

付 帶 資 料





## 付 帯 資 料

### 1. 物理探査 (SIP法) の調査仕様

電極配置 : ダイポール・ダイポール法

電極間隔 : 100 m

電極隔離係数 :  $n = 1 \sim 5$

周波数 : 0.125 ~ 88 Hz (18周波数)

測線長 : 6 km (1 km × 6本)

測線 J, K, L Sable Antelope 地区

測線 M, N, O Kamiyobo 地区

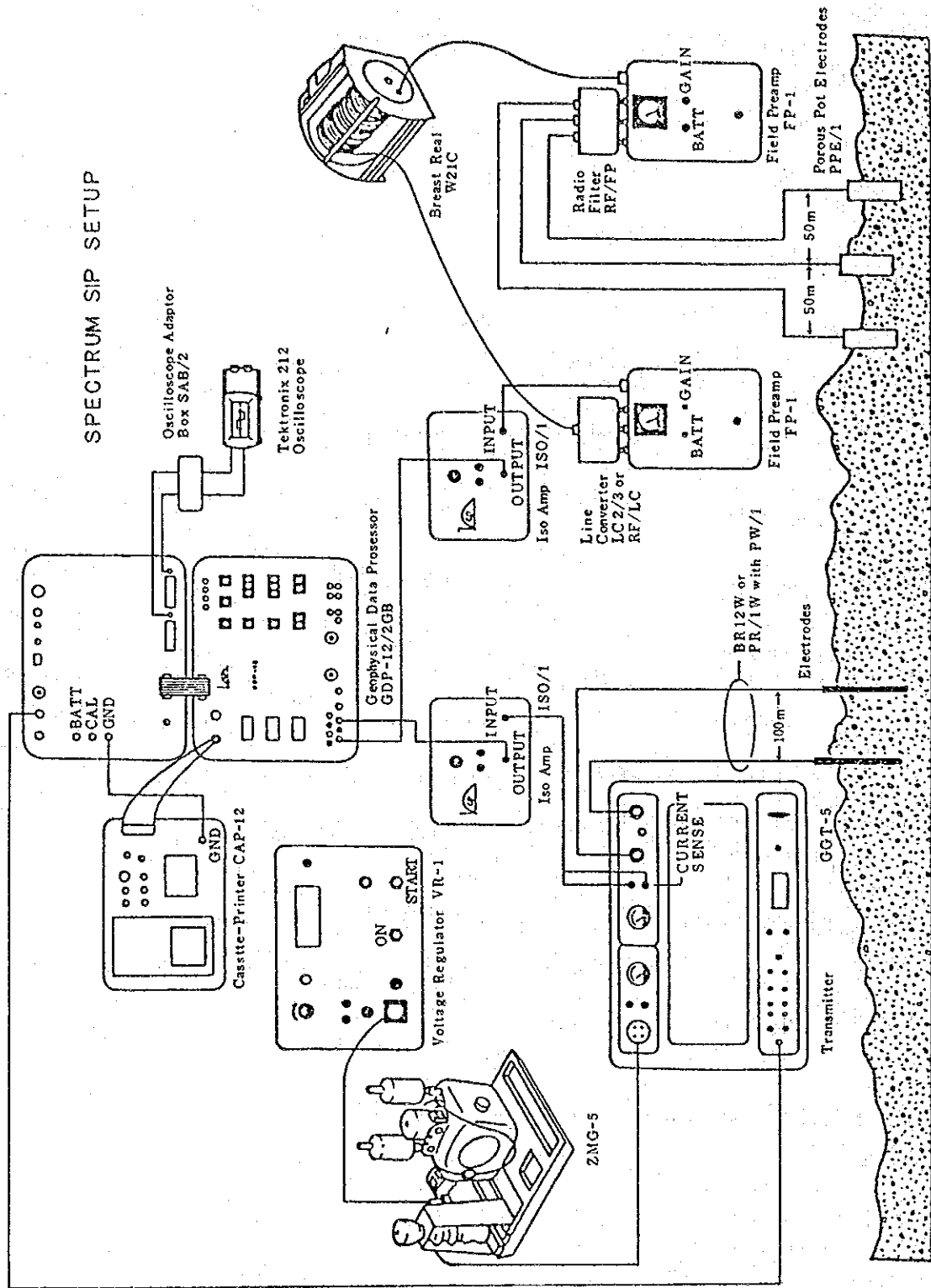
### 2. 調査方法

SIP法 (Spectral Induced Polarization Method) では、一般に 0.01 ~ 100 Hz の広範囲の周波数で IP 現象を測定する。測定された結果は位相および振幅スペクトル図、コール・コール図に表示される。SIP法の特徴は IP 現象の周波数スペクトルを解析する事による鉱種の判別や電磁カップリング除去の可能性を有している事である。

本調査では Zonge Inc (ゾング社, 米国) の開発したハーモニックシステムを使用している。この装置は 0.125, 1, 8 Hz の3つの基本波で測定を行い、測定結果を FFT (高速フーリエ変換) によりフーリエ解析し、基本波の3倍, 5倍, 7倍, 9倍, 11倍の周波数応答を計算する。したがって 0.125 ~ 88 Hz の範囲の IP スペクトルが求められる。

### 3. 測定機器及びブロックダイヤグラム

測定機器を付第1表に、ブロックダイヤグラムを付第1図に示す。



付第1図 SIP 調査ブロックダイヤグラム

付第1表 SIP 機器一覧表

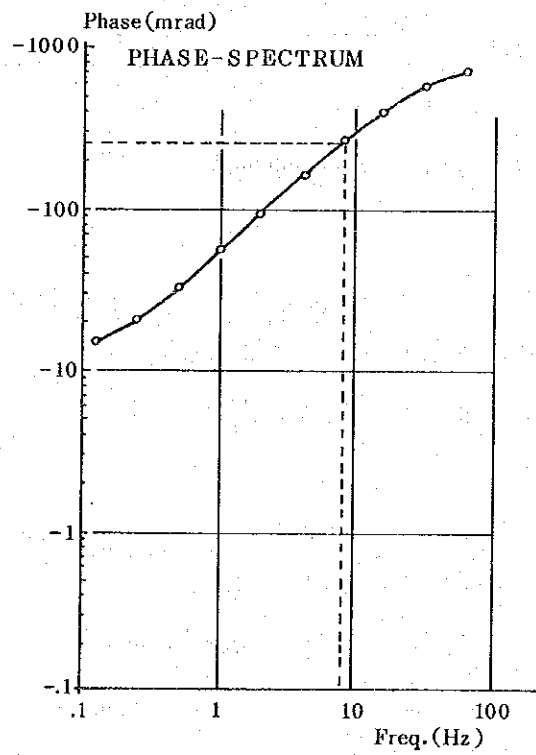
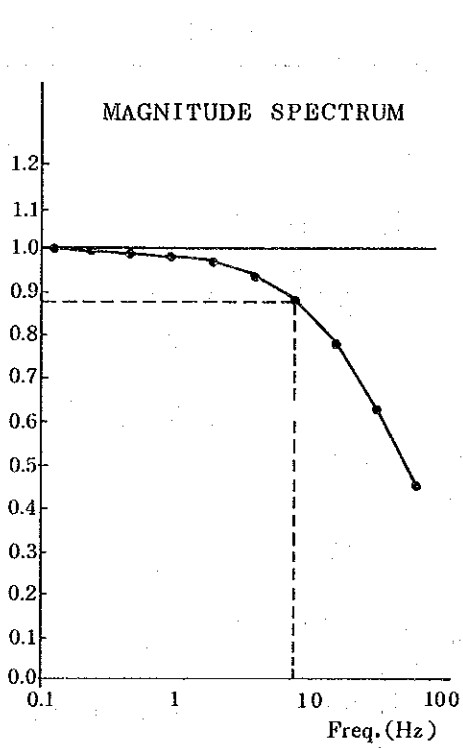
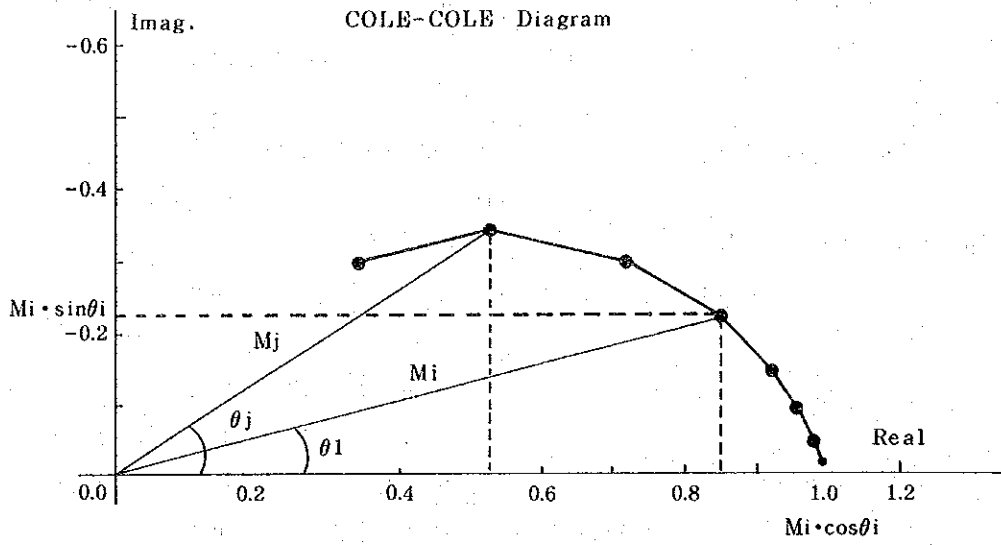
Equipment	Model	Specification	Qty
Power Supply	ZMG-5	Maximum Power : 5kw Alternator : 400Hz, 115 V Engine : Honda G400 10HP	1
Regulator	VR-1	Voltage Regulation	1
Transmitter	GGT-5	Output Voltage : 250, 500 750, 1000 V Output current : Max 20 A Square Wave Frequency : DC~10 KHz	1
Receiver	GDP-12/2GB	2 Channel Data Processor	1
Cassette/printer	CAP-12	Printer, Minicassette	1
Isolation Amp	ISO/1		2
Field Preamp	FP-1		2

#### 4. SIP 法のデータ処理

SIP法における測定は3つの基本波 0.125, 1, 8 Hz について行われる。測定結果は周波数毎の実数成分および虚数成分として出力される。また基本波の振幅、位相差、及び見掛比抵抗の他、基本波、第7次および第9次高調波の振幅によって計算された周波数効果が出力される。

これ等のデータから(1)コール・コール図 (2)振幅スペクトル図 (3)位相差スペクトル図 (4)各周波数毎の位相差断面図 (5)周波数効果断面図 (6)見掛比抵抗断面図等が作成される。

コール・コール図は横軸に実数成分、縦軸に虚数成分をとり、各周波数のデータをプロットしたものである(付第2図)。Miは振幅、Qiは位相差である。振幅スペクトル図の振幅は最低周波数 0.125 Hz の振幅で割算され正規化されている。位相差スペクトル図は位相差の周波数スペクトルを表わしている。



付第2図 コール・コール図、振幅スペクトル、位相スペクトル

## 5. デカップリング

SIP法の測定値に含まれる電磁カップリングを除去することをデカップリングという。本調査におけるデカップリングはP.G. HallofとW.H. Peltonの考案した方法によった。

この解析法の概要は次の様である。

SIP測定で得られる複素インピーダンス $Z_A(f)$ を次式で近似する。

$$Z_A(f) = R_0 \left[ 1 - m_1 \left\{ 1 - \frac{1}{1 + (i 2 \pi f \tau_1) C_1} \right\} - m_2 \left\{ 1 - \frac{1}{1 + (i 2 \pi f \tau_2) C_2} \right\} + m_3 \left\{ 1 - \frac{1}{1 + (i 2 \pi f \tau_3) C_3} \right\} \right] \dots\dots\dots(1)$$

