COMINCO LTD.

EXPLORATION

WESTERN DISTRICT

NTS: 82G/5

GEOPHYSICAL REPORT

UTEM SURVEY ON THE

S T. J O E C L A I M S

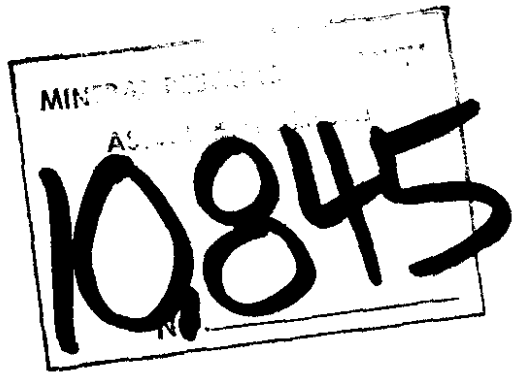
Fort Steele Mining Division

Latitude: 49°28'N; Longitude: 115°52'W

Work Performed By: Syd J. Visser and Doug C. McCollor

Claim Owner and Operator: COMINCO LTD.

October 1982



SYD J. VISSER

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COMINCO LTD.

EXPLORATION WESTERN DISTRICT

GEOPHYSICAL REPORT

UTEM SURVEY ON THE ST. JOE CLAIMS

List of Claims

Cominco Interest = 100% - Subject to Option Agreement

Adjoining Cominco's "VINE GROUP" to the North, Fort Steele M.D., B.C.:

Property: 10 claims (39 units)

Name	Number of Units	Record Numbers	Date Recorded	Assessment Work Due
St. Joe 1 RL	1	1612	March 1, 1982	March 1, 1987
St. Joe 2 RL	2	1613	March 1, 1982	March 1, 1987
St. Joe 3	9	34	Oct. 24, 1975	October 24, 1987
St. Joe 4	6	36	Oct. 27, 1975	October 27, 1987
St. Joe 5	1	66	Sept. 7, 1976	September 7, 1987
St. Joe 6	2	67	Sept. 7, 1976	September 7, 1987
St. Joe Fr.	1	1614	March 1, 1982	March 1, 1987
St. Joe 7	10	1611	March 1, 1982	March 1, 1987
St. Joe 8	4	1610	March 1, 1982	March 1, 1987
St. Joe 9	3	1686	Sept. 28, 1982	Sept. 28, 1983

INTRODUCTION

The ST. JOE claims are located about 9 km S.W. of Cranbrook, B.C. (see Plate 1). The access to the grid is along old logging roads southwest from Jim Smith Lake. Jim Smith Lake is 5 km southwest of Cranbrook.

All of the lines are accessible by a myriad of old logging roads.

The St. Joe claims were optioned in 1982 by Cominco Ltd. They are underlain by the clastic sediments of the Middle and Lower Aldridge Formation of Proterozoic age. These rocks have been intruded by the Moyie gabbros. The sediments of the Aldridge Formation are known to host the Sullivan orebody near Kimberley, B.C.

This report describes a UTEM electromagnetic survey which had the objective of locating electrical anomalies which may be caused by economic mineralization.

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 meters and 1,500 meters long. In this survey, the loop dimensions varied between 1,500 x 1,000 m to 1,000 x 500 meters. 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 method.

The Utem survey, described in this report covers an area of 2500 m by 3500 m. A line spacing of 500 meters with station spacing of 50 meters was used for the majority of the grid.

In the area between lines 1500N and 3000N from 1500W to 2500W a line spacing of 250 meters and less was used. In areas of interest the station spacing was reduced from 50 meters to 25 meters.

A total of 35.7 km of lines were surveyed for a total of 737 stations. The vertical component (Hz) was acquired at every station and horizontal component (Hx) at 47 stations. Eight channels of information, for each components were acquired and plotted at each station for a total of 6,272 readings.

The transmitter loop is energized with a triangular current at a carefully controlled frequency (30.496 Hz for this survey). The receiver consists 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.

The receiver sensor coil measures the vertical or horizontal component of the magnetic field and it responds to the time derivative of the magnetic field. Since the transmitter current wave form is triangular, the receiver coil 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 eight channels of data at each station. The later number channels (7-8) corresponds 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 give responses on progressively lower number channels as well. For example, massive, highly conducting sulphides or graphite will produce a response on all eight channels.

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

FIELD WORK

A field report including Personnel is in Appendix I. All surveying was done in the period from September 16 to October 2, 1982.

The grid is in the metric system. Therefore, 30N, 20W means for example 3,000 meters north, and station 2,000 meters west.

DATA PRESENTATION

The results of the survey are presented in one location map, one compilation map and 29 data sections.

The maps are listed as follows:

Plate 1 (in envelope)	Location Map Scale 1:50,000
Plate 2 (in envelope)	UTEM Compilation Sheet Scale 1:10,000

Legends for both the UTEM compilation map and the data sections are also attached.

The data sections are arranged in order of loop number (Loop 1, 2, 3-7).

In order to reduce the field data, the theoretical primary field of the loop must be computed at each station. The normalization of the data is as follows:

a) For channel 1:

$$\% \text{ Ch 1 anomaly} = \frac{\text{Ch.1} - P}{P} \times 100\%$$

where P is the primary field from the loop at the station and Ch.1 is the observed amplitude of Channel 1

b) For remaining channels (n = 2 to 9)

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

where Ch.n is the observed amplitude of channel n (2 to 8)

INTERPRETATION

All of the field results are displayed in the data section on 29 diagrams, with a compilation of all of the relative points on Plate 2. The transmitter loop is positioned on the east side of the lines on data sections for loops 1, 2, 6 and 7 to the west for loops 3 and 4, and to the south for loop 5.

Since the UTEM system measures during the transmitter ON time, the measurements are susceptible to errors in chaining and station locating. However, because all readings are normalized to channel 1, the noise from orientation errors is seen only on this channel. Because channel 1 responds only to highly conductive bodies and because there were none of these bodies found in this survey, the extra noise in channel 1 is not a problem in this case.

The data sections show typical background response. This is a gradual increase in response with increasing distance from the loop. Depending on the background conductivity, the early channels (first 8, then 7 and so on) reach a maximum and then begin to decrease and go negative, one by one. The later channels (1 to 4) do not reach this maximum unless the host rock and/or overburden are very conductive. A comparison of the data with model studies indicate the host rock in the survey area is moderately resistive with a resistivity of about 350 ohm meters.

A typical anomaly from a steeply dipping conductor is characterized by a crossover type of anomaly with the positive shoulder on the loop side and the negative shoulder on the side away from the loop. All channels affected by the anomaly cross over from the positive to the negative (taking background into account) at the same location. Several crossover type anomalies were located on this grid. The most interesting zone has been labelled as Conductor A (see d.s. 6, 7, 27 & 28) on the compilation map (plate 2). It appears to be a thin flat-lying body at a depth of about 60 meters with a conductance of about 2 mhos. The strike length is about 750 meters and the width about 200 meters. The anomaly is probably caused by a lens of weakly conductive material such as clays or disseminated sulfides. The conductance is not high enough for massive sulfides.

There are several other anomalies scattered across the grid but no trends can be seen from them to make it possible to establish other zones. Of these anomalies, only the one at 0 on line 1000N warrants further investigation, possibly by geochemistry, although all of the others should be investigated on the ground for their geological significance.

CONCLUSION

One flat-lying, weakly conductive zone was located by the present UTEM survey. Although this zone definitely does not contain large amounts of massive sulfides, more investigation is warranted.

Report by:

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Geophysicist
Cominco Ltd.

Endorsed by:

John M. Hamilton, P.Eng.
Chief Geologist
Kimberley

DISTRIBUTION:

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Kootenay Exploration
Western District, Exploration
Technical Support Group

REFERENCES

1) Lamontagne, Y., 1975 Applications of Wideband, Time Domain EM Measurements in Mineral Exploration: Doctoral Thesis, University of Toronto

APPENDIX I

FIELD REPORT FOR

ST. JOE UTEM 1982

DATE	LOOP	LINE	FIELD CREW	COMPUTER	COMMENTS
SEPT.					
16					SJV checking grid access. DM moving to Cranbrook. DK, GR day off
17	1	1500N	DM,GR,DK		SJV field in morning setting up camp in aftn. Loop breaks in p.m., down for 2 hrs.
18	1	1000N,500N & ON	SJV,DM,GR,DK		Picking up loop 2.
19	2	2000N,2500N	SJV,DM,GR,DK		Picking up loop 1. Laying out loop 3.
20	2	3000N,3500N	DM,DK	SJV	GR laying out loop on Clair.
21	3	2000N,2500N	DM,DK,SJV	SJV	GR laying out loop on Clair in morning St. Joe in aftn.
24	3	500N,0	SJV,DM,DK,BP		
25	4	3000N,2500N	DM,DK,BP	SJV	Problems with the Ford. laying out loop 5.
26	4	2000N,2500N	DM,DK,BP	SJV	Rain laying out loop 5.
27	5	1500W,1900W	DM,DK,BP	SJV	The Ford needs a new piston. Spent most of the time in K.E. office. GR expense account $289.94 charged to K.E.
29	6	2000N,2250N	DM,DK,BP	SJV	Starting some detail work using toppo lines across a small showing, work was asked for by Doug A.
30	6	1750N	DM,BP,DK	SJV	Loop broken 1st thing in a.m.
	7	1500N,1750N 2250N	DM,BP,DK	SJV	and once by linecutters; short lines using smaller loops (-1000m x 500m)
OCT.					
1	7	2750N	SJV,BP,DK	DM	Showing UTEM equipment to
	6	2250N,2325N 2350N	"	"	Hardy & Assoc. rep.
2			BP,DK	SJV,DM	

SJV	Syd J. Visser	Geophysicist	Cominco Ltd., 853 - 409 Granville St. Vancouver, B.C. V6C 1T2
DM	Doug C. McCollar	Geophysicist	" "
GR	Glen Rodgers)	Helper	c/o Kootenay Exploration, Cominco Ltd. 1051 Industrial Road #2, Cranbrook, B.C.
DK	Dave Keith)		
BP	Brian Price	Helper	c/o Cominco Ltd., 853 - 409 Granville St. Vancouver, B.C. V6C 1T2

APPENDIX II

APPENDIX II

LEGEND

UTEM DATA SECTIONS

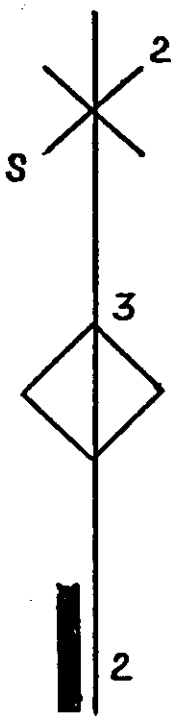
ORDINATE: Amplitude scale is given in %

ABSCISSA: Station or Picket Numbers in Hundreds of Meters

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
	5	1.6	0.8
	6	0.8	0.4
	7	0.4	0.2
	8	0.2	0.1
	9	0.1	0.05
	10	0.05	

LEGEND

UTEM COMPILATION MAPS

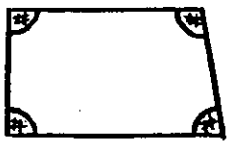


Axis of a crossover anomaly. The number indicates the latest anomalous channel.

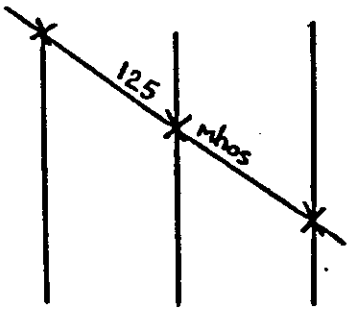
Depth indicated by: S - Shallow (30m)
M - Moderate (30-75m)
D - Deep (75m)

Axis of reversed crossover anomaly produced when a small conductor dips at less than 70° towards the transmitter. In normal crossover 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 crossover anomaly.



Outline of a transmitter loop.



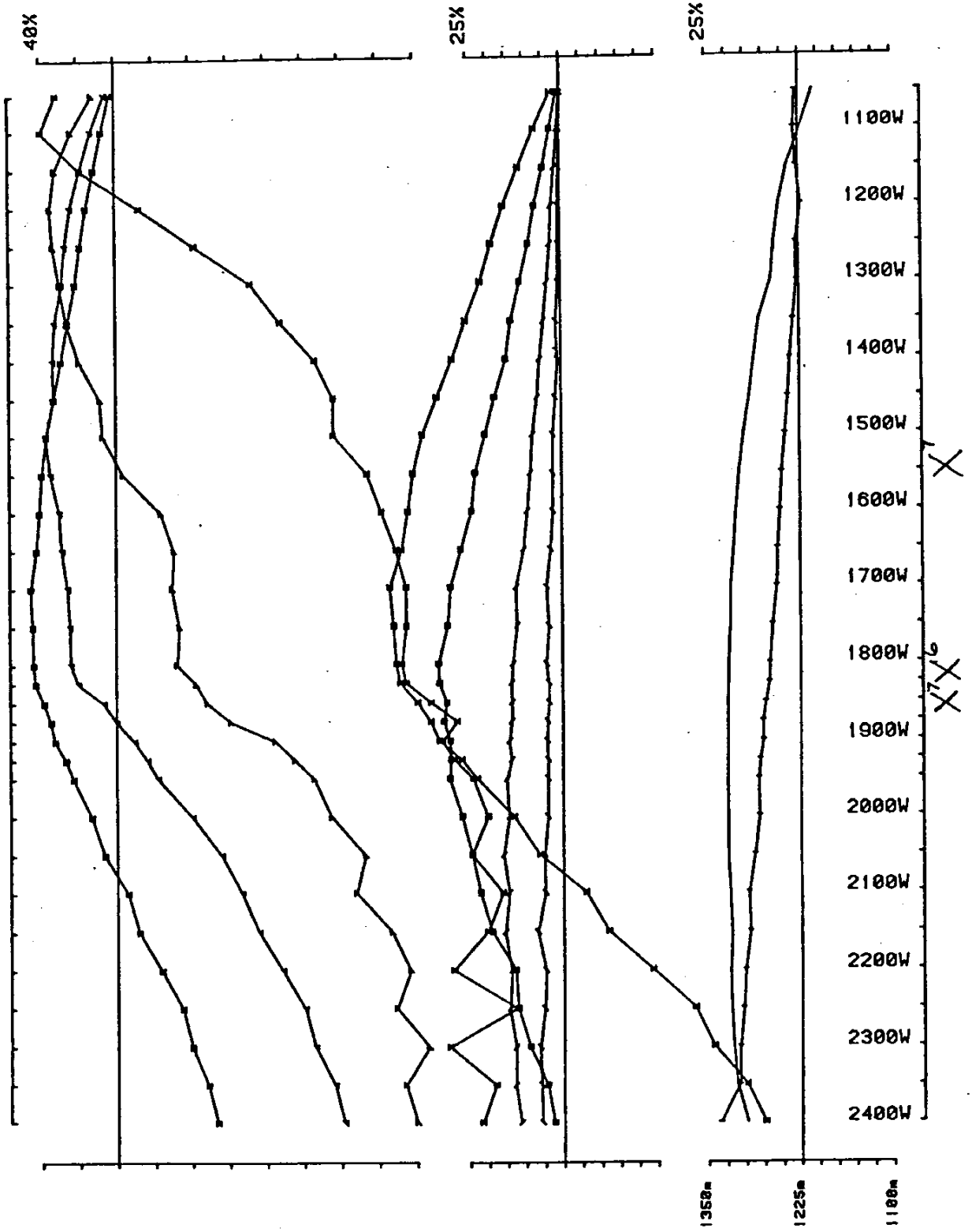
Conductor axis located by crossover anomalies with a conductance determination. The conductance is the interpreted conductivity x thickness of the conductor in mhos (same as Siemens).

Only the principal crossovers are indicated.

