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LONG RANGE SEISMIC MEASUREMENTS

SCOTCH

23 MAY 1967

Prepared for
AIR FORCE TECHNICAL APPLICATIONS CENTER
Washington, D. C.

25 OCTOBER 1967

By
TELEDYNE, INC.

Under
Project VELA UNIFORM

Sponsored By
ADVANCED RESEARCH PROJECTS AGENCY
Nuclear Test Detection Office
ARPA Order No. 624



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LONG RANGE SEISMIC MEASUREMENTS

SCOTCH

23 May 1967

SEISMIC DATA LABORATORY REPORT NO. 200

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AVAILABILITY

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SCOTCH

EVENT DESCRIPTION

DATE: 23 May 1967

TIME OF ORIGIN: 14:00:00.0Z

YIELD:

MAGNITUDE: 5.51 ± 0.75

LOCATION:

SITE: Nevada Test Site, Area U19as

GEOGRAPHIC COORDINATES:

Lat: $37^{\circ} 16' 30.0''$ N

Long: $116^{\circ} 22' 12.0''$ W

ENVIRONMENT:

GEOLOGIC MEDIUM: RHYOLITE

SURFACE ELEVATION: 6761 ft.

SHOT ELEVATION: 3492 ft.

SHOT DEPTH: 3269 ft.

COMPUTED EPICENTER: ALL STATIONS

GEOGRAPHIC COORDINATES:

Lat: $37^{\circ} 14' 16.8''$ N

Long: $116^{\circ} 28' 58.8''$ W

TIME OF ORIGIN: 14:00:01.4Z

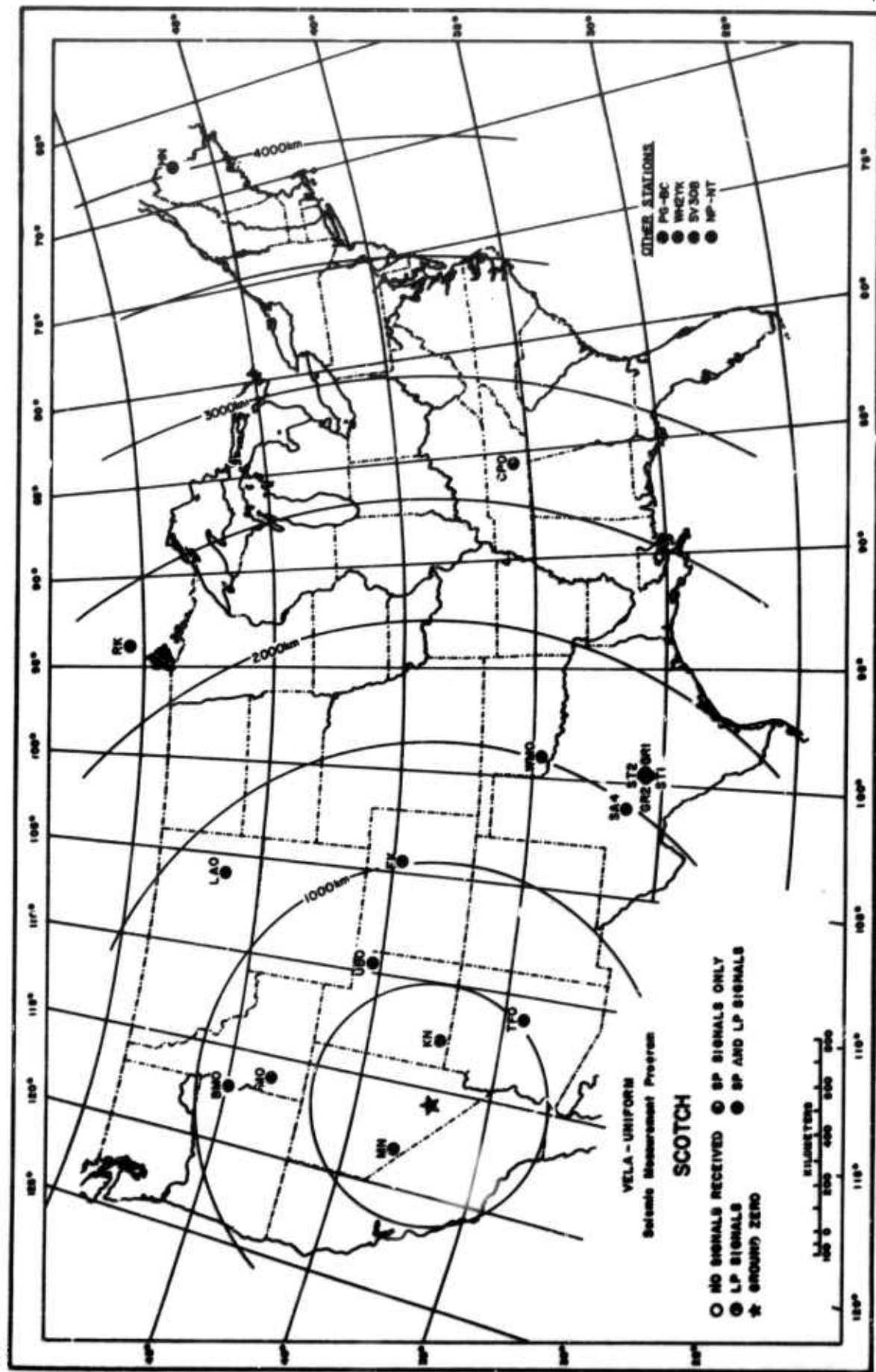
DEPTH CONSTRAINED TO: 0 km

EPICENTER SHIFT: 10.8 km S 68° W

Code	Station	Final							Tape	Timing
		SPZ	SPR	SPT	LPZ	LPR	LPT			
ME-NV	Mina, Nevada	+	+	+	+	+	+	*	P	
KN-UT	Kanab, Utah	+	+	+	+	+	+	*	P	
TPSO	Tonto Forest Seismological Observatory, Arizona	+	+	+	+	+	+	*	P	
MO-ID	Mountain Home, Idaho	+	I	+	+	+	+	*	P	
UBSO	Uinta Basin Seismological Observatory, Oregon	+	+	+	+	+	+	*	P	
BMISO	Blue Mountain Seismological Observatory, Oregon	+	+	+	+	+	+	*	P	
FK-CO	Franktown, Colorado	+	+	+	+	+	+	*	P	
LAO	Subarray, AO-10, Montana	+	N	N	**	**	**		P	
SAATX	San Angelo, Texas	+	N	N	+	+	<	*	P	
WMISO	Wichita Mountains Seismologi- cal Observatory, Oklahoma	+	+	+	+	+	+	*	P	
ST2TX	Streeter, Texas	+	N	N	+	+	-	*	P	
GR2TX	Grit, Texas	+	N	N	+	+	+	*	P	
GR1TX	Grit, Texas	+	N	N	+	+	+	*	P	
ST1TX	Streeter, Texas	+	N	N	+	+	+	*	P	
PG-BC	Prince George, British Columbia, Canada	+	+	+	+	+	+	*	P	
RK-ON	Red Lake, Ontario, Canada	+	+	+	+	+	+	*	P	
CPSO	Cumberland Plateau Seis- mological Observatory, Tenn.	+	+	+	I	I	I		P	
WHZYK	Whitehorse, Yukon Territory, Canada	+	+	+	+	+	+	*	P	
HM-ME	Moulton, Maine	+	+	+	+	+	+	*	P	
SV3QB	Schefferville, Quebec, Canada	+	+	+	+	+	+	*	P	
FP-WT	Mould Bay, Northwest Territories, Canada	+	+	+	+	+	+	*	P	

I Inoperative - No Signal
 N No Instrument * Magnetic Tape Available
 P Primary Timing ** Magnification Questionable
 + Signal

Table 1



Recording Stations and Signals Received

INTRODUCTION

A long seismic measurements (LRSM) program and several larger seismographic observatories were established under VELA-UNIFORM to record seismological data resulting from natural seismic activity and a planned series of U. S. underground nuclear tests. The LRSM teams are mobile and occupy locations selected to provide optimum data from events of special interest; the observatories are permanent installations as follows:

Wichita Mountains Seismological Observatory (WMSO)
Lawton, Oklahoma

Uinta Basin Seismological Observatory (UBSO)
Vernal, Utah

Tonto Forest Seismological Observatory (TFSO)
Payson, Arizona

Large Aperture Seismic Array (LASA)
Billings, Montana

The purpose of this report is to provide an analysis of data resulting from the SCOTCH event recorded by the LRSM teams and the VELA observatories and a preliminary summary of data reported by other permanent and temporary seismographic stations.

INSTRUMENTATION AND PROCEDURE

The instrumentation at each of the LRSM locations consists of three-component short-period and three-component long-period seismographs. In general, data are recorded on 35 millimeter film and on one-inch 14 channel magnetic tape, although recently more portable instrumentation has been incorporated which records only on magnetic tape. The stations are all equipped to record WWV continuously to provide accurate time control. Calibration is accomplished once each day and just prior to each shot at the operational settings. Pertinent information useful for analysis of LRSM data is available to qualified users of this data and is contained in Technical

Report 65-43, "Interpretation and Usage of Seismic Data, LRSM Program." General information on LRSM van and portable system equipment and operation is given in Technical Report 66-27, "The LRSM Mobile Seismological Laboratory," and 65-74, "A Portable Seismograph." Copies of these reports may be obtained from DDC. The AD control number of Technical Report 66-27 is 480343. All the observatories have both long-period and short-period, three-component instrumentation, in addition to their other specialized facilities.

Station information is presented in Appendix I(A). This includes the station name and code; the geographic coordinates; the distances and azimuths involved; the station elevations; and the type of instruments in use at each location. Representative instrumental response curves are shown in Appendix II(B), II(C), and II(D).

The procedures used in measuring amplitudes reported herein are illustrated in Appendix II(A) and the unified magnitude is calculated as shown in Appendix I(B). The distance factors (B) beyond 16° are from Gutenberg and Richter*. For distance less than 16° values were read from a curve in the Gutenberg and Richter paper back to 10° and then extrapolated to 2° , using an inverse cube relationship. An additional magnitude for less than 16° was computed using a method described by Evernden**. (Figure 3)

A standard hypocenter location program for a digital computer is used to determine the location using data from all stations analyzed.

- 3 -

* Gutenberg, B. and Richter, C. F., Magnitude and Energy of Earthquakes Ann. Geofis., 9 (1956), pp. 1-15.

** Evernden, J. F., Magnitude Determination at Regional and Near Regional Distances in the United States, AFTAC/VELA Seismological Center Technical Report VU-65-4A, (1965), pp. 6,13.

Best-fit values of latitude, longitude, and time of origin are determined statistically by a least squares technique. This utilizes a Jeffreys-Bullen travel-time curve as modified by Herrin in 1961 on the basis of Pacific surface-focus recordings. Precision of the computation is limited primarily by the accuracy of arrival times, the validity of the standard travel-time curve, and by local velocity deviations. This method is based on P-wave arrivals with depth constrained to zero.

DATA AND RESULTS (LRSM AND VELA OBSERVATORIES)

The parameters of the SCOTCH event and a summary of the seismic evaluation are shown on the Event Description page. The operational status of the 21 LRSM stations and observatories is given in Table I, and illustrated in Figure 1.

Table 2 summarizes the measurements made of the principal phases from the SCOTCH event at the LRSM and VELA stations. Included are the Pn and P arrival times, the maximum amplitudes (A/T) of Pn or P motion and other phases as seen on the short-period instruments. Long-period Love and Rayleigh wave motion are also tabulated in (A/T) form. In addition, individual station Rayleigh wave areas (mm^2) is indicated as measured on the LPZ only. Although reduced to 1K magnification, they have not been normalized to any magnitude. Twenty-one stations recorded short-period and long-period signals.

The unified magnitudes determined from the LRSM and VELA observatories are shown in Figure 2. The average magnitude is 5.51 ± 0.75 . The adjusted unified magnitude is 5.29 ± 0.62 .

The travel-time residuals from the Pn and P phases are shown in Figure 4. Figures 5 through 9 illustrate plots of the amplitudes of P, Pg, Lg, LQ, and LR.

Attached to the report are illustrative seismograms showing the signals recorded at four stations. The most distant station analyzed that recorded SCOTCH was NP-NT at a distance of 4348 kilometers.

Code	Station	Distance (km)	Depth (m)	Magnitude (m)	Phase	Observed Time		Period (sec)	Minimum Amplitude μV	Amplitude (m)		Area (km ²)
						(min)	(sec)			ab	ac	
82-07	Rico, Nevada	105	000	0.150	Pn	00	32.5	5.45	11,472	0.55	5.05	
			000	0.100	Pg	19	30.5	0.5	(100,000)			
			000	0.112	Lg			(5.0)	34,300			
			L00		L0							
82-07	Ranch, Utah	528	L00	0.00	L0			(0.0)	151,015			2065.01
			000	0.0000	Pn	10	67.7	0.4	7667	6.50	6.34	
			000	0.0000	Pg	00	59.0	0.55	32,544			
			000	0.007	Lg			0.6	16,602			
			L00	0.0020	L0			(10.0)	(10,797)			
			L00	0.710	L0			(10.0)	(4000)			
W00	Pinto Peak Seismological Observatory, Arizona	500	000-00	1.37	Pn	01	19.5	(0.0)	15317	16.151	15.041	990.20
			000-00	1.97	e	01	00.3	0.00	907			
			000-00	1.97	e	01	07.0	0.4	815			
			000-00	1.37	Pg	01	00.9	0.6	4100			
			000	1.25	Lg			1.1	1276			
			000	1.37	Lg			1.1	1530			
			L00	3.5	L0			10.0	240			
			L00	3.1	L0			10.0	270			
			L00	0.000	L0			10.0	(1710)			
			000	0.005	Pn	01	(20.3)	0.5	900	6.30	6.10	
			000	0.305	e	07	30.5	0.6	1000			
			000	0.303	e	02	40.0	0.6	5000			
80-70	Mountaine Home, Idaho	544	000	0.305	Pg	15	00.3	(0.0)	(1000)			00.00
			000	0.256	Lg			0.0	5000			
			L00	0.176	L0			1.0	4070			
			L00	0.0155	L0			(14.0)	(1000)			
			000-10	0.00	Pn	01	(07.5)	5.55	521	6.00	6.03	
			000-10	0.00	Pg	01	51.0	0.55	2237			
			000	5.5	Lg			0.7	2055			
			000	5.5	Lg			0.7	1006			
			L00	0.00	L0			10.0	505			
			L00	0.00	L0			10.0	305			
8000	O'ne Mountain Seismological Observatory, Oregon	505	L00	0.53	L0			10.0	675			206.70
			000-5	24.0	Pn	01	55.0	0.9	810	5.00	5.00	
			000-5	24.0	e	05	57.5	(5.0)	(100)			
			000-5	00.0	Pg							
			000		Lg							
			000		Lg							
			L00		L0							
			L00		L0							
			L00	1.0	L0			15.0	800			
			000	15.00	Pn	00	02.6	0.75	260	6.04	5.17	
75-00	Frankton, Colorado	1070	000	15.00	100	00	30.7	(5.0)	(107)			430.00
			000	15.00	e	00	30.0	0.75	155			
			000	15.00	Pg	05	(05.4)	(0.7)	(004)			
			000	11.57	Lg			5.5	1541			
			L00	0.002	L0			(15.0)	(1000)			
			L00	0.100	L0			11.0	3000			
L00	Subarray, AB-10, Montana	1360	000	42.5	Pn	00	55.5	1.1	97.0	5.00	6.00	601.27
			000	42.5	e	00	00.0	0.9	550			
			000	42.5	e	05	00.5	0.0	100			
			000	42.5	e	05	57.0	1.0	200			
			000	41.5	(100)	05	00.0	0.75	100			
			L00		L0			10.0				
			L00		L0			10.0				
			L00		L0			17.0				
			000-1	00.0	Pn	05	115.0	0.0	00.0	5.70	5.05	
			000-1	24.0	e	03	57.0	(0.0)	(10.0)			
0000	San Angelo, Texas	1497	000-1	00.0	e	05	10.0	(0.7)	(10.7)			
			000-1	00.0	e	00	09.0	1.1	111			
			000-1	00.0	Pg	00	00.5	(0.7)	(117)			
			L00	0.10	L0			(15.0)	(000)			
			L00	0.15	L0			(15.0)	(007)			
			000-0	33.7	P	03	(30.7)	(1.0)	(50.0)	(6.00)	(6.30)	
			000-0	31.7	e	03	30.5	1.2	305			
			000-0	33.7	Pg	10	(30.0)	0.0	150			
			L00	13.7	e	00	35	50.0	21.0			
			000	00.0	Lg			10.0	1500			
0000	Sawyer, Texas	1717	L00	3.25	L0			70.0	300			170.10
			L00	0.10	L0			(50.0)	(200)			
			000-1	00.5	P	00	(00.0)	0.0	30.0	4.70	4.70	
			000-1	20.0	e	03	45.0	0.7	10.0			
			000-1	20.0	e	10	10.0	0.7	00.0			
			000-1	00.5	Lg	00	10.0	0.0	03.5			
			000-1	10.0	Pg	10	44.5	0.0	10.0			
			L00	0.000	L0			(11.0)	(000)			
			000-0	10.0	P	03	01.0	0.0	30.5	0.10	0.07	
			000-0	10.0	e	03	02.7	0.7	30.0			
0000	Griff, Texas	1700	000-0	40.0	e	00	00.0	0.0	00.0			000.00
			000-0	10.0	Pg	04	00.0	1.5	77.3			
			L00	0.10	L0			10.0	000			
			L00	0.000	L0			10.0	1000			
			000-0	10.0	P	03	01.0	0.0	30.5	0.10	0.07	
			000-0	10.0	e	03	02.7	0.7	30.0			
			000-0	40.0	e	00	00.0	0.0	00.0			
			000-0	10.0	Pg	04	00.0	1.5	77.3			
			L00	0.10	L0			10.0	000			
			L00	0.000	L0			10.0	1000			