ここに、 $m$ は充電率、 $\tau$ は時定数、 $C$ は次数、および $f$ は周波数である。(1)は次の3つの項に分類される。

$$1 - m_1 \left\{ 1 - \frac{1}{1 + (i 2 \pi f \tau_1) C_1} \right\} \quad (2)$$

$$- m_2 \left\{ 1 - \frac{1}{1 + (i 2 \pi f \tau_2) C_2} \right\} \quad (3)$$

$$+ m_3 \left\{ 1 - \frac{1}{1 + (i 2 \pi f \tau_3) C_3} \right\} \quad (4)$$

(2)はIP応答、(3)は均質大地の電磁カップリング、(4)は良導体による電磁カップリングを表現している。測定値を用いて10個のパラメータ( $R_0, m_1, \tau_1, C_1, m_2, \tau_2, C_2, m_3, \tau_3, C_3$ )を非線型最小自乗法により決定する。そしてIP応答だけによる複素インピーダンス $Z_{co}(f)$ を求める。

## 6. サンプル測定

本年度実施した試錐の岩芯サンプルを計32個採取し、各サンプルのSIP特性を測定した。付第3表は測定結果をまとめたものである。また各サンプルの位相差スペクトル、振幅スペクトル、コール・コール図を付第3図に示す。

多くの頁岩、黄銅鉱を含む砂岩や石灰岩がしばしば高いPFEと位相差を示している。高いPFEを示す岩石の位相差スペクトルは周波数の増加と共に位相差が減少するCタイプやYタ



イブである。一方低い PFE および位相差を示す岩石の位相差スペクトルは周波数の増加と共に位相差が増加する A タイプが多く、位相差が殆んど変化しない B タイプも一部に見られる。特に低周波領域 ( 0.125 ~ 3 Hz ) における位相差スペクトルはほぼ次の傾向にあることが判明した ( 第 2 年次, 第 3 年次のサンプル )。

付第 2 表 岩石、鉱石の位相特性

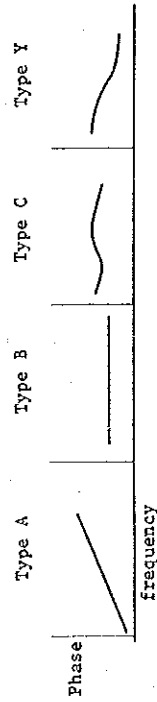
岩石, 鉱石	位 相 差		
	0.125 Hz	0.125 Hz → 0.375 Hz	1 Hz → 3 Hz
黄銅鉱, 黄鉄鉱を含む Sable Antelope の鉱石	大きい > -20mrad	増加かほぼ一定	不確定
黄銅鉱, 黄鉄鉱鉱染の黒色頁岩	同 上	減少かほぼ一定	不確定
黄銅鉱, 黄鉄鉱鉱染のない黒色頁岩	同 上	やや増加	やや増加
黄鉄鉱鉱染の砂岩, 石灰岩	同 上	減 少	減 少
黄鉄鉱鉱染のない砂岩, 石灰岩	小さい < -20mrad	増 加	増 加

第 3 年次の試錐によってその存在が明らかにされた黄鉄鉱を含む黒色頁岩では, 周波数の増加 ( 0.125 → 0.375 Hz ) につれて位相差が減少するものが多い。一方黄銅鉱を含む Sable Antelope 鉱山の鉱石は周波数の増加 ( 0.125 → 0.375 Hz ) につれて位相差が増加するものが多い。

これ等の結果は異常帯の解析に役立つものと思われる。

付第3表 岩石、鉱石サンプル測定結果

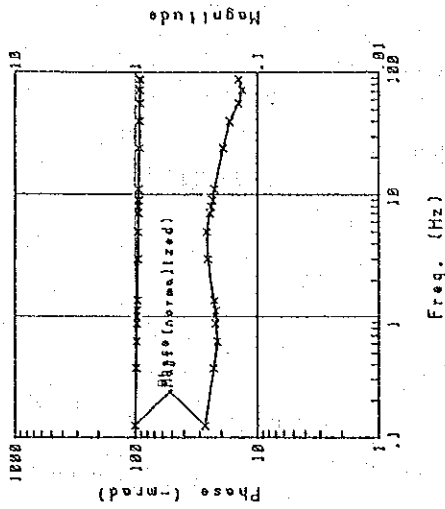
Sample No.	Rock	Location		Resistivity 0.125 Hz (ohm-m)	PPE 0.125-1 Hz (%)	Phase 0.125 Hz (-mrad)	Type of Spectrum	Description
		Drill Hole No.	Depth (m)					
1	Calcareous Sandstone		101.0	29,900	0.7	5.0	A	dolomite veinlet
2	do.		107.6	15,400	2.3	15.2	A	sandstone bearing black shale lamina
3	Siderite Sandstone		118.8	195	3.0	26.8	C	brown limestone like marl
4	Sandstone		153.5	9,460	0.8	5.3	A	sandy shale, dolomite veinlet
5	do.	MJZ-8	192.4	1,200	0.4	3.6	A	black shale, massive, dolomite veinlet
6	Shale		223.6	6,280	2.3	15.9	A	do. , do. , do
7	Sandstone		275.3	79	57.0	395.0	C	black silty shale, phillitic pyrite diss.
8	Shale		290.8	6,080	4.3	31.1	A	black shale, phillitic
9	do.		298.9	9,700	4.8	34.5	A	do. , brecciated
10	Shale		44.7	8,860	2.1	14.2	A	sandy, dolomitic
11	do.		83.0	38,900	1.8	12.4	A	silty, dolomitic
12	Calcareous Shale		124.0	238	1.9	17.3	C	black shale, brecciated
13	Limestone	MJZ-7	152.0	1,020	4.2	36.2	Y	brown limestone bearing hematite shale
14	Shale		170.0	14,800	5.5	34.8	B	silty shale
15	Black Shale		121.5	1,720	123.2	558.6	Y	conglomeratic, matrix, massive, pyrite diss.
16	do.		147.6	8,780	3.0	21.5	B	pyrite diss.
17	do.	MJZ-9	179.0	11,800	0.8	5.8	A	do. , silty shale.
18	Conglomerate		294.3	4,070	1.5	12.7	B	micro porphyry breccia
19	Chert		109.5	38,900	0.4	2.9	A	brecciated
20	Conglomeratic Shale		187.8	4,740	67.1	533.2	C	hematite around pebbles, pyrite, hematite
21	do.	MJZ-10	226.4	3,900	126.5	736.1	C	sandy banded pebbles, pyrite diss.
22	do.		297.2	4,630	75.8	540.5	C	sandy, silic, black shale etc. pyrite diss.
23	Dolomitic Limestone		86.1	20,600	0.4	3.0	A	conglomeratic
24	do.		117.2	14,000	0.3	2.5	A	brecciated
25	Siliceous Rock		151.4	5,530	0.9	6.7	A	pyrite diss. porous/calcite
26	do.	MJZ-11	174.2	10,200	2.1	15.1	B	do. , massive/sandy
27	do.		212.2	70,300	0.7	5.2	A	milky
28	do.		265.9	9,600	0.5	4.6	A	pinkish film portion
29	Sandy Rock		37.5	7,180	0.9	6.7	B	py. bearing
30	Dolomitic Rock		62.5	6,640	1.2	8.5	B	aukerite, calcite in druse
31	Siliceous Rock	MJZ-12	133.4	13,700	0.8	6.3	B	argillaceous layer bearing
32	Limestone		192.4	10,800	0.3	2.0	A	argillaceous?



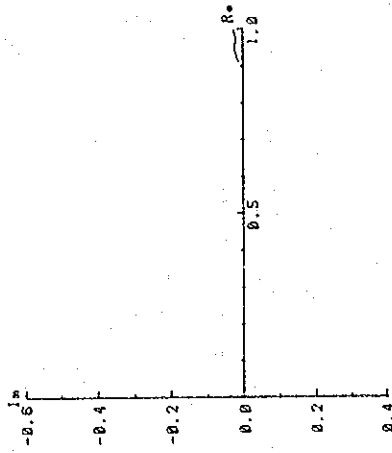
Phase Spectrum Types of Rock Sample

付第3図 岩石、鉱石サンプルの位相・振幅スペクトル  
コール・コール図

NO. 3

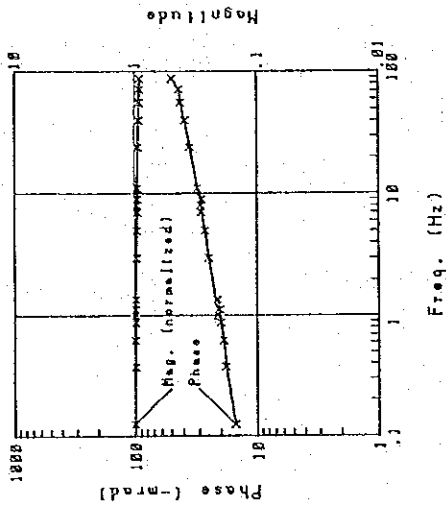


NO. 3 Cole-Cole Diagram

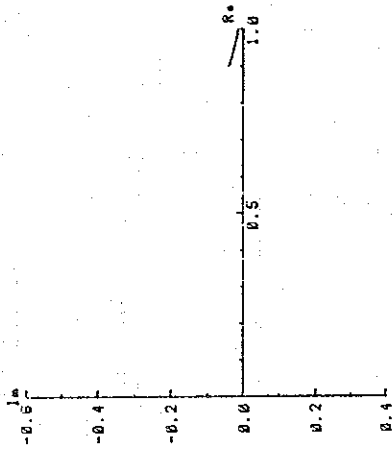


Spectrum type C  
 Siderite Sandstone  
 Phase = 26.8 (-mrad)  
 P F E = 3.0 (%)  
 Resi. = 195 (ohm-m)

NO. 2

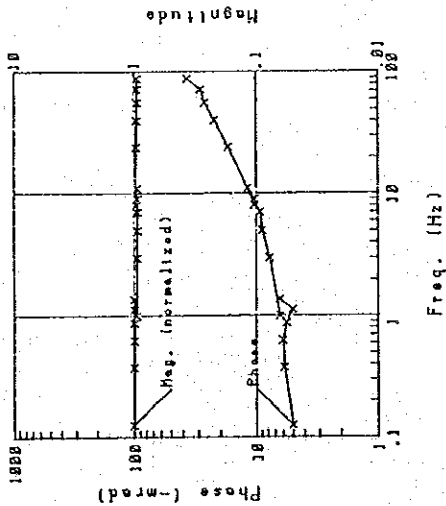


NO. 2 Cole-Cole Diagram

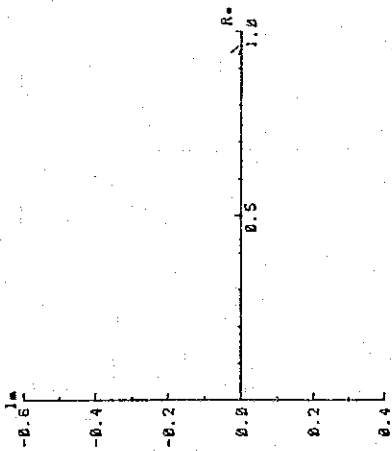


Spectrum type A  
 Calcareous Sandstone  
 Phase = 15.2 (-mrad)  
 P F E = 2.3 (%)  
 Resi. = 15400 (ohm-m)