A P P E N D I X III

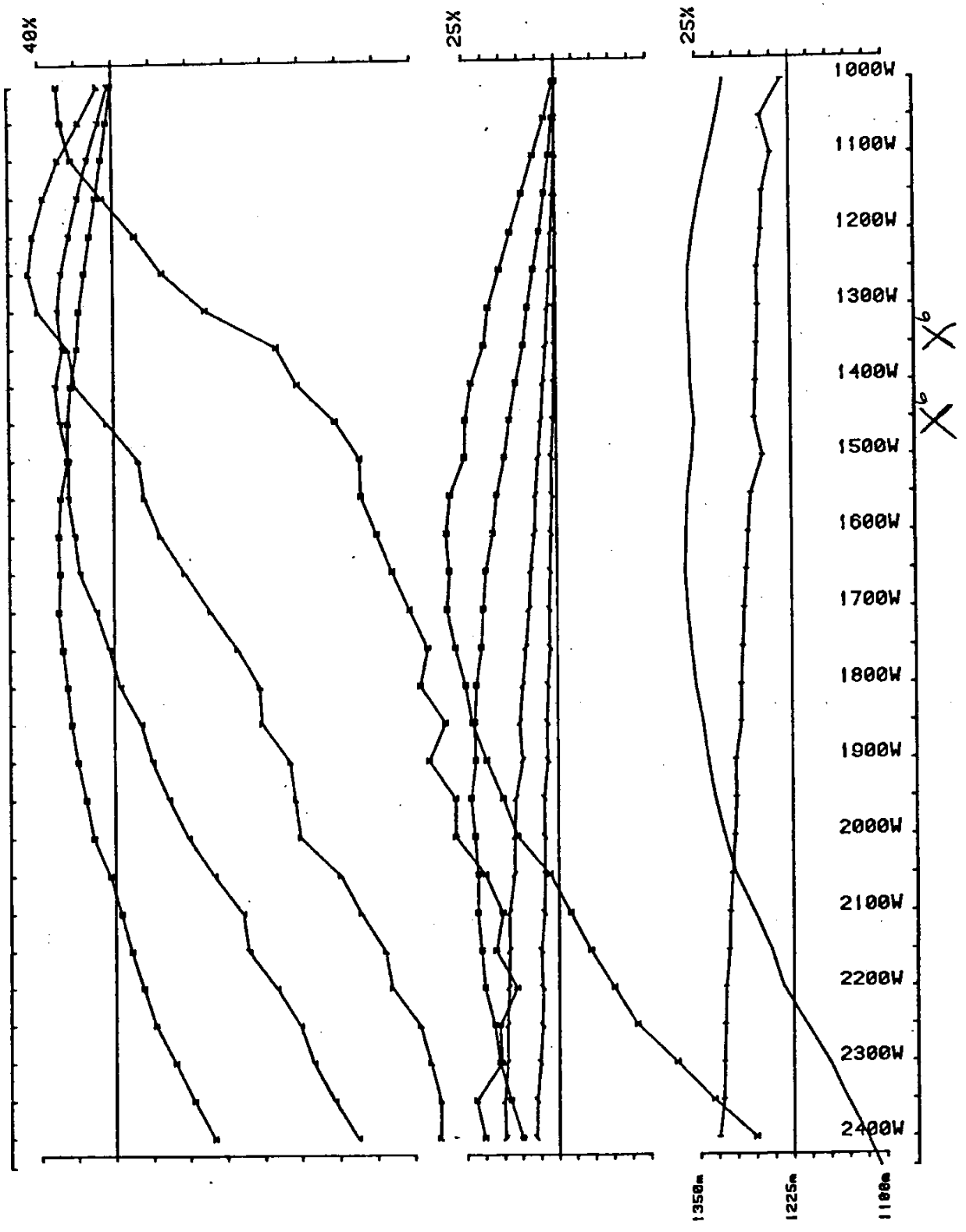
DATA SECTIONS

D.S. 1 - 29

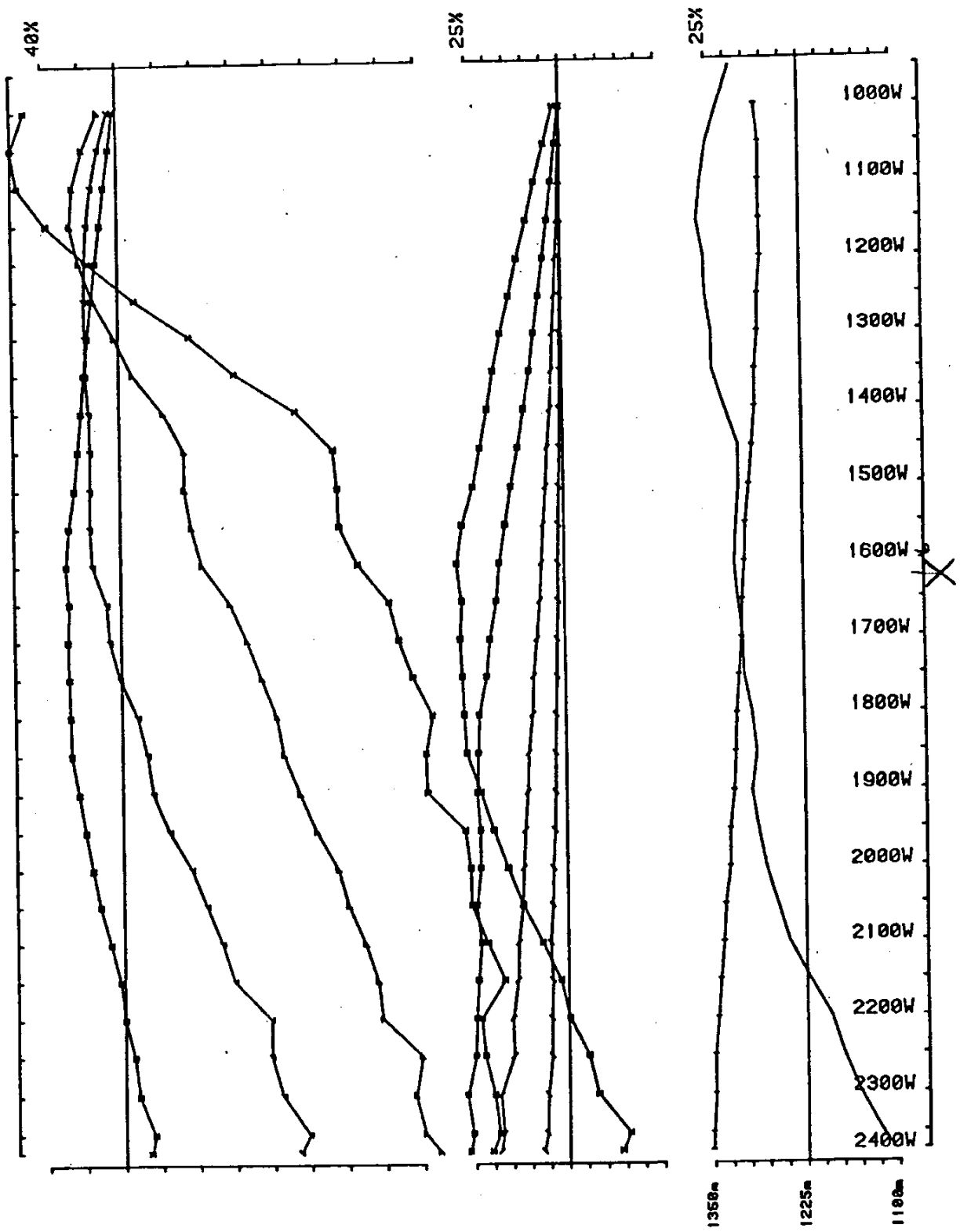


Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 1 Line 0N component Hz secondary Ch 1 normalized Ch 1 reduced

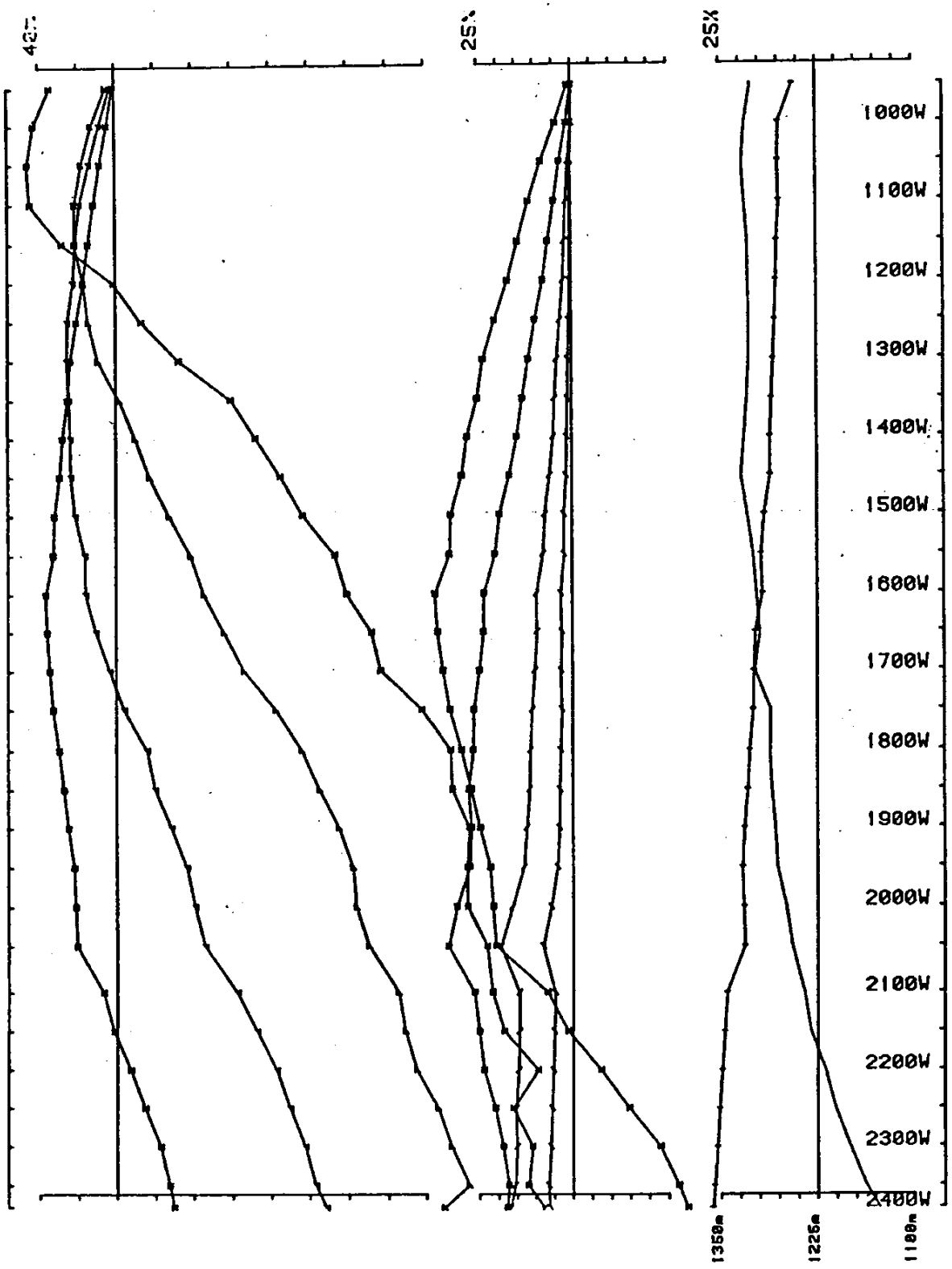

40X
25X
25X
1000W
1100W
1200W
1300W
1400W
1500W
1600W
1700W
1800W
1900W
2000W
2100W
2200W
2300W
2400W
1350m
1225m
1100m
Area St Joe 82 Cominco operator S&D freq(hz) 30.974
Loopno 1 Line 500N component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 2



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 1 Line 1000N component Hz secondary Ch 1 normalized Ch 1 reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

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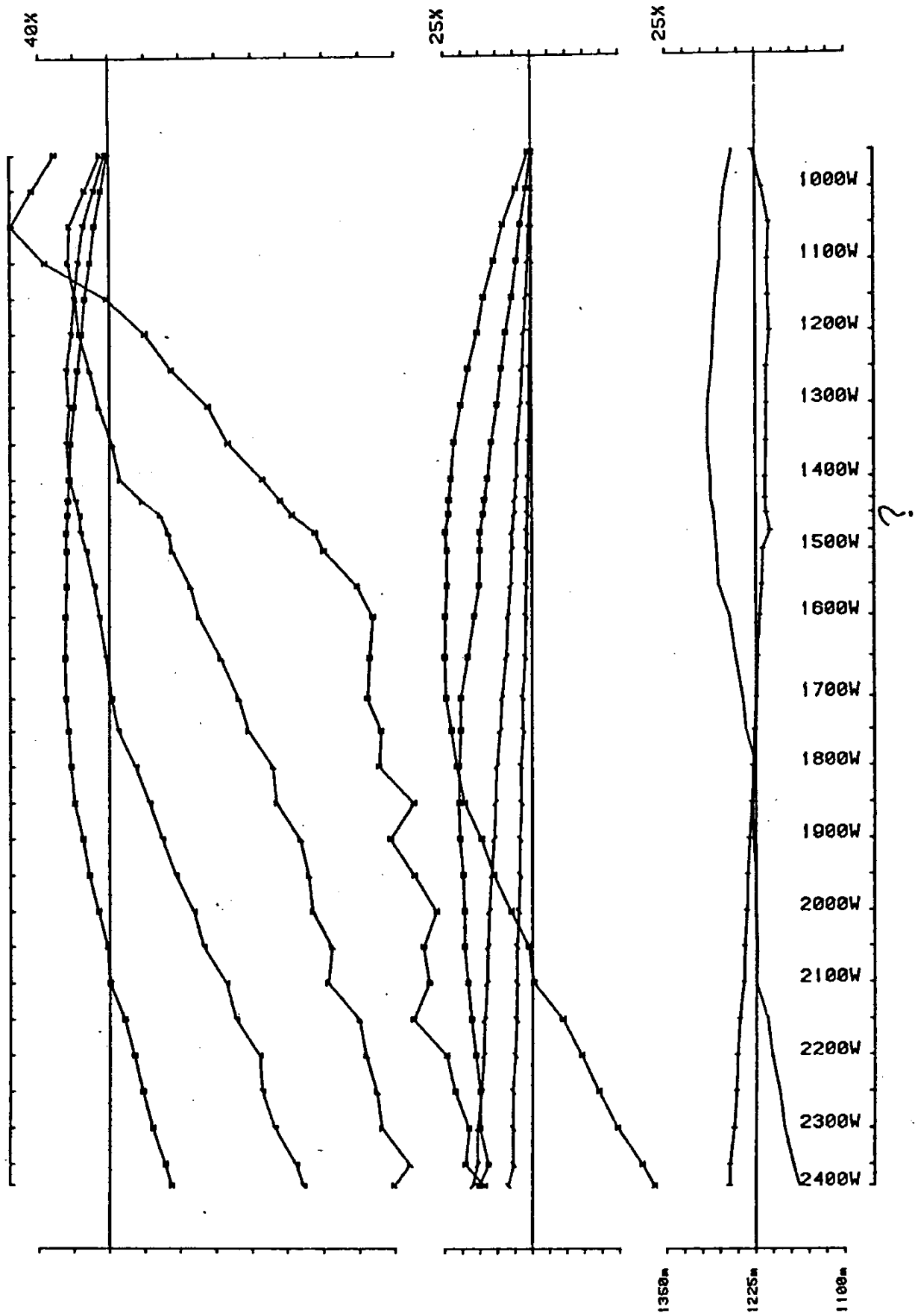
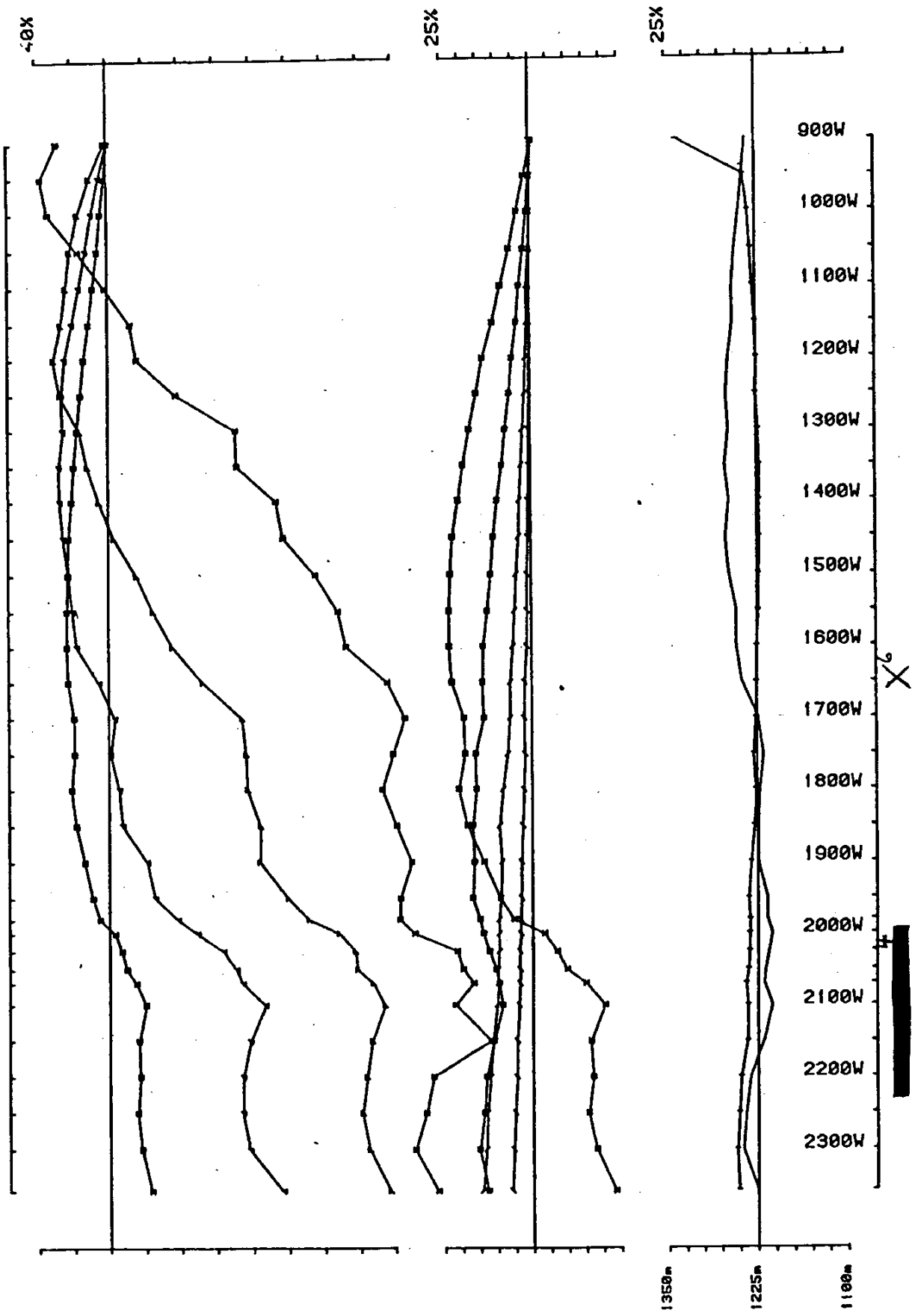


Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 2 Line 2000N component Hz secondary Ch 1 normalized Ch 1 reduced

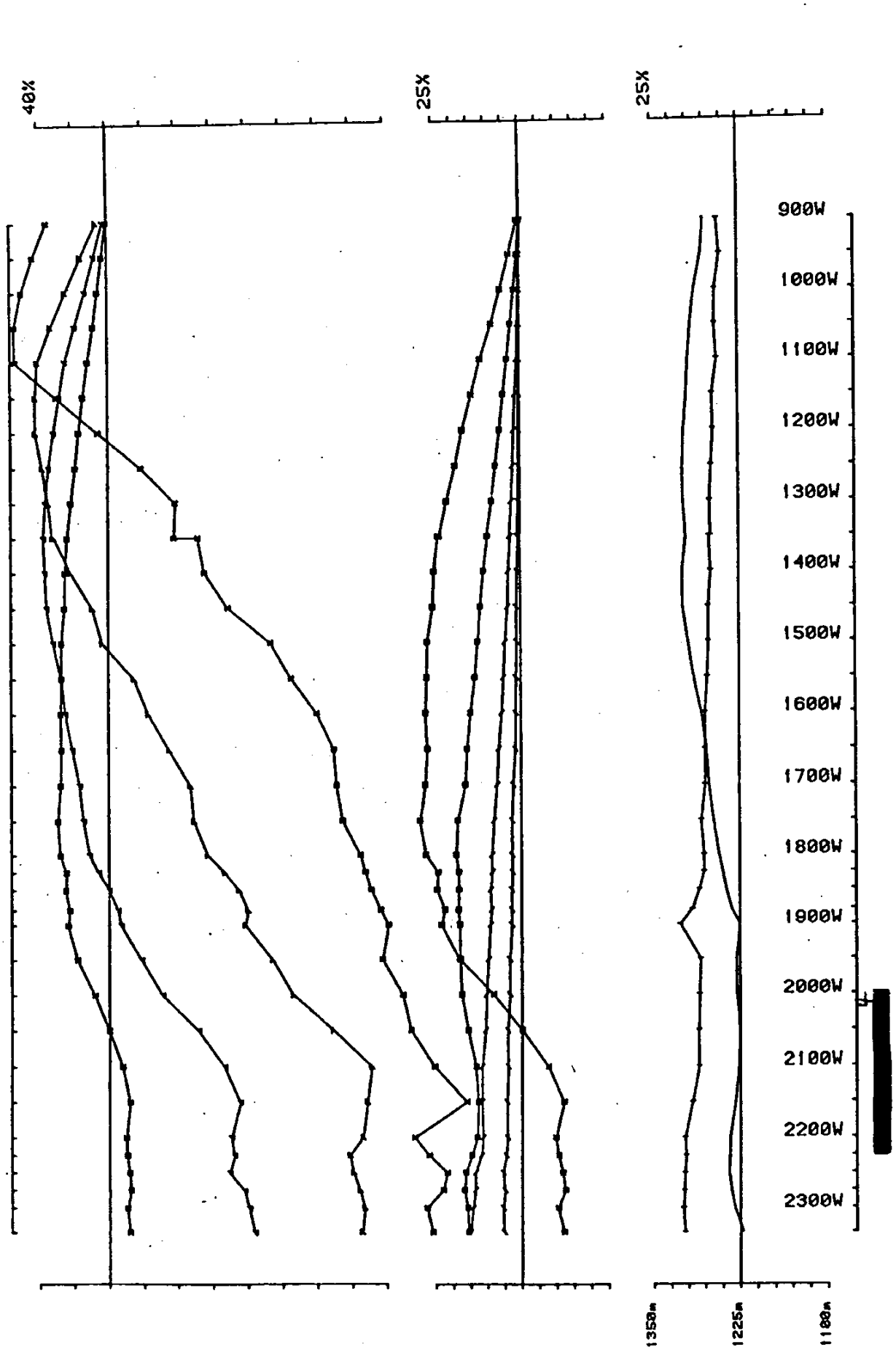
d.s. 5



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

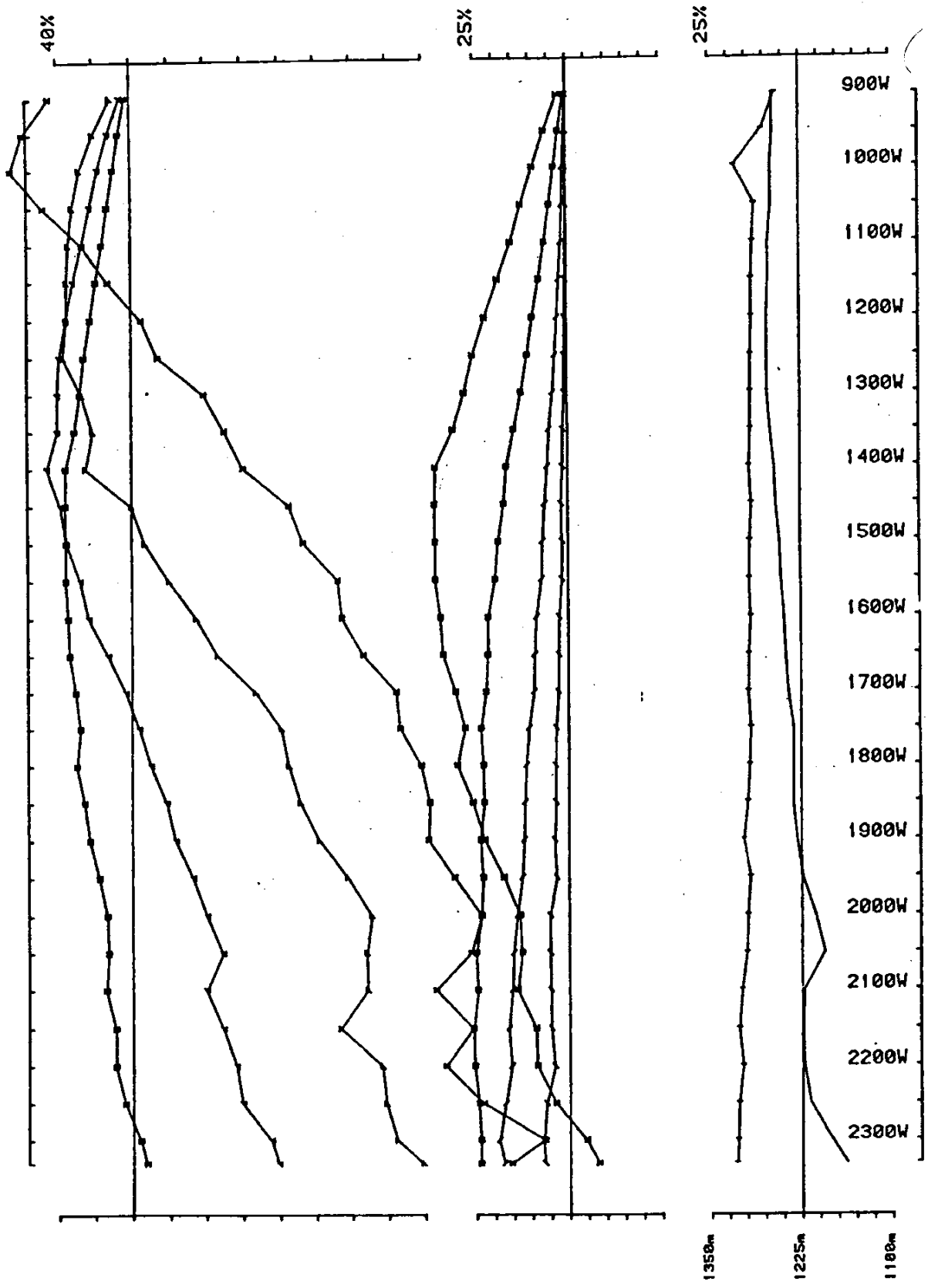
Loopno 2 Line 2500N component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 6



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

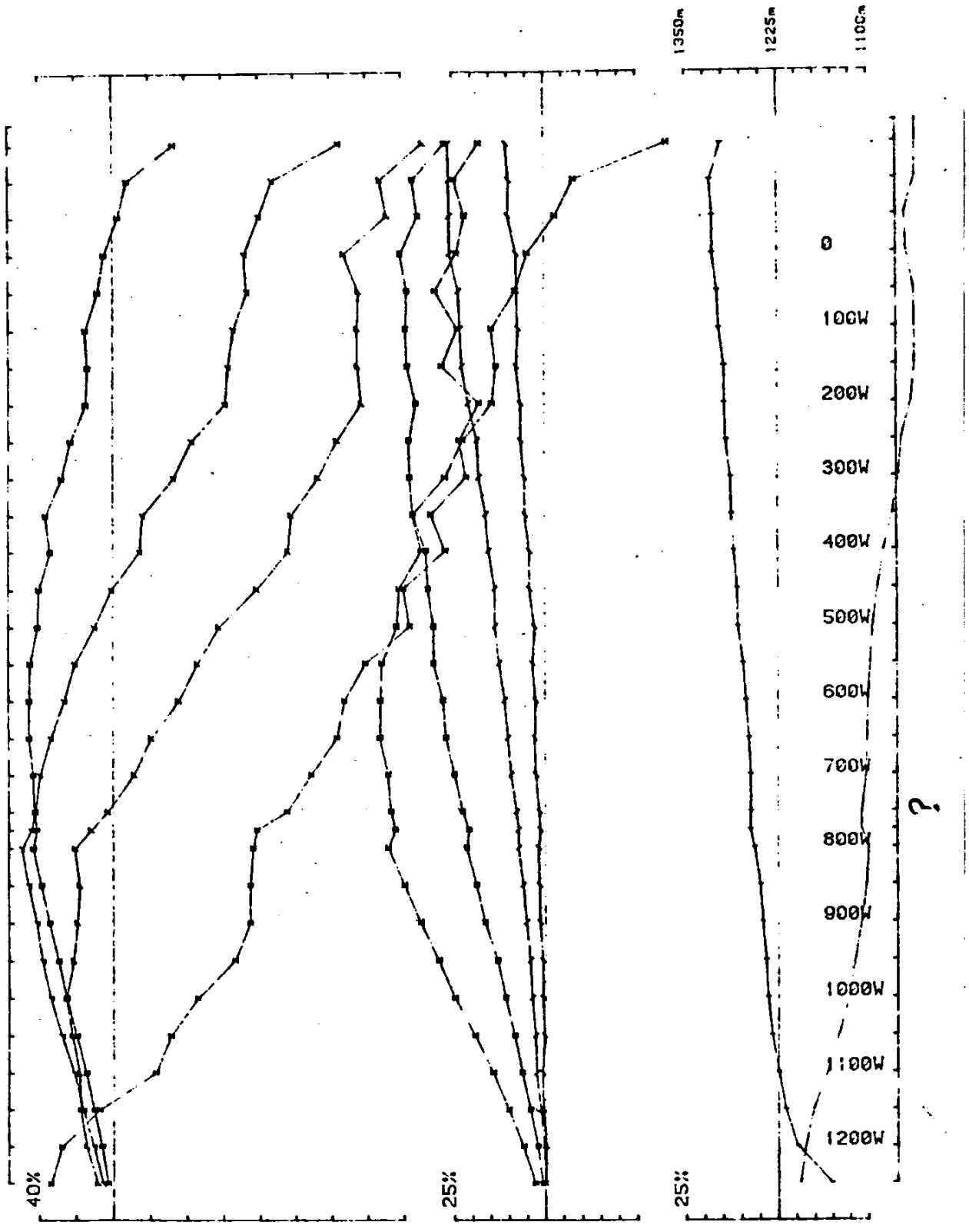
Loopno 2 Line 3000N component Hz secondary Ch 1 normalized Ch 1 reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 2 Line 3500N component Hz secondary Ch I normalized Ch I reduced