Principal Phases
Table 2 Page 1

Code	Station	Distance (km)	Elev.	Magnet. Location (N)	P1m x 10	Name	Observed Typical Time		Period τ (sec)	Maximum Amplitude A/V	Magnitude		Area (km ²)
							(min)	(sec)			mb	ms	
0422	Orin, Yukon	1723	1723	04.0	P	03	41.1	0.0	73.0	4.04	0.71	300.06	
				04.0	0	03	04.3	0.4	70.3				
				04.0	0	03	03.3	1.1	99.0				
				04.0	(Pg)	04	(04.0)	(0.7)	(04.0)				
				0.00	10			(13.0)	(040)				
				0.04	10			(11.0)	(1700)				
0422	Orin, Yukon	1727	1727	04.0	P	03	(41.0)	0.0	41.3	4.72	0.04	300.06	
				04.0	0	03	04.0	0.7	04.1				
				04.1	0	03	44.0	0.4	99.6				
				04.0	0	03	04.0	(0.4)	(01.3)				
				04.0	0	04	04.3	0.0	110				
				04.0	Pg	04	(04.0)	0.7	(33.3)				
0422	Prince George, British Columbia, Canada	1950	1950	0.000	10			14.0	043	4.20		304.05	
				0.100	10			13.0	0430				
				04.3	P	04	04.1	0.0	00.7				
				04.3	0	04	04.3	1.0	00.0				
				04.3	0	04	04.0	0.0	220				
				04.3	0	04	00.7	0.0	204				
0422	Red Lake, Ontario, Canada	2306	2306	04.3	0	04	10.0	0.0	100	4.04		304.73	
				04.3	0	04	10.0	0.0	100				
				04.3	0	04	13.0	0.7	04.0				
				04.3	0	04	16.0	1.1	134				
				04.3	0	04	21.0	0.0	30.4				
				04.3	0	04	24.0	1.1	100				
				04.0	10			3.1	100				
				04.0	10			3.1	104				
				0.74	10			13.0	361				
				0.04	10			13.0	341				
				3.04	10			13.0	360				
				0.04	P	04	43.0	0.4	360				
				0.04	0	04	47.7	(0.7)	(331)				
				0.04	0	04	04.0	0.0	360				
0.04	0	04	04.3	1.0	360								
0.04	0	04	37.3	0.7	104								
0.04	0	04	(03.0)	0.0	131								
0.00	10			1.7	140								
1.04	10			13.0	104								
13.7	10			13.0	334								
0422	Cambridge Platten Island, Inuvik, Northwest Territory, Canada	2704	2704	04.0	P	04	24.3	0.73	111	3.61		91.61	
				04.0	0	04	04.7	1.0	09.0				
				04.0	10								
				04.0	10								
0422	Whitcomb, Yukon Territory, Canada	2917	2917	27.0	P	04	(07.0)	1.0	27.7	4.03			
				27.0	0	04	20.0	0.0	04.4				
				27.0	0	04	41.3	(1.0)	(27.0)				
				27.0	(Pg)	04	07.0	0.0	6.0				
				1.53	(0)	10	20	10.0	30.0				
				20.0	10			0.3	(62.0)				
0422	Houlton, Maine	4001	4001	0.013	10			10.0	104	(3.04)		400.91	
				3.03	10			(14.0)	(010)				
				14.3	P	07	00.0	(0.03)	(144)				
				14.3	0	07	15.0	0.0	31.4				
				14.3	Pg	04	25.3	0.0	13.0				
				17.0	10			(3.7)	(04.0)				
0422	Schottsville, Quebec, Canada	4104	4104	1.11	10			(13.0)	(131)	(3.30)		37.04	
				7.0	10			13.0	100				
				29.0	0	07	10.3	(3.0)	(77.4)				
				04.0	(04)	04	47.0	(0.0)	(04.0)				
				04.0	10			(1.0)	(01.0)				
				04.7	10			1.4	27.7				
0422	Houlton, Maine	4001	4001	3.40	10			13.0	70.3			40.04	
				4.10	10			13.0	73.0				
				4.40	10			14.0	120				
				114	P	07	20.0	0.7	100				
				114	0	07	23.3	0.7	61.0				
				114	0	07	47.4	0.7	04.3				
0422	Houlton, Maine	4001	4001	114	0	07	00.7	0.0	04.0				
				114	04	00	00.4	1.3	04.1				
				114	Pg	09	20.4	0.0	30.7				
				100	10			0.0	110				
				10.140	10			20.0	300				
				13.01	10			17.0	200				

A/V m/sec
 (1) Earth's Velocity on Phase
 C Maximum Amplitude Ratio (m/sec)
 m Maximum Amplitude Clipped on Site and Type
 m Magnification Constant