NO. 1

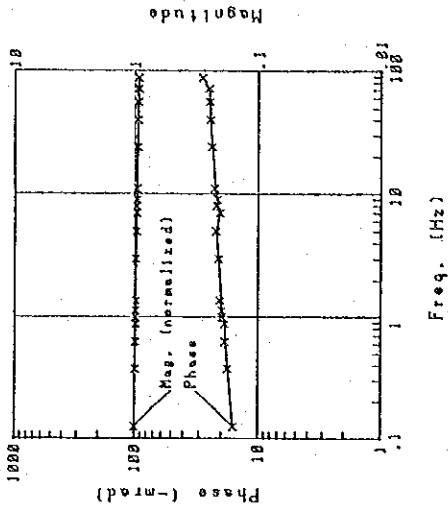


NO. 1 Cole-Cole Diagram

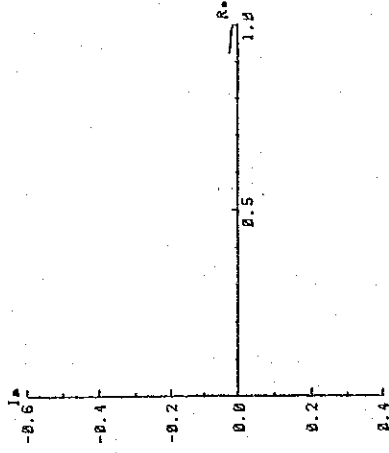


Spectrum type A  
 Calcareous Sandstone  
 Phase = 5.0 (-mrad)  
 P F E = 0.7 (%)  
 Resi. = 29900 (ohm-m)

NO. 6

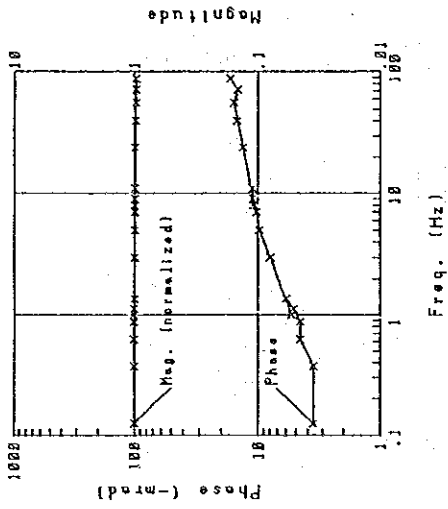


NO. 6 Cole-Cole Diagram

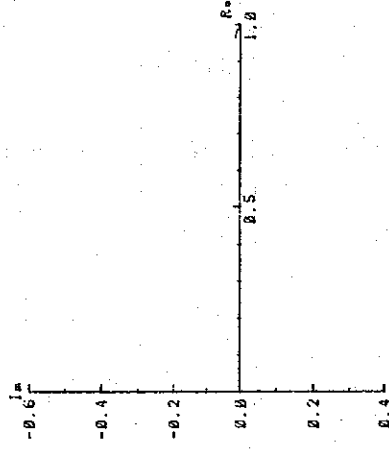


Spectrum type A  
 Shale  
 Phase = 15.9 (-mrad)  
 P F E = 2.3 (%)  
 Resi. = 6280 (ohm-m)

NO. 5

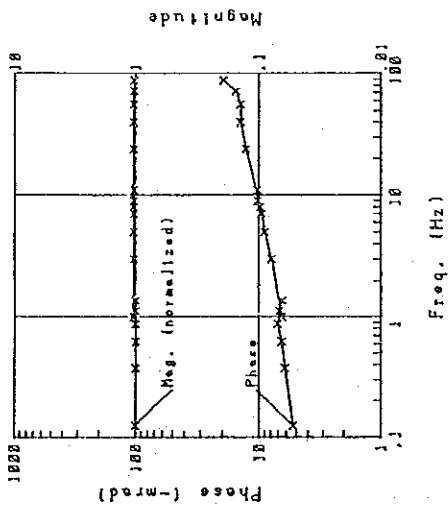


NO. 5 Cole-Cole Diagram

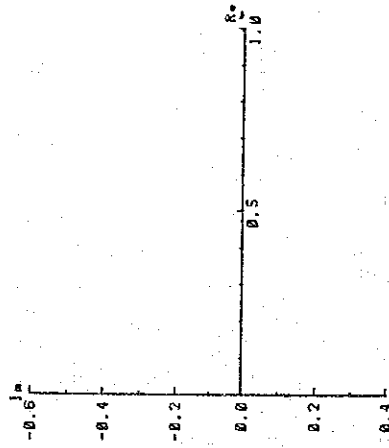


Spectrum type A  
 Sandstone  
 Phase = 3.6 (-mrad)  
 P F E = 0.4 (%)  
 Resi. = 1200 (ohm-m)

NO. 4

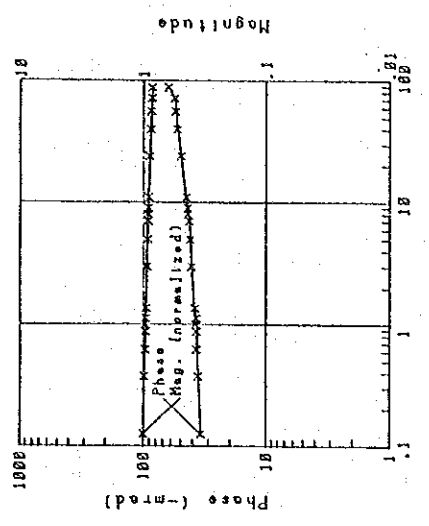


NO. 4 Cole-Cole Diagram

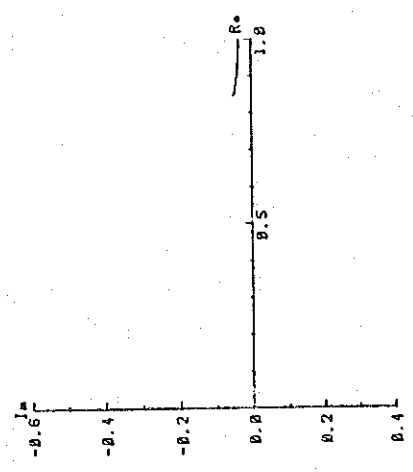


Spectrum type A  
 Sandstone  
 Phase = 5.3 (-mrad)  
 P F E = 0.8 (%)  
 Resi. = 9460 (ohm-m)

NO. 9

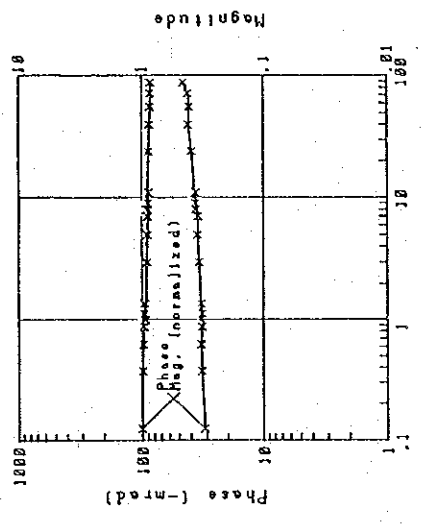


NO. 9 Cole-Cole Diagram

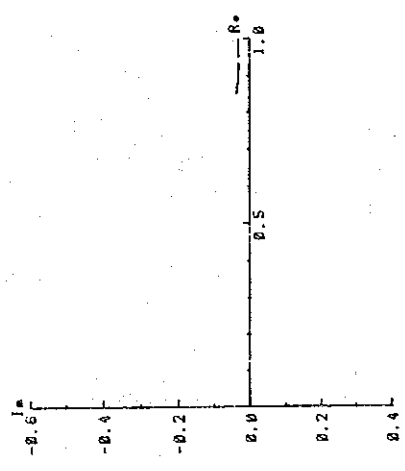


Spectrum type A  
 Shale  
 Phase = 34.5 (-mrad)  
 P F E = 4.8 (%)  
 Resi. = 9700 (ohm-m)

NO. 8

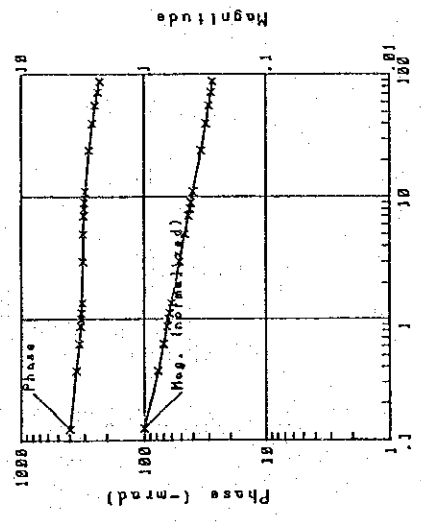


NO. 8 Cole-Cole Diagram

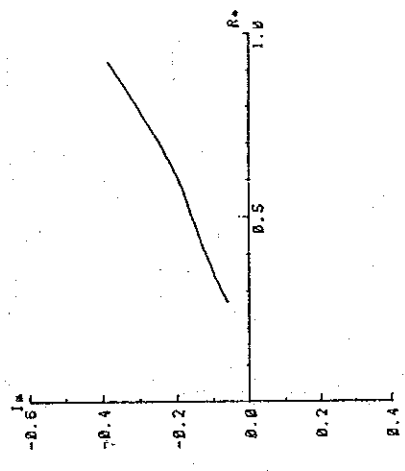


Spectrum type A  
 Shale  
 Phase = 31.1 (-mrad)  
 P F E = 4.3 (%)  
 Resi. = 6080 (ohm-m)

NO. 7

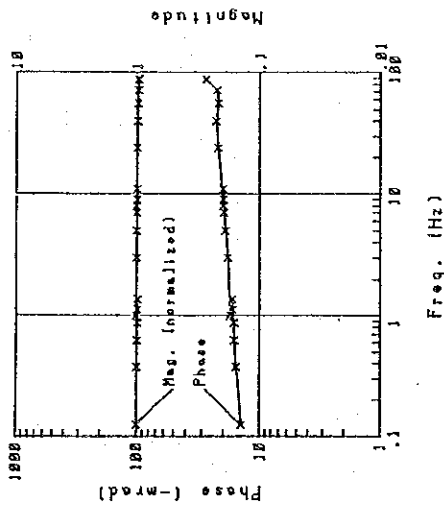


NO. 7 Cole-Cole Diagram

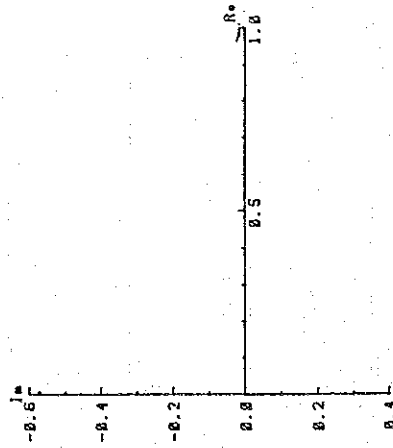


Spectrum type C  
 Sandstone  
 Phase = 395 (-mrad)  
 P F E = 57.0 (%)  
 Resi. = 79 (ohm-m)

NO. 10



NO. 10 Cole-Cole Diagram



Spectrum type A

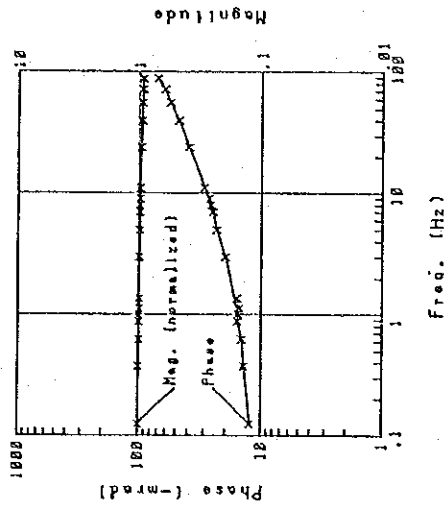
Shale

Phase = 14.2 (-mrad)