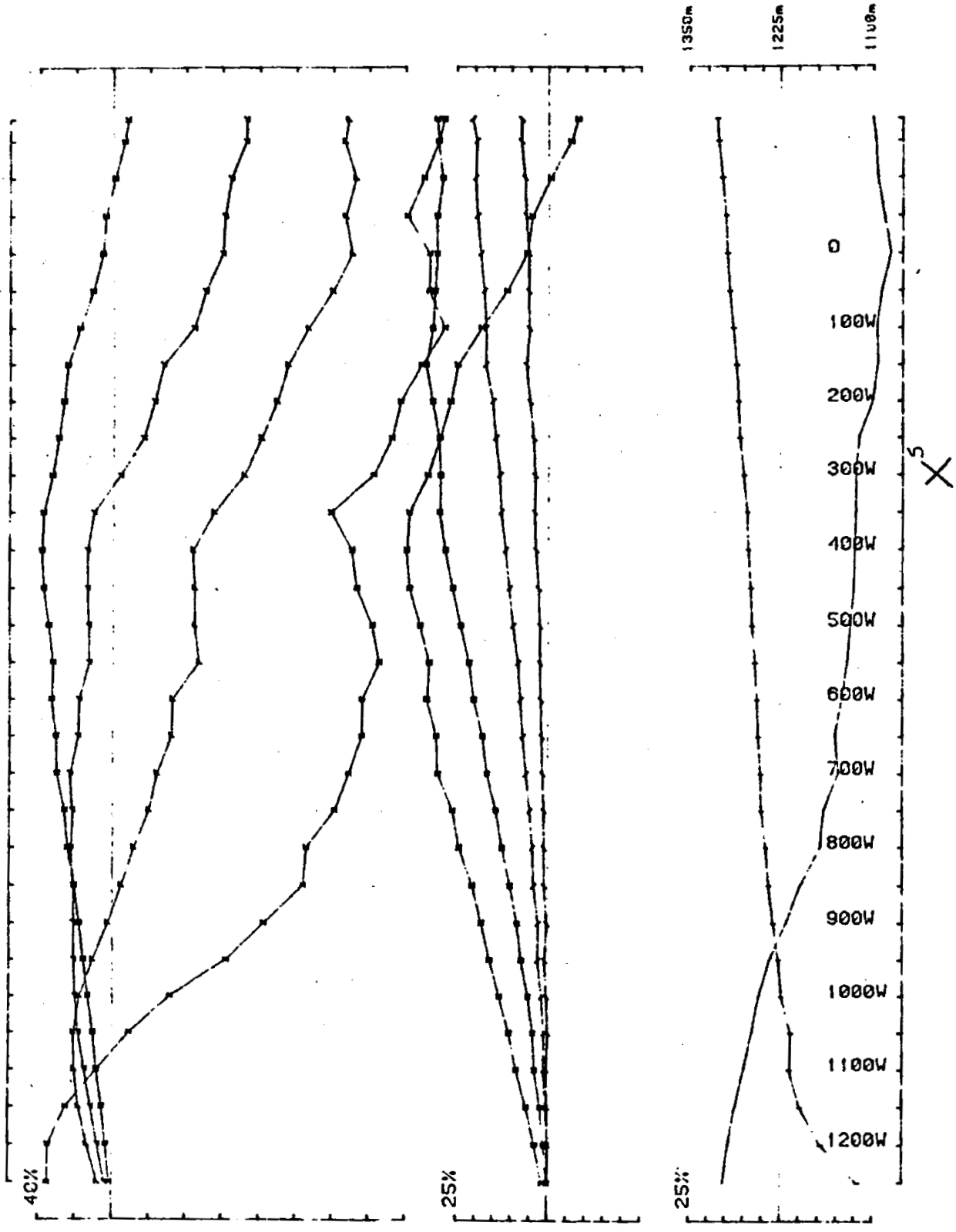
d.s. 8



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

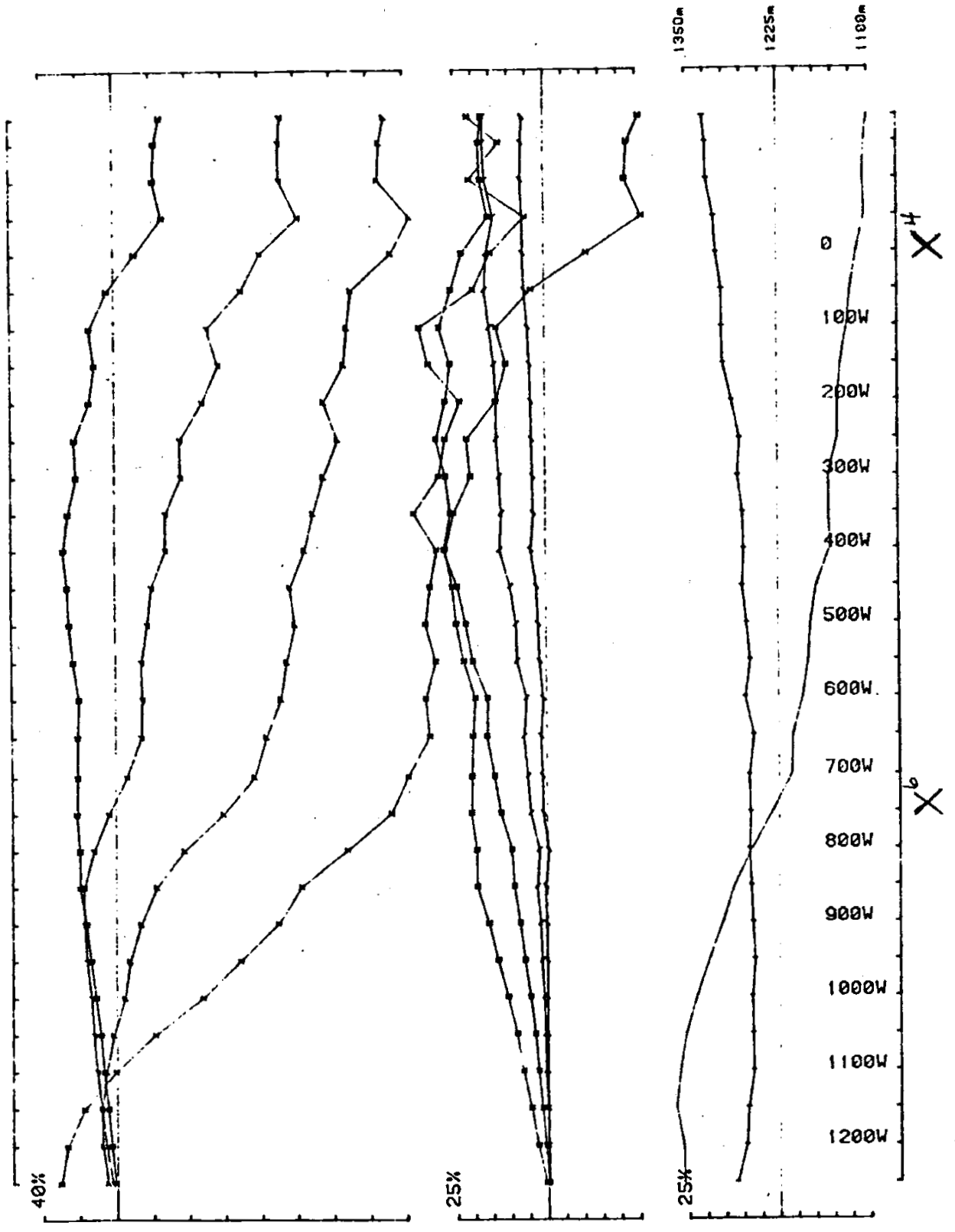
Loopno 3 Line OS component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 9



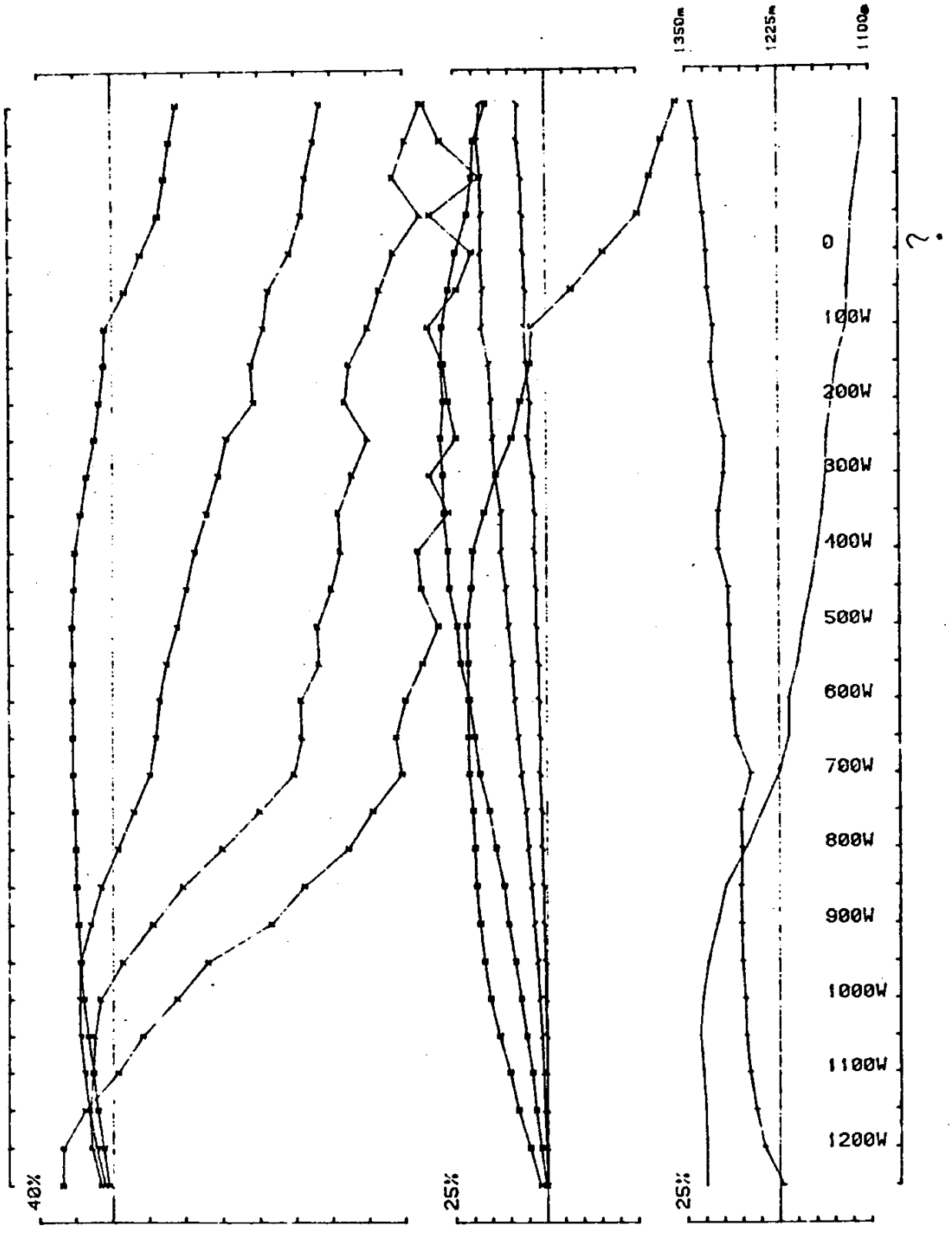
Area St Joe 82 Cominco operator S&D freq(hz) 30.974
Loopno 3 Line 500N component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 10



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

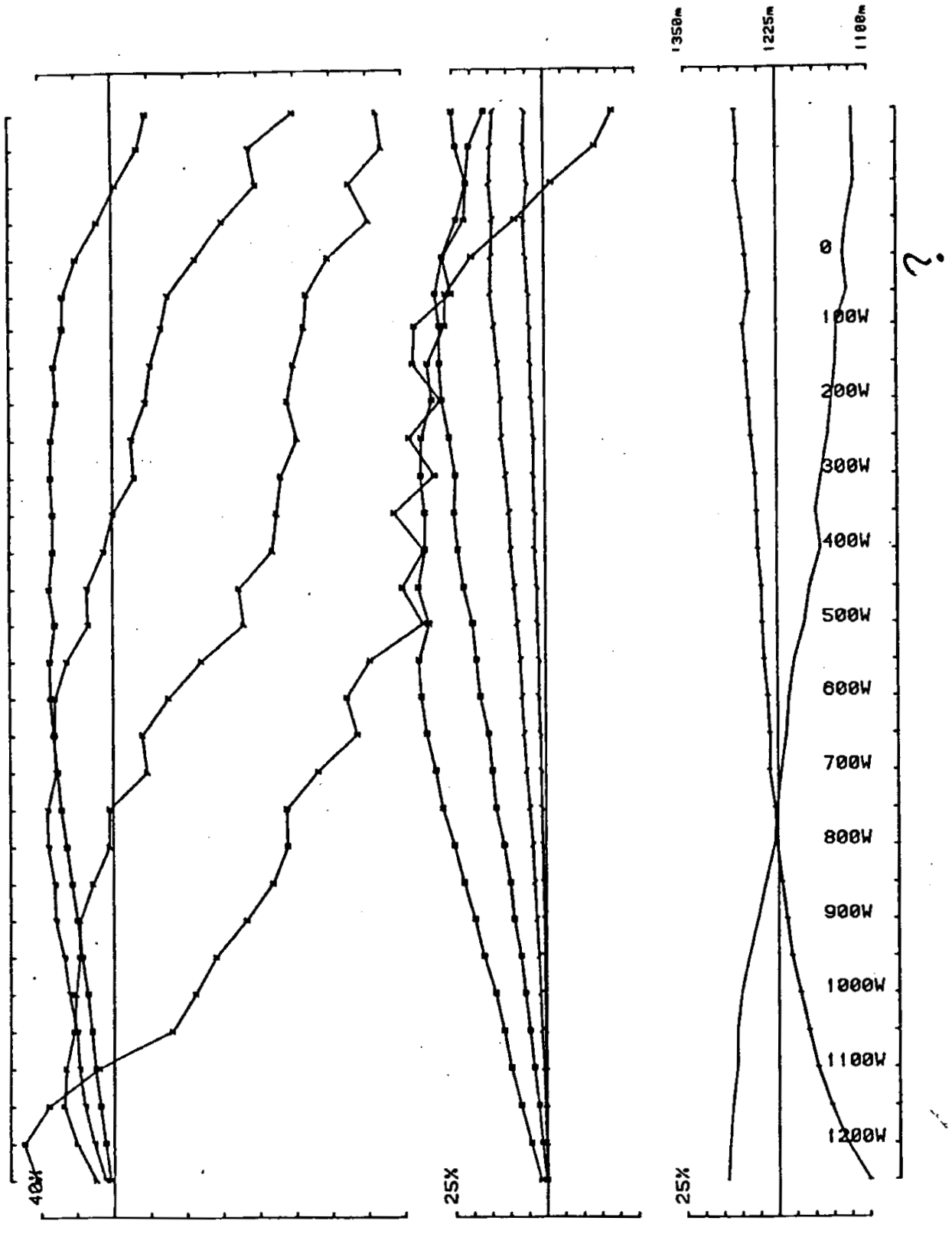
Loopno 3 Line 1000N component Hz secondary Ch 1 normalized Ch 1 reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

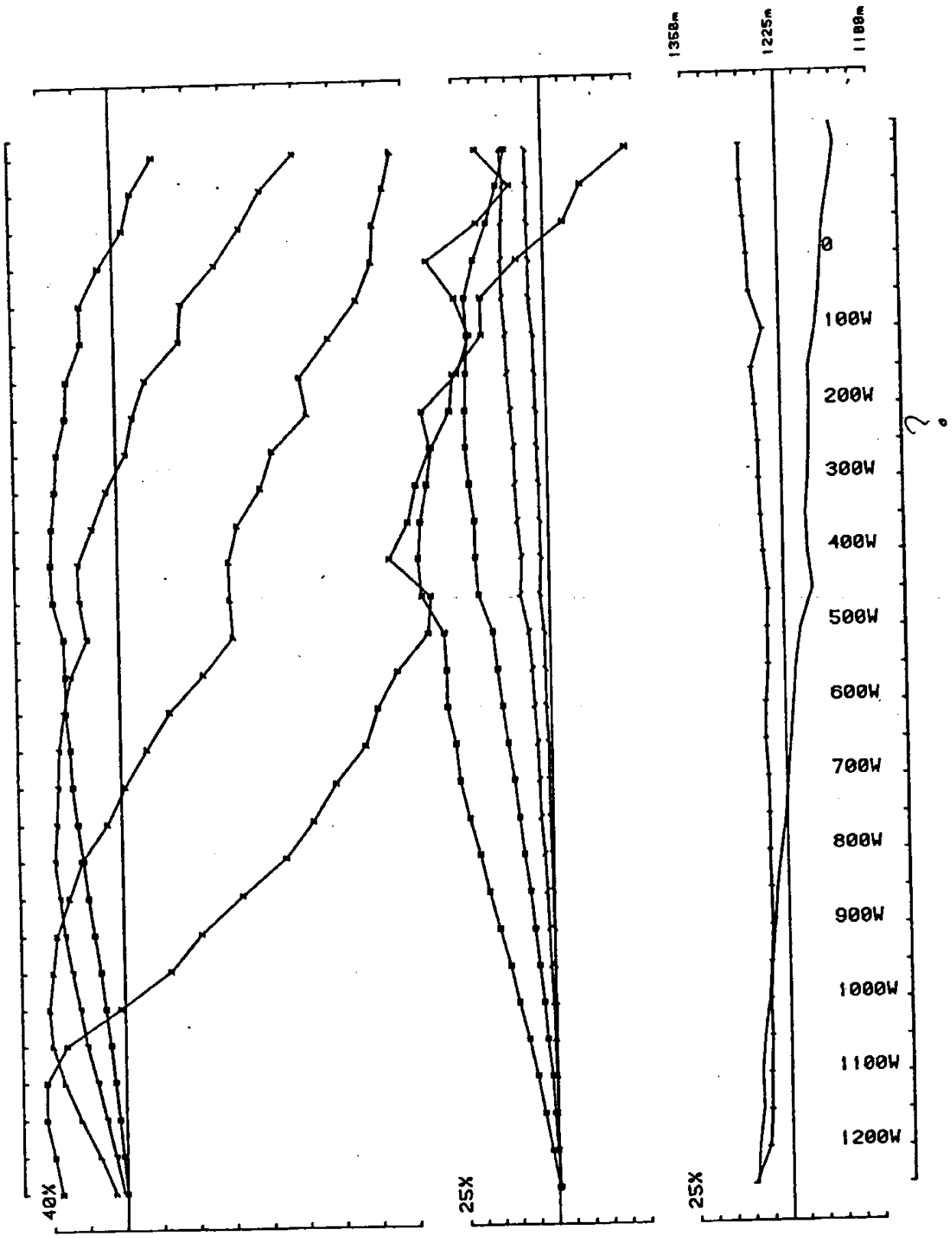
Loopno 3 Line 1500N component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 12