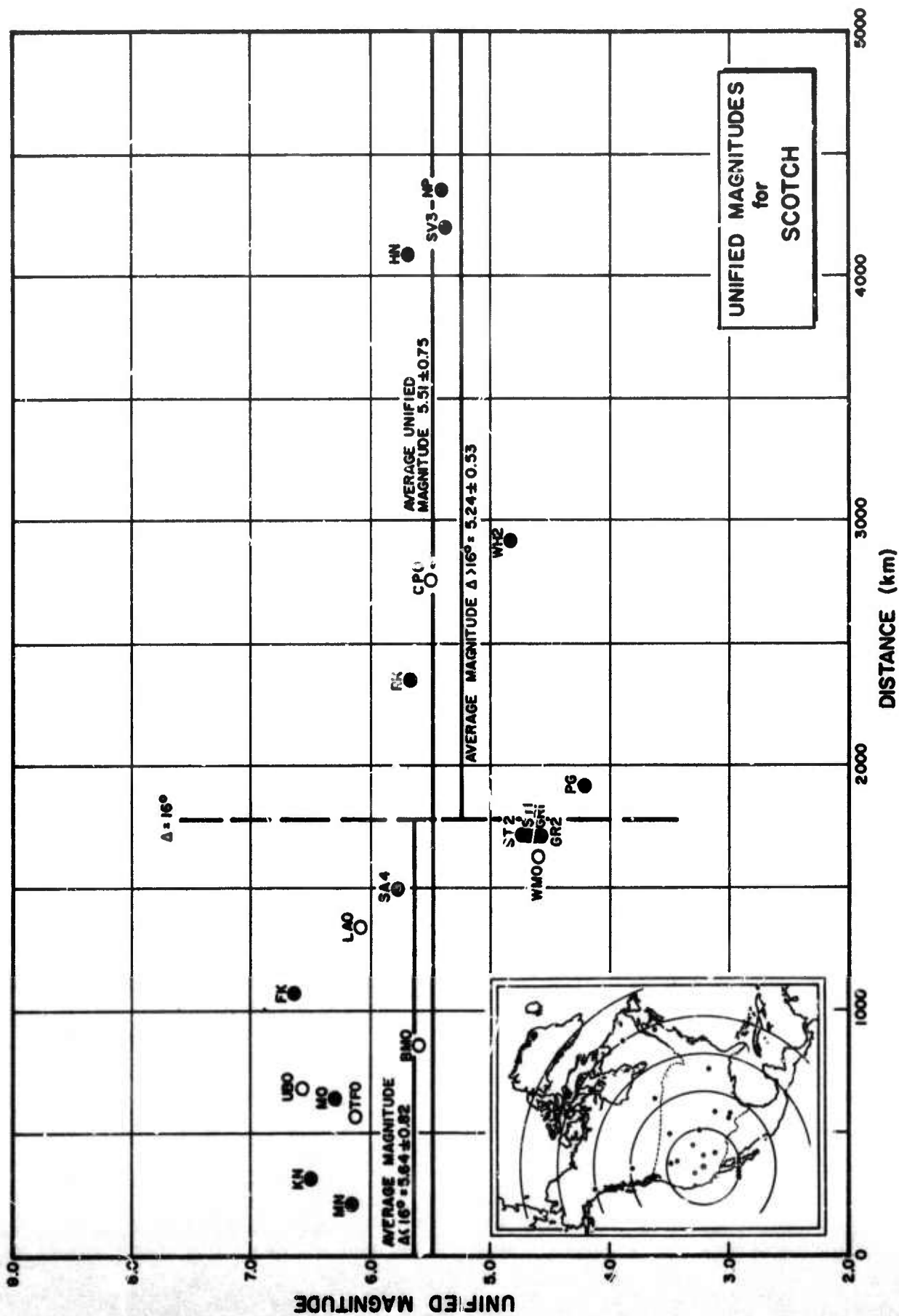


Figure 2

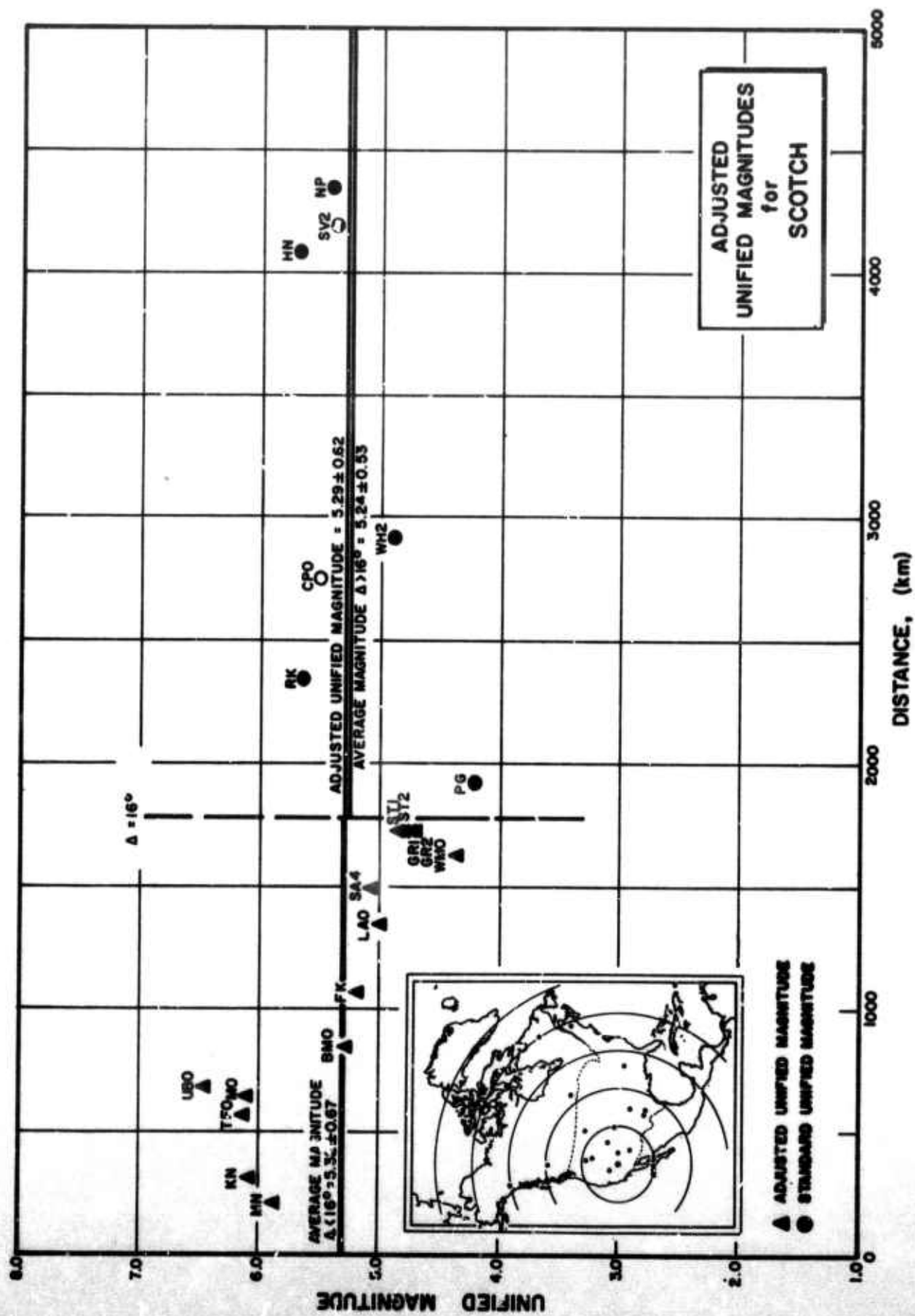


Figure 3

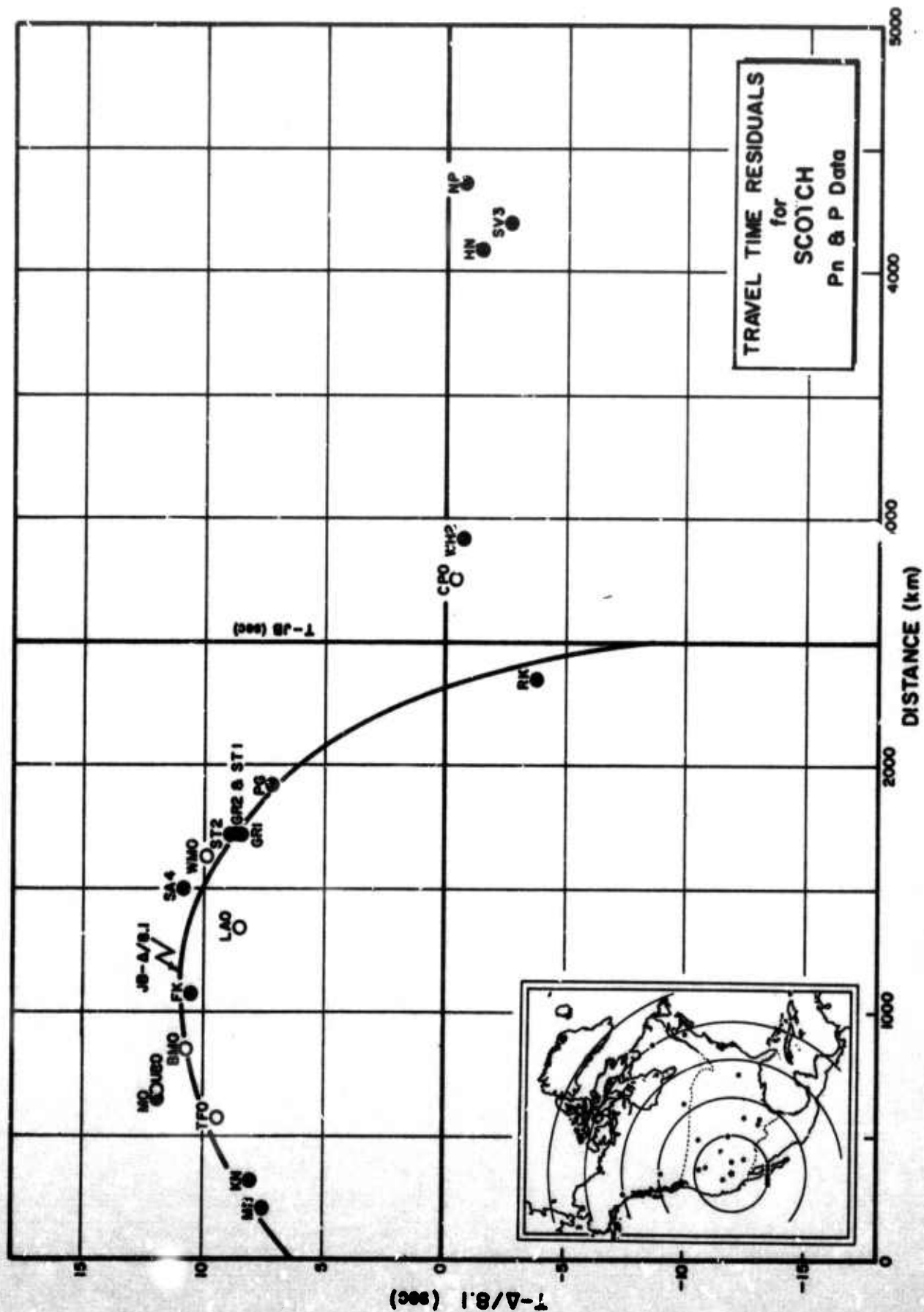


Figure 4

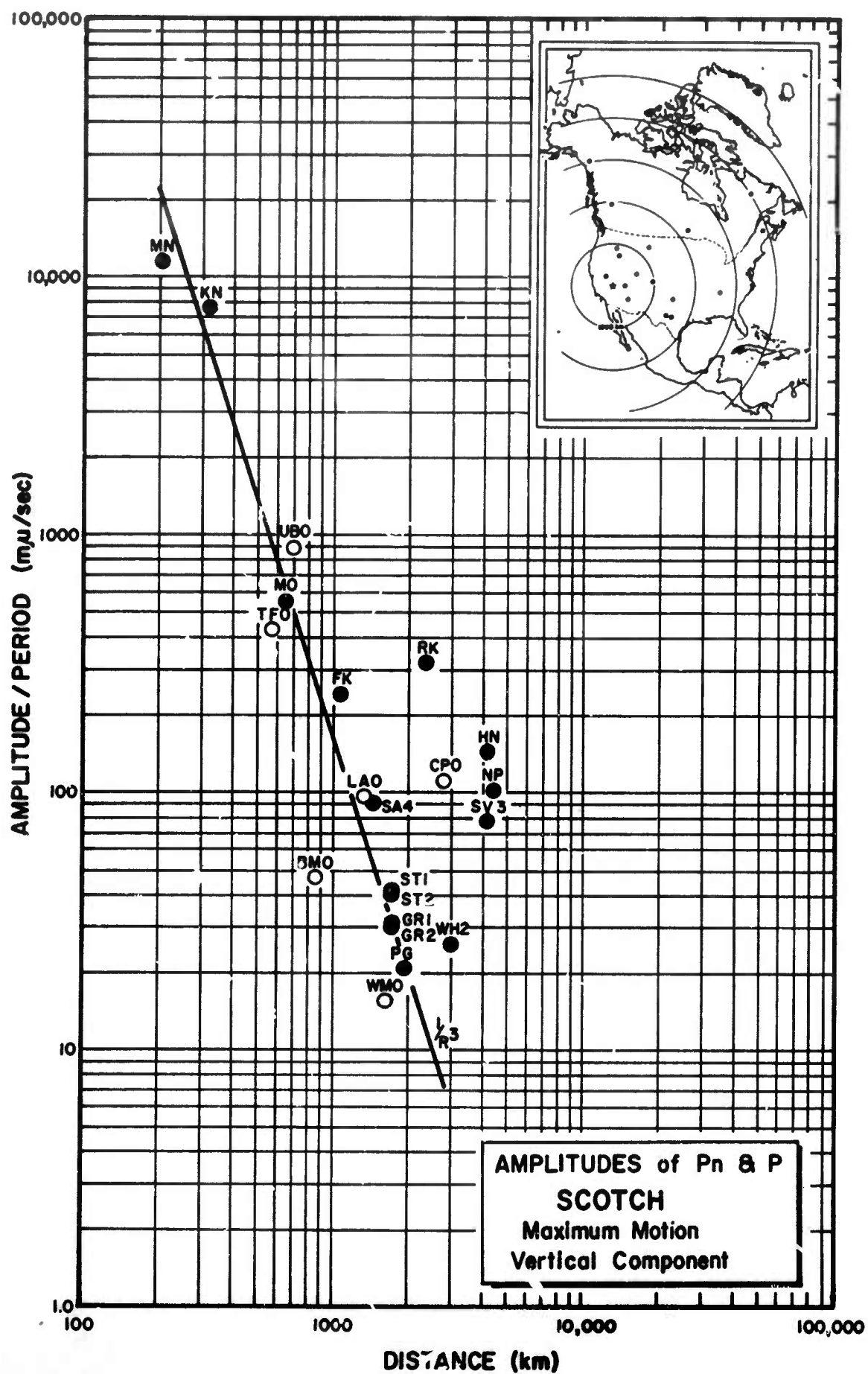
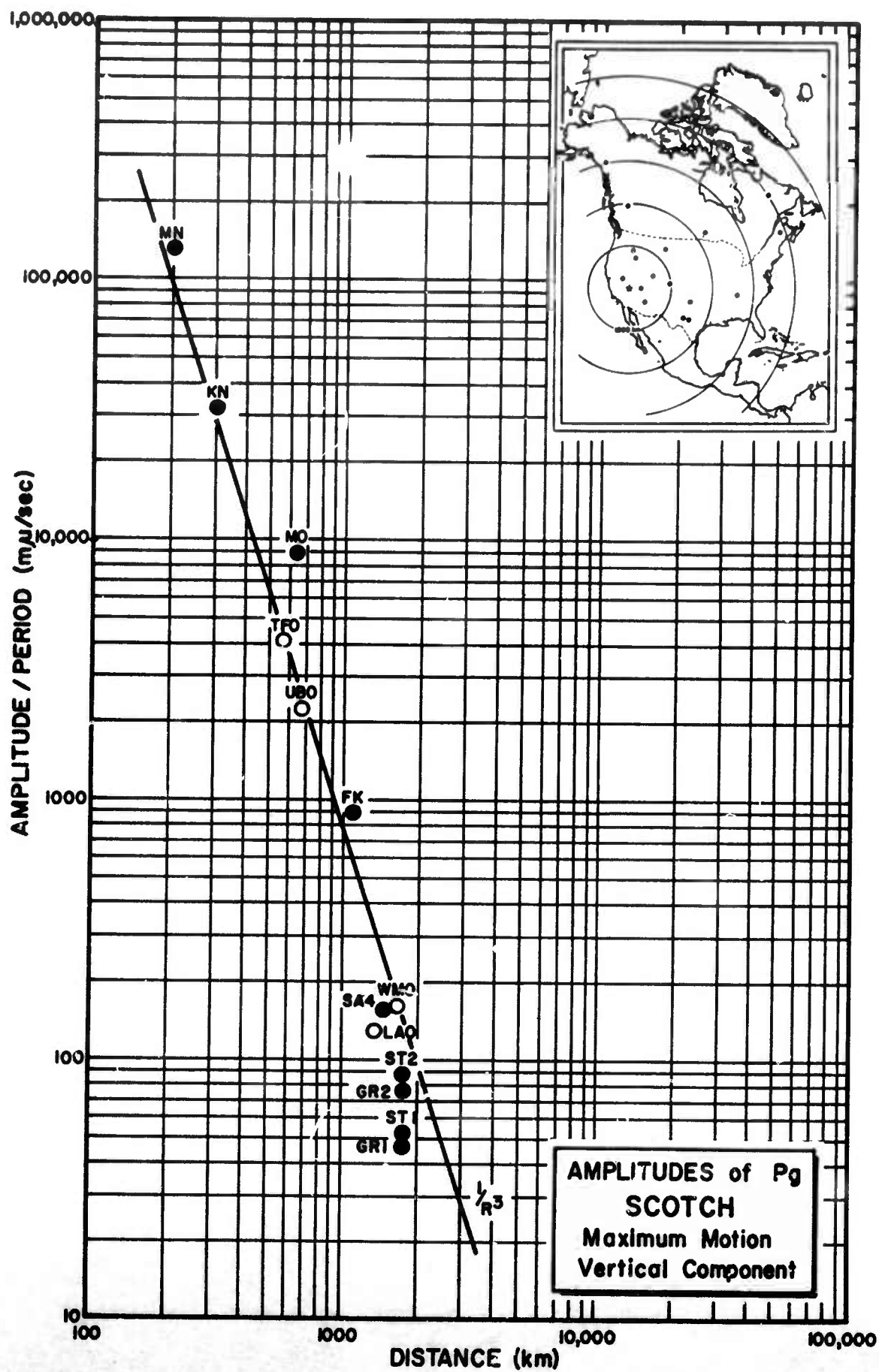


Figure 5



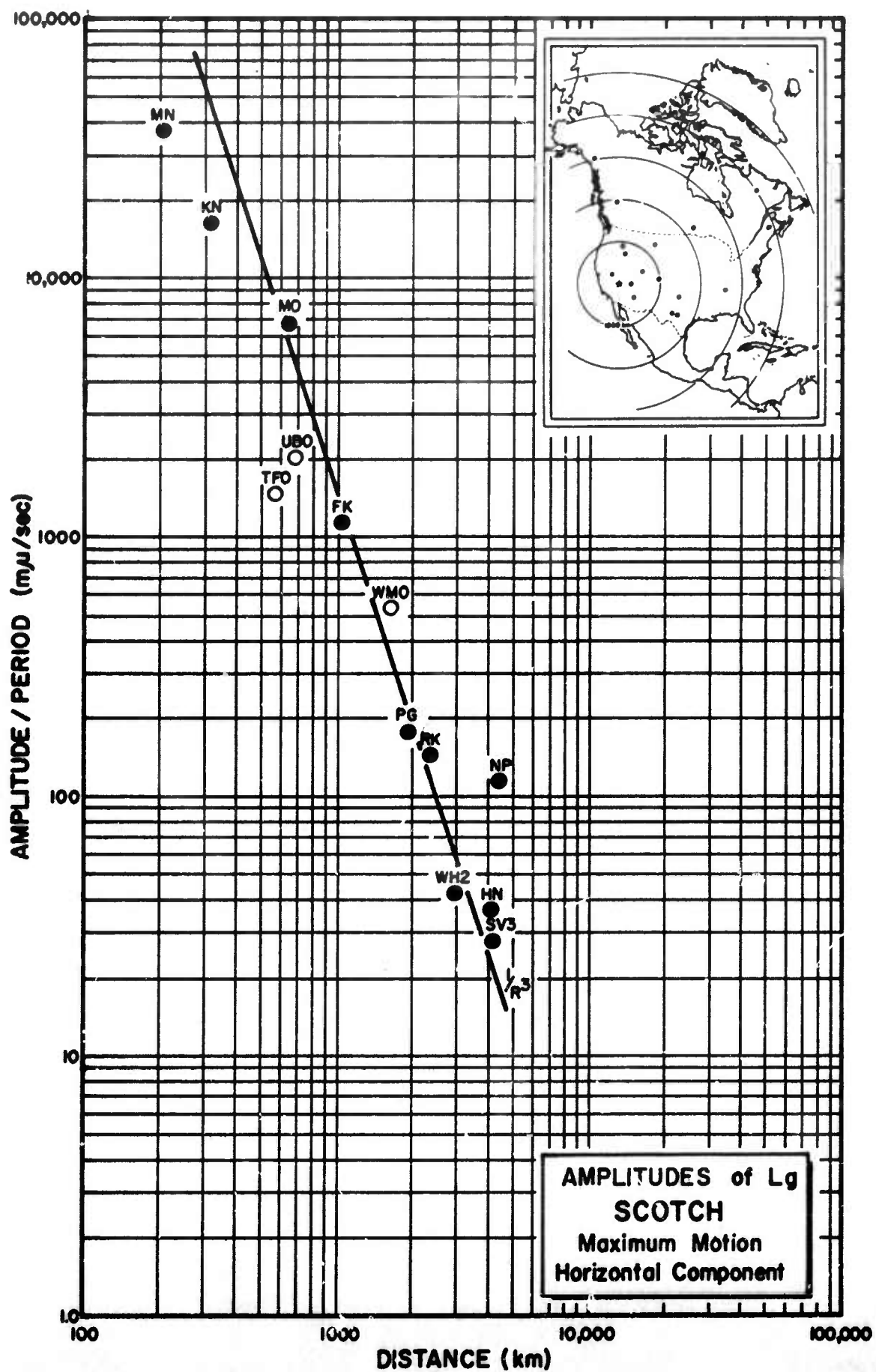


Figure 7

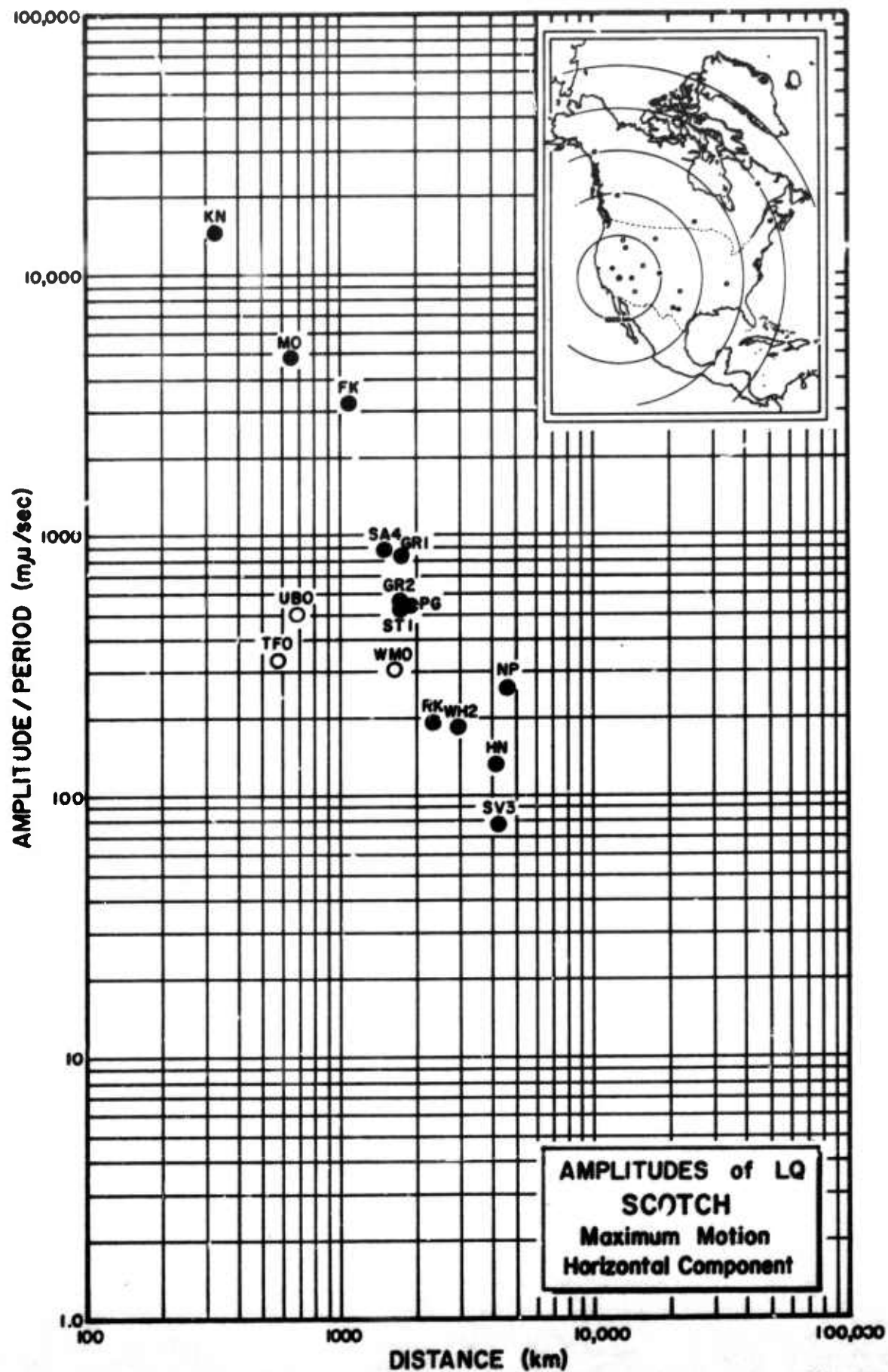


Figure 8

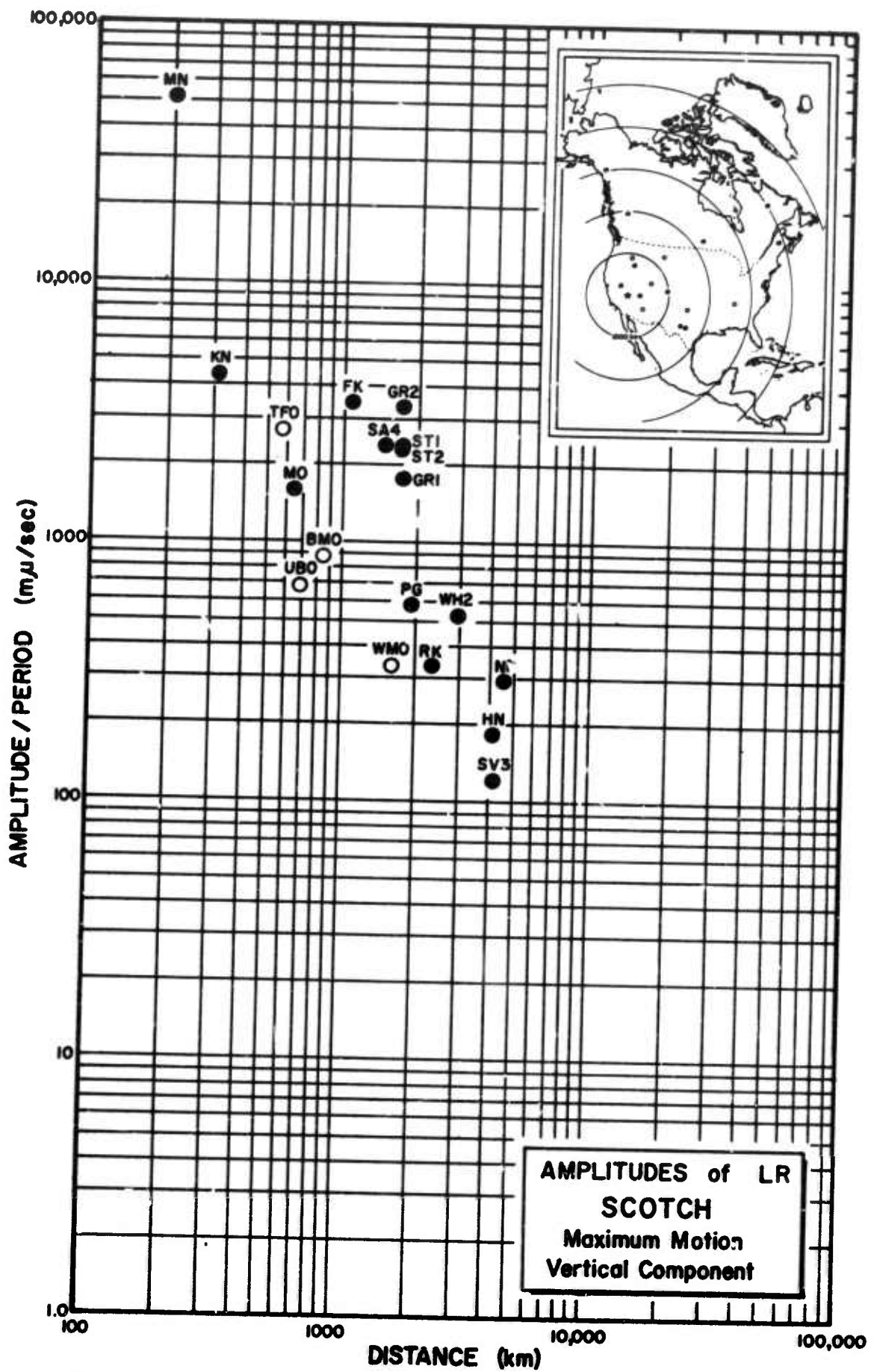


Figure 9

SCOTCH - 23 May 1967

Code	Station	Distance (km)	Geographic Latitude	Geographic Longitude	Elev. (km)	Computed Azimuth		Installed Azimuth		Large or Small SP	LP Inst.
						Epi. Sta.	Epi. Sta.	Radial	Tang.		
MM-NV	Mina, Nevada	203	38°26'10" N	118°08'53" W	1.52	310°	129°	308°	38°	L	X
KR-UT	Kanab, Utah	316	37°01'22" N	112°49'39" W	1.74	94°	276°	95°	185°	L	X
TR80*	Tonto Forest Seismological Observatory, Arizona	568	34°17'12" N	111°16'03" W	1.49	124°	307°	90°	0°	JM	X
MC-ID	Mountain Home, Idaho	644	43°04'19" N	116°15'56" W	0.79	1°	181°	359°	89°	L	X
UB80*	Uinta Basin Seismological Observatory, Utah	681	40°19'18" N	109°34'07" W	1.60	58°	242°	90°	0°	JM	X
BM80*	Blue Mountain Seismological Observatory, Oregon	845	44°50'56" N	117°18'20" W	1.19	355°	174°	0°	90°	JM	X
FK-CO	Franktown, Colorado	1070	39°35'12" N	104°27'42" W	1.80	72°	260°	79°	169°	L	X
LAO*	Suberay, AO-10, Montana	1340	46°41'19" N	106°13'20" W	0.90	36°	222°	90°	0°	H82	X
SA4TX	San Angelo, Texas	1497	31°49'29" N	101°25'35" W	0.79	109°	298°	116°	208°	Geotech	X
WM80*	Wichita Mountain Seismo- logical Observatory, Okla.	1625	34°43'05" N	98°35'21" W	0.51	95°	285°	90°	0°	JM	X
ST2TX	Streeter, Texas	1717	30°47'32" N	99°26'52" W	0.58	110°	299°	119°	209°	Geotech	X
GR2TX	Grit, Texas	1720	30°47'11" N	99°24'58" W	0.55	110°	299°	119°	209°	Geotech	X
GR1TX	Grit, Texas	1723	30°46'40" N	99°23'03" W	0.52	110°	299°	119°	209°	Geotech	X
ST1TX	Streeter, Texas	1727	30°45'08" N	99°21'20" W	0.52	110°	299°	119°	209°	Geotech	X
PG-WC*	Prince George, British Columbia, Canada	1919	53°59'50" N	122°31'23" W	0.91	348°	163°	110°	200°	L	X
UK-CN	Red Lake, Ontario, Canada	2346	50°50'20" N	93°46'20" W	0.37	43°	239°	58°	148°	S	X
CP80*	Cumberland Plateau Seis- mological Observatory, Tenn.	2756	35°35'41" N	85°34'13" W	0.57	85°	283°	90°	0°	JM	X
WB2YK	Whitehorse, Yukon Territory Canada	2917	60°41'41" N	134°58'02" W	0.85	339°	145°	325°	55°	L	X
HM-ME	Houlton, Maine	4081	46°09'43" N	67°59'09" W	0.21	60°	274°	93°	183°	S	X
SV3QB*	Schefferville, Quebec, Canada	4195	54°48'39" N	66°45'00" W	0.58	46°	263°	139°	229°	S	X
XP-WT	Mould Bay, Northwest Territories, Canada	4348	76°15'08" N	119°22'18" W	0.06	359°	176°	356°	96°	JMS S	X