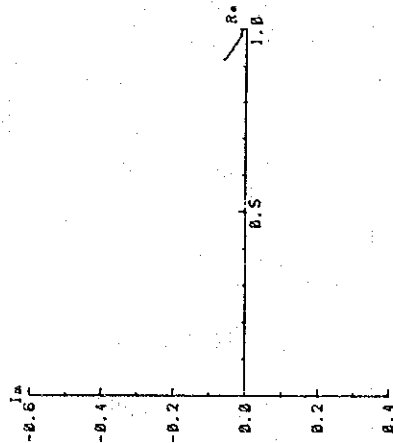
P.F.E = 2.1 (%)

Resi. = 8860 (ohm-m)

NO. 11



NO. 11 Cole-Cole Diagram



Spectrum type A

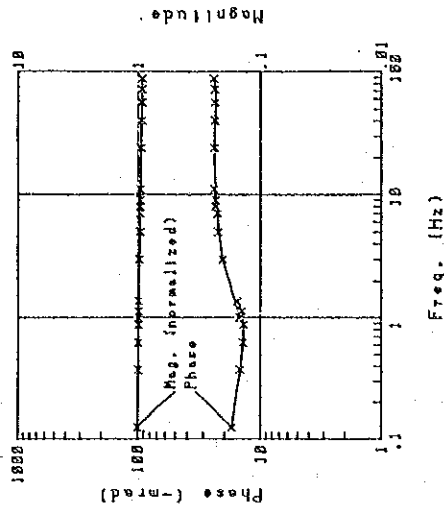
Shale

Phase = 12.4 (-mrad)

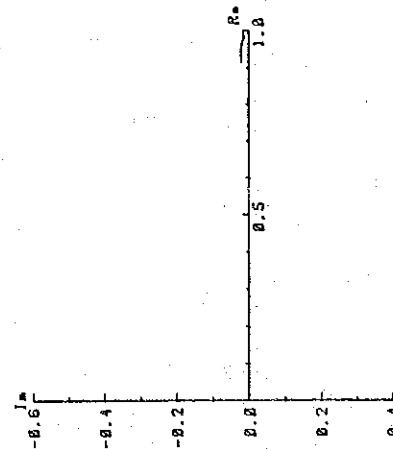
P.F.E = 1.8 (%)

Resi. = 38900 (ohm-m)

NO. 12



NO. 12 Cole-Cole Diagram



Spectrum type C

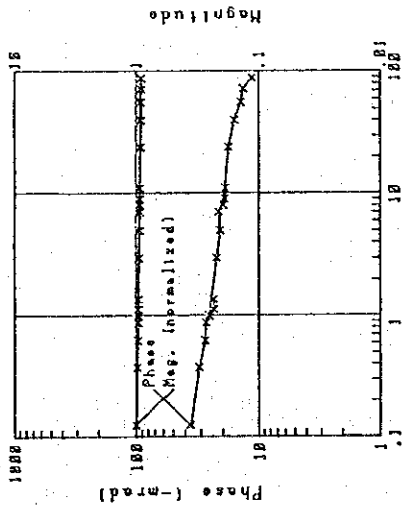
Calcareous Shale

Phase = 17.3 (-mrad)

P.F.E = 1.9 (%)

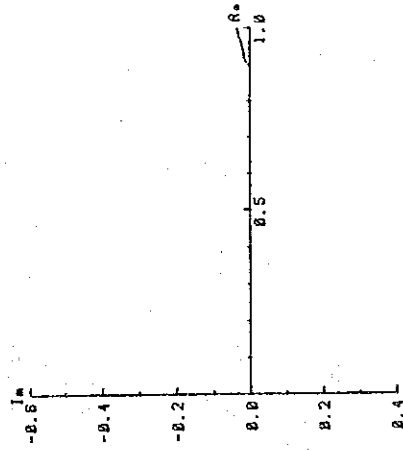
Resi. = 238 (ohm-m)

NO. 13



Freq. (Hz)

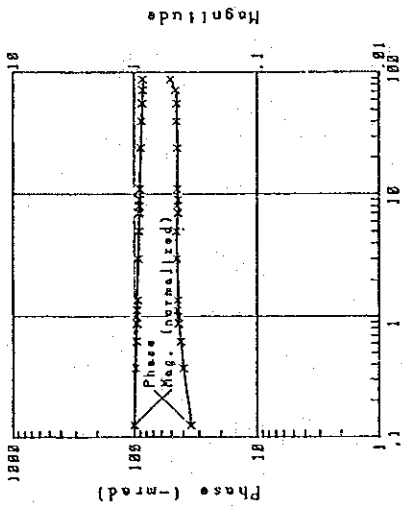
NO. 13 Cole-Cole Diagram



Spectrum type Y

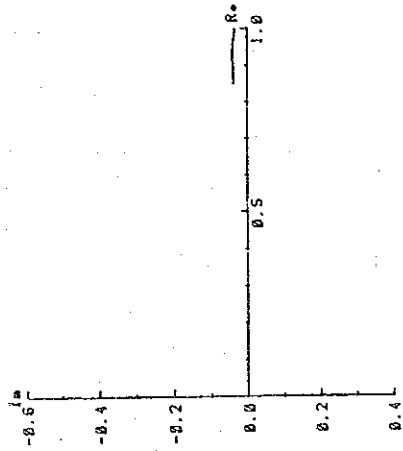
Limestone  
 Phase = 36.2 (-mrad)  
 P F E = 4.2 (%)  
 Resi. = 1020 (ohm-m)

NO. 14



Freq. (Hz)

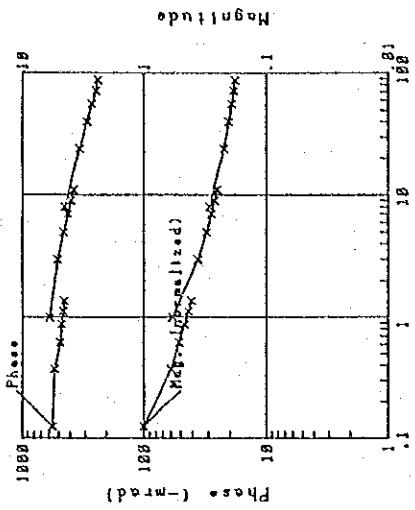
NO. 14 Cole-Cole Diagram



Spectrum type B

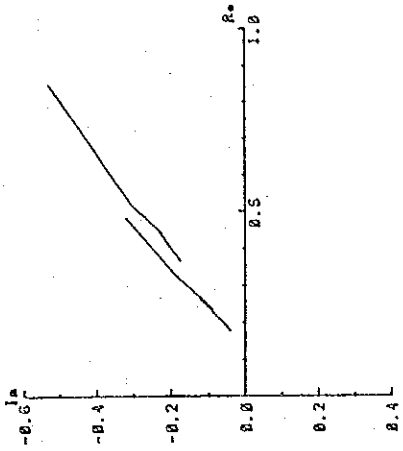
Shale  
 Phase = 34.8 (-mrad)  
 P F E = 5.5 (%)  
 Resi. = 14800 (ohm-m)

NO. 15



Freq. (Hz)

NO. 15 Cole-Cole Diagram

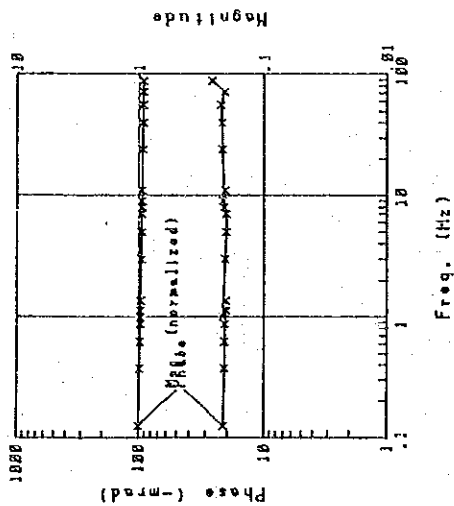


Spectrum type Y

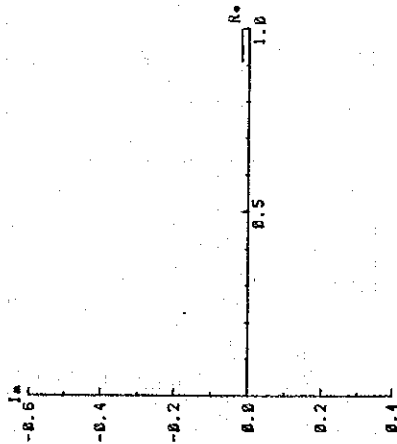
Black Shale  
 Phase = 558 (-mrad)  
 P F E = 123 (%)  
 Resi. = 1720 (ohm-m)



NO. 16

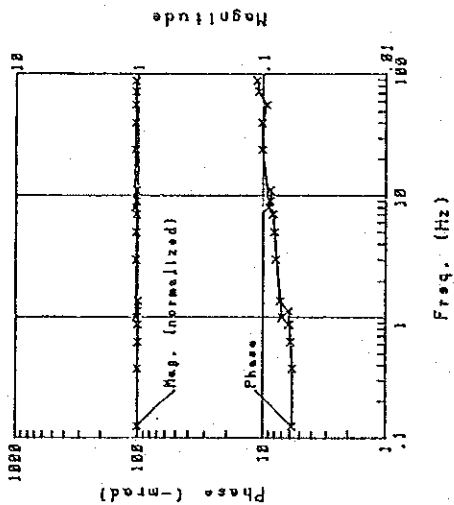


NO. 16 Cole-Cole Diagram

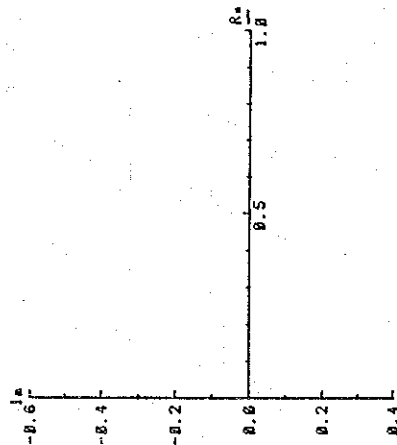


Spectrum type B  
 Black Shale  
 Phase = 21.5 (-mrad)  
 P F E = 3.0 (%)  
 Resi. = 8780 (ohm-m)

NO. 17

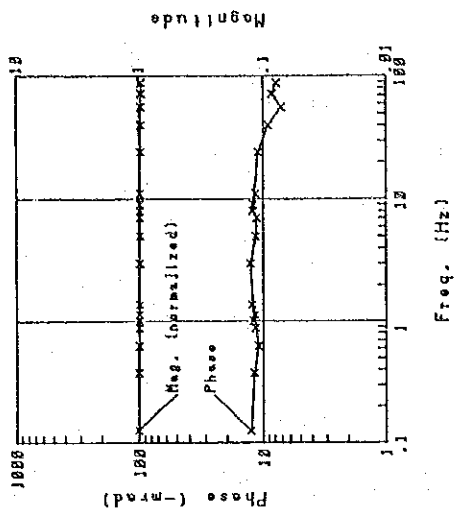


NO. 17 Cole-Cole Diagram

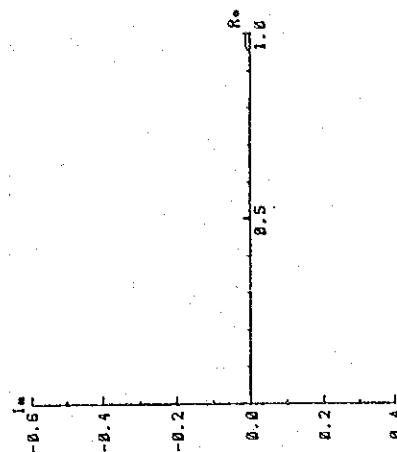


Spectrum type A  
 Black Shale  
 Phase = 5.8 (-mrad)  
 P F E = 0.8 (%)  
 Resi. = 11800 (ohm-m)