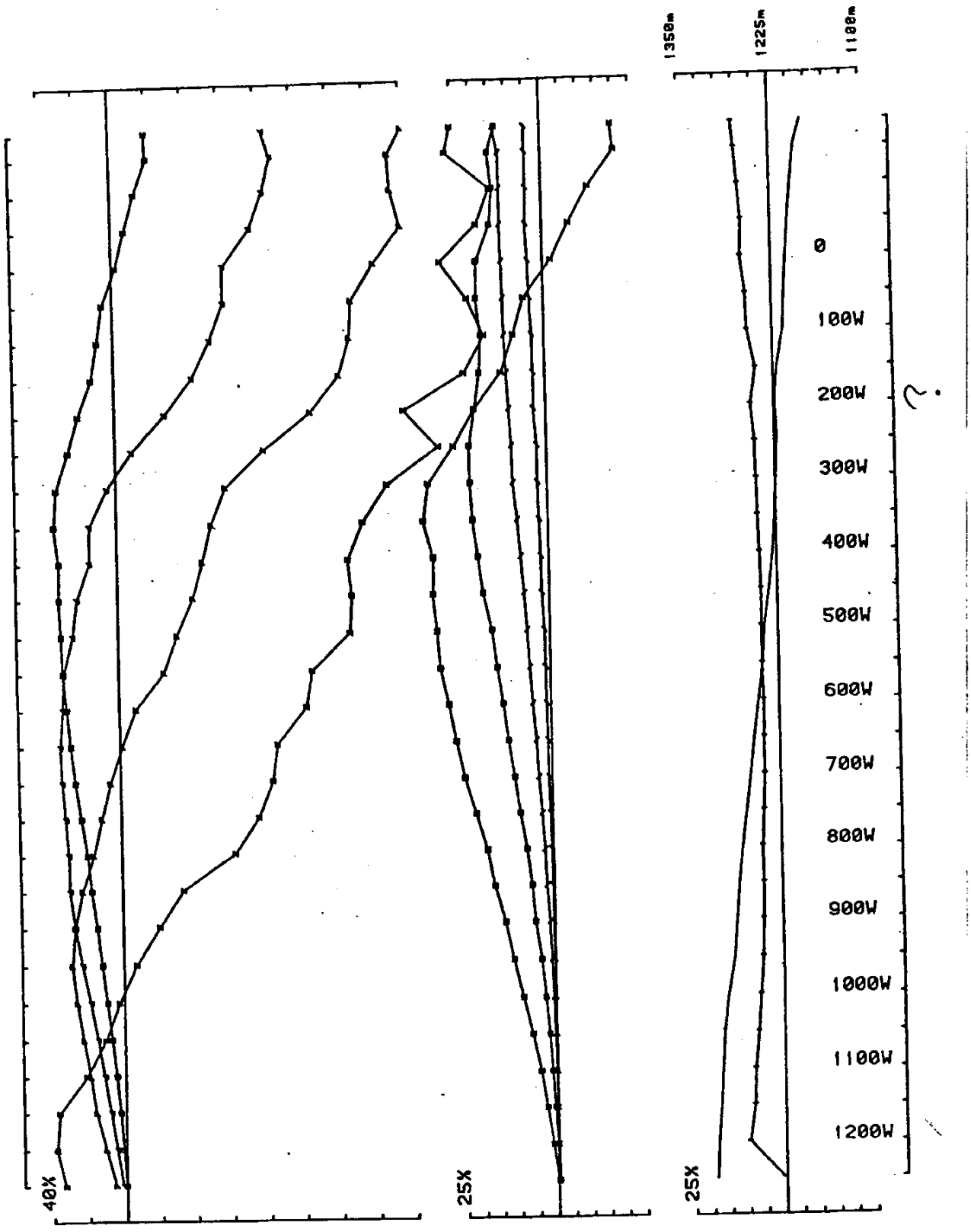


Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 4 Line 2000N component Hz secondary Ch I normalized Ch I reduced



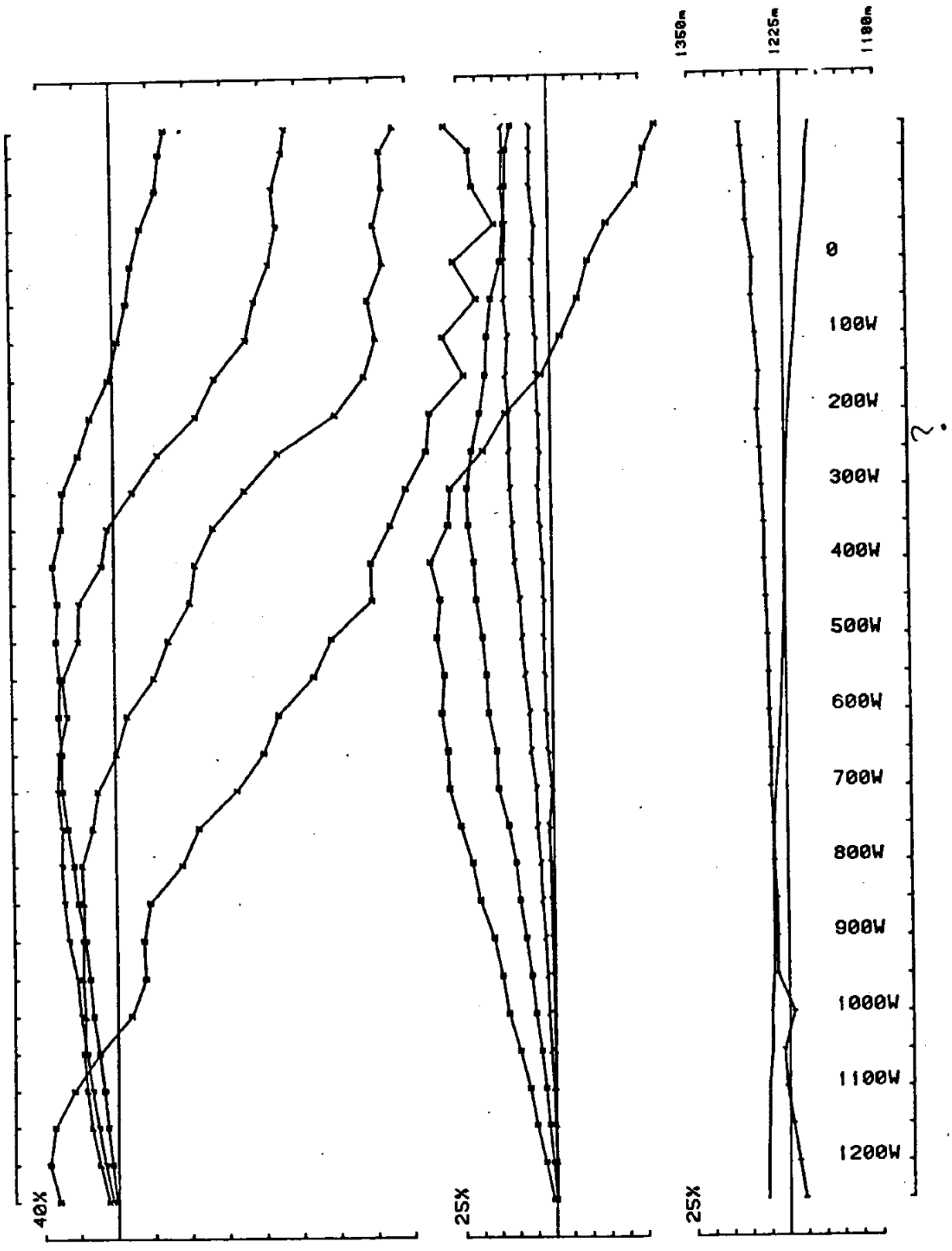
Area St Joe 82 Cominco operator S&D freq(hz) 30.974
Loopno 4 Line 2500N component Hz secondary Ch I normalized Ch I reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

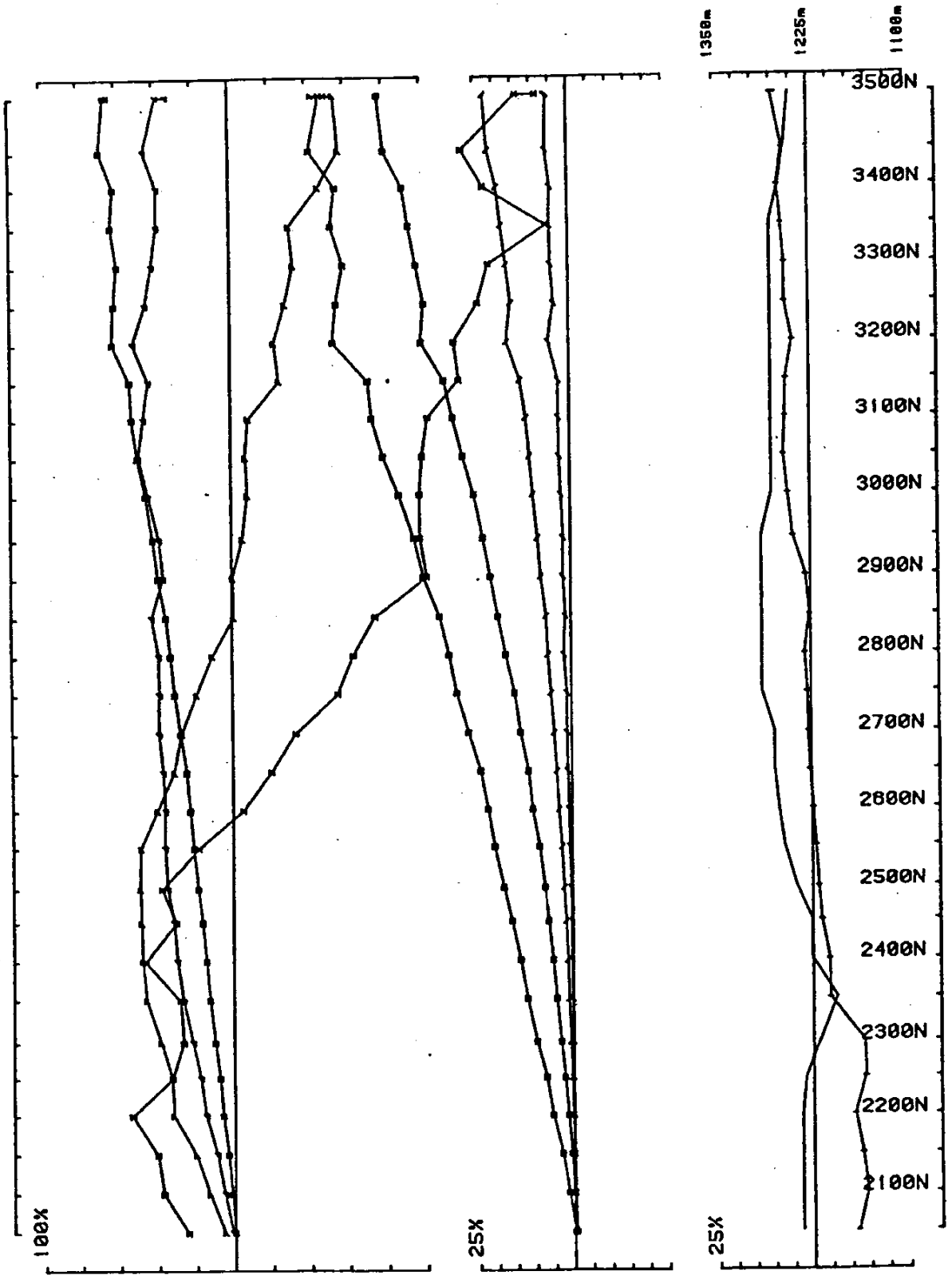
Loopno 4 Line 3000N component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 15

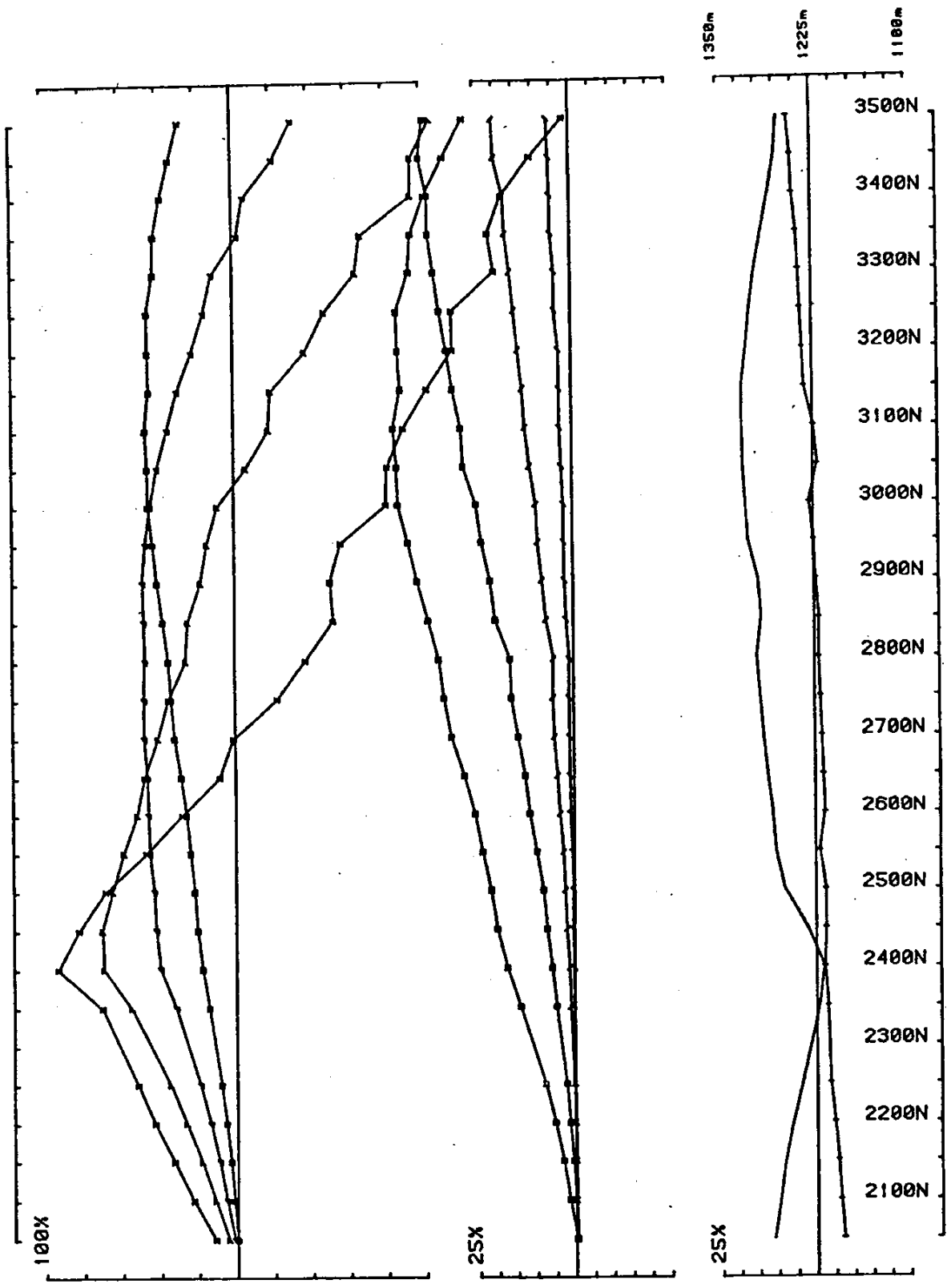


Area St Joe 82 Cominco operator S&D freq(hz) 30.974
Loopno 4 Line 3500N component Hz secondary Ch I normalized Ch I reduced

d.s. 16



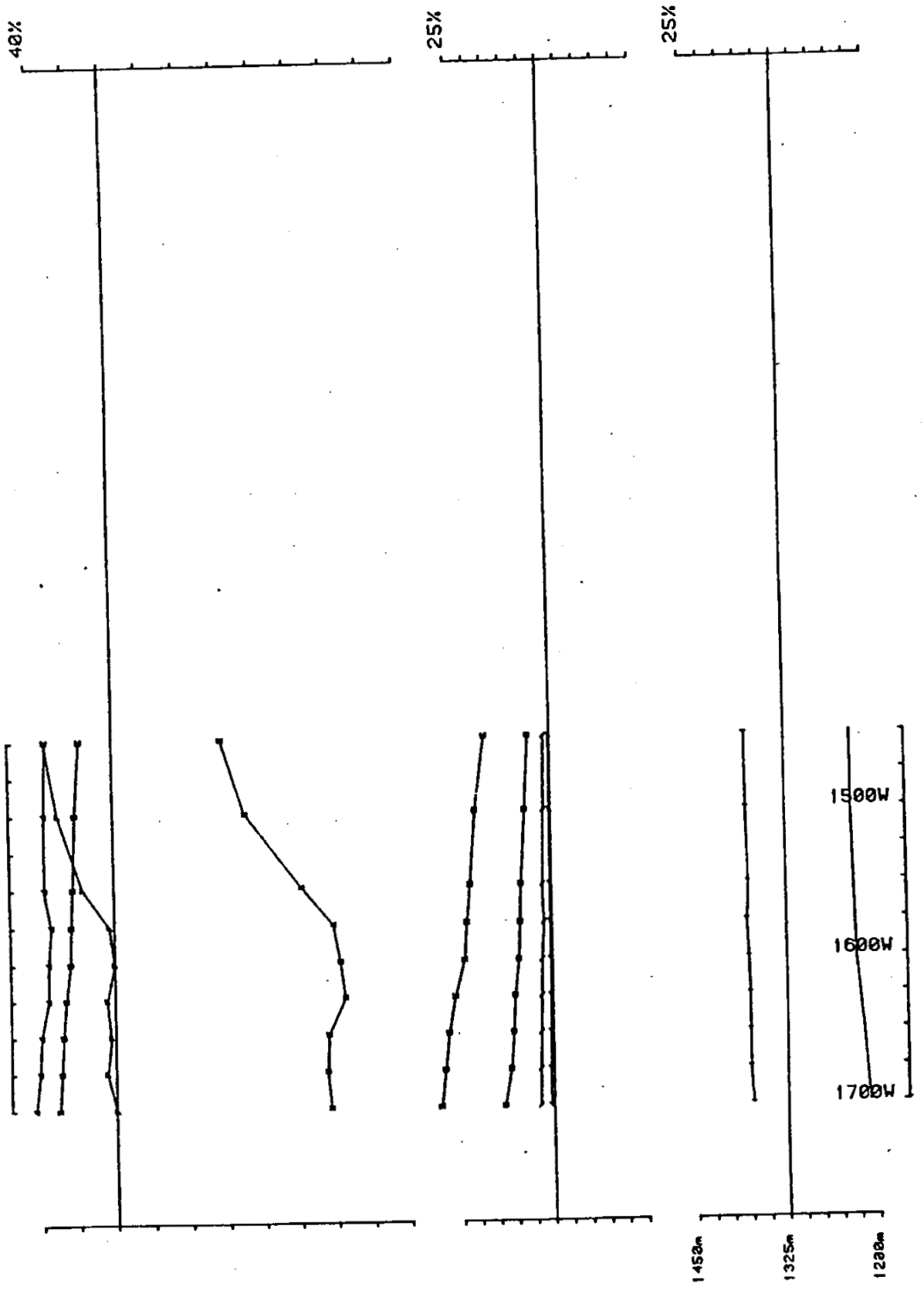
Area St Joe 82 Cominco operator S&D freq(hz) 30.974
Loopno 5 Line 1900W component Hz secondary Ch 1 normalized Ch 1 reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