* Seismometers Not Oriented Toward N78

Recording Site Information
Appendix: I(A)

Unified Magnitude: $m = \log_{10} (A/T) + B$

where

A = zero to peak ground motion in millimicrons
 $= \frac{(\text{mm}) (1000)}{K}$

T = signal period in seconds

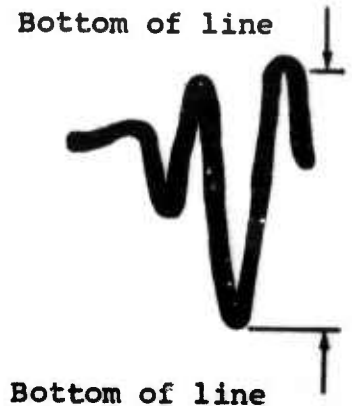
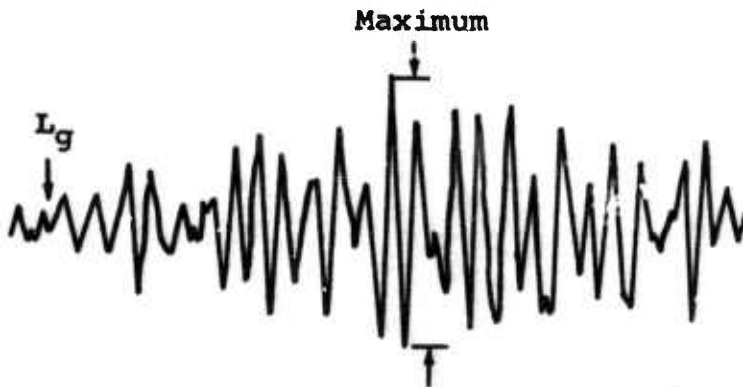
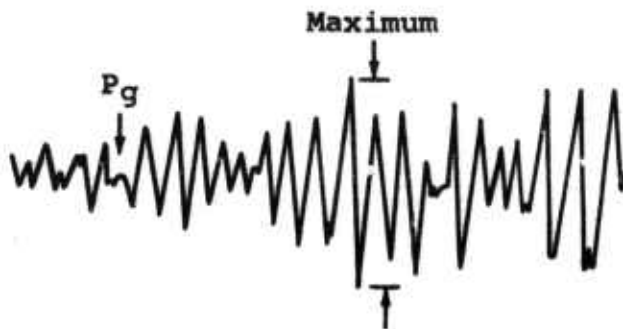
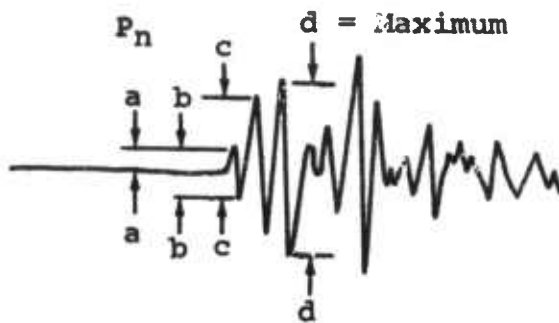
B = distance factor (see Table below)

mm = record amplitude in millimeters zero to peak

K = magnification in thousands at signal frequency

Table of Distance Factors (B) for Zero Depth

Dist (deg)	B	Dist (deg)	B	Dist (deg)	B	Dist (deg)	B
0°	-	27°	3.5	54°	3.8	80°	3.7
1	-	28	3.6	55	3.8	81	3.8
2	2.2	29	3.6	56	3.8	82	3.9
3	2.7	30	3.6	57	3.8	83	4.0
4	3.1	31	3.7	58	3.8	84	4.0
5	3.4	32	3.7	59	3.8	85	4.0
6	3.6	33	3.7	60	3.8	86	3.9
7	3.8	34	3.7	61	3.9	87	4.0
8	4.0	35	3.7	62	4.0	88	4.1
9	4.2	36	3.6	63	3.9	89	4.0
10	4.3	37	3.5	64	4.0	90	4.0
11	4.2	38	3.5	65	4.0	91	4.1
12	4.1	39	3.4	66	4.0	92	4.1
13	4.0	40	3.4	67	4.0	93	4.2
14	3.6	41	3.5	68	4.0	94	4.1
15	3.3	42	3.5	69	4.0	95	4.2
16	2.9	43	3.5	70	3.9	96	4.3
17	2.9	44	3.5	71	3.9	97	4.4
18	2.9	45	3.7	72	3.9	98	4.5
19	3.0	46	3.8	73	3.9	99	4.5
20	3.0	47	3.9	74	3.8	100	4.4
21	3.1	48	3.9	75	3.8	101	4.3
22	3.2	49	3.8	76	3.9	102	4.4
23	3.3	50	3.7	77	3.9	103	4.5
24	3.3	51	3.7	78	3.9	104	4.6
25	3.5	52	3.7	79	3.8	105	4.7
26	3.4	53	3.7				

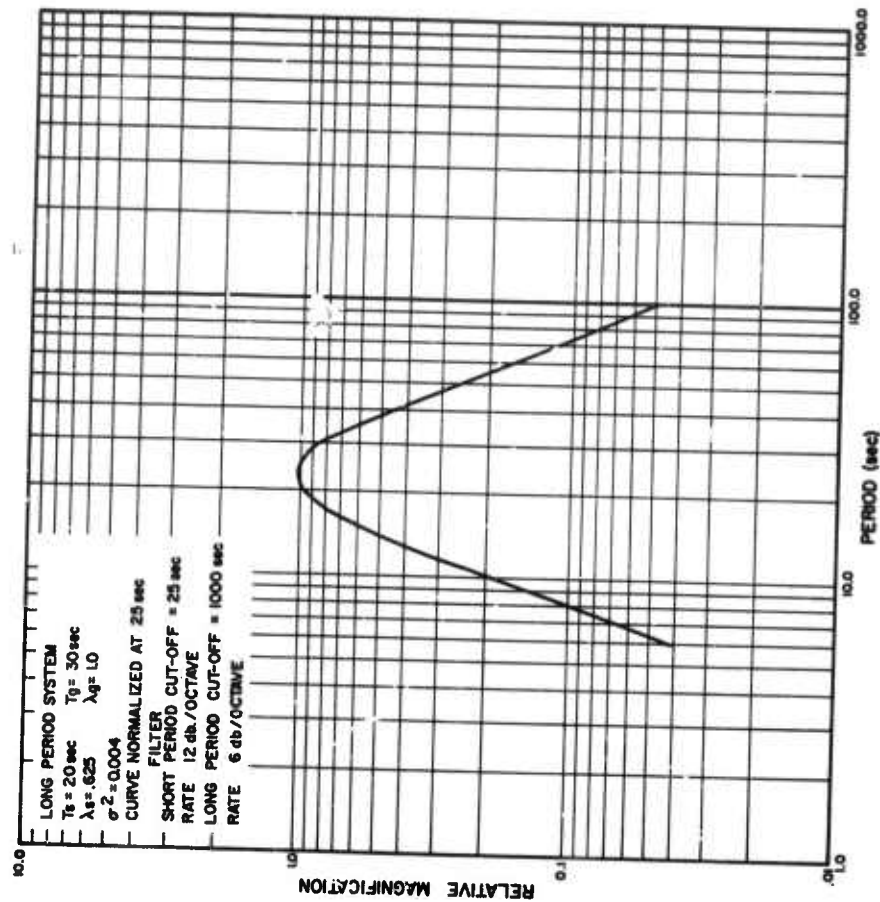
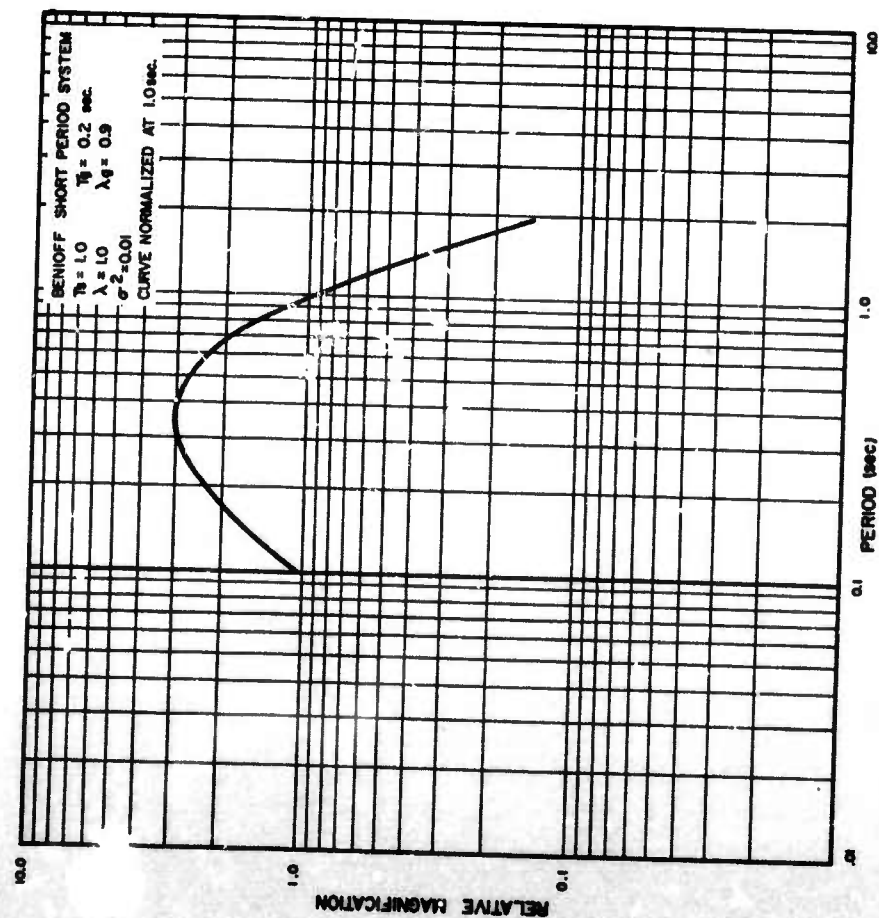


Detail Showing Allowance
For Line Width

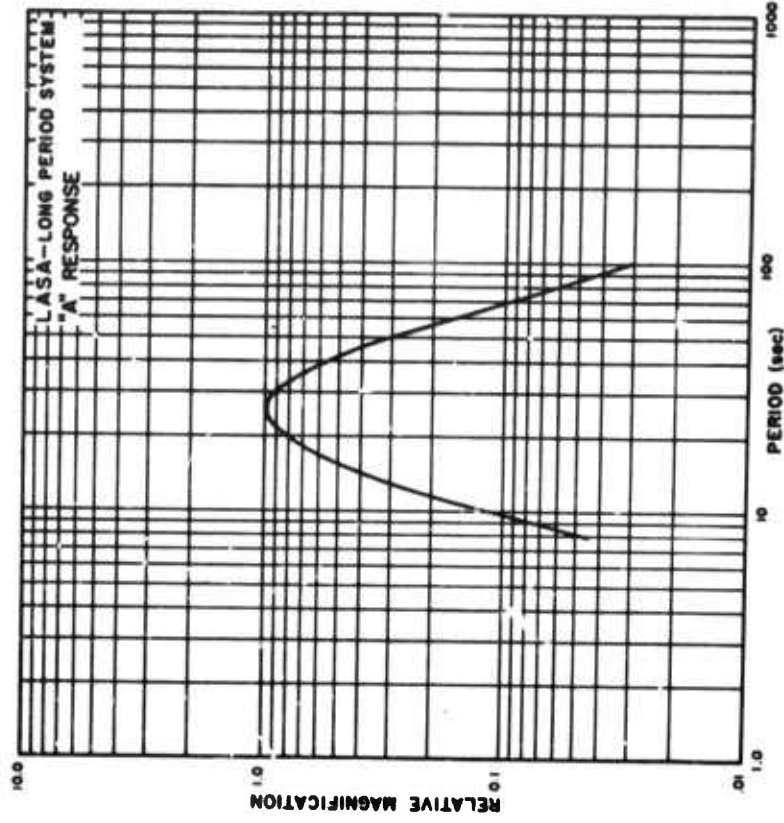
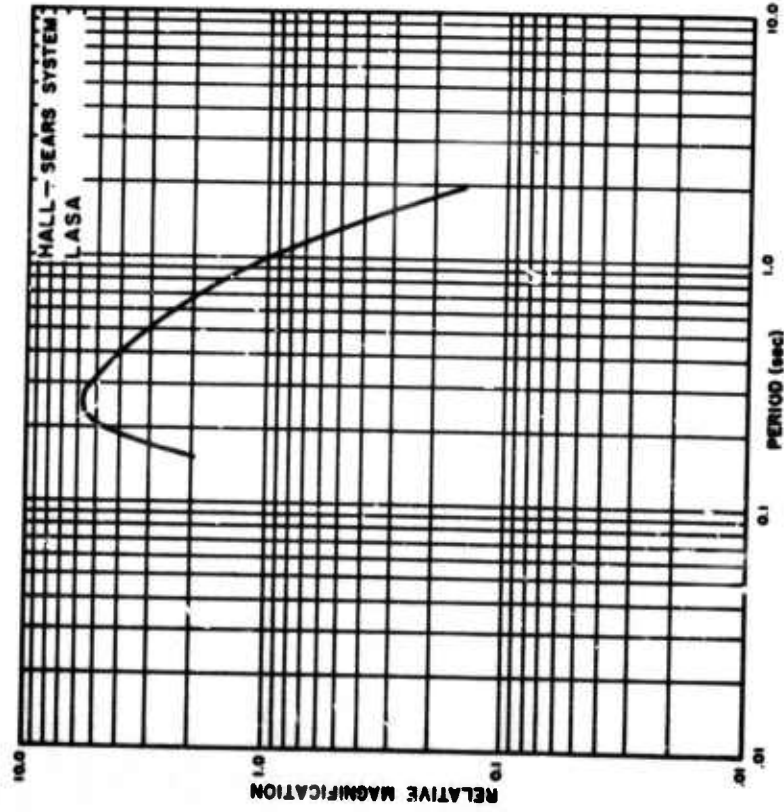
Pick time of P_n at beginning of "a" half cycle.

Pick amplitude of P_n as maximum " $d/2$ " within 2 or 3 cycles of "c".