NO. 18

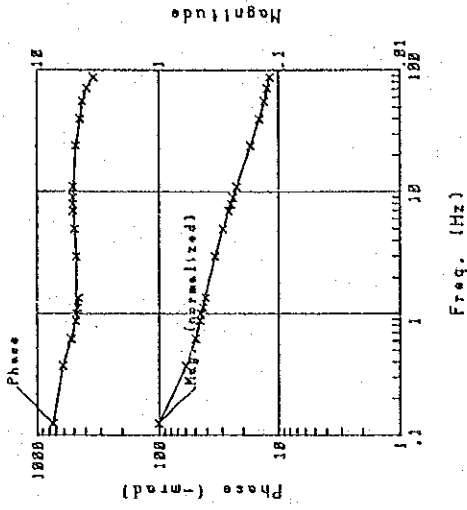


NO. 18 Cole-Cole Diagram

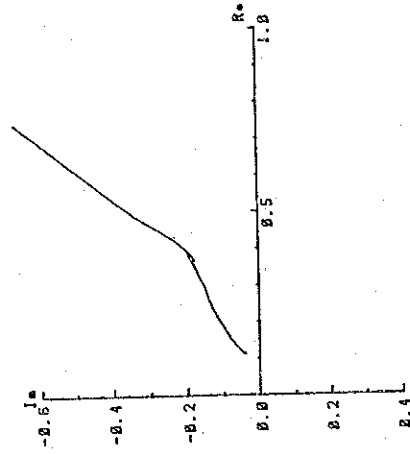


Spectrum type B  
 Conglomerate  
 Phase = 12.7 (-mrad)  
 P F E = 1.5 (%)  
 Resi. = 4070 (ohm-m)

NO. 21

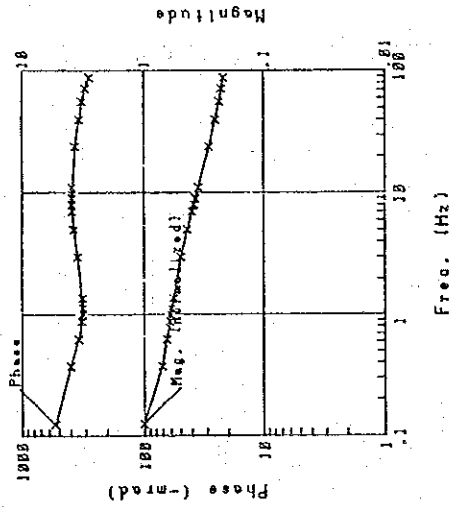


NO. 21 Cole-Cole Diagram

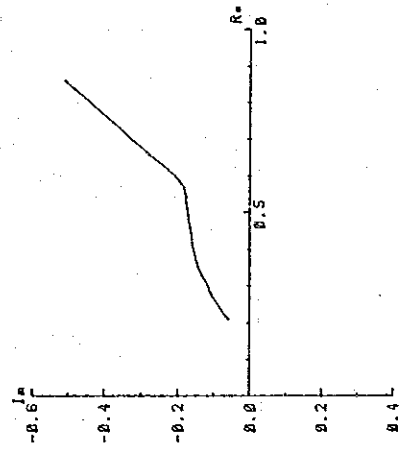


Spectrum type C  
 Conglomeretic Shale  
 Phase = 736 (-mrad)  
 P F E = 126 (%)  
 Resi. = 3900 (ohm-m)

NO. 20

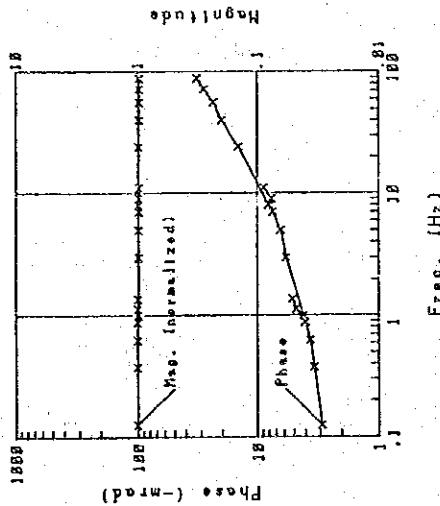


NO. 20 Cole-Cole Diagram

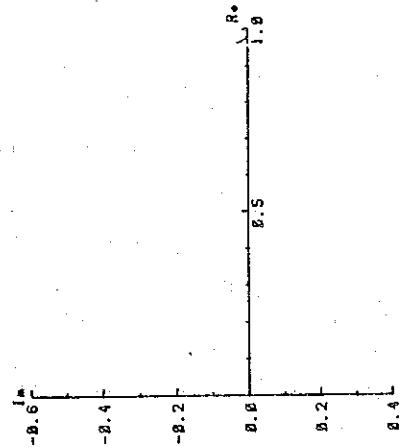


Spectrum type C  
 Conglomeretic Shale  
 Phase = 533 (-mrad)  
 P F E = 67.1 (%)  
 Resi. = 4740 (ohm-m)

NO. 19

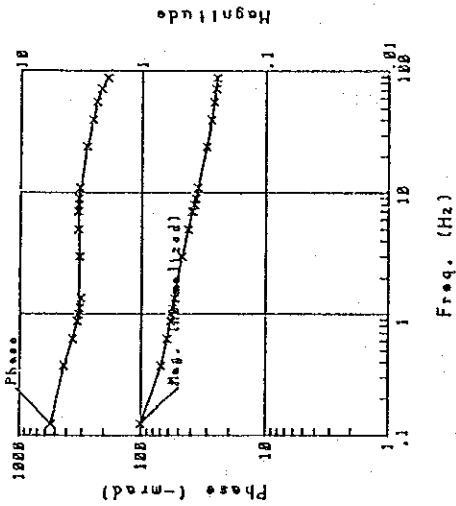


NO. 19 Cole-Cole Diagram

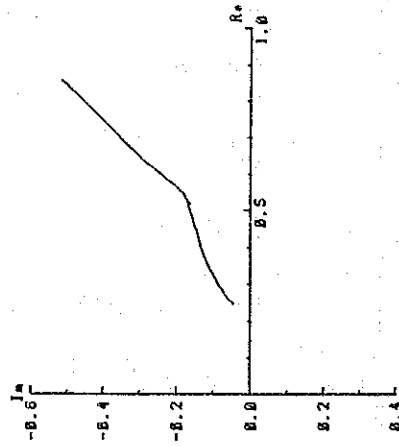


Spectrum type A  
 Chert  
 Phase = 2.9 (-mrad)  
 P F E = 0.4 (%)  
 Resi. = 38900 (ohm-m)

NO. 22

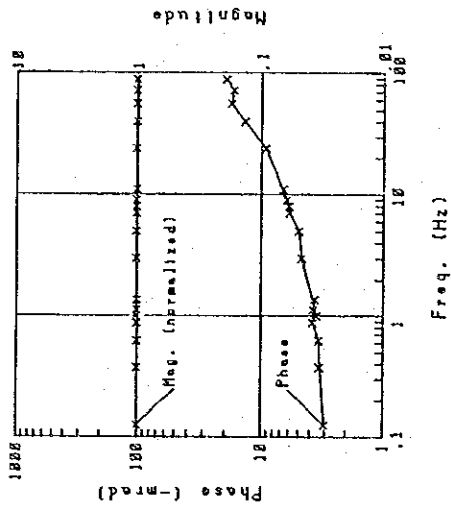


NO. 22 Cole-Cole Diagram

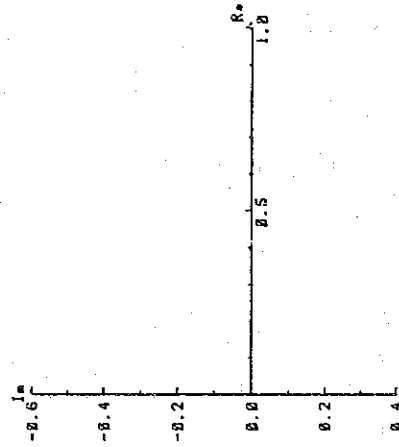


Spectrum type C  
 Conglomeretic Shale  
 Phase = 540 (-mrad)  
 P F E = 75.8 (%)  
 Resi. = 4630 (ohm-m)

NO. 23

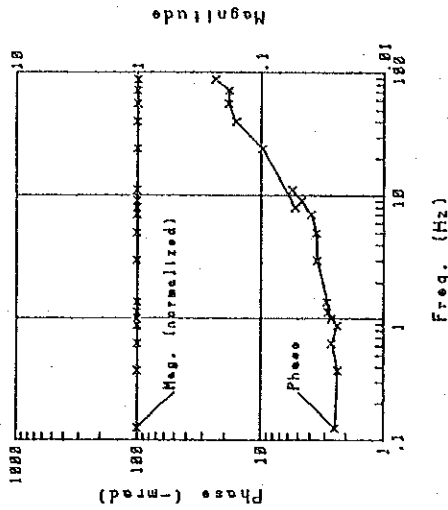


NO. 23 Cole-Cole Diagram

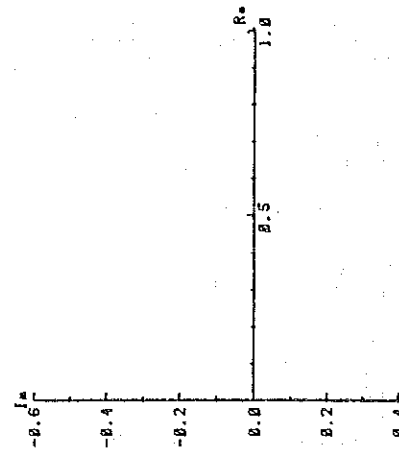


Spectrum type A  
 Dolomitic Limestone  
 Phase = 3.0 (-mrad)  
 P F E = 0.4 (%)  
 Resi. = 20600 (ohm-m)

NO. 24

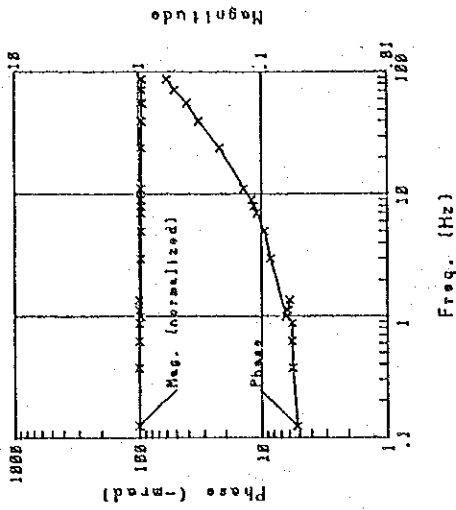


NO. 24 Cole-Cole Diagram

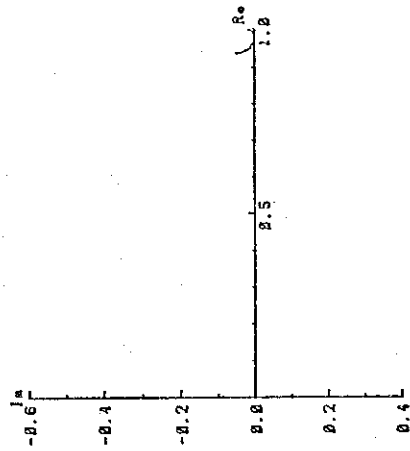


Spectrum type A  
 Dolomitic Limestone  
 Phase = 2.5 (-mrad)  
 P F E = 0.3 (%)  
 Resi. = 14000 (ohm-m)