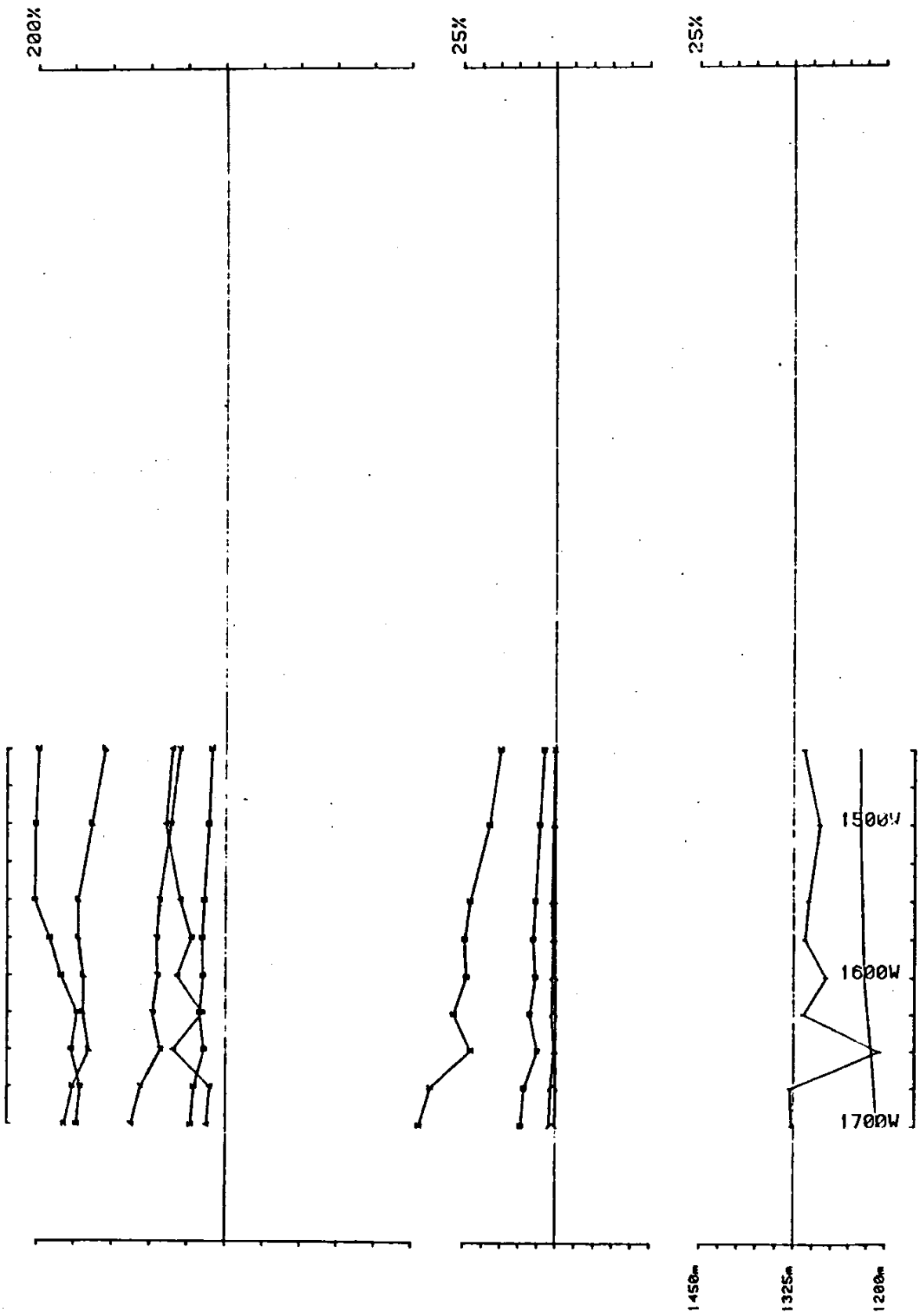
Loopno 5 Line 1500W component Hz secondary Ch 1 normalized Ch 1 reduced

d.s. 18



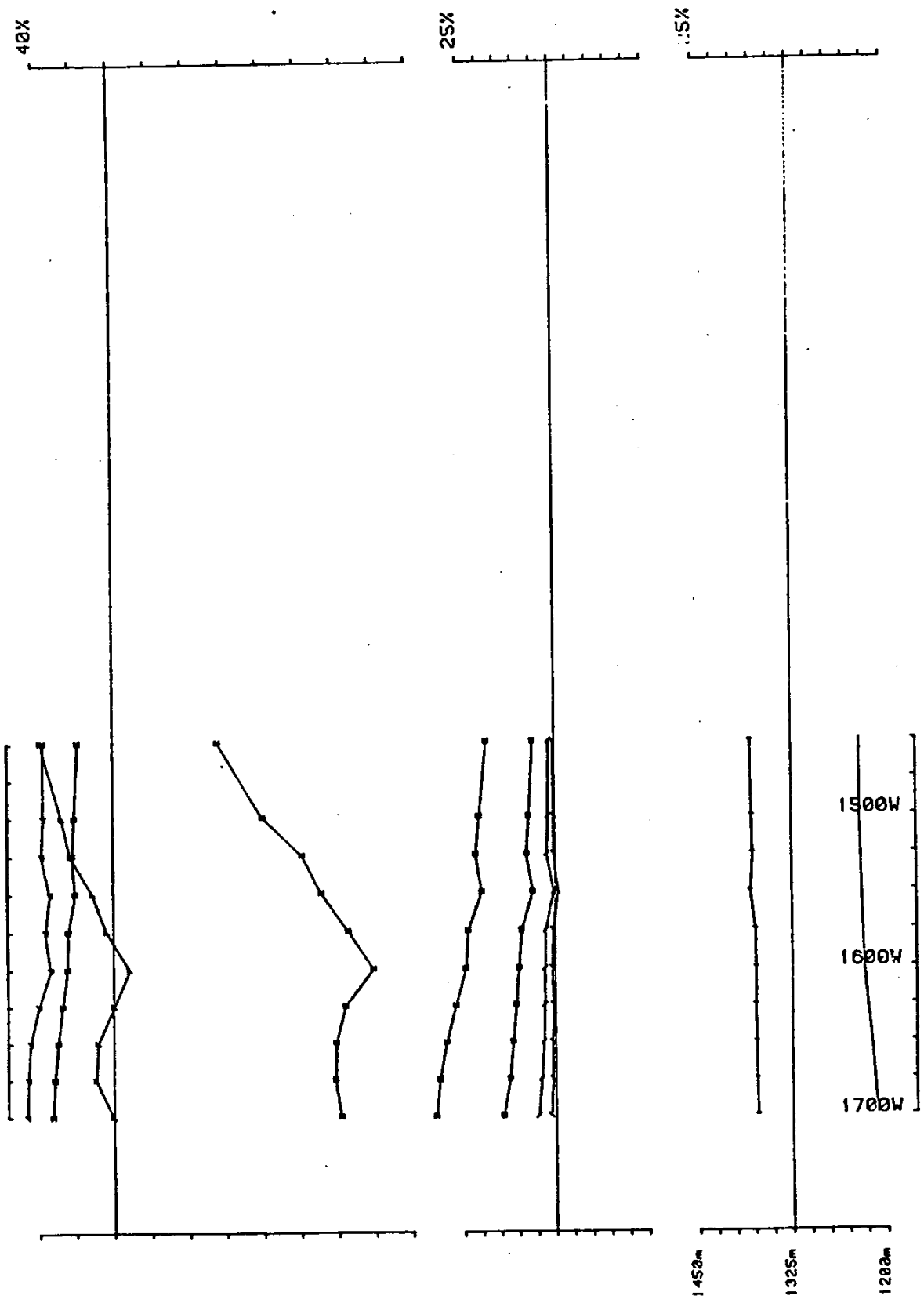
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2325N component Hz secondary Ch 1 normalized Ch 1 reduced



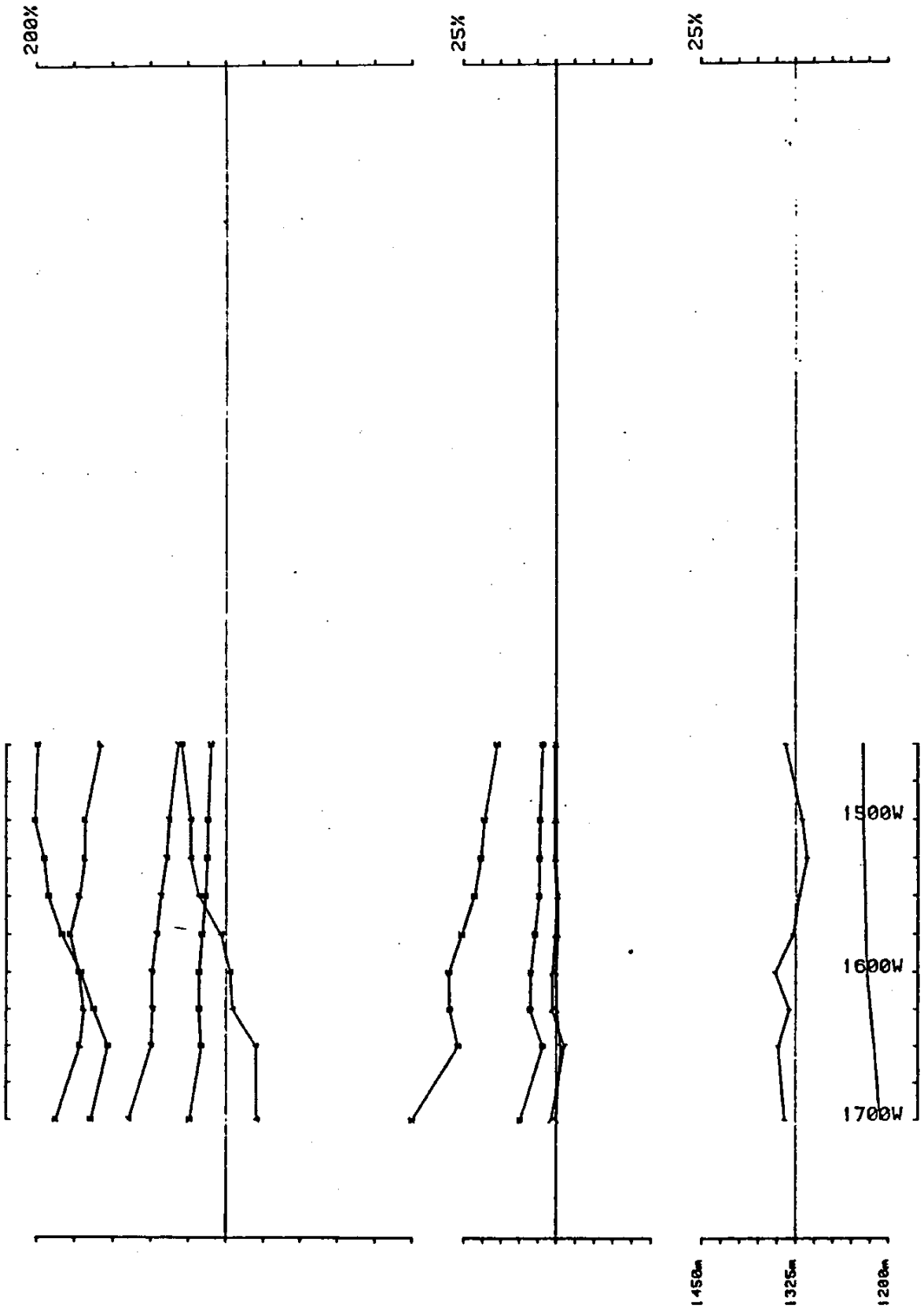
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2325N component Hx secondary primary field normalized Ch 1 reduced



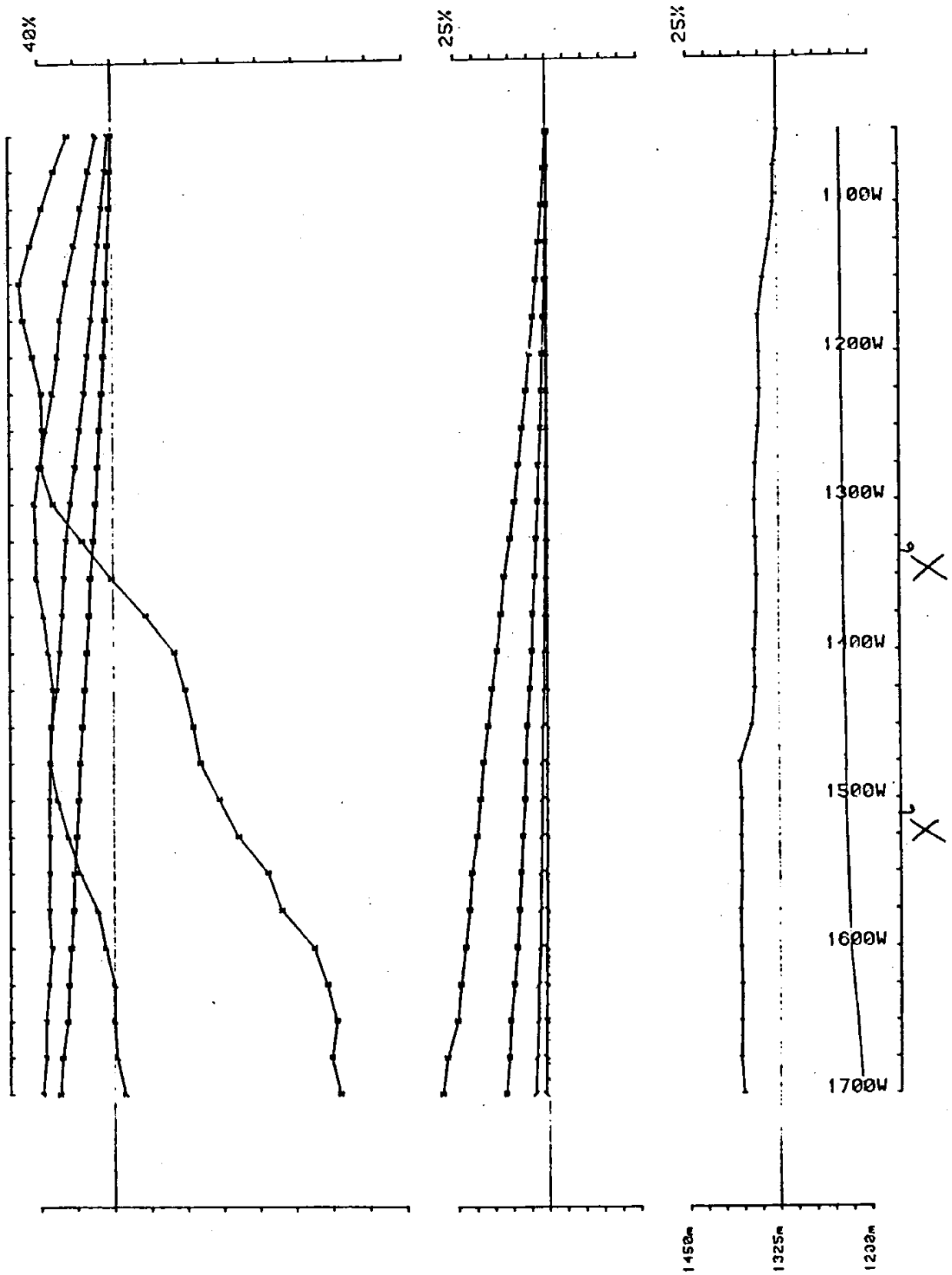
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2350N component Hz secondary Ch 1 normalized Ch 1 reduced



