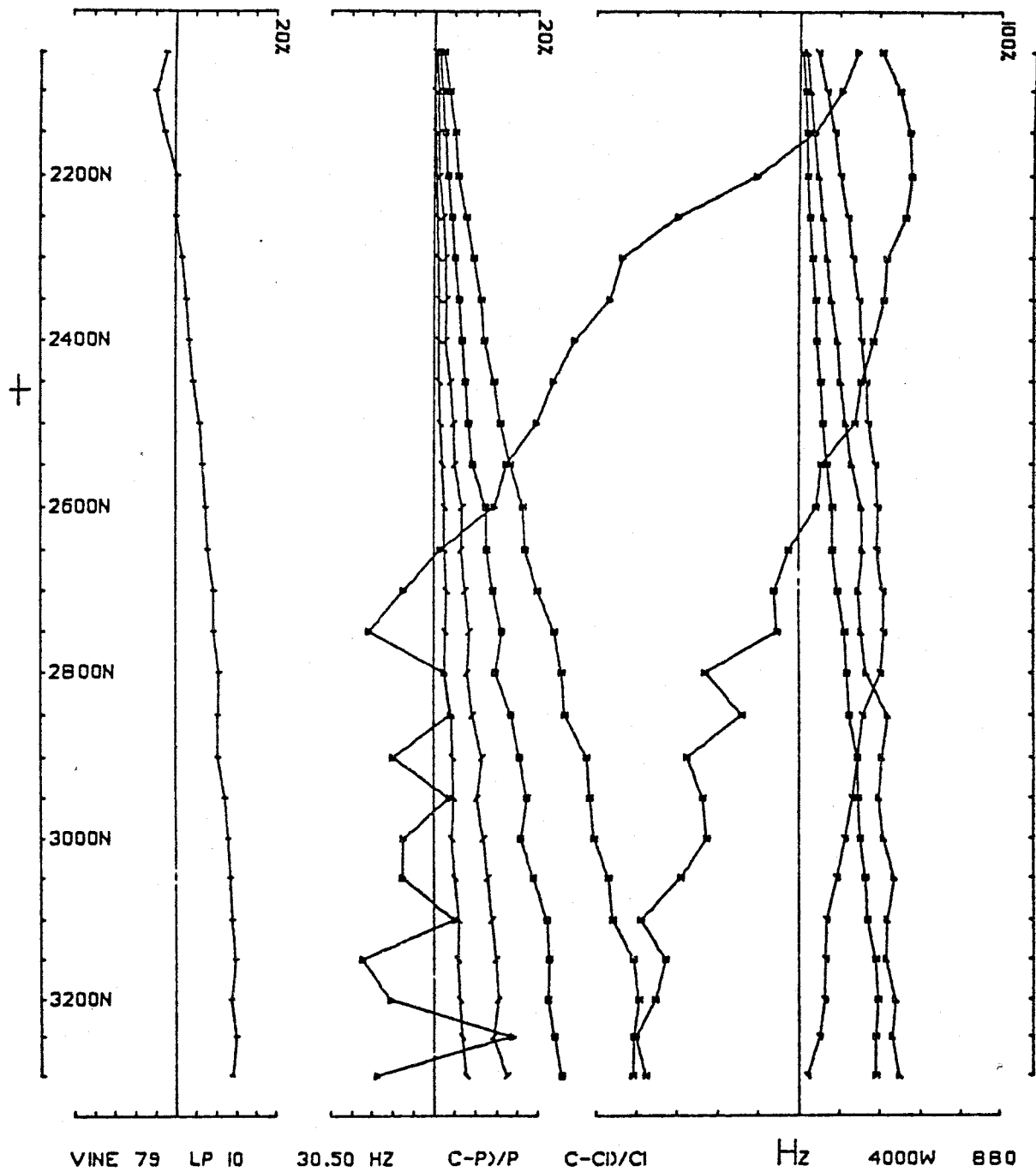
D.S.26

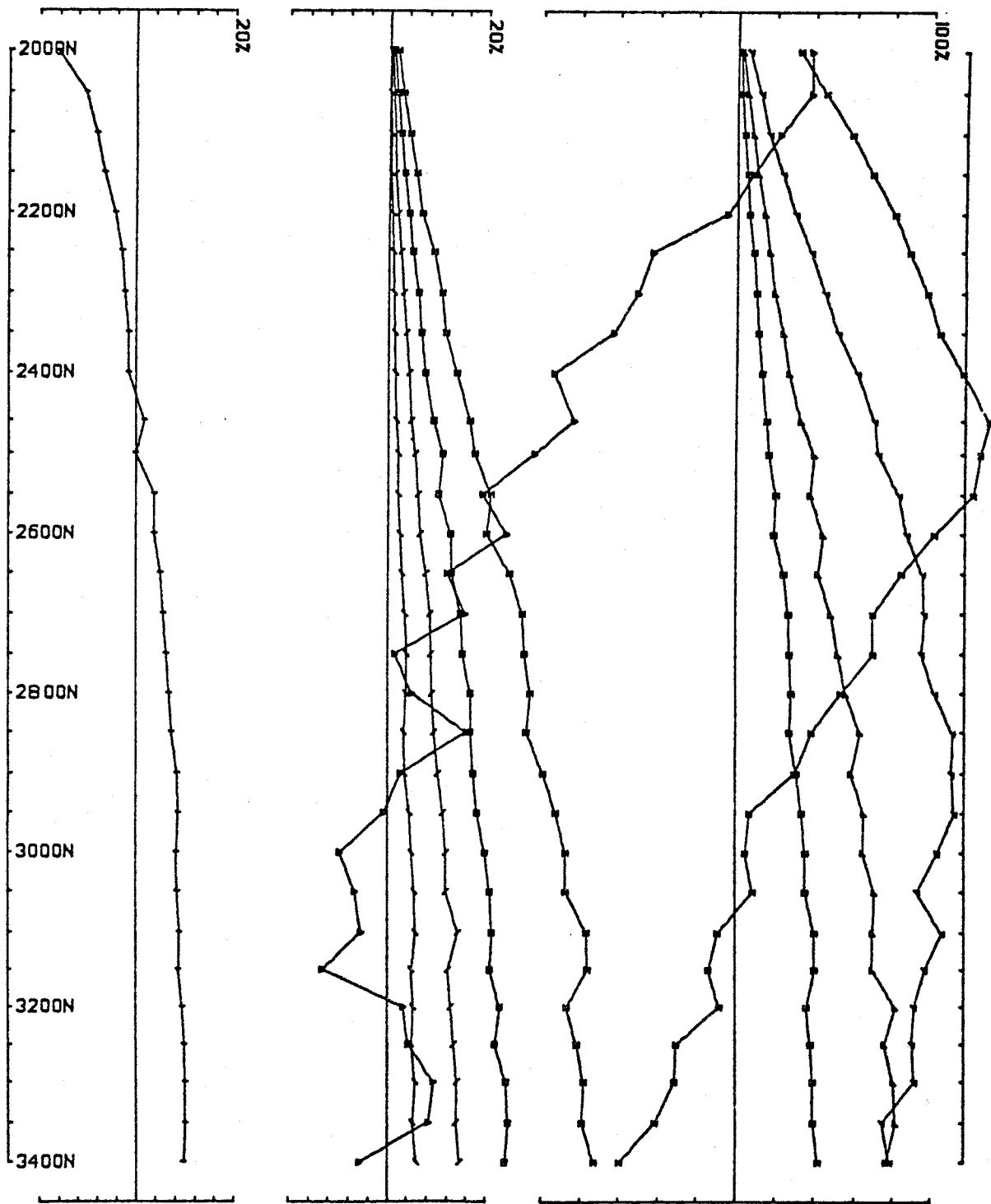