NO. 27

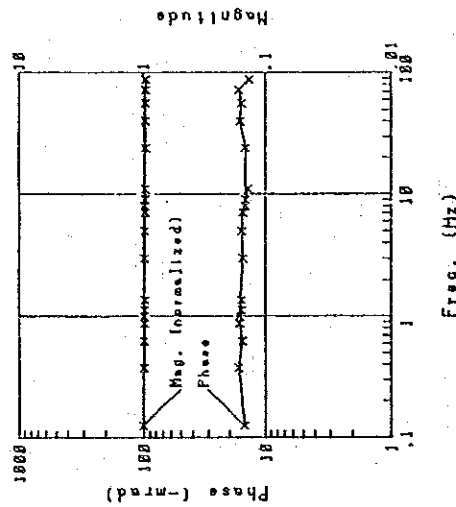


NO. 27 Cole-Cole Diagram

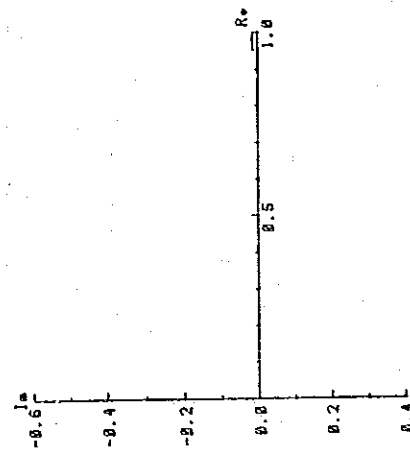


Spectrum type A  
 Siliceous Rock  
 Phase = 5.2 (-mrad)  
 P F E = 0.7 (%)  
 Resi. = 70300 (ohm-m)

NO. 26

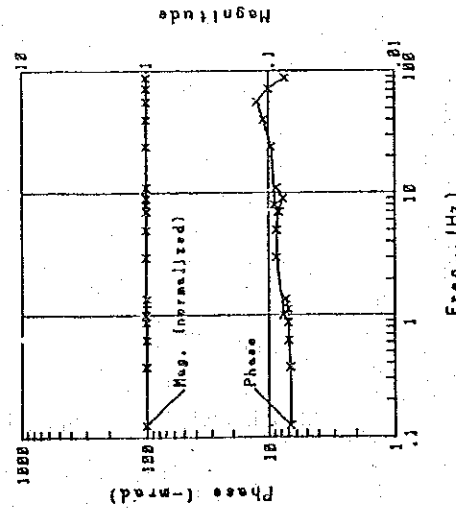


NO. 26 Cole-Cole Diagram

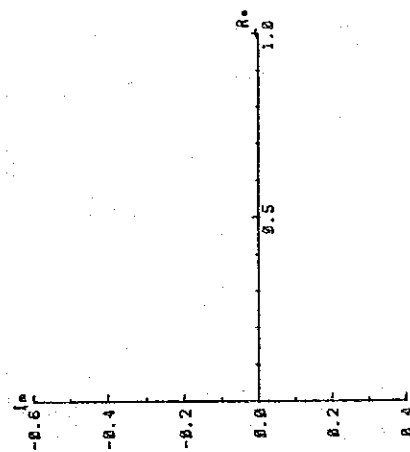


Spectrum type B  
 Siliceous Rock  
 Phase = 15.1 (-mrad)  
 P F E = 2.1 (%)  
 Resi. = 10200 (ohm-m)

NO. 25

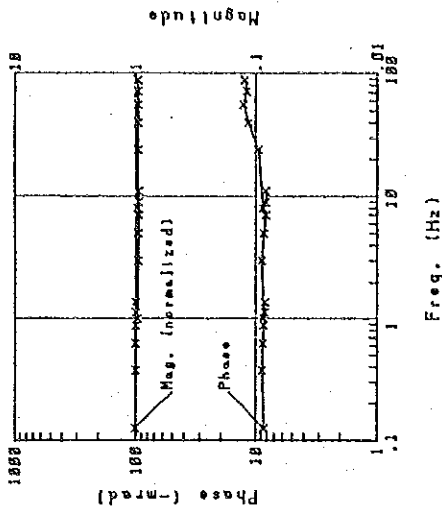


NO. 25 Cole-Cole Diagram

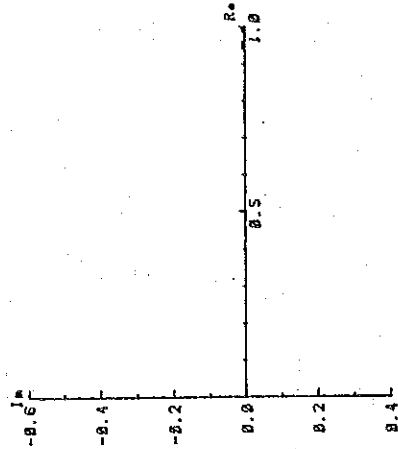


Spectrum type A  
 Siliceous Rock  
 Phase = 6.7 (-mrad)  
 P F E = 0.9 (%)  
 Resi. = 5530 (ohm-m)

NO. 30

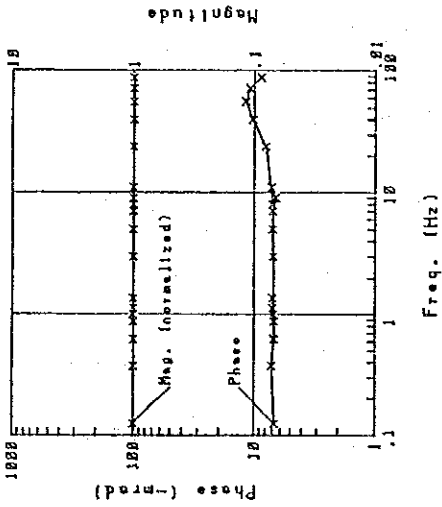


NO. 30 Cole-Cole Diagram

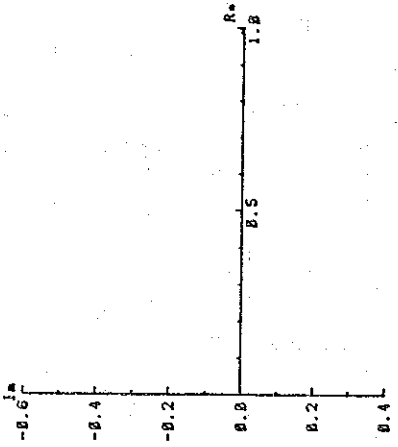


Spectrum type B  
 Dolomitic Rock  
 Phase = 8.5 (-mrad)  
 P F E = 1.2 (%)  
 Resi. = 6640 (ohm-m)

NO. 29

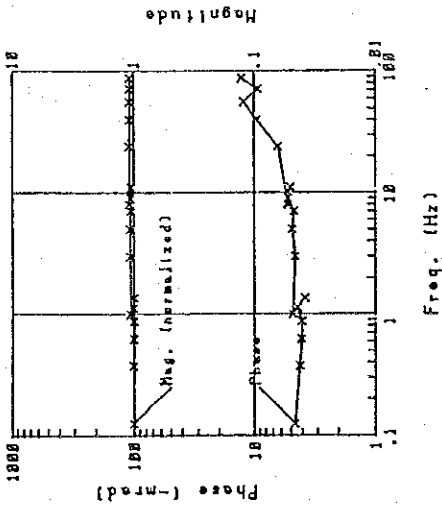


NO. 29 Cole-Cole Diagram

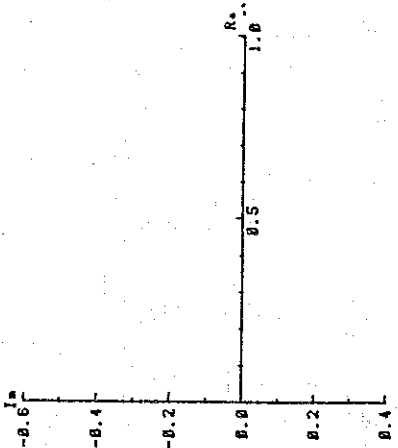


Spectrum type B  
 Sandy Rock  
 Phase = 6.7 (-mrad)  
 P F E = 0.9 (%)  
 Resi. = 7180 (ohm-m)

NO. 28

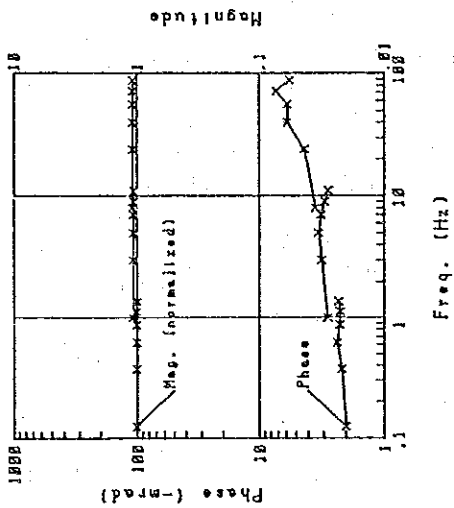


NO. 28 Cole-Cole Diagram

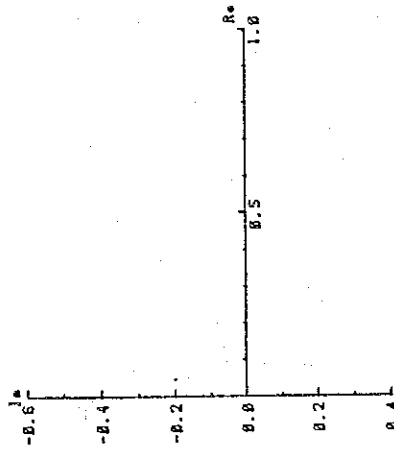


Spectrum type A  
 Siliceous Rock  
 Phase = 4.6 (-mrad)  
 P F E = 0.5 (%)  
 Resi. = 9600 (ohm-m)

NO. 32

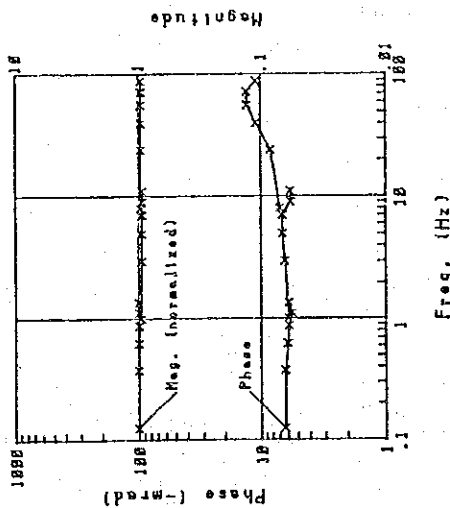


NO. 32 Cole-Cole Diagram

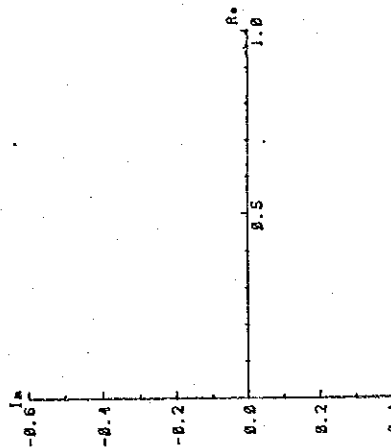


Spectrum type A  
 Limestone  
 Phase = 2.0 (-mrad)  
 P F E = 0.3 (%)  
 Resi. = 10800 (ohm-m)