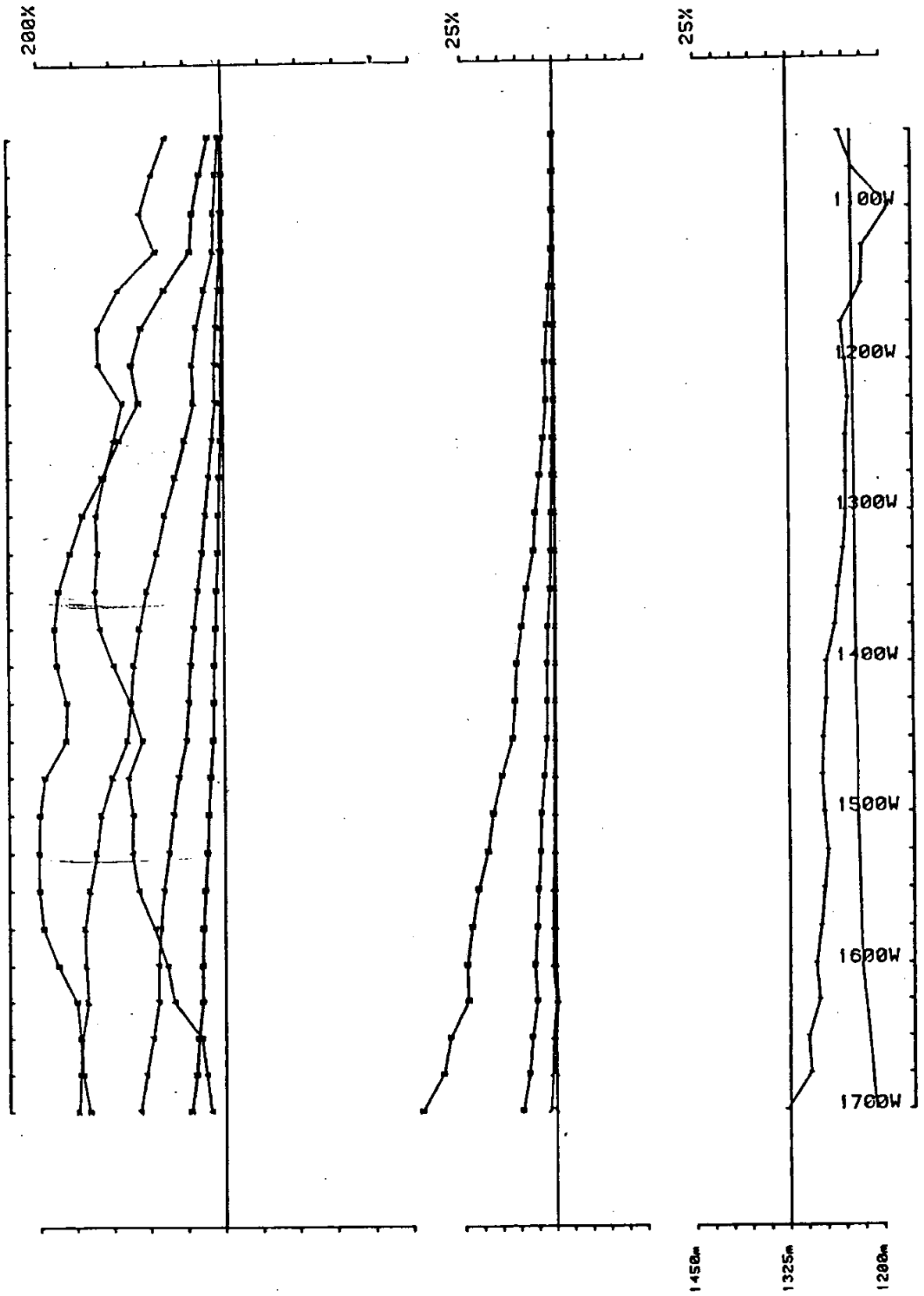
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2350N component Hx secondary primary field normalized Ch 1 reduced



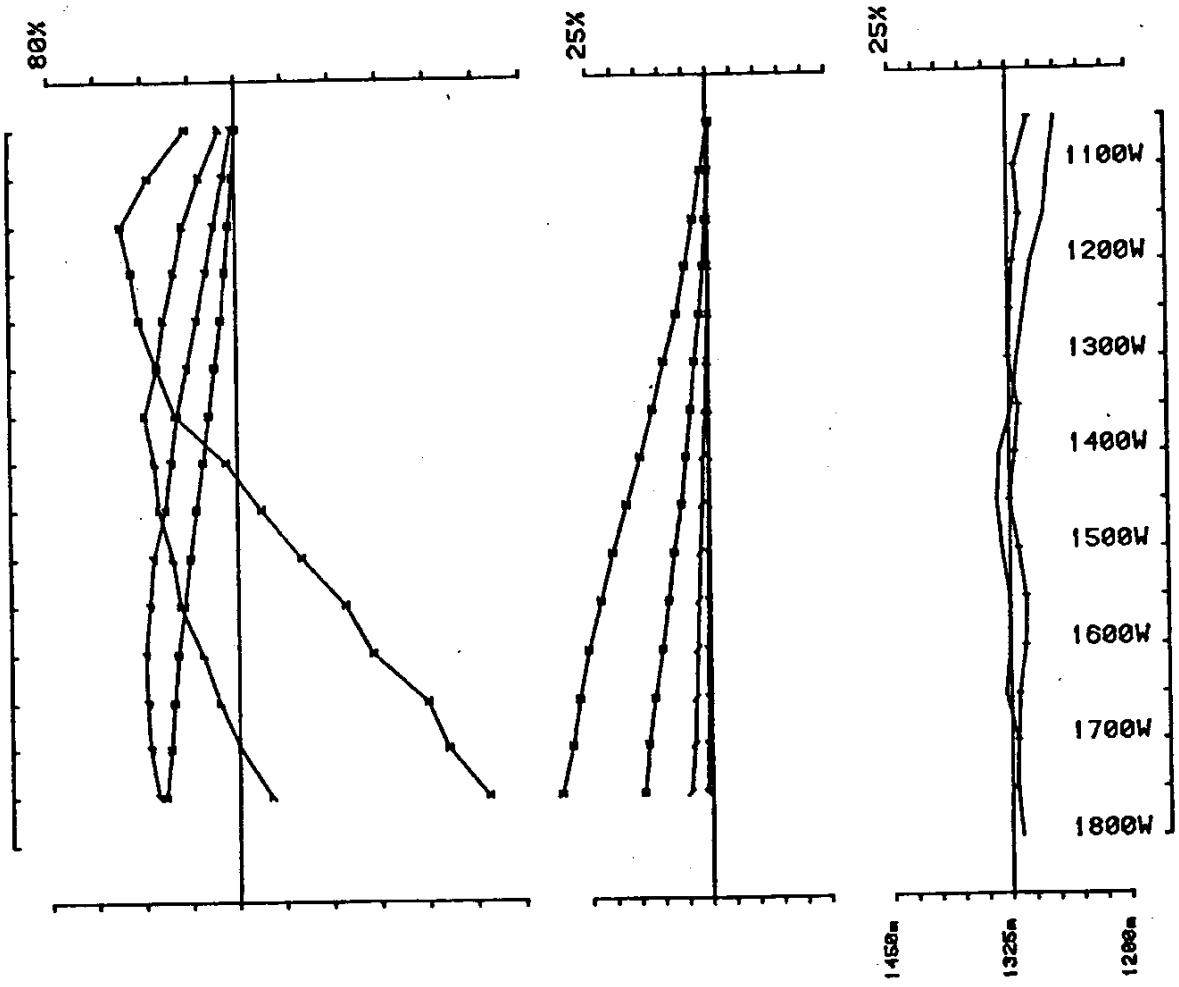
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2250N component Hz secondary Ch 1 normalized Ch 1 reduced



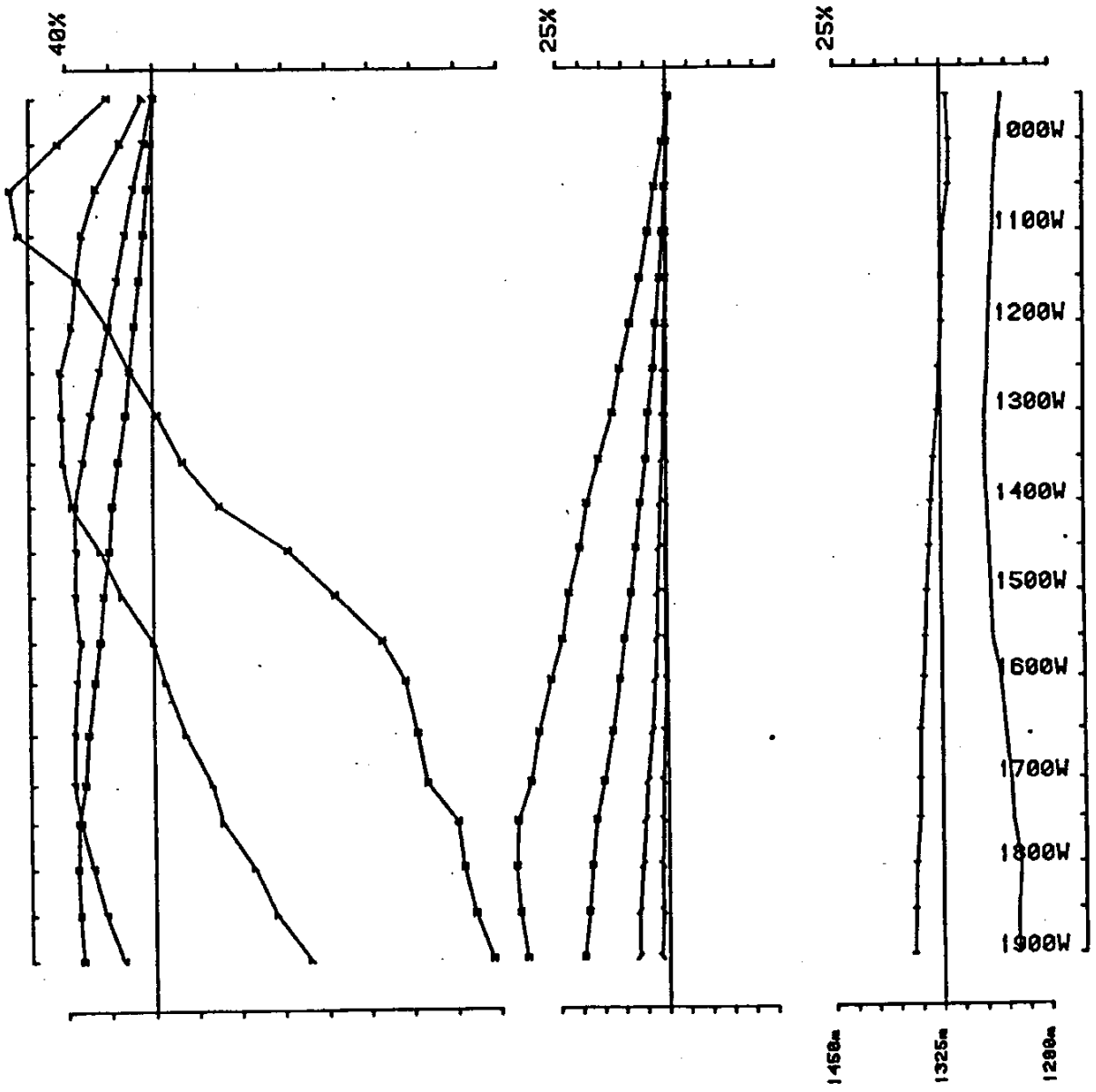
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2250N component Hx secondary primary field normalized Ch I reduced



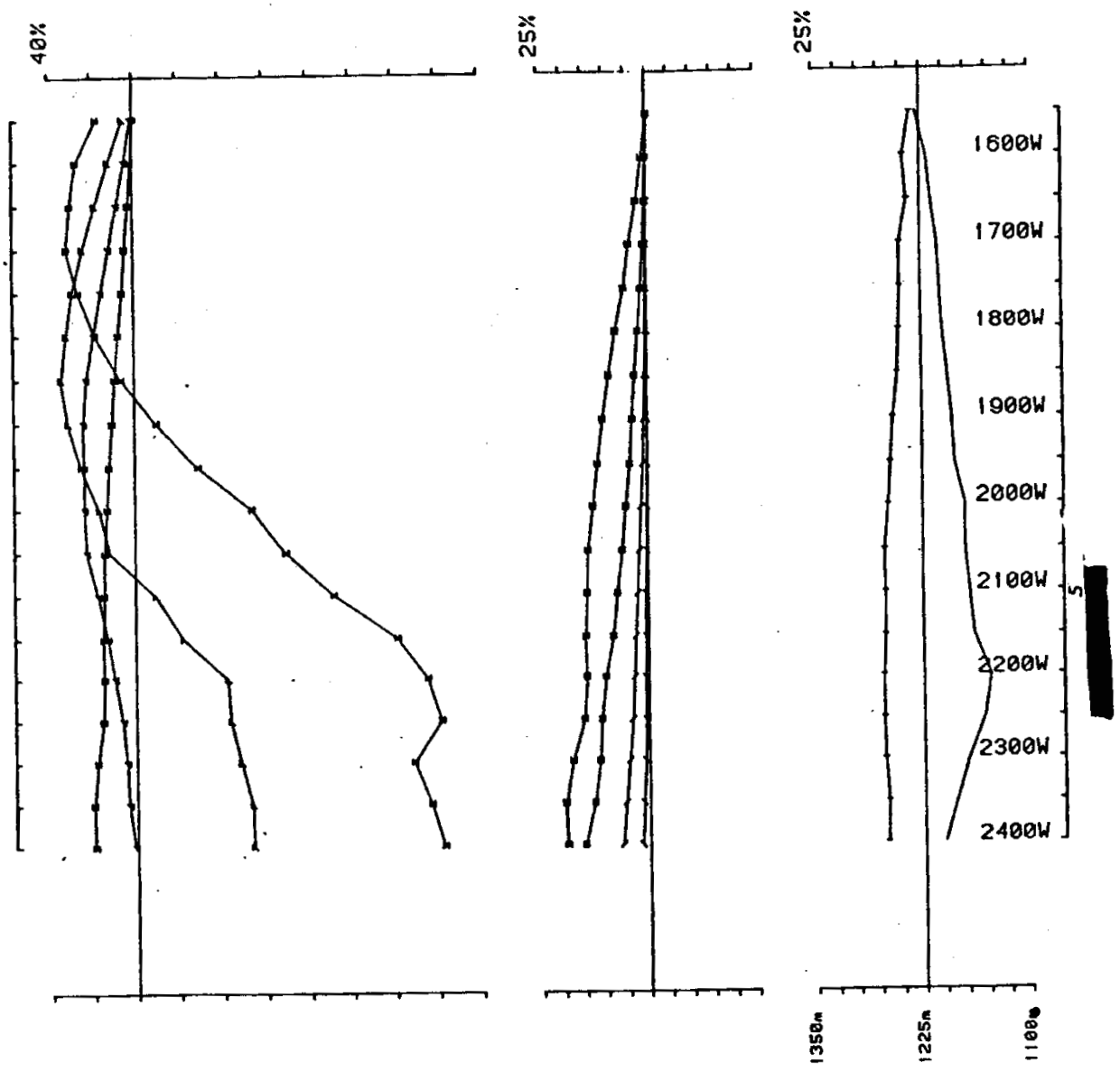
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 1750N component Hz secondary Ch 1 normalized Ch 1 reduced