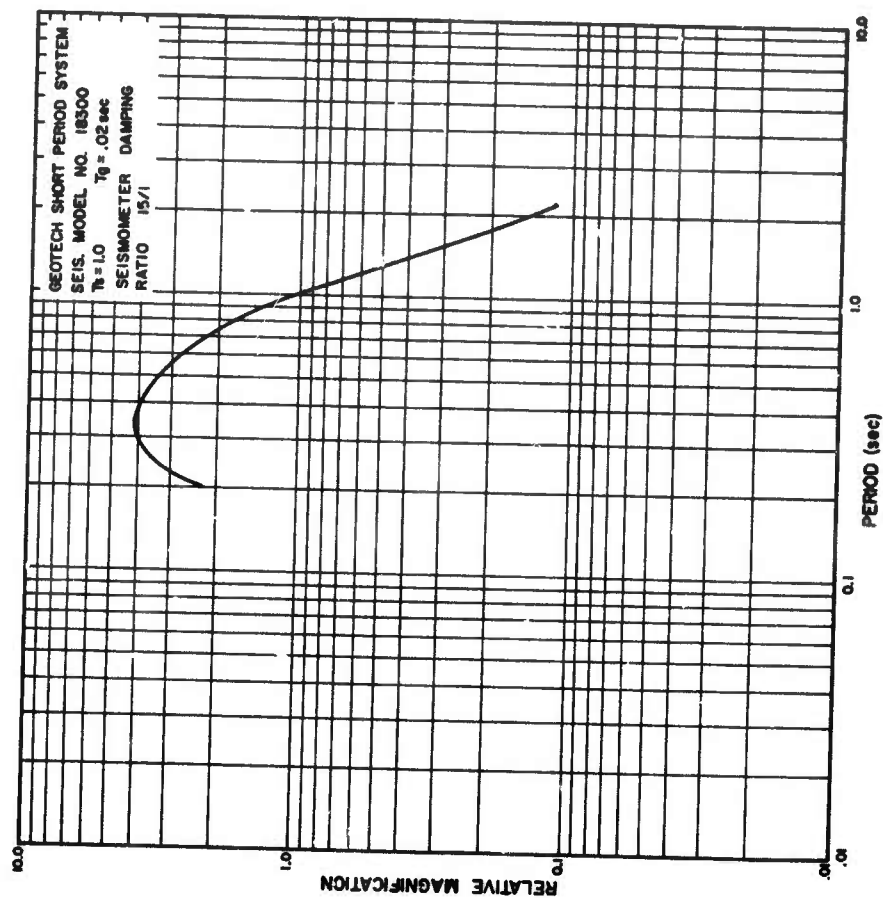
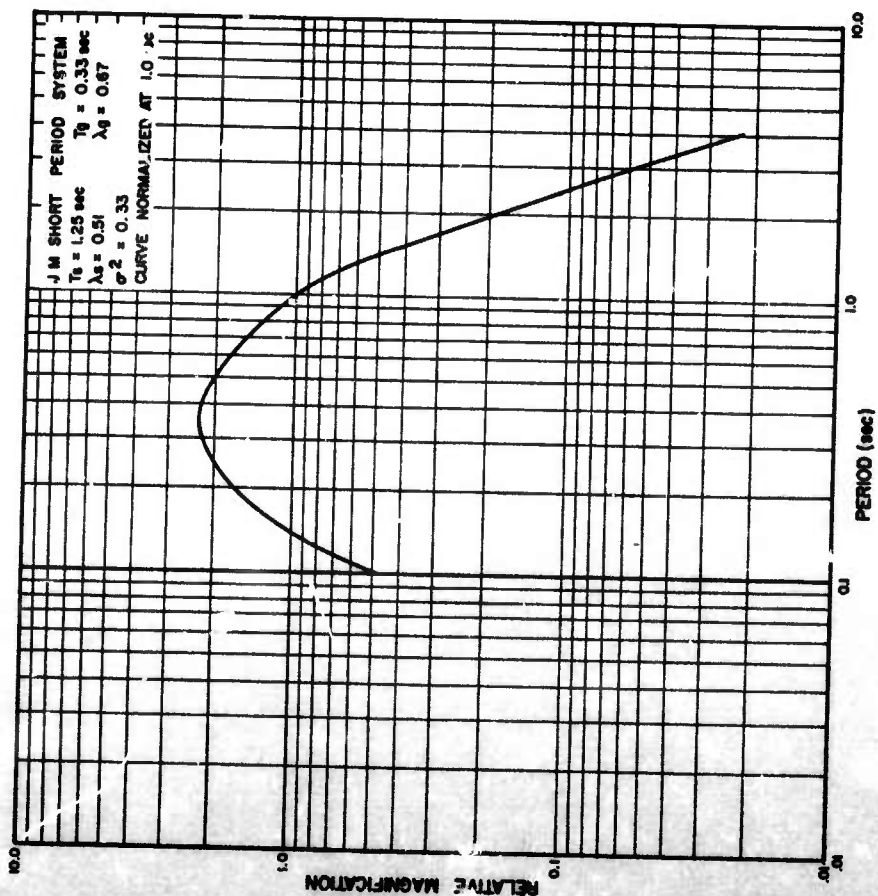
Pick amplitudes of P_g and L_g at maximum of corresponding motion.



INSTRUMENT RESPONSE CURVES - LRSM



INSTRUMENT RESPONSE CURVE - LASA



INSTRUMENT RESPONSE CURVES - OTHER SHORT PERIOD

Unclassified

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An analysis of seismological data from an underground nuclear explosion as a continuing study to provide information to aid in distinguishing between earthquakes and explosions. A table of travel-times and amplitudes of P, Pg, Lg, and surface waves are included along with other unidentified phases.		

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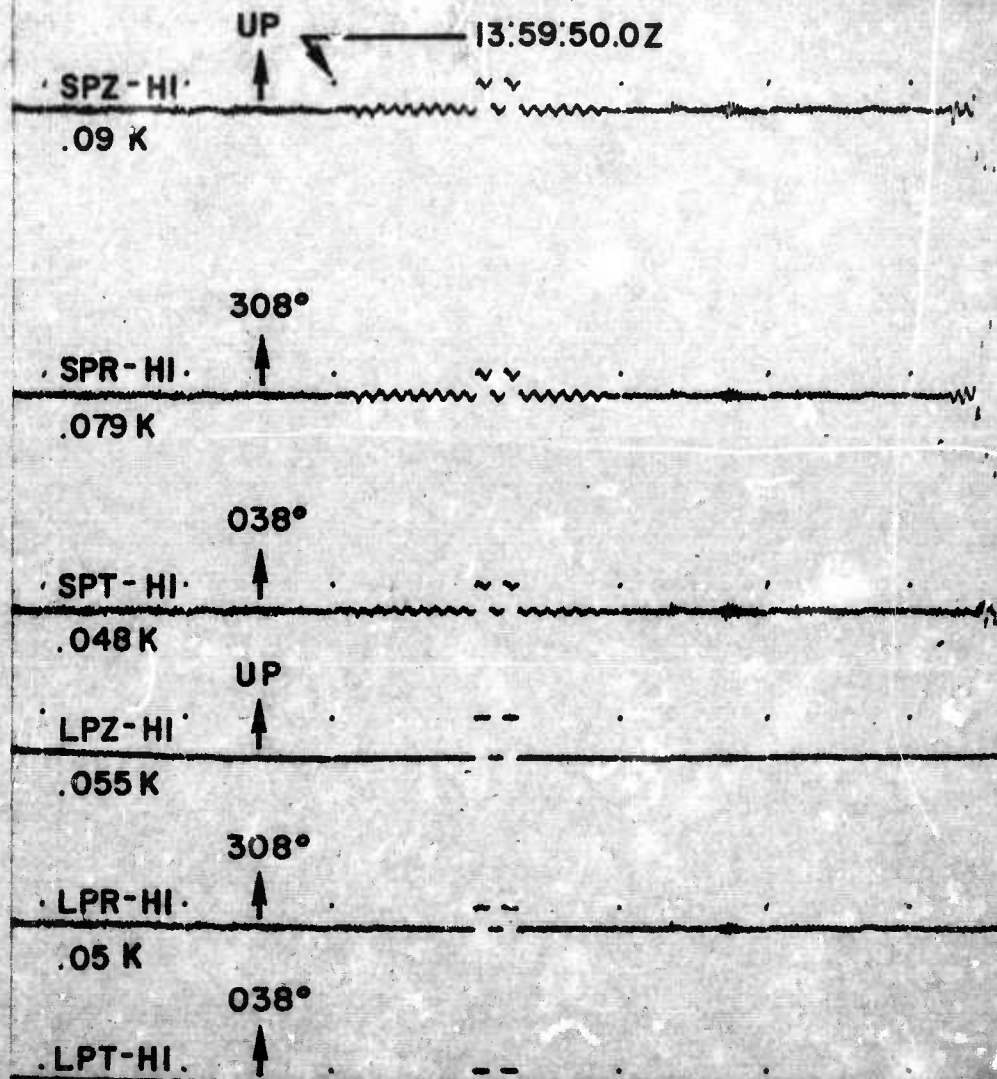
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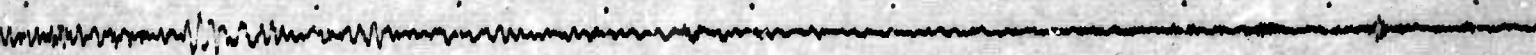
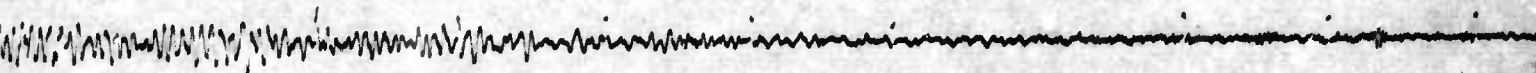
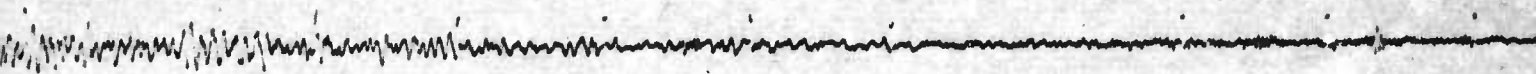
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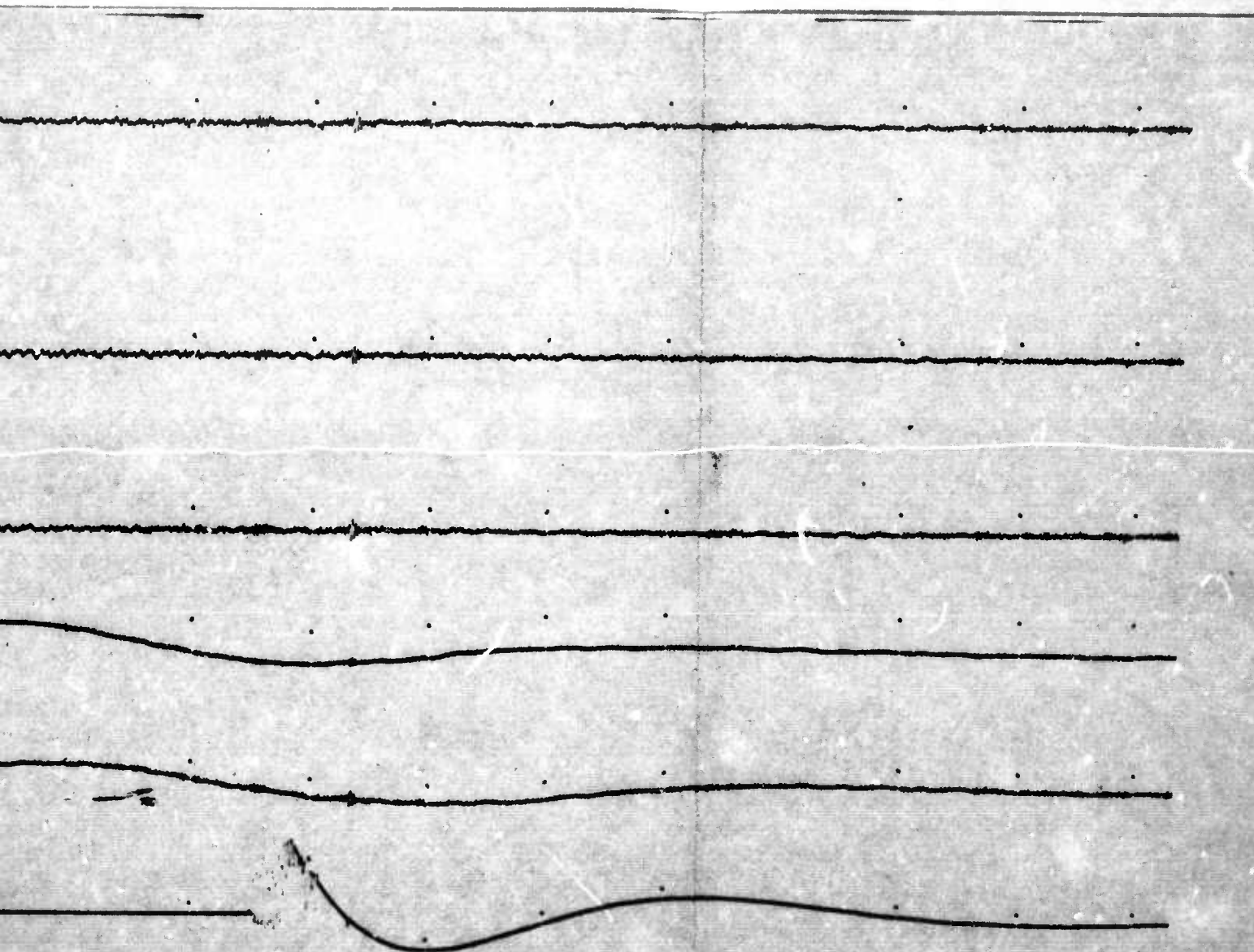
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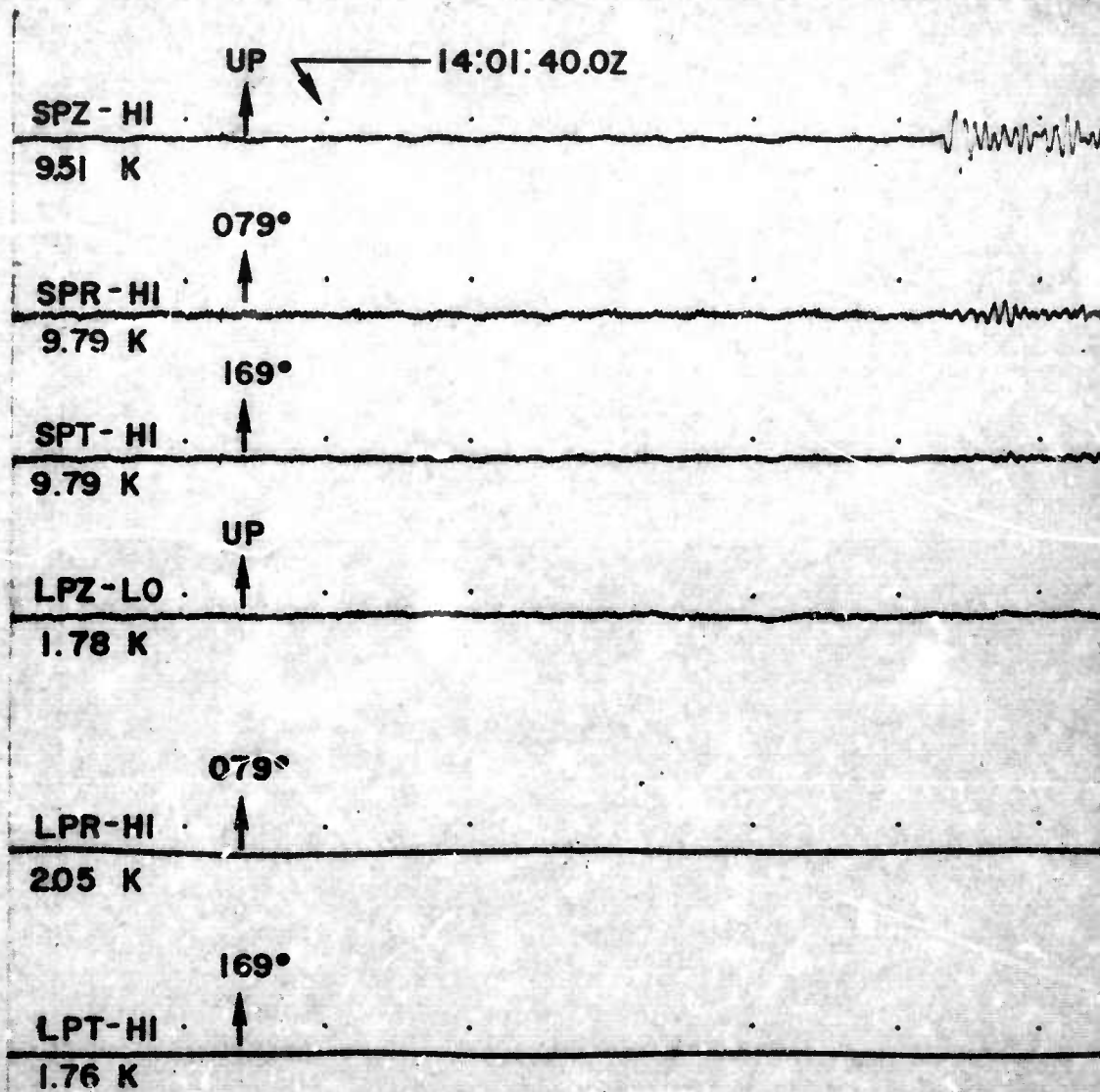


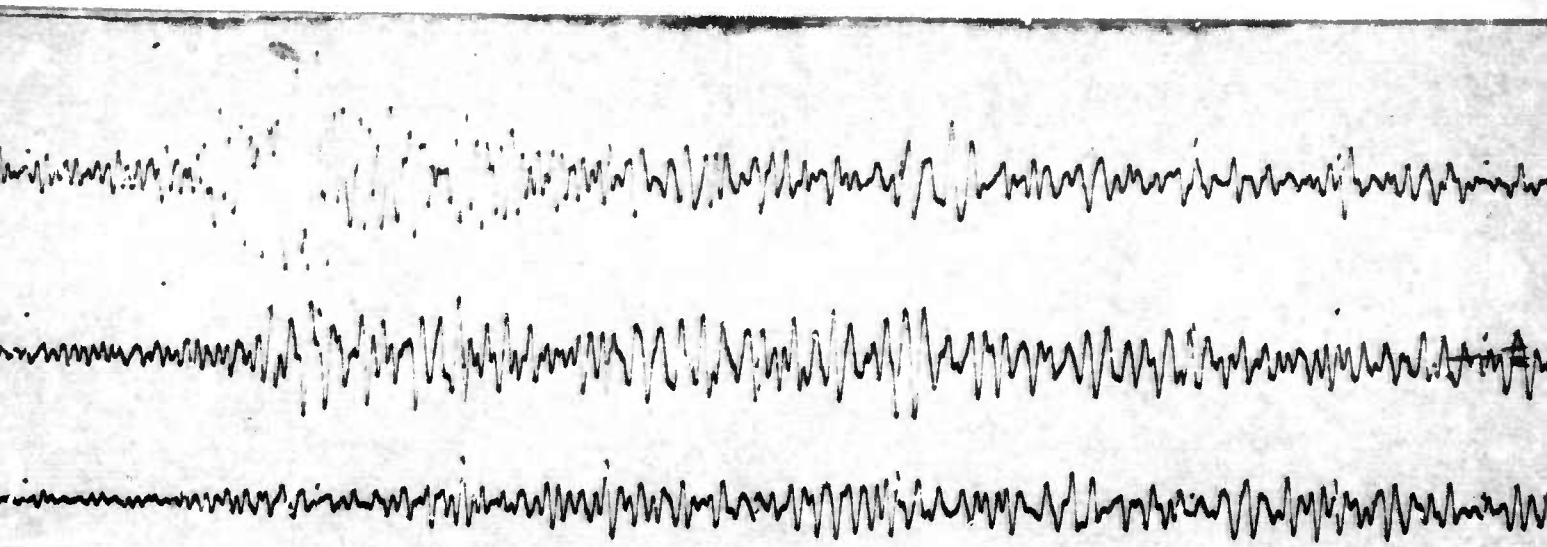
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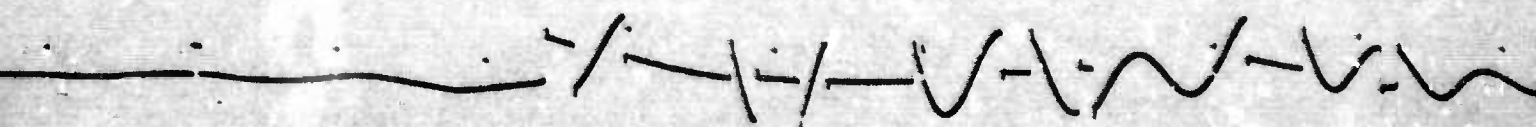
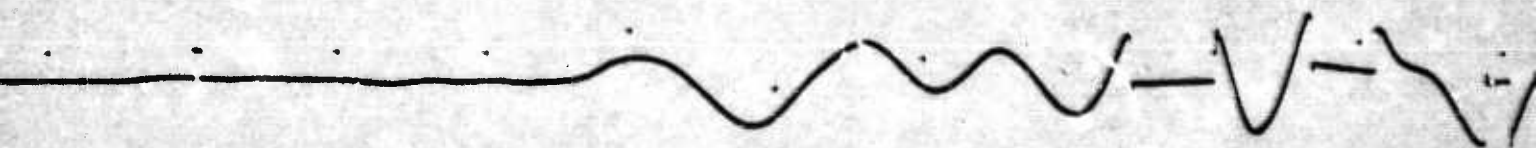
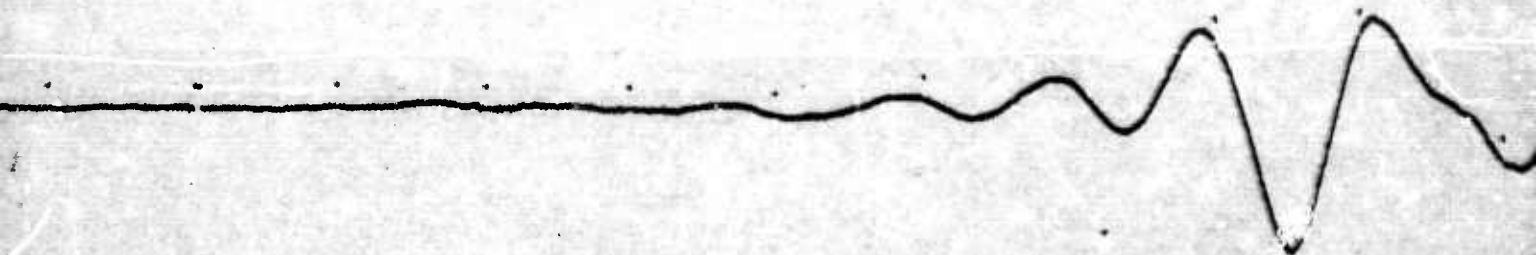
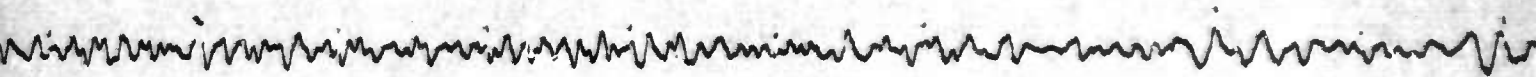
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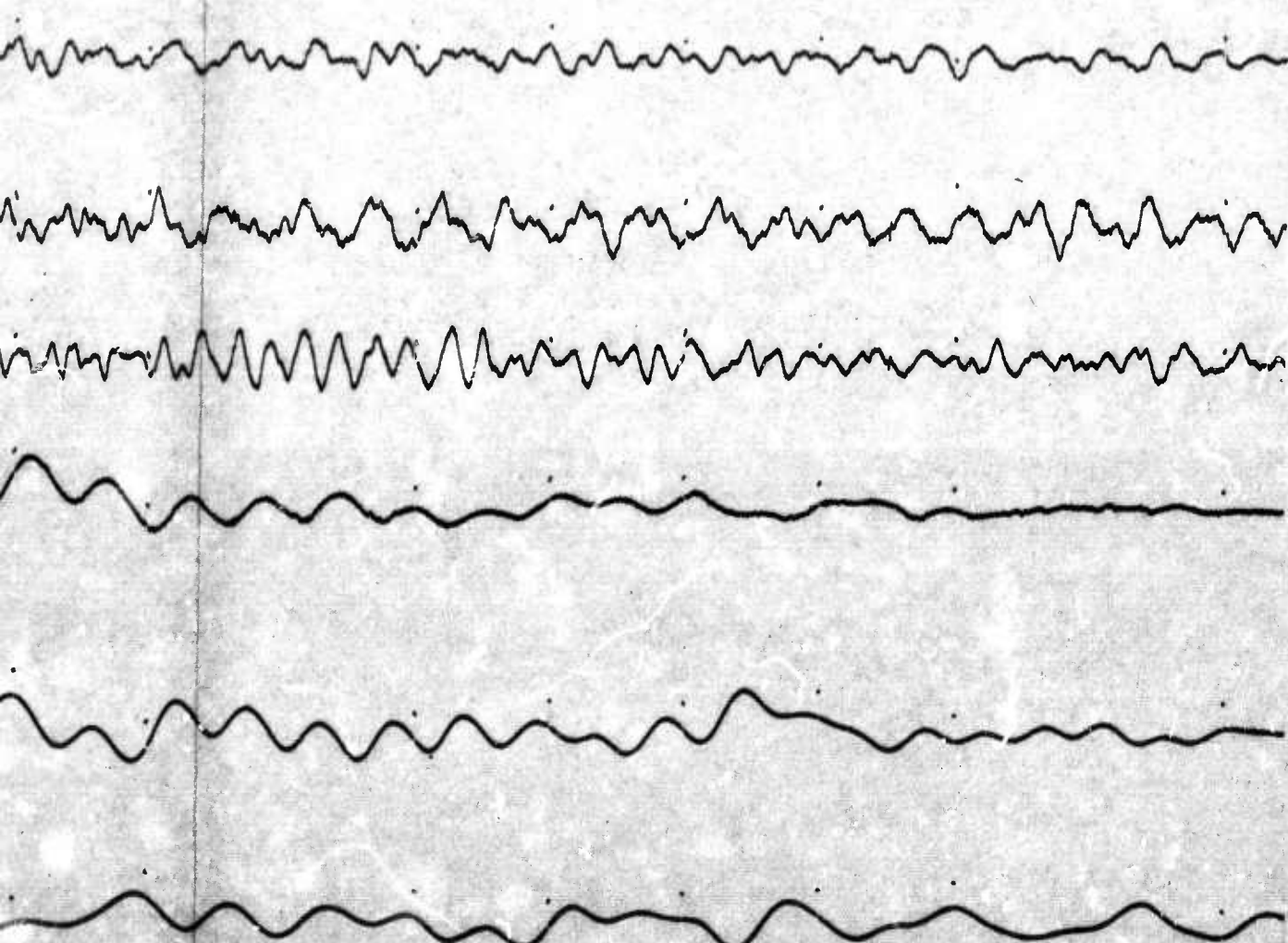




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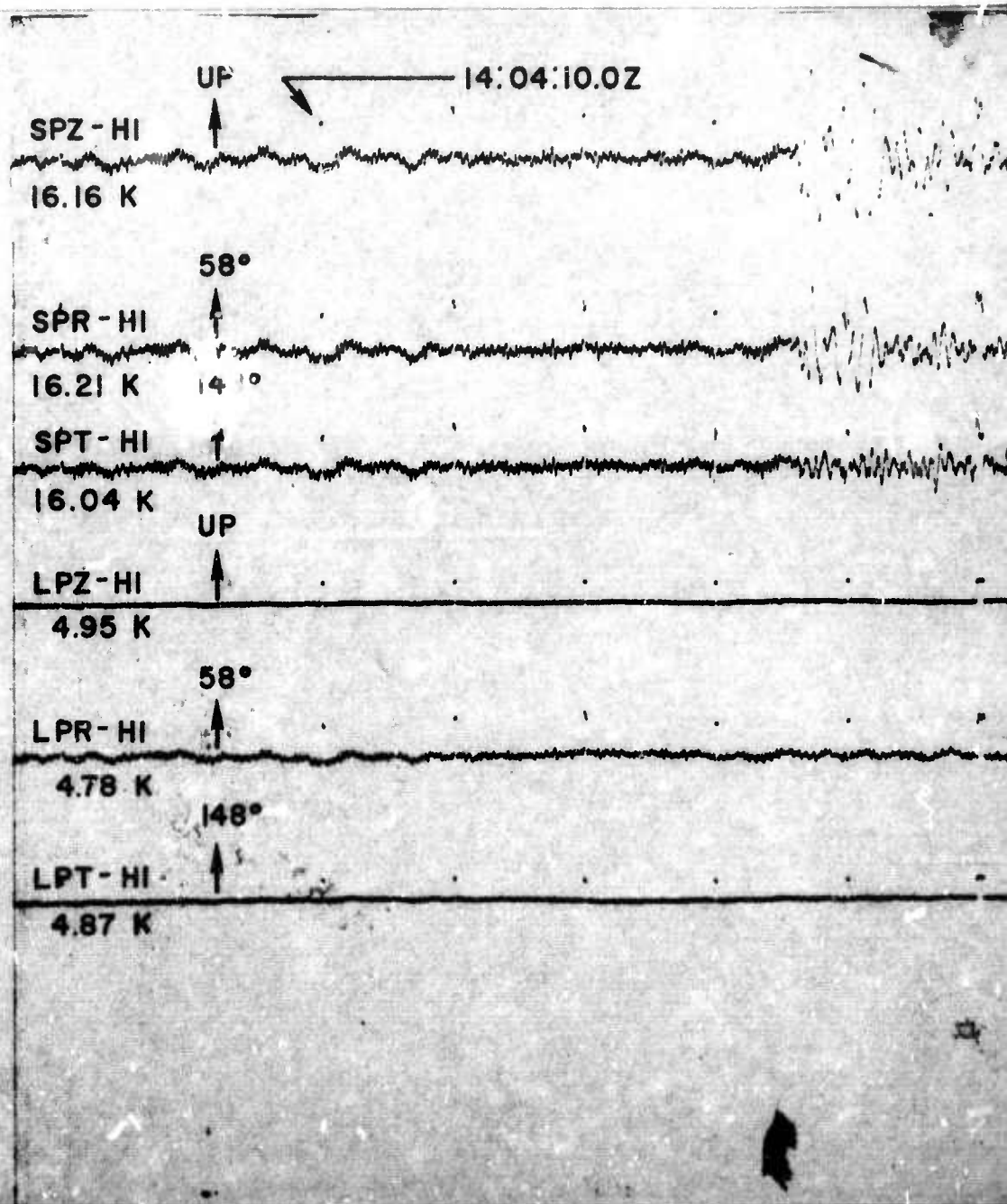


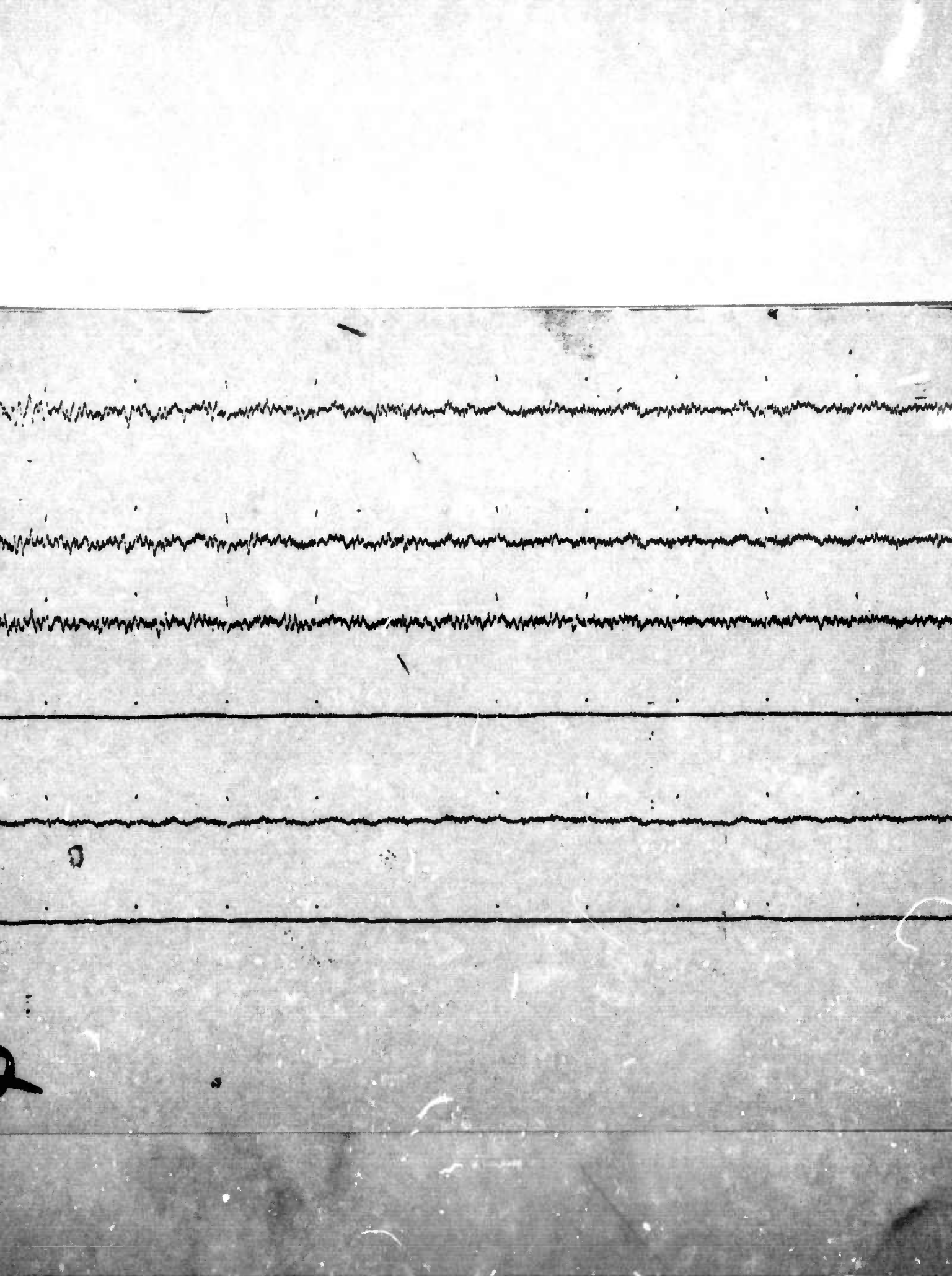
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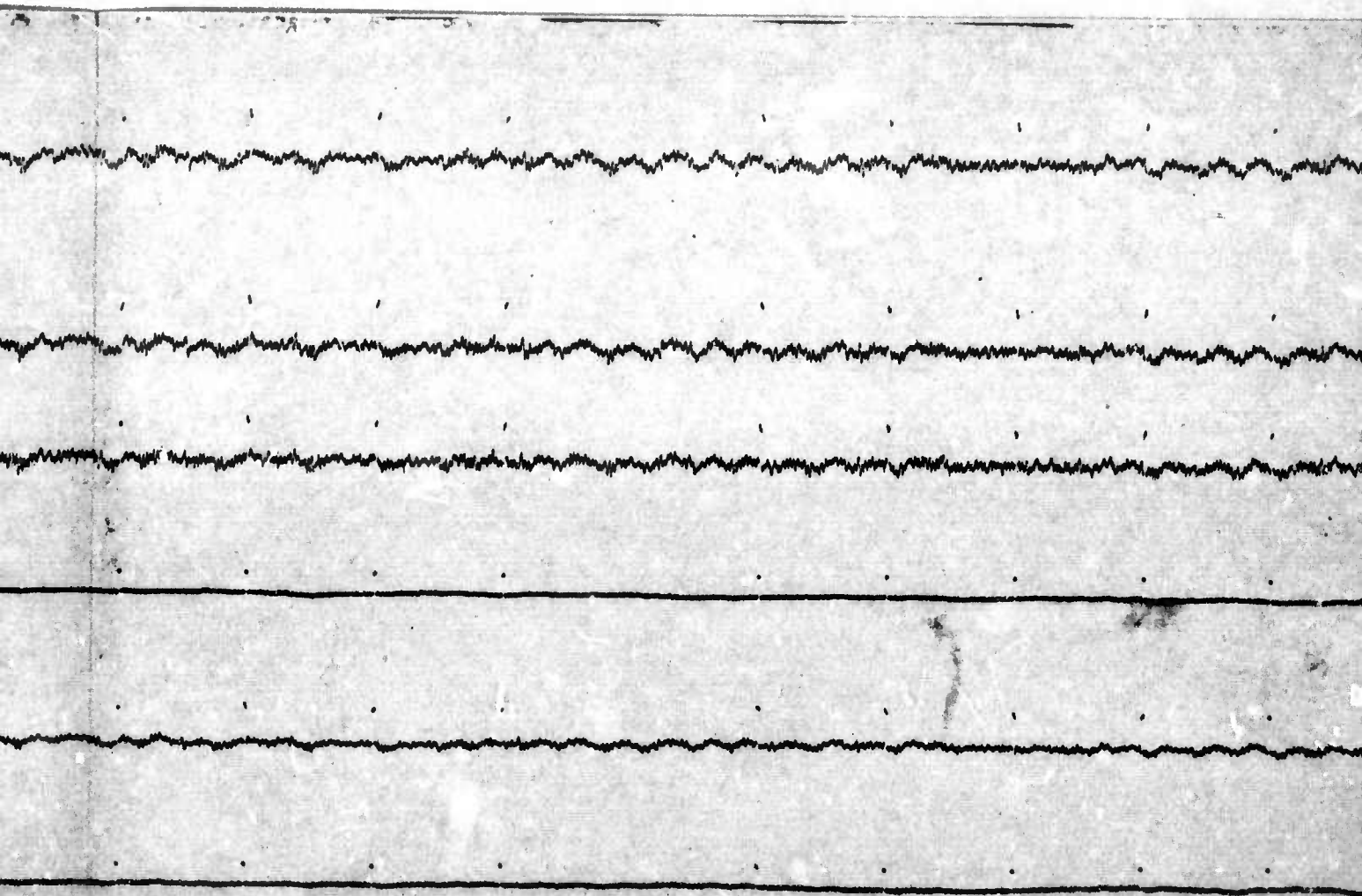


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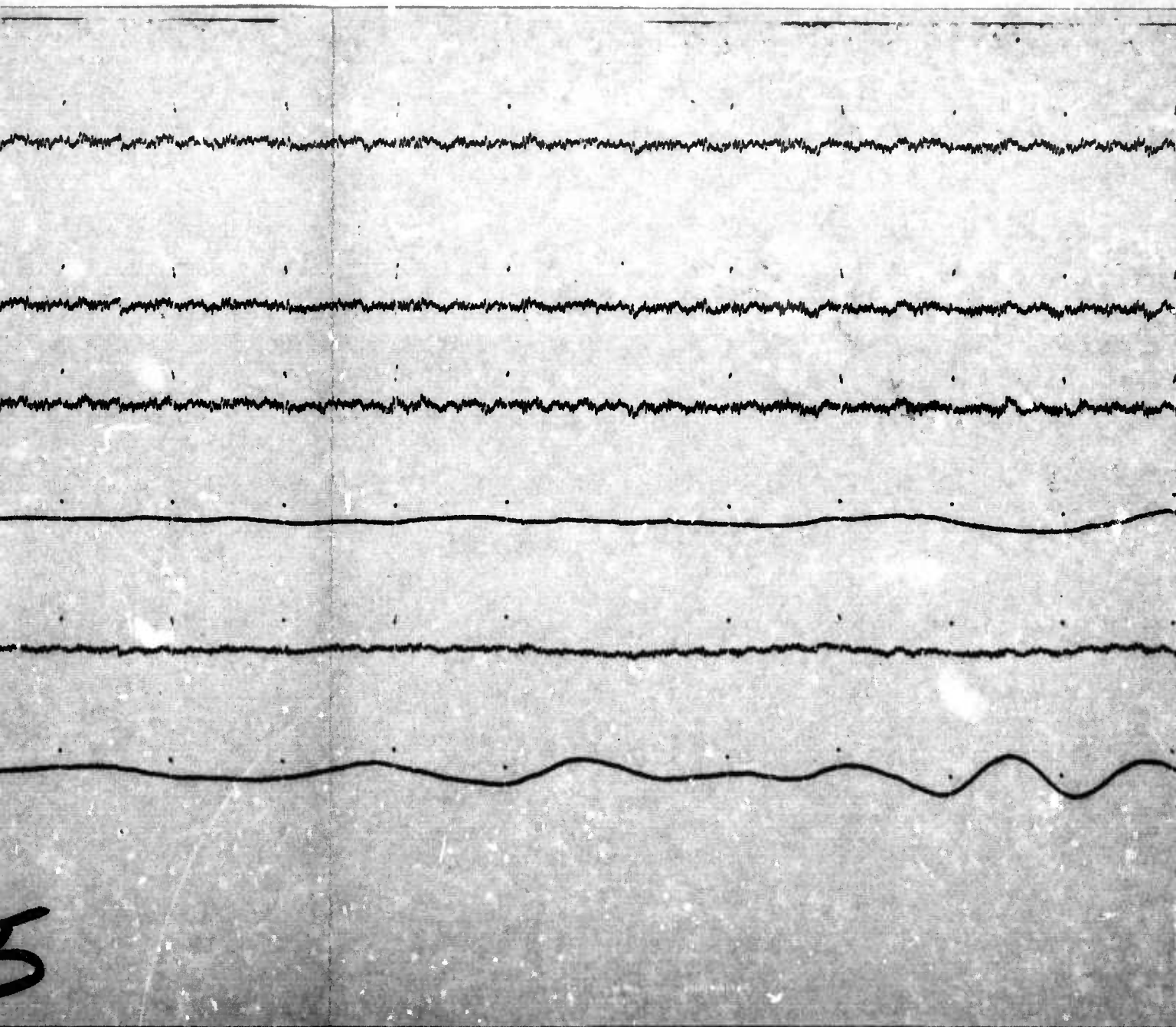


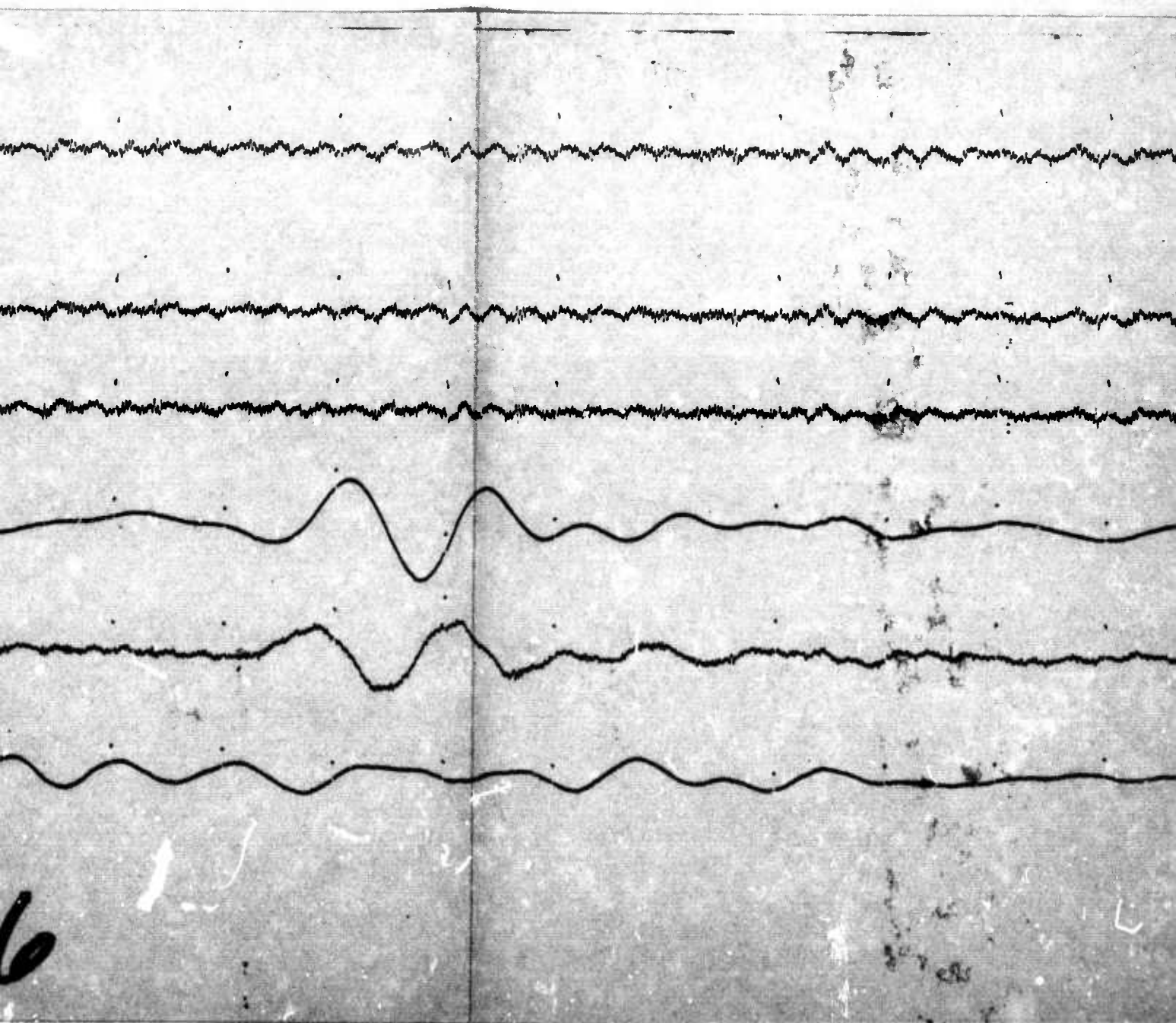


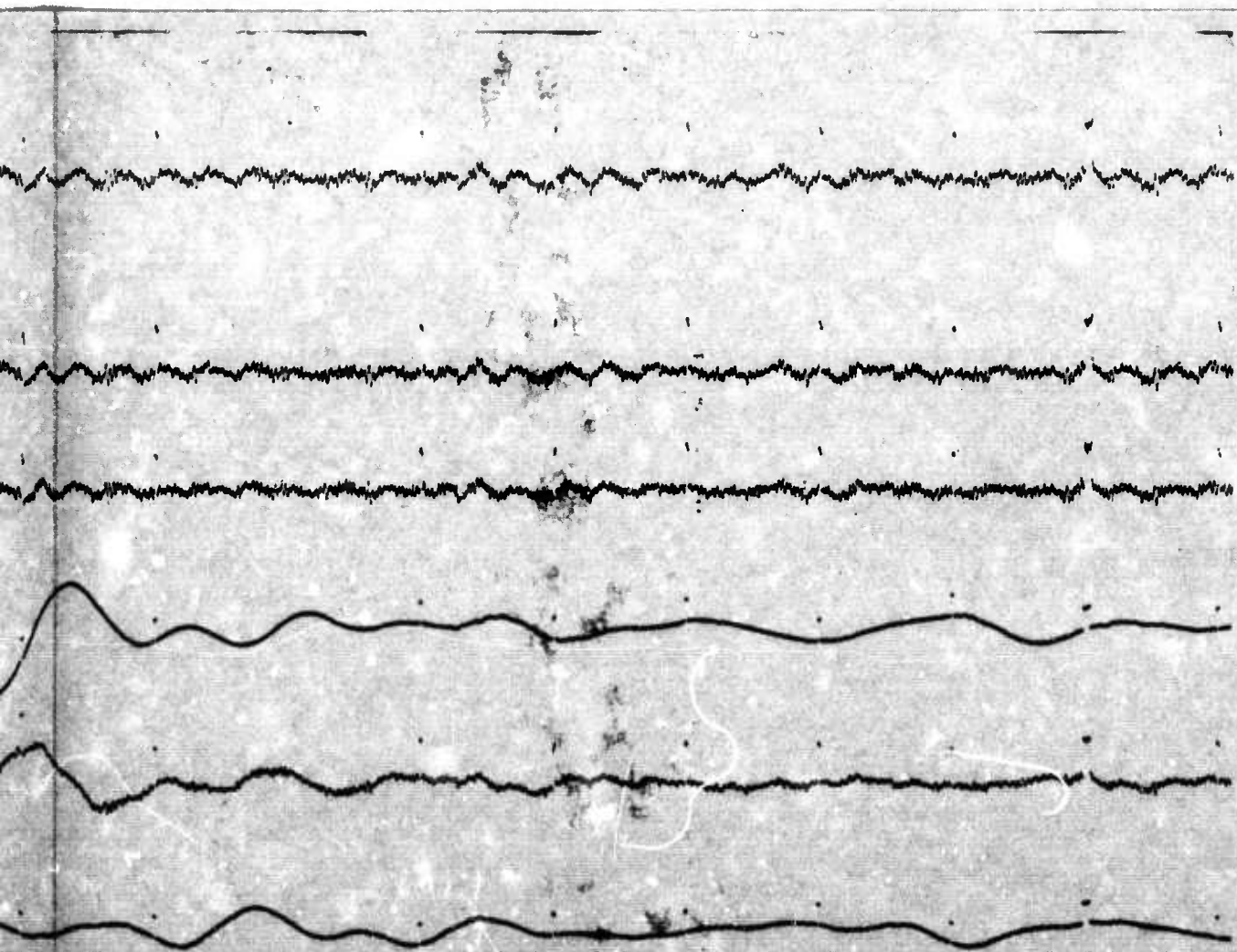


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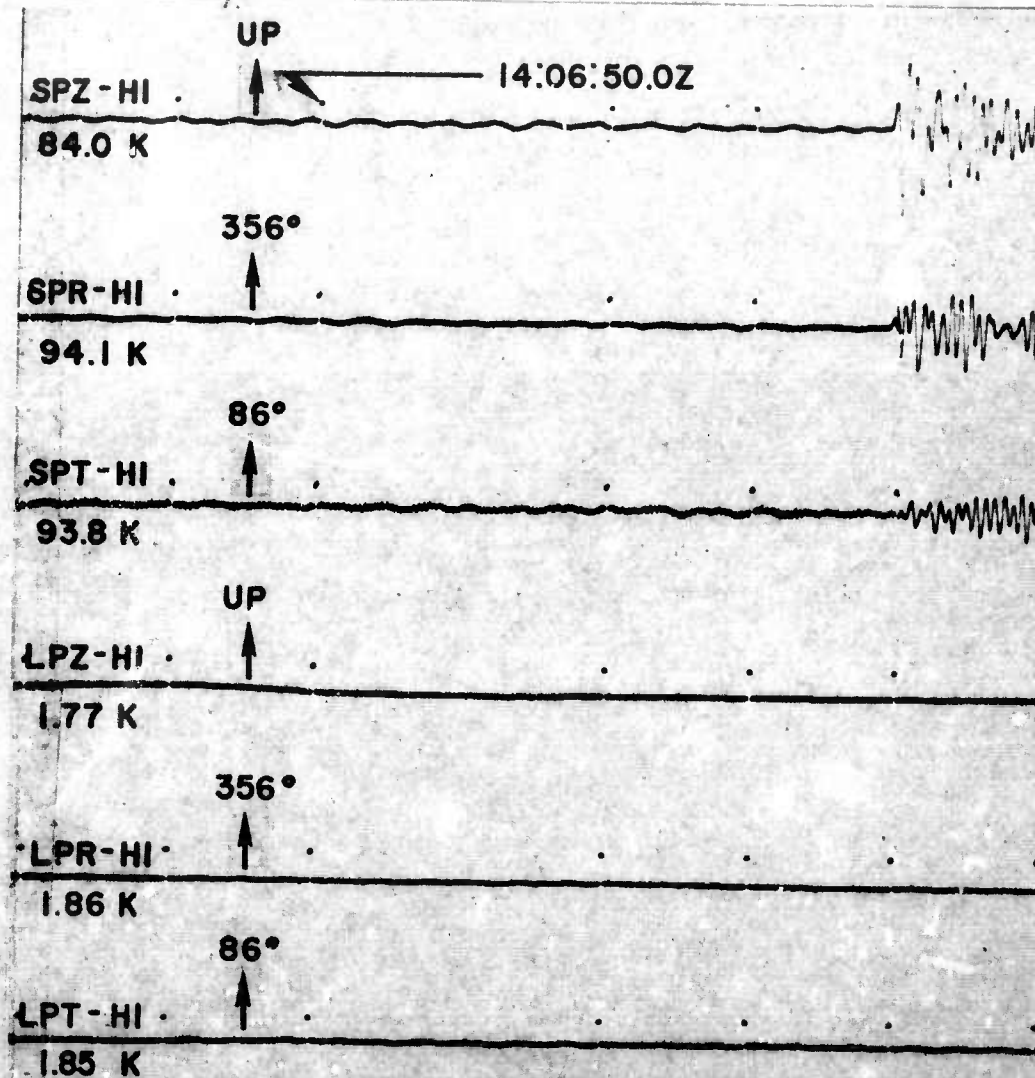


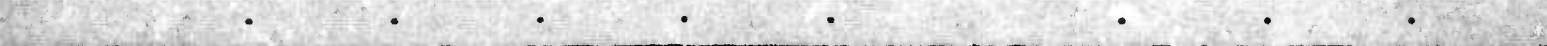
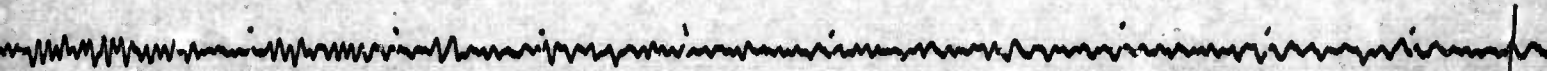
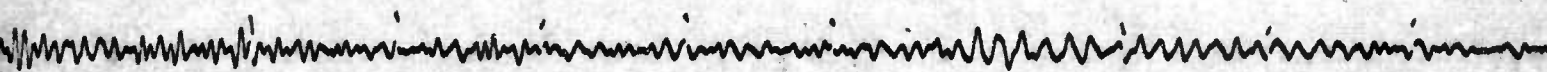
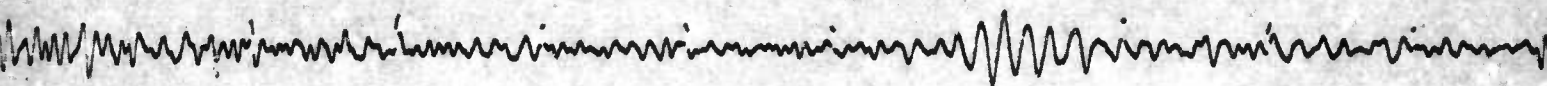




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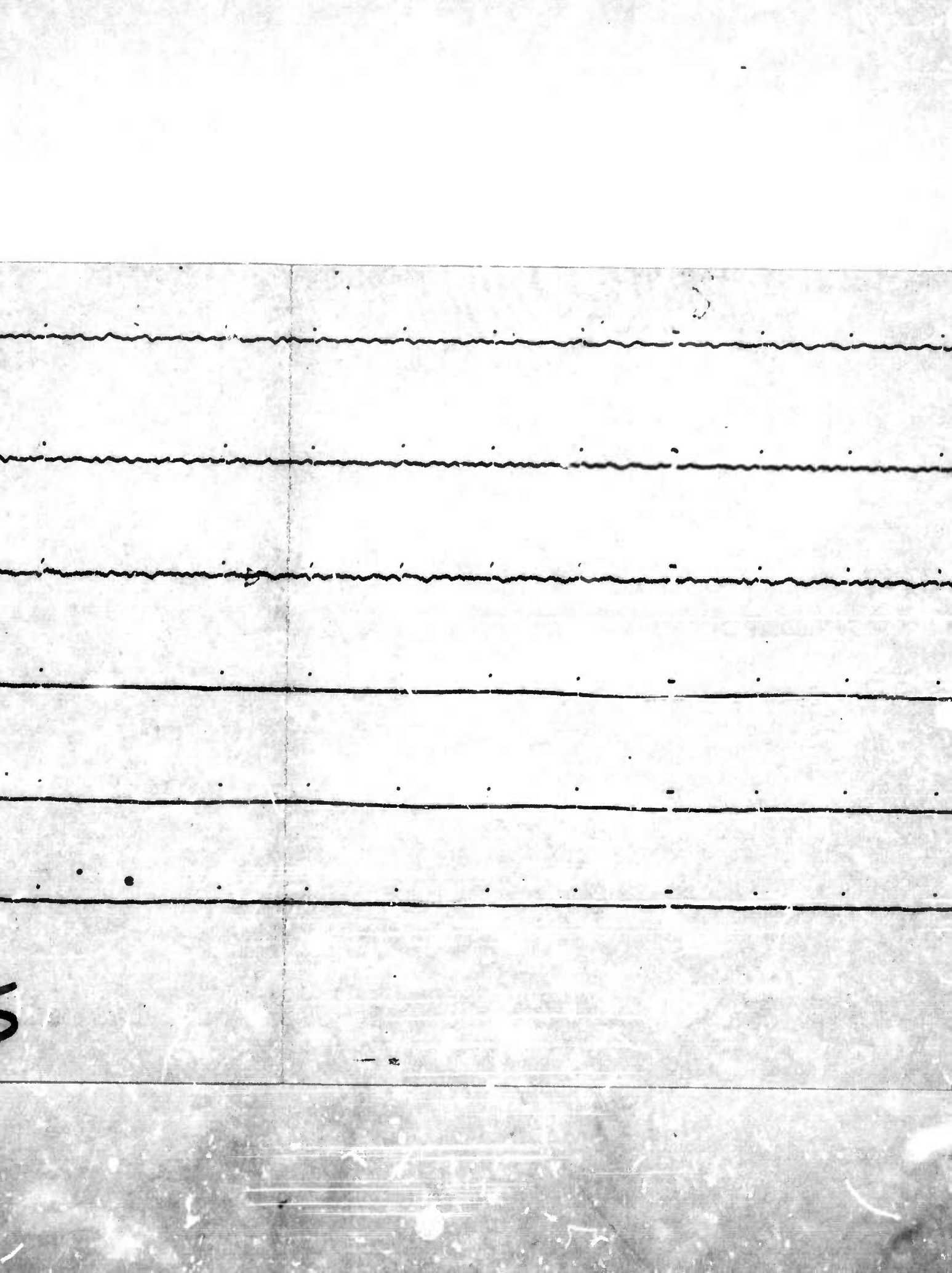
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23 MAY 1967
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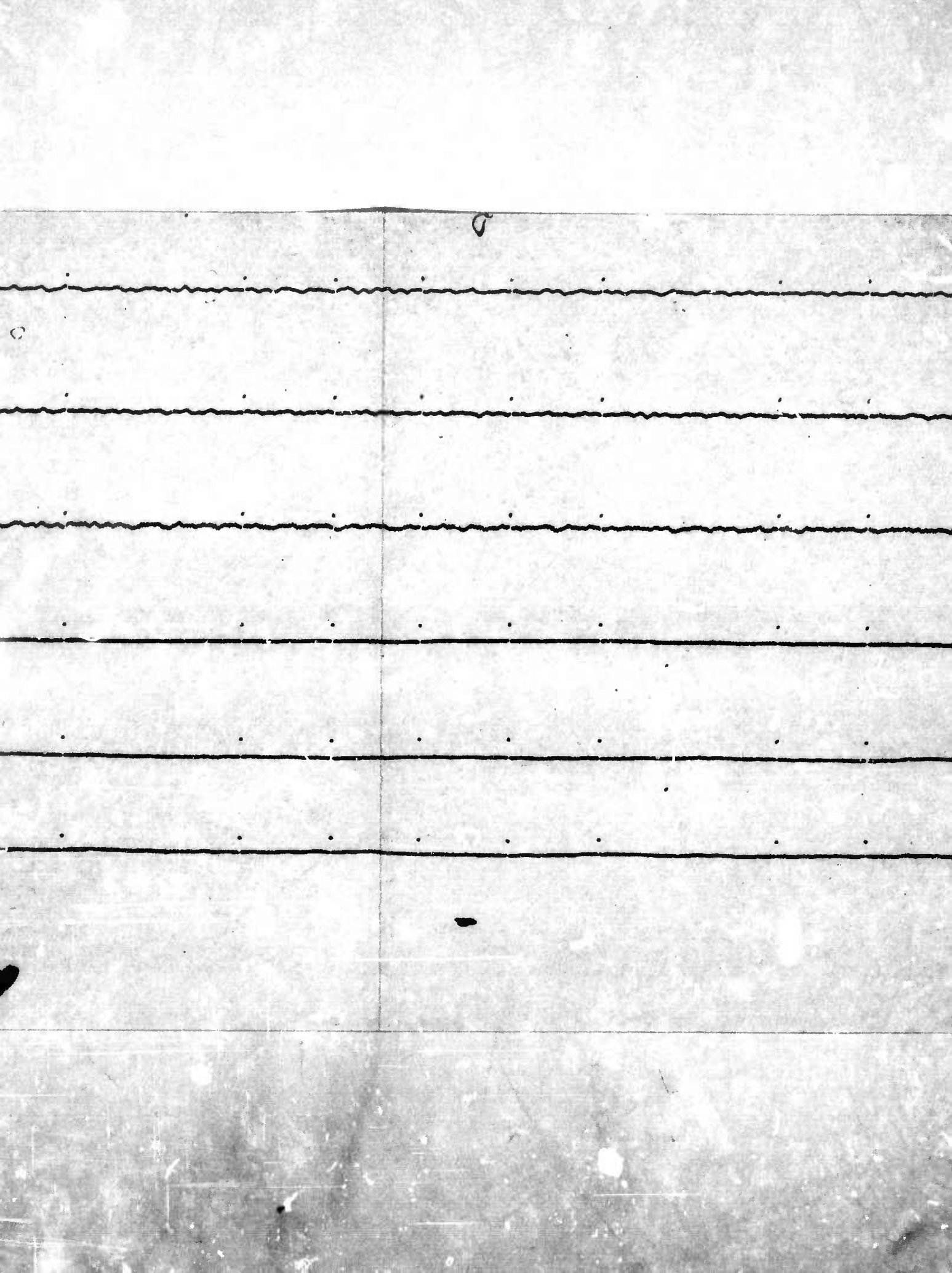


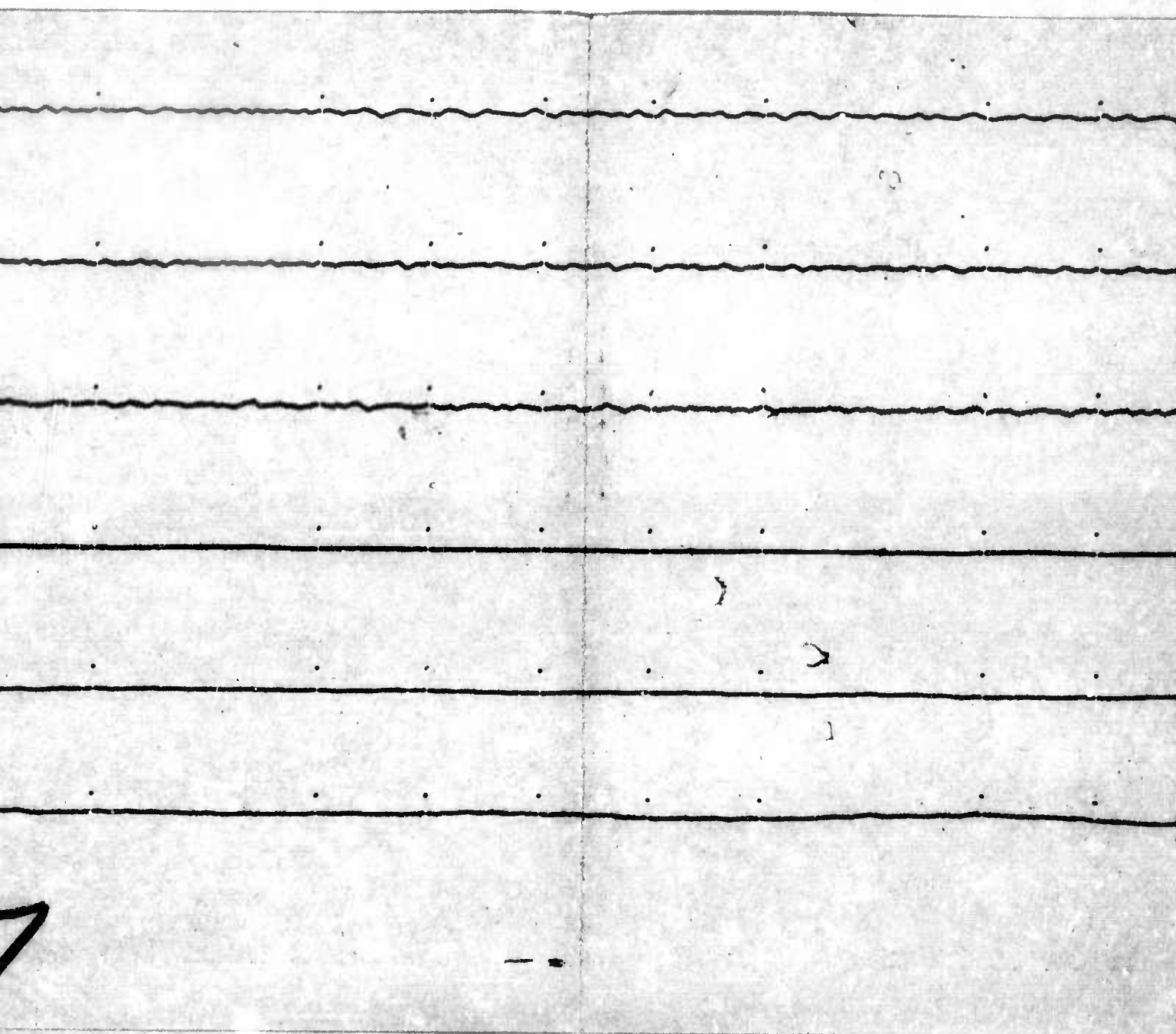


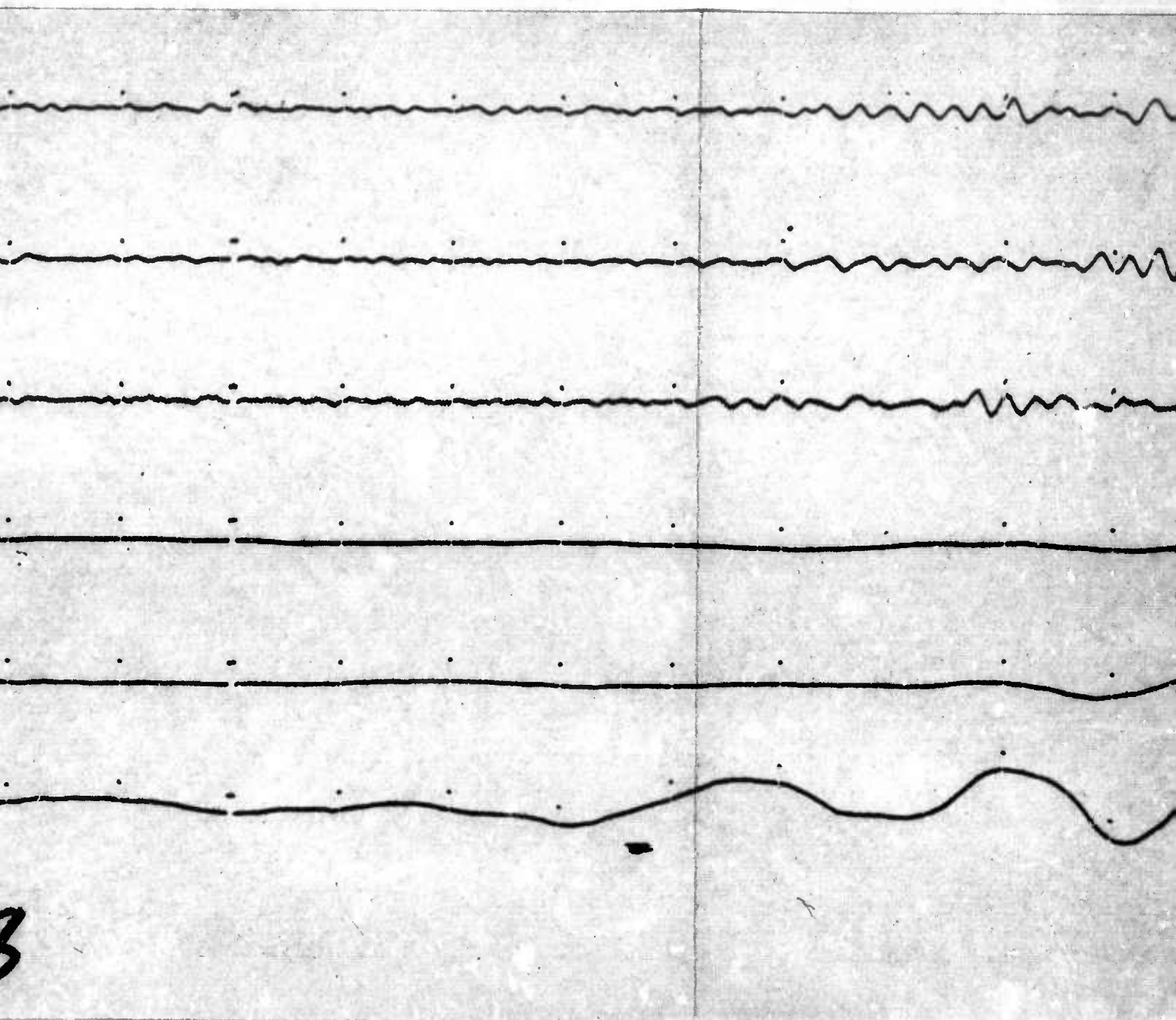


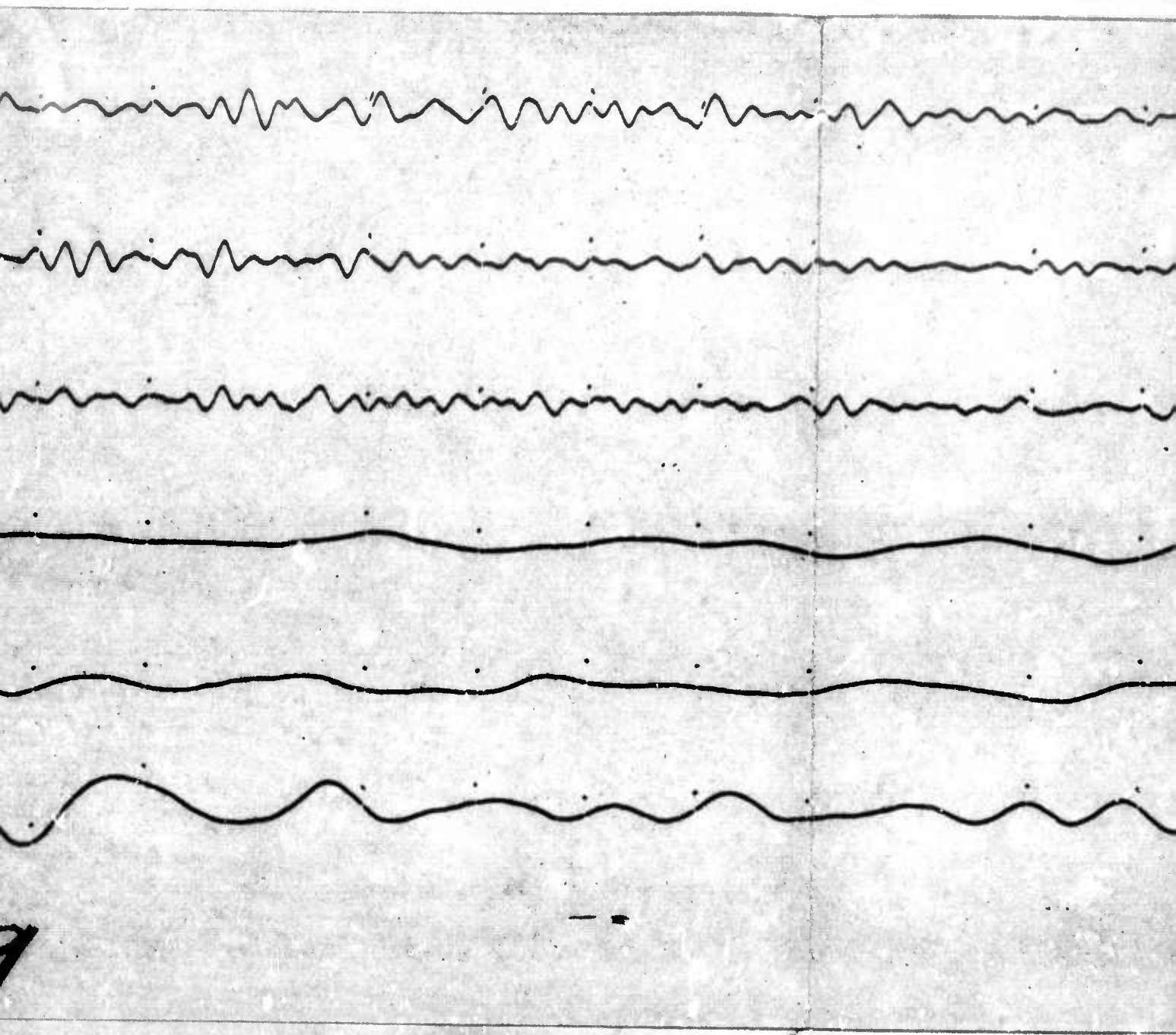