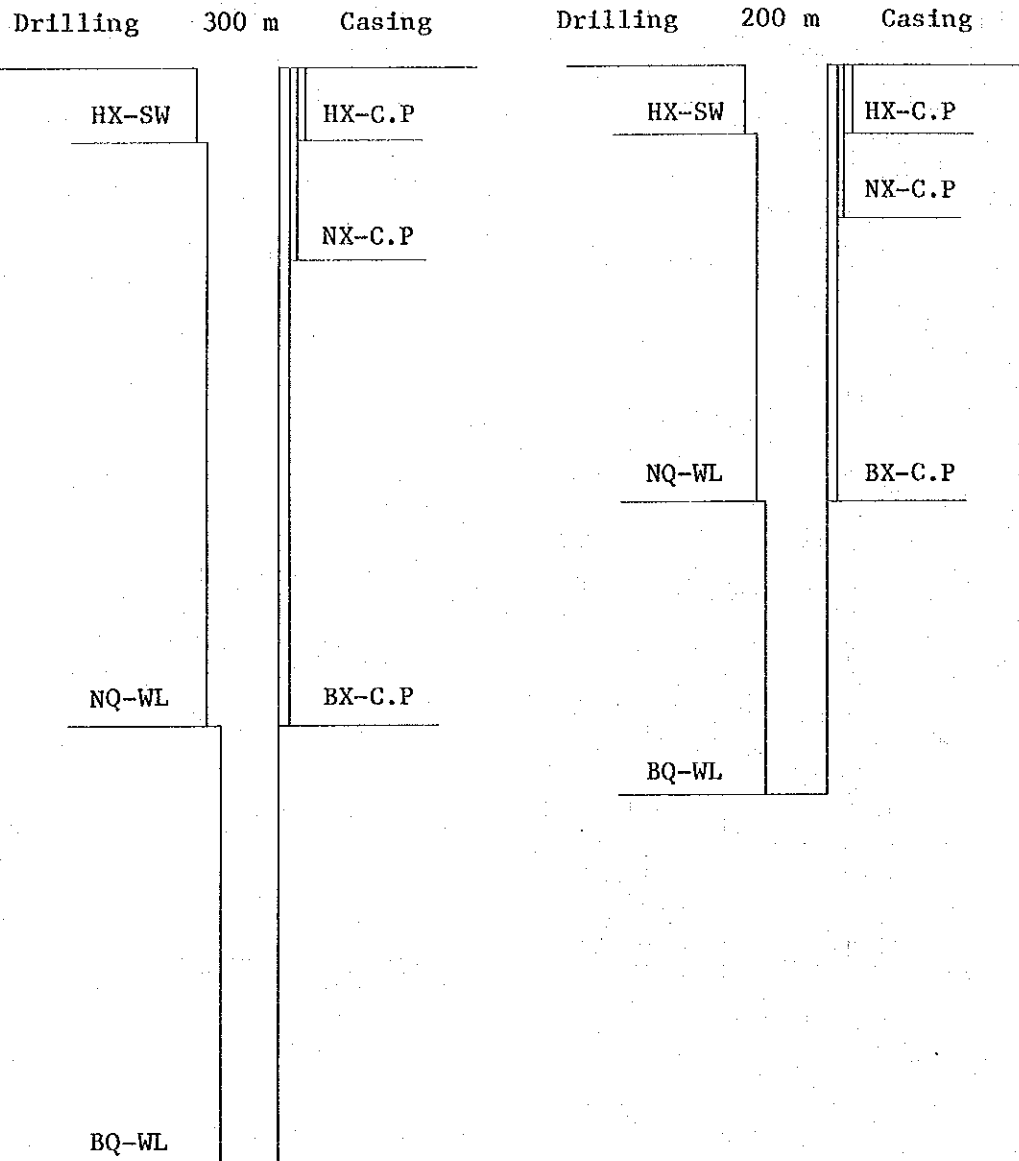
NO. 31



NO. 31 Cole-Cole Diagram



Spectrum type B  
 Siliceous Rock  
 Phase = 6.3 (-mrad)  
 P F E = 0.8 (%)  
 Resi. = 13700 (ohm-m)



付第4図 ケーシングプログラム

付第4表 ボーリング使用機器一覧表

<u>Drilling Machine Model "OE-8BL"</u> Specifications: Capacity Dimensions L × W × H Hoisting capacity Spindle speed Engine Model "F2L912"	1 set  300 m (BQ-WL) 1,550mm × 700mm × 1,510mm 2,000 kg forward 100,190,320,530, rpm 25.5 ps/1,800 rpm
<u>Drilling Pump Model "WLMG-10"</u> Specifications: Piston diameter Stroke Capacity Dimensions L × W × H Engine Model "NF-110K"	1 set  68 mm 100 mm discharge capacity 144 ℓ/min 1,460mm × 580mm × 980mm 11 ps/2,200 rpm
<u>Wire line hoist Model "WLH-4"</u> Specifications: Rope capacity Hoisting speed Engine Model "NF-80K"	1 set  500 m 8 ~ 105m/min 8ps/2,200 rpm
<u>Mud Mixer Model "HM-250"</u> Specifications: Capacity Engine Model "NF-80K"	1 set  200 ℓ/600 rpm 8ps/2,200 rpm
<u>Generator Model "YSG-10E"</u> Specifications: Capacity	1 set  10KVA 8KW 220V
<u>Generator Model "YSG-2000B"</u> Specifications: Capacity	3 set  2KVA 1.7KW 100V
<u>Water supply pump Model "KTV-22H"</u> Specifications: Capacity	1 set  discharge capacity 300 ℓ/min
<u>Derrick</u> Specifications: Height Max load capacity	1 set  9.5 m 4,000 kg
<u>Drilling tools</u> Dri-ling rod  Casing pipe	NQ-WL      3 m      67 pcs BQ-WL      3 m      100 pcs HX          1.5 m      5 pcs HX          1 m      3 pcs NX          1 m      2 pcs NX          3 m      11 pcs BX          1 m      2 pcs BX          3 m      60 pcs



付第5表 ダイヤモンドビット使用タイプ一覧表

Item	Size of bit	Type of bit	Carats of bit ct	Matrix	Stones per carat	Waterway	Total bit Used
Diamond bit	94 mm	HX - SW	25	E	15	4	2
		NQ - WL	30	E	15	4	14
	79 mm	NQ - WL	30	CE	15	4	10
		BQ - WL	22	E	15	4	14
	62 mm	BQ-WL	22	CE	25	4	4
				*1,166			
Total							

E : for ordinary rock

CE : for harder rock

\* : total amount of diamond carat

付第6表 ダイヤモンドビット使用状況表

Item	Size	Bit No.	Drilling Meterage by Unit: Meter						Total (m)
			MJZ-7	MJZ-8	MJZ-9	MJZ-10	MJZ-11	MJZ-12	
Diamond Bit	HX	186561	5.00	4.00	5.00				14.00
		186562				18.80	5.50	3.60	27.90
		Total	5.00	4.00	5.00	18.80	5.50	3.60	41.90
	Drilling length/bit (41.90/2)								20.95
	NQ	186551			30.40				30.40
		186552			26.00				26.00
		186553			27.80				27.80
		186554			27.60				27.60
		186555			35.60				35.60
		186556			28.10				28.10
		186557	38.00						38.00
		186558	44.30						44.30
		186559	47.20						47.20
		186560	44.60						44.60
		NNZ-1				31.20			31.20
		NNZ-2				39.70			39.70
		NNZ-3				36.60			36.60
		NNZ-4				31.40			31.40
		NNZ-5					45.70		45.70
		NNZ-6					42.00		42.00
		NNZ-7					34.50		34.50
		NNZ-8						41.00	41.00
		NNZ-9						48.00	48.00
		NNZ-10						38.20	38.20
		NNZ-11							52.80
		NNZ-12							52.30
		NNZ-13							49.50
		NNZ-14							42.40
	Total	174.10	175.50	138.90	122.20	127.20	197.00	934.90	
	Drilling length/bit (934.90/24)								38.95
BQ	175472			31.90				31.90	
	175473			33.00				33.00	
	175474			25.80				25.80	
	175475			30.30				30.30	
	NBZ-1	44.40						44.40	
	NBZ-2	36.00						36.00	
	NBZ-3	41.00						41.00	
	NBZ-4				34.50			34.50	
	NBZ-5				45.00			45.00	
	NBZ-6				42.00			42.00	
	NBZ-7				35.10			35.10	
	NBZ-8					37.40		37.40	
	NBZ-9					48.00		48.00	
	NBZ-10					36.00		36.00	
	NBZ-11					38.10		38.10	
	NBZ-12						51.70	51.70	
NBZ-13						57.00	57.00		
NBZ-14						59.10	59.10		
Total	121.40	121.00	156.60	159.50	167.80		726.30		
Drilling length/bit (726.30/18)								40.35	
Grand Total			300.50	300.50	300.50	300.50	300.50	200.60	1,703.10
Drilling length/bit (1,703.10/44)								38.70	

付第7表 ポーリング消耗品使用明細表

Description	Specifications	Unit	Quantity						Total
			MJZ-7	MJZ-8	MJZ-9	MJZ-10	MJZ-11	MJZ-12	
Light oil		l	870	1,110	825	1,100	1,090	615	5,610
Petrol		l	1,150	1,400	965	950	970	310	5,745
Hydraulic oil		l		40	10		12		62
Engine oil		l	32	30	20	30	24	24	160
Gear oil		l	5	12	8	5	5	5	40
Greas		kg	6	10	8	6	8	5	43
Bentonite		kg	2,375	2,100	1,450	1,375	850	700	8,850
C.M.C.		kg	44	48	52	49	41	28	262
Tel - stop		kg	10	20	20	20	30		100
Mud oil		l	144	162	118	222	214	36	896
Cement		kg	200	100	150	200	150	250	1,050
Diamond bit	HX-SW	pc		1		1			2
Diamond bit	NQ-WL	pc	4	6	4	3	3	4	24
Diamond bit	BQ-WL	pc	3	4	4	4	3		18
Diamond reamer	NQ-WL	pc	2	2	1	2	1	2	10
Diamond reamer	BQ-WL	pc	1	2	2	2	2		9
Casing diamond shoe	NX	pc		1		1			2
Casing metal shoe	HX	pc	1	1	1	1	1	1	6
Casing metal shoe	BX	pc	1	1	1	1	1		5
Core barrel Ass'y	NQ-WL	set		1	1		1		3
Core barrel Ass'y	BQ-WL	set		1	1		1		3
Inner tube	NQ-WL	pc		1	2		2		5
Inner tube	BQ-WL	pc	2	1		2			5
Core lifter case	NQ-WL	pc	4	6	4	4	4	4	26
Core lifter case	BQ-WL	pc	2	4	2	2	2		12
Core lifter	NQ-WL	pc	4	6	4	4	4	4	26
Core lifter	BQ-WL	pc	2	4	2	2	2		12
Thrust ball bearing	NQ-WL	pc	2	4	4	4	2	2	18
Thrust ball bearing	BQ-WL	pc	2	2	4	2	4		14
Innertube stabilizer	NQ-WL	pc	2	2	1	2	1	2	10
Innertube stabilizer	BQ-WL	pc	1	2	2	2	2		9
Chack piece	NQ-WL	set		1		1		1	3
Chack piece	BQ-WL	set		1		1			2
Cylinder liner	HG-10 68mm	pc	2			2		2	6
Piston rod		pc	2			2		2	6
Piston rubber	68mm	pc	4	4	4	4	4	2	22
Valve seat		pc			8				8
Steel ball		pc			8				8
V - packing		pc	14			14		14	42
Waste		kg	15	20	20	15	20	30	120
Wire rope	6mm x 300m	roll		1		1			2
Core box	NQ-WL	pc	25	31	20	17	18	31	142
Core box	BQ-WL	pc	13	13	16	19	29		90