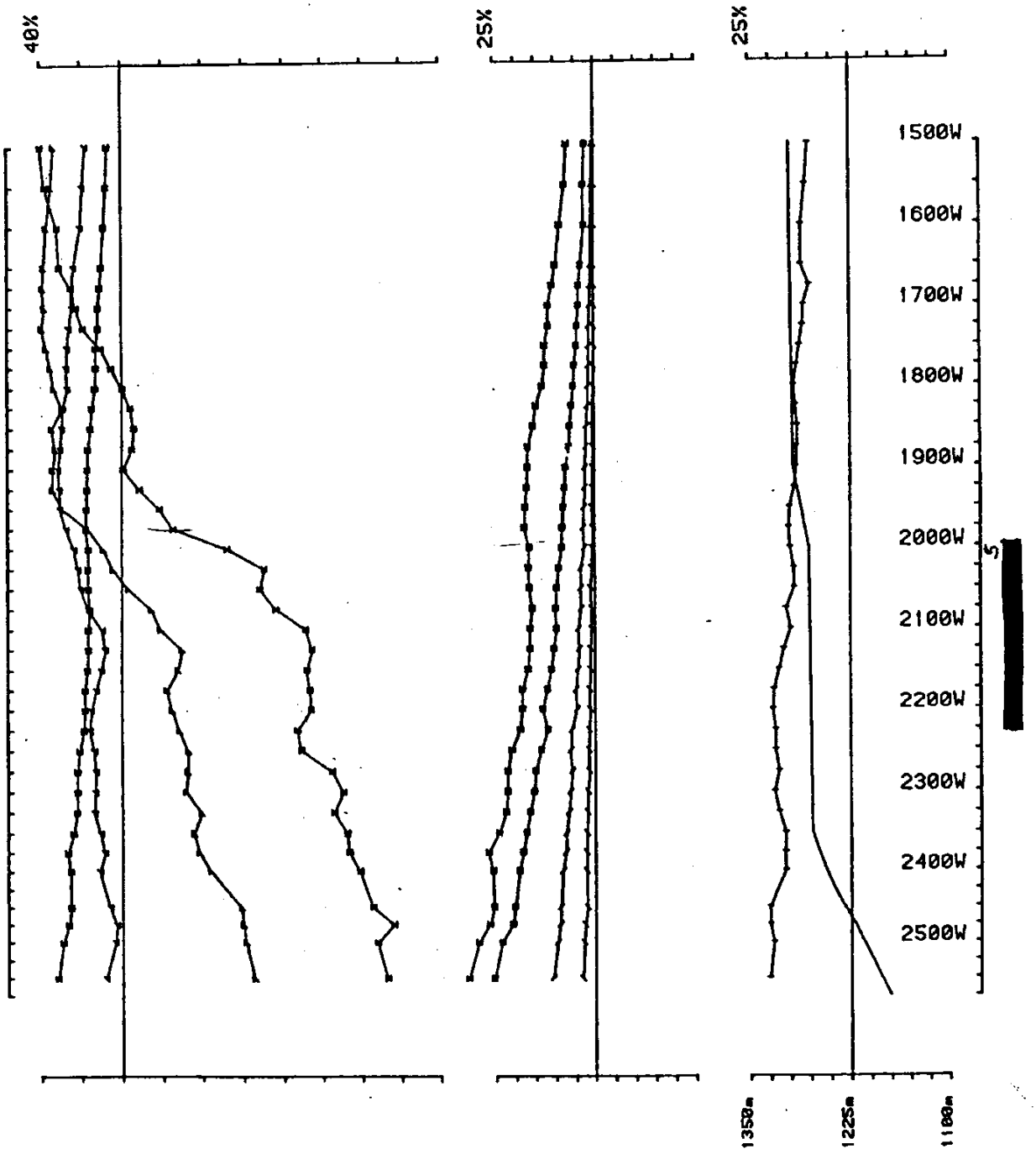
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 6 Line 2000N component Hz secondary Ch 1 normalized Ch 1 reduced



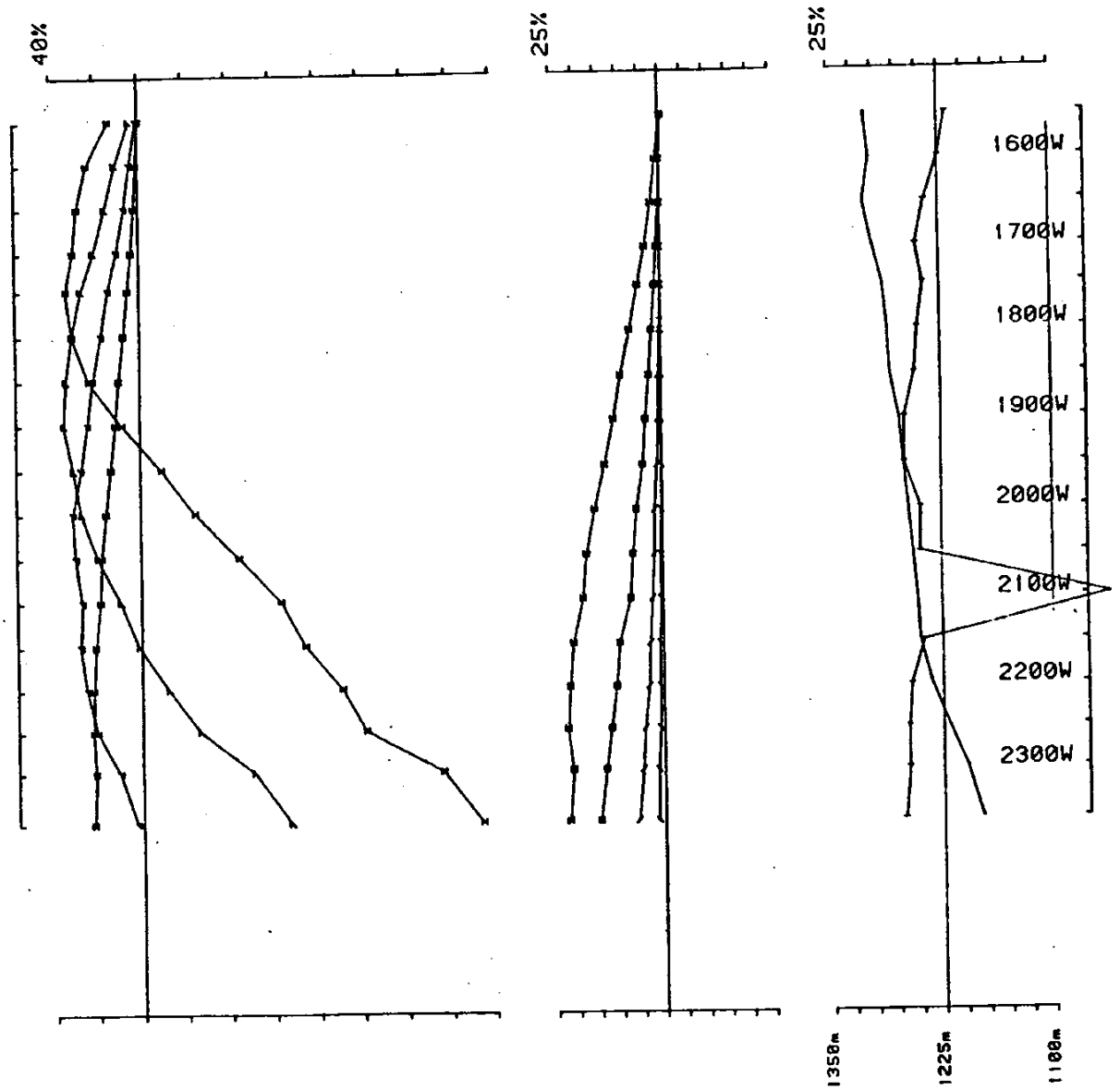
Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 7 Line 2250N component Hz secondary Ch I normalized Ch I reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 7 Line 2750N component Hz secondary Ch I normalized Ch I reduced



Area St Joe 82 Cominco operator S&D freq(hz) 30.974

Loopno 7 Line 1750N component Hz secondary Ch 1 normalized Ch 1 reduced

A P P E N D I X IV

IN THE MATTER OF THE B.C. MINERAL ACT

AND IN THE MATTER OF A GEOPHYSICAL PROGRAMME

CARRIED OUT ON THE ST. JOE CLAIMS

LOCATED 9 KM S.W. OF CRANBROOK, B.C.

IN THE FORT STEELE MINING DIVISION OF THE

PROVINCE OF BRITISH COLUMBIA, MORE PARTICULARLY

N.T.S. 82G/5

S T A T E M E N T

I, SYD J. VISSER, of the City of Surrey 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 hereinafter 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 St. Joe mineral claims;

3. That the said expenditures were incurred between September 16 and October 2, 1982, for the purpose of mineral exploration of the above-named claims.

Syd J. Visser, B.Sc.
Geophysicist
Cominco Ltd.

"EXHIBIT A"

ST. JOE CLAIMS

STATEMENT OF GEOPHYSICAL EXPENDITURES 1982

1.	STAFF TIME		
	S.J. Visser Sept. 16-21, 24-27, 29-30; Oct. 1-2; 14 days @ $175/day	$ 2,450.00	
	D.C. McCollor Sept. 16-21, 24-27, 29-30; Oct. 1-2; 14 days @ $135/day	1,890.00	
	D. Keith Sept. 17-21, 24-27, 29-30; Oct. 1-2; 13 days @ $71/day	923.00	
	G. Rodgers Sept. 17-21 5 days @ $71/day	355.00	
	B. Price Sept. 24-27, 29-30; Oct. 1-2 8 days @ $85/day	680.00	$ 6,298.00
2.	UTEM RENTAL		
	Standby: Sept. 16 1 day @ $75/day	75.00	
	Operating: Sept. 17-21, 24-27, 29-30; Oct 1; 12 days @ $150/day	1,800.00	1,875.00
3.	OPERATING DAY CHARGE		
	Sept. 17-21, 24-27, 29-30; Oct. 1 12 days @ $250/day		3,000.00
4.	EXPENSE ACCOUNTS		
	S.J. Visser Sept	850.00	
	Oct	75.00	
	D.C. McCollar Sept	1,200.00	
	Oct	200.00	
	B. Price Sept	85.14	
	Oct	152.10	2,562.24
5.	MISCELLANEOUS		
	Wire Usage - 1 Spool @ $175	175.00	
	Truck Rental - GMC - Sept	360.00	
	Oct	60.00	
	Camp Supplies	37.53	
	Fuel	16.00	648.53
	TOTAL COST		$ 14,383.77

Syd J. Visser, B.Sc.
Geophysicist

APPENDIX V

CERTIFICATION

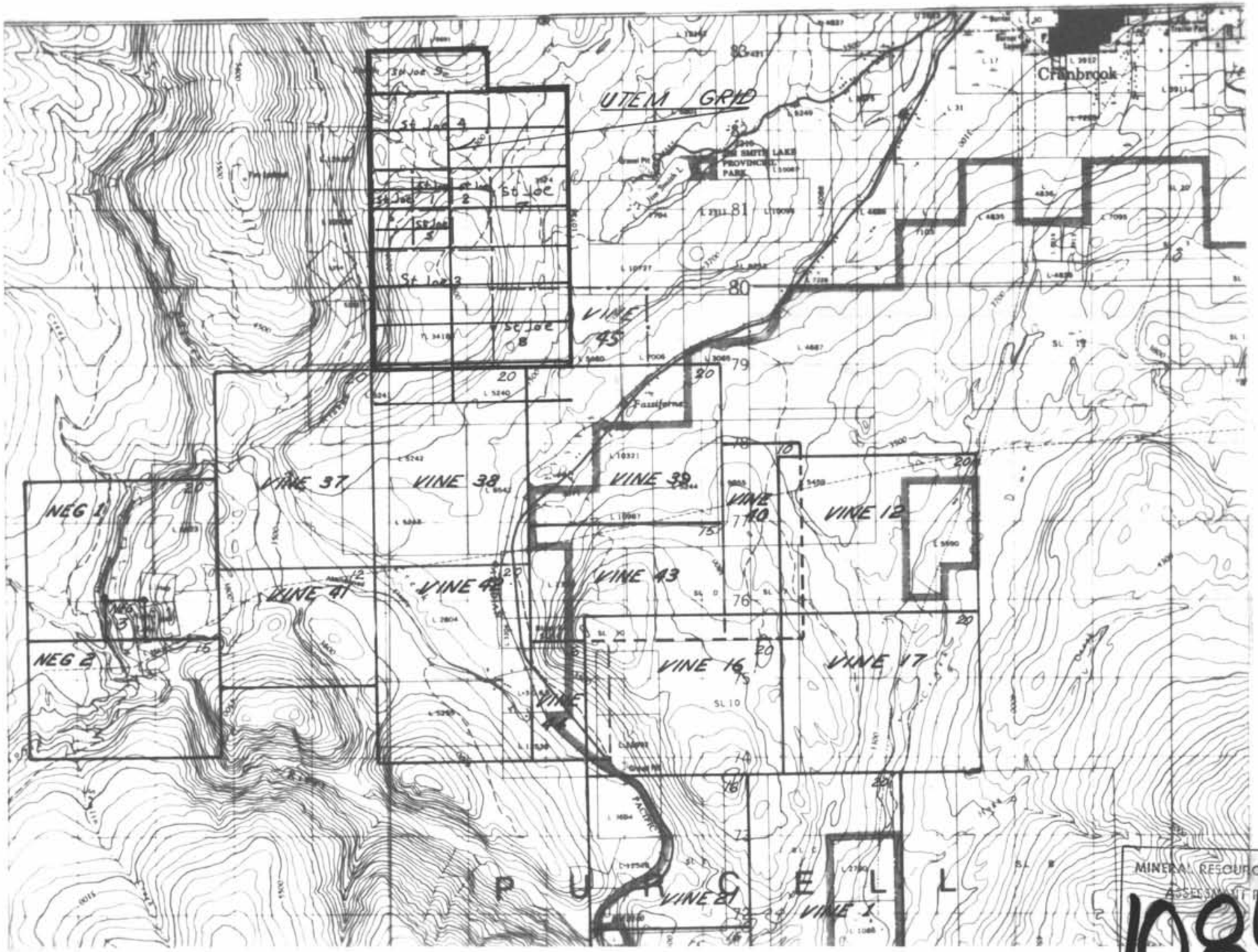
I, Syd J. Visser, of 12627 - 98th Avenue in the City of Surrey, in the Province of British Columbia, do hereby certify that:-

1) I graduated from Haileybury School of Mines in 1971 as a Mining Technician and from the University of British Columbia in 1981 with Honours B.Sc. in Geophysics and Geology.

2) I have worked in mineral exploration since 1968.

SYD J. VISSER
Geophysicist

October 21, 1982



0 1 2 3 4 Km

St. JOE CLAIMS

Cominco

Drawn by:		Traced by:		LOCATION MAP		
Revised by	Date	Revised by	Date			
				Scale: 1:50,000	Date: Oct. 25, 1982	Plate: 1

210.0620

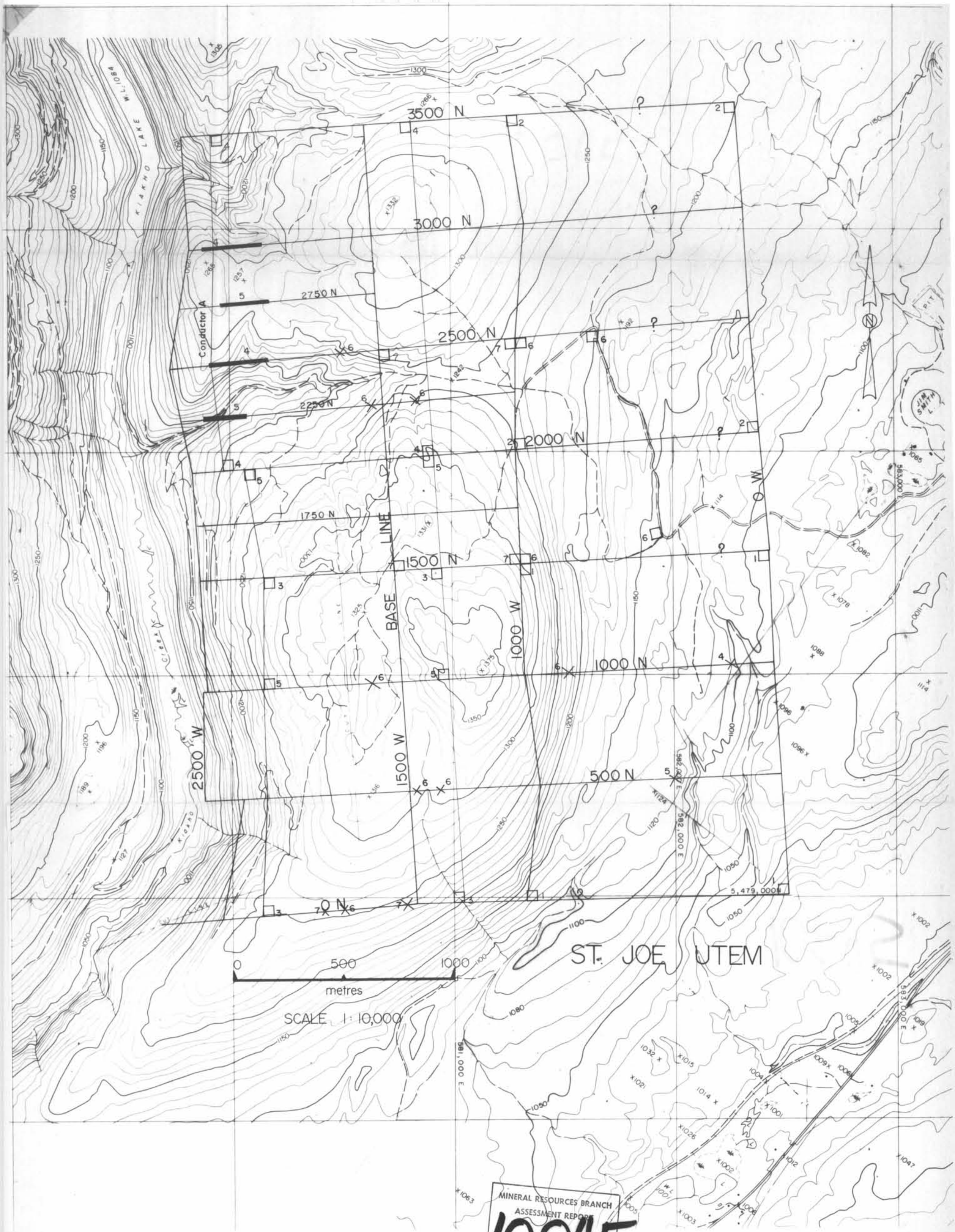


PLATE 2

UTEM COMPILATION MAP

(FOR LEGEND SEE APPENDIX II)