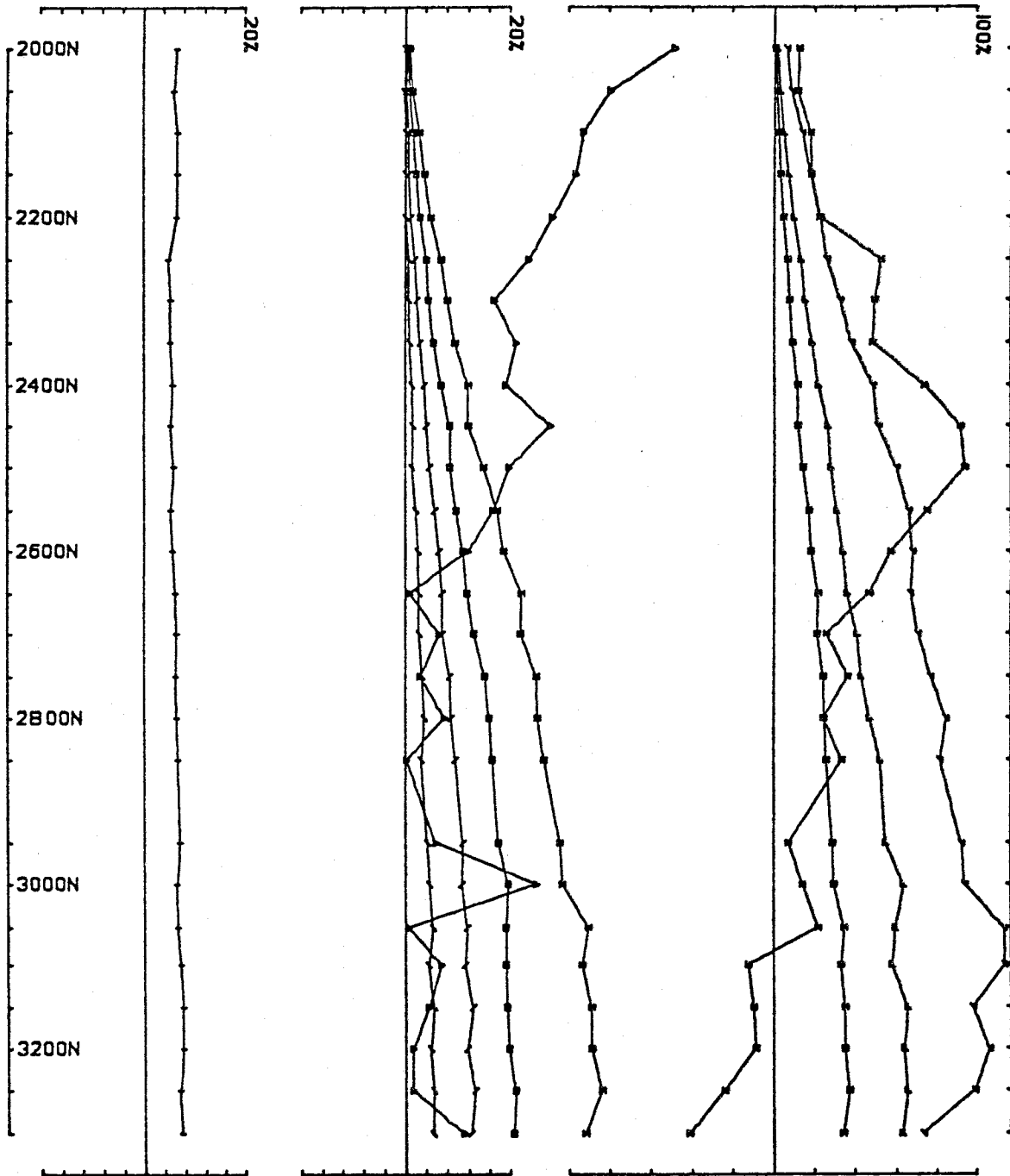
VINE 79 LP 9 30.50 HZ C-P)/P C-CI)/CI Hz 1000W 878











VINE 79 LP II

30.50 HZ

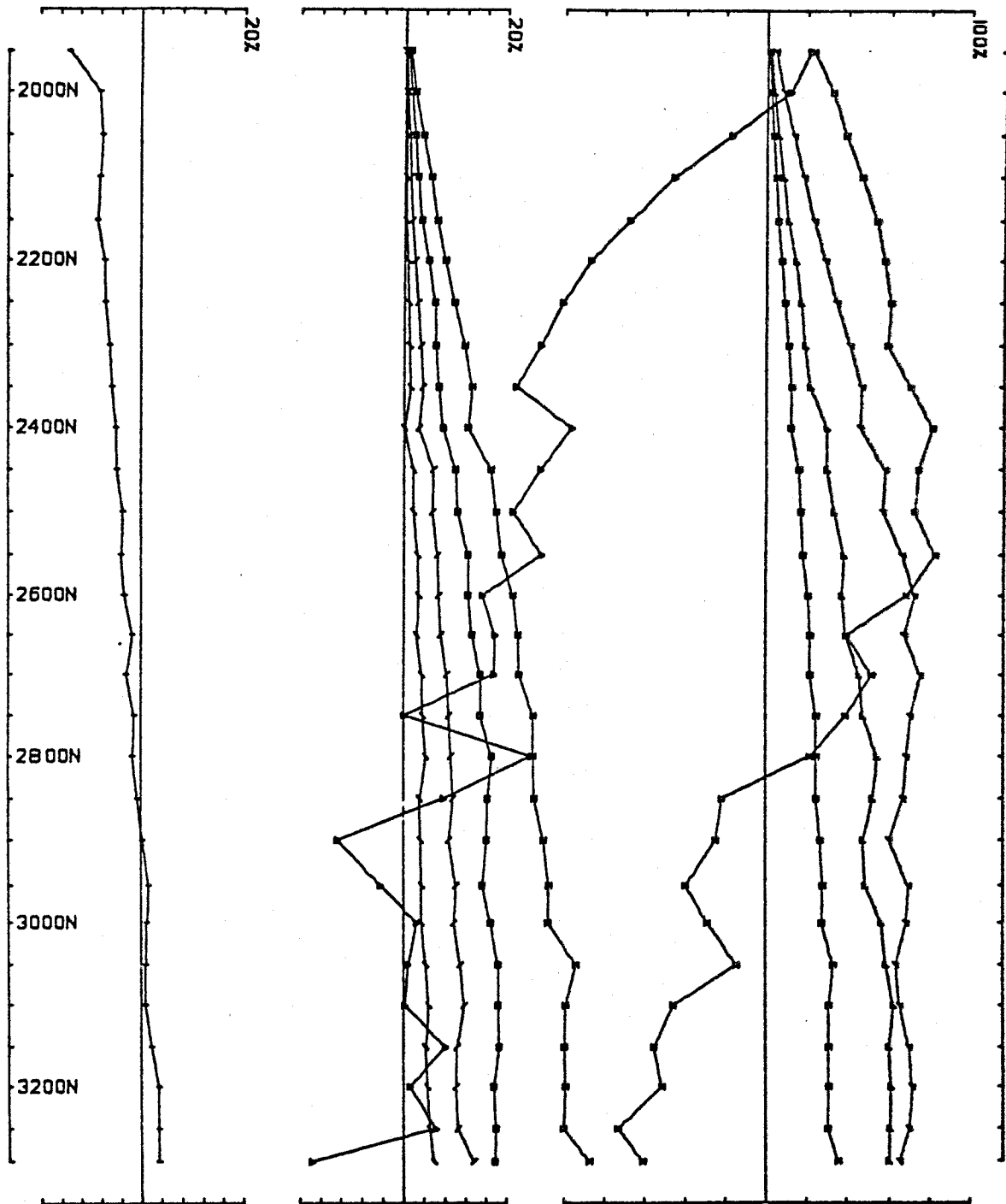
C-P)/P

C-CI)/CI

Hz

5000W

881



VINE 79 LP II

30.50 HZ

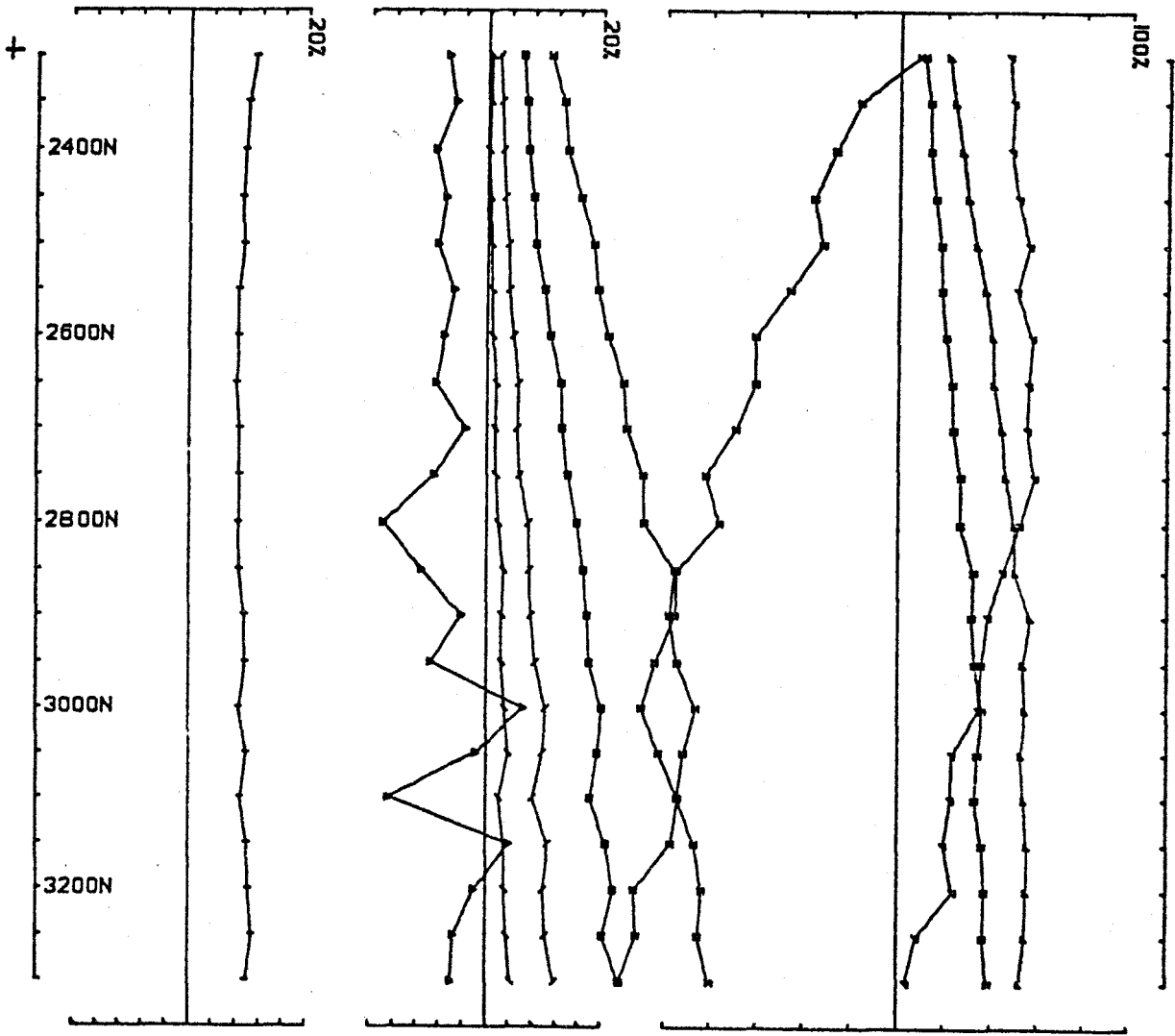
C-P)/P

C-CI)/CI

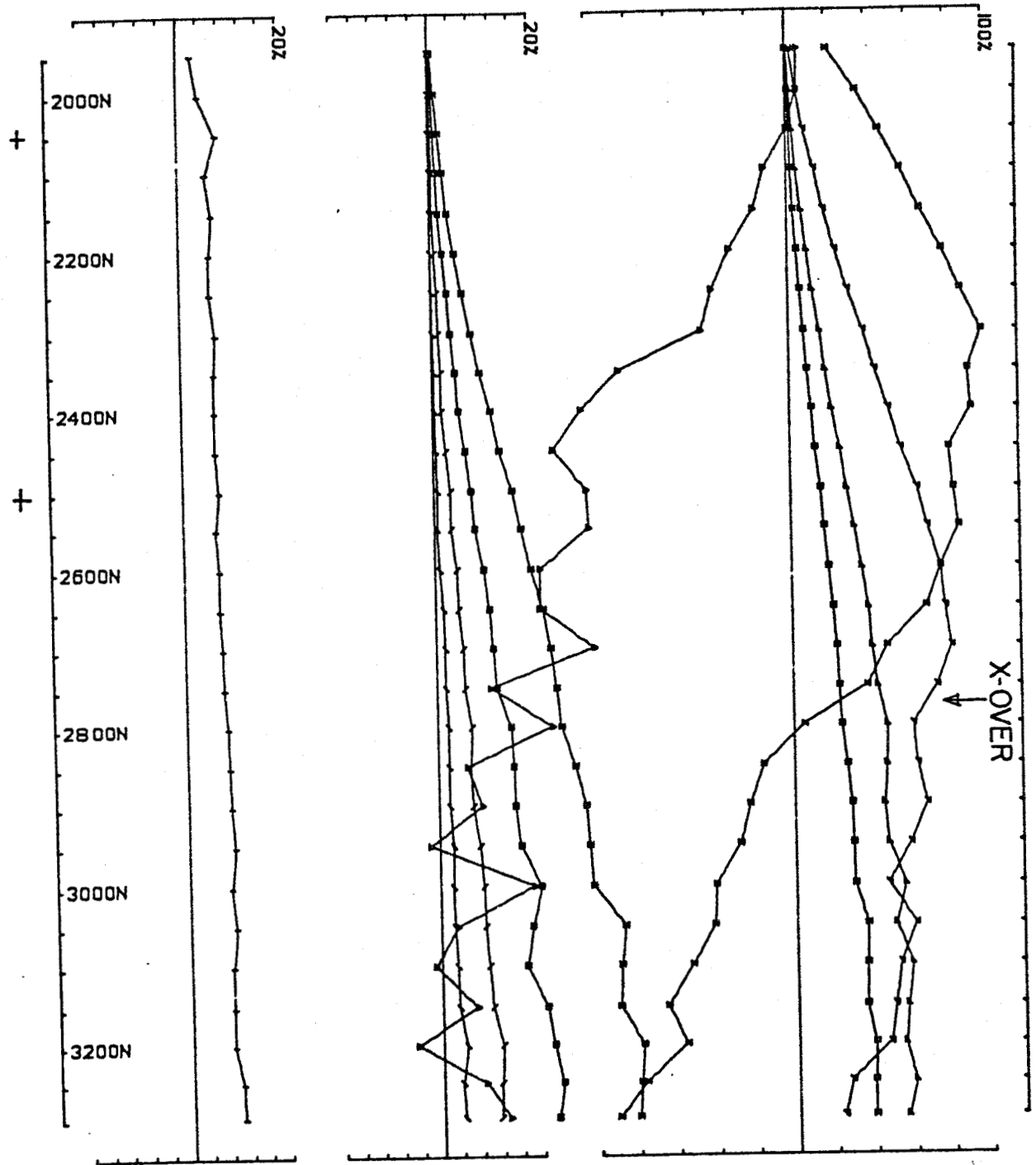
Hz

5500W

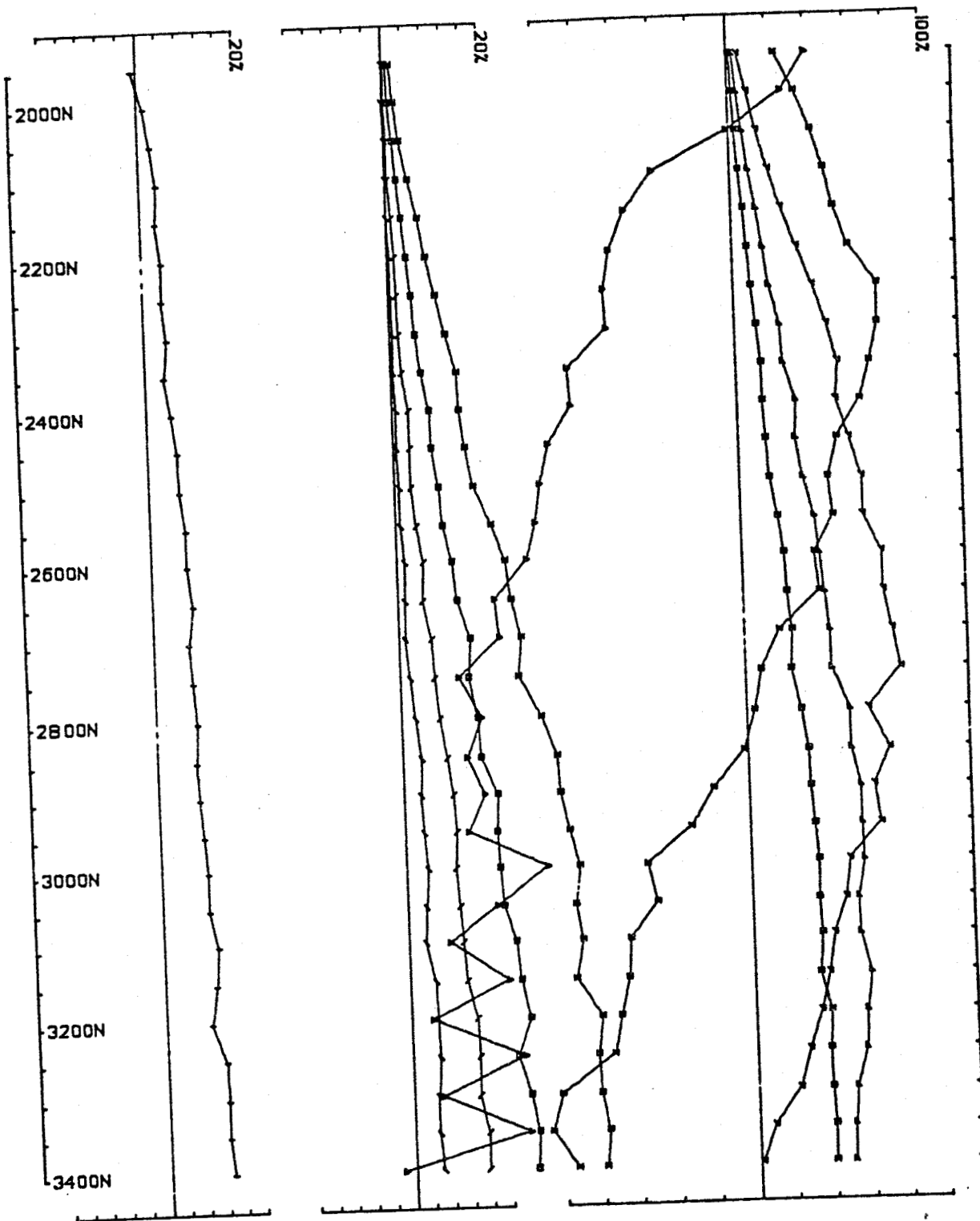
881



VINE 79 LP 12 30.50 HZ C-P)/P C-CI)/CI Hz 6000W 882



VINE 79 LP 12 30.50 HZ C-P)/P C-CI)/CI Hz 6500W 882



VINE 79 LP 12

30.50 HZ

C-P)/P

C-CI)/CI

Hz

7000W

882

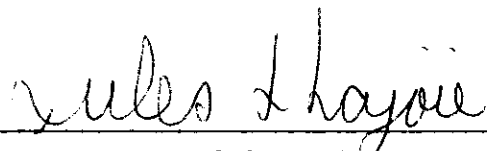
IN THE MATTER OF THE B.C. MINERAL ACT
AND IN THE MATTER OF A GEOPHYSICAL PROGRAMME
CARRIED OUT ON PORTIONS OF THE VINE MINERAL CLAIMS
ON THE VINE PROPERTY
LOCATED 20 KM SOUTH-SOUTHWEST OF CRANBROOK IN THE
FORT STEELE MINING DIVISION OF THE
PROVINCE OF BRITISH COLUMBIA MORE PARTICULARLY

N.T.S. 82 G/5

S T A T E M E N T

I, Jules J. Lajoie of the City of West Vancouver in the Province of British Columbia, make oath and say:-

1. That I am employed as a geophysicist by Cominco Ltd. and, as such have a personal knowledge of the facts to which I herein-after depose;
2. That annexed hereto and marked as "Exhibit A", to this statement is a true copy of expenditures incurred on geophysical survey on the VINE mineral claims;
3. That the said expenditures were incurred between the 1st of June and the 10th of July, 1979, for the purpose of mineral exploration of the above noted claims.



JULES J. LAJOIE, Ph.D.
Research Geophysicist

EXHIBIT "A"

VINE CLAIMS

STATEMENT OF EXPENDITURES

(Linecutting, EM survey)

Salaries: (Work done June 1 to July 10, inclusive).

Dr. J.J. Lajoie (Geophysicist) 40 days @ \$150/day	\$ 6,000
Dr. Y. Lamontagne (Geophysicist) 40 days @ \$150/day	6,000
K. Fennessy (field assistant) 23 days @ \$50/day	1,150
A. Atwood (field assistant) 5 days @ \$50/day	250
D. Sherret (field assistant) 8 days @ \$50/day	400
	<u>13,800</u>

Miscellaneous

Commercial accommodations - 2 men - 40 days @ \$31.50 per day x 2	2,520
Gas 40 days @ \$7.00/day	280
Consumable wire	200
Truck rentals - 4 x 4 - 40 days @ \$25/day	1,000
2-wheel drive 40 days @ \$15/day	600
Operating Charges - \$175 x 23 days	4,025
Geophysical Equipment Rental - U. of Toronto	2,750
Air Fares - \$520 - 20% claimed	104
Air Freight - CPAir and PWA	476
	<u>11,955</u>

Linecutting

Contractor - Frank P. O'Grady Box 26, Kimberley, B.C. V1A 2Y5 80.29 km @ \$202	<u>16,218</u>
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TOTAL \$41,973

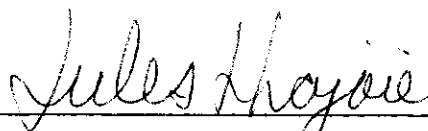
This is Exhibit "A" to the Statutory
Declaration of Jules Thayer
declared before me this 18th
day of September, 1979.

J. L. Fothergill
A Commissioner for taking Affidavits
for the Province of British Columbia.

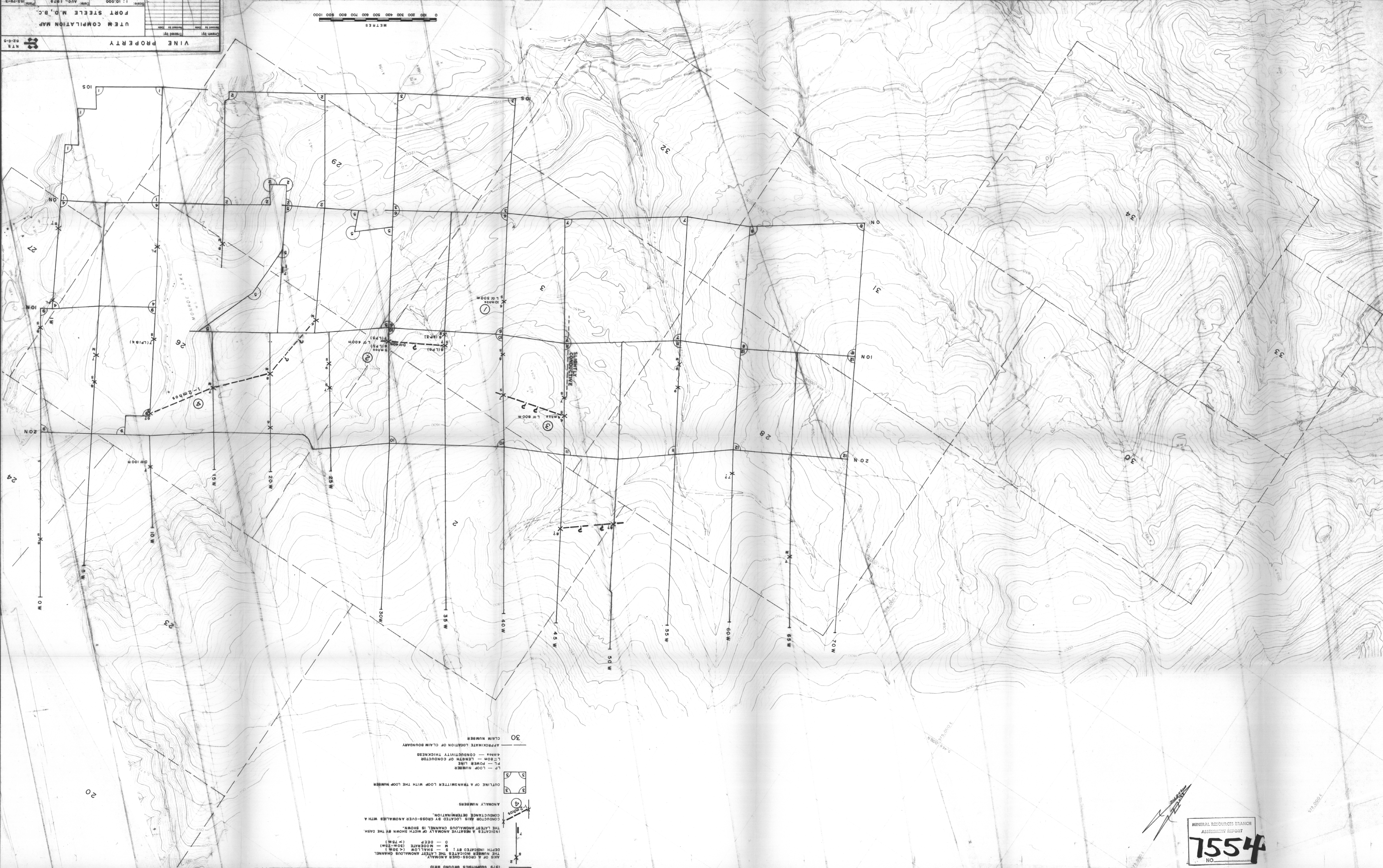
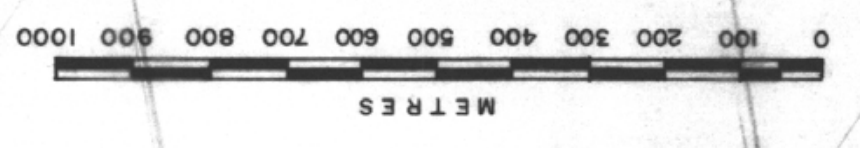
C E R T I F I C A T I O N

I, Jules J. Lajoie, of 5655 Keith Road, in the City of West Vancouver, in the Province of British Columbia do hereby certify that:-

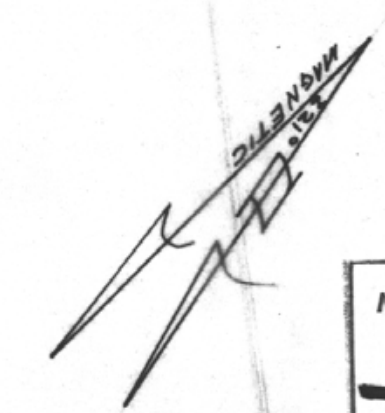
1. I graduated from the University of Ottawa in 1968 with an Honours B.Sc. in Physics, from the University of British Columbia in 1970 with a M.Sc. in Geophysics, and from the University of Toronto in 1973 with a Ph.D. in Geophysics.
2. I am a member (EIT) of the Association of Professional Engineers of the Province of British Columbia, the Society of Exploration Geophysicists, and the British Columbia Geophysical Society
3. I have been practicing my profession for the past six years.



JULES J. LAJOIE, Ph.D.
Research Geophysicist



1879 GEOPHYSICAL GROUND GRID
 THIS OF A CROSS-OVER ANOMALY
 THE NUMBER INDICATES THE LATEST ANOMALY CHANNEL.
 DEPTH INDICATED BY: S - SHALLOW ($10m-25m$)
 M - MODERATE ($25m-75m$)
 D - DEEP (> $75m$)
 INDICATES A NEGATIVE ANOMALY OF WIDTH SHOWN BY THE DASH.
 THE LATEST ANOMALY CHANNEL IS SHOWN.
 CONDUCTANCE DETERMINATION.
 CROSS-OVER ANOMALIES WITH A
 CONDUCTANCE DETERMINATION.
 ANOMALY NUMBERS
 OUTLINE OF A TRANSMITTER LOOP WITH THE LOOP NUMBER
 LP - LOOP NUMBER
 PL - POWER LINE
 L-C - LENGTH OF CONDUCTOR
 A-M - CONDUCTIVITY THICKNESS
 APPROXIMATE LOCATION OF CLAIM BOUNDARY
 CLAIM NUMBER



MINERAL RESOURCES BRANCH
 ASSESSMENT REPORT
4551
 NO.