付第8表 ボーリング作業時間総括表

Hole No.	Drilling			Shift		Working man			Working Time					G.Total	
	Bit size	Drilling	Core length	Drilling	Total	Engineer	Worker		Drilling	Other working	Recover-ing	Total	Removing		Road con-struction and others
MJZ-7	HX	5.00	-	1 shift	6 shift	24 man	67 man		2'00"	6'00"	-	8'00"	43'00"	-	51'00"
	NQ	174.10	162.80	17	17	24	83		90'50"	45'10"	-	136'00"	-	-	136'00"
	BQ	121.40	121.00	12	17	31	113		64'40"	41'20"	-	106'00"	8'00"	24'00"	138'00"
	Total	300.50	283.80	30	40	79	263		157'30"	92'30"	-	250'00"	51'00"	24'00"	325'00"
MJZ-8	HX	4.00	1.10	1	11	44	152		2'40"	3'20"	-	6'00"	78'00"	9'00"	93'00"
	NQ	175.50	159.50	20	21	28	98		95'20"	75'10"	0'30"	171'00"	-	-	171'00"
	BQ	121.00	120.70	16	18	28	95		76'20"	59'40"	-	136'00"	8'00"	-	144'00"
	Total	300.50	281.30	37	50	100	345		174'20"	138'10"	0'30"	313'00"	86'00"	9'00"	408'00"
MJZ-9	HX	5.00	-	1	7	26	111		2'00"	4'00"	-	6'00"	54'00"	-	60'00"
	NQ	138.90	128.60	11	11	14	53		61'20"	28'40"	-	90'00"	-	-	90'00"
	BQ	156.60	156.60	14	16	23	85		79'50"	37'50"	2'20"	120'00"	8'00"	-	128'00"
	Total	300.50	285.20	26	34	63	349		143'10"	70'30"	2'20"	216'00"	62'00"	-	278'00"
MJZ-10	HX	18.80	-	1	3	10	42		3'30"	4'30"	-	8'00"	20'00"	-	28'00"
	NQ	122.20	110.30	11	11	14	55		61'00"	27'00"	-	88'00"	-	-	88'00"
	BQ	159.50	159.50	17	19	27	106		99'30"	44'30"	-	144'00"	9'00"	-	153'00"
	Total	300.50	269.80	29	33	51	203		164'00"	76'00"	-	240'00"	29'00"	-	269'00"
MJZ-11	HX	5.50	-	1	5	18	80		2'10"	5'50"	-	8'00"	37'00"	-	45'00"
	NQ	127.20	117.30	12	12	16	58		63'00"	33'00"	-	96'00"	-	-	96'00"
	BQ	167.80	167.80	14	15	21	80		84'50"	30'40"	-	115'30"	6'30"	-	122'00"
	Total	300.50	285.10	27	32	55	218		150'00"	69'30"	-	219'30"	43'30"	-	263'00"
MJZ-12	HX	3.60	2.60	1	4	14	53		1'00"	3'00"	-	4'00"	27'00"	-	31'00"
	NQ	197.00	195.90	17	31	77	283		100'40"	39'20"	-	140'00"	40'00"	72'00"	252'00"
	Total	200.60	198.50	18	35	91	336		101'40"	42'20"	-	144'00"	67'00"	72'00"	283'00"
	Grand Total	1,703.10	1,603.70	167	224	439	1,614		890'40"	489'00"	2'50"	1,382'30"	338'30"	105'00"	1,826'00"

付第9表 鈹石分析結果一覽表

No.	Sample Locality	Depth m	Wd. m	Ag g/t	Cu ppm	Pb ppm	Zn ppm	No.	Sample Locality	Depth m	Wd. m	Ag g/t	Cu ppm	Pb ppm	Zn ppm
1		46.23-46.41	0.13	2.0	1220	28	78	21		5.90-14.20	8.30	<1.0	150	68	700
2		47.29-47.66	0.37	2.0	3600	32	130	22		104.80-107.00	2.20	<1.0	950	60	60
3		49.62-49.92	0.30	2.0	700	24	76	23		107.00-107.10	0.10	480.0	137500	44	4400
4		51.85-52.05	0.20	1.4	720	24	54	24		107.10-109.55	2.45	<1.0	150	40	72
5		128.11-128.52	0.41	0.1	98	24	36	25		126.25-127.45	1.20	<1.0	200	40	60
6		128.66-129.00	0.34	0.4	136	24	78	26	MJZ-8	195.85-196.40	0.55	0.3	24	24	36
7		129.00-129.60	0.60	0.6	580	28	118	27		231.77-231.90	0.13	0.3	120	28	48
8		128.60-130.30	0.70	<0.10	98	30	82	28		254.65-256.40	1.75	0.1	88	84	52
9	MJZ-7	130.30-130.70	0.40	<0.10	76	28	70	29		256.40-256.94	0.54	<0.1	24	30	44
10		130.70-132.67	1.97	<0.10	50	24	34	30		282.49-282.98	0.49	0.6	26	28	36
11		135.32-135.70	0.38	<0.10	70	20	66	31		282.98-283.62	0.64	0.3	16	24	24
12		136.30-136.50	0.20	0.4	84	28	34	32		53.28-53.53	0.25	0.2	1640	52	180
13		136.50-137.55	1.05	0.4	76	32	54	33		54.08-54.26	0.18	0.5	440	60	124
14		197.77-198.20	0.43	1.0	180	32	118	34		136.30-137.00	0.70	1.7	8000	50	360
15		256.50-256.86	0.36	1.0	1900	44	940	35		154.27-155.55	1.28	0.9	640	72	132
16		280.56-280.76	0.20	2.0	660	52	440	36	MJZ-9	155.55-157.00	1.45	0.3	144	60	68
17		280.76-281.63	0.87	1.0	300	56	640	37		157.00-158.55	1.55	0.2	400	52	112
18		292.20-292.49	0.29	1.4	320	124	700	38		158.55-160.15	1.60	0.2	360	35	116
19	MJZ-8	3.40-3.80	0.40	<1.0	37500	44	112	39		196.16-197.26	1.10	0.2	220	68	140
20		3.80-5.90	2.10	<1.0	350	56	440	40		198.48-199.40	0.92	0.1	92	37	64

No.	Sample Locality	Depth m	Wd. m	Ag g/t	Cu ppm	Pb ppm	Zn ppm	No.	Sample Locality	Depth m	Wd. m	Ag g/t	Cu ppm	Pb ppm	Zn ppm
41		199.40-200.10	0.70	0.1	40	30	96	61		287.95-288.43	0.48	0.7	1040	48	300
42		205.65-206.76	1.11	0.2	280	36	70	62		289.40-290.14	0.74	0.5	640	56	200
43		206.76-207.40	0.64	0.1	76	24	172	63		290.14-290.85	0.71	0.6	1200	68	108
44		240.20-241.40	1.20	0.1	56	28	280	64	MJZ-10	291.40-292.40	1.00	1.2	1480	44	240
45		241.40-242.40	1.00	<0.1	76	24	124	65		292.40-293.02	0.62	1.0	1260	60	200
46		242.40-243.40	1.00	0.1	80	24	88	66		293.02-293.75	0.73	1.6	1600	52	112
47		243.40-244.40	1.00	0.1	32	20	100	67		298.70-299.30	0.60	0.6	2000	52	200
48	MJZ-9	244.40-244.80	0.40	<0.1	40	22	120	68		125.75-126.40	0.65	0.1	12	56	72
49		253.25-254.40	1.15	0.1	164	30	180	69		126.40-127.50	1.10	0.1	18	46	50
50		254.40-255.40	1.00	<0.1	132	24	76	70		145.03-145.40	0.37	0.1	220	60	184
51		255.40-256.40	1.00	<0.1	50	27	40	71		169.63-170.18	0.55	0.3	44	176	44
52		256.40-256.83	0.43	<0.1	60	22	84	72	MJZ-11	170.86-171.23	0.37	0.1	40	60	108
53		256.83-256.91	0.08	0.1	880	36	180	73		212.40-213.70	1.30	0.1	76	120	148
54		256.91-257.75	0.84	<0.1	40	25	46	74		272.05-272.30	0.25	0.1	64	84	148
55		143.90-144.52	0.62	0.2	20	24	28	75		272.76-272.98	0.22	<0.1	52	96	76
56		145.90-146.40	0.50	0.1	128	30	150	76		20.40-20.61	0.21	<0.1	5	30	58
57		146.40-147.40	1.00	0.1	500	32	320	77	MJZ-12	68.90-69.35	0.45	<0.1	10	64	76
58	MJZ-10	147.40-148.40	1.00	0.1	320	64	400								
59		148.40-149.70	1.30	0.1	172	76	460								
60		284.76-285.06	0.30	0.7	320	56	200								

付第10表 檢鏡結果一覽表

No.	Sample	Locality	Kind of Ore	Mineral Constituents										Remarks				
				Cp	Dl	Cc	Cv	Bo	Mal	Sp	Py	He	Go		Gn	Te		
1	MJZ-7 128.16m	Sable Ante- lope(Blue Jacket 2	fine Py disseminated along bedding dolomitic arenaceous rock															cubic or granular Py, veinlet
2	Ditto 129.60m	ditto	fine Py veinlet/dolomitic arenaceous rock															cubic or granular Py, veinlet or dissemination
3	MJZ-8 3.50m	ditto	Mal, Go disseminated with siderite/ sandstone			?												massive Mal or Mal veinlet
4	Ditto 107.00m	ditto	Cp disseminated dolomitic veinlet/ dolomitic arenaceous rock															massive Cp or Cp veinlet, Py dis- seminated Gn
5	Ditto 107.00m	ditto	Bo, Cp vein /dolomitic arenaceous rock															Bo, Cp exsolution paragenesis, Cp associated with Te
6	Ditto 126.60m	ditto	Cp disseminated dolomitic veinlets/ dolomitic arenaceous rock															Cp associated with massive or cubic Py
7	MJZ-9 136.50m	Kamiyobo	Cp, Mal, Py calcite vein/black shale															fine grained Cp, vein Mal, colloformed Py
8	Ditto 157.92m	ditto	Cp, Py disseminated/Py calcite veinlet/conglomeratic black shale															fine grained Cp, associated cubic or massive Py
9	Ditto 197.16m	ditto	Cp disseminated, Py bedded or veinlets, black shale															fine grained Cp, cubic Py, vein or irregular Py
10	Ditto 243.52m	ditto	Py disseminated/ conglomeratic black shale															cubic Py associated with fine grained Cp
11	Ditto 253.26m	ditto	Py disseminated/conglomerate															cubic or granular Py, disseminated
12	MJZ-10 84.10m	ditto	Go calcite vein/chert															colloformed Go or He
13	Ditto 143.90m	ditto	Py, Go disseminated quartz vein/chert															cubic Py rimmed by Go
14	Ditto 208.30m	ditto	Cp, Cv, Py calcite veinlet/conglom- eratic black shale															cv associated with Cp and Py, cubic or granular Py
15	Ditto 290.55m	ditto	Cp, Cc calcite veinlet/ conglomeratic black shale															massive or vein Cc, associated with Cp and Py

No.	Sample	Locality	Kind of Ore	Mineral Constituents											Remarks			
				Cp	Dl	Cc	Cv	Bo	Mal	Sp	Py	He	Co	Gn		Te		
16	MJZ-11 145.40m	Sable Ante- lope	Py disseminated vein/dolomitic arenaceous rock										○					cubic Py, disseminated
17	Ditto 169.73m	ditto	Py disseminated network/dolomitic arenaceous rock										○					massive or disseminated
18	Ditto 180.80m	ditto	Py veinlet/fine dolomitic arenaceous rock	○									○					Sp associated with Cp and Py, cubic or granular Py
19	Ditto 213.85m	ditto	Py disseminated/fine dolomitic arenaceous rock															vein or cubic Py, disseminated
20	MJZ-12 20.60m	ditto	Py disseminated/dolomitic sand stone															cubic Py, disseminated

Abbreviation

- Cp : Chalcopyrite      ⊙ : Abundant
- Dl : Digenite          ○ : Common
- Cc : Chalcocite        ◦ : Few
- Bo : Bornite            . : Rare
- Mal : Malachite
- Py : Pyrite
- Go : Goethite
- He : Hematite
- Te : Tennantite
- Cv : Covellite
- Sp : Sphalerite
- Gn : Gangue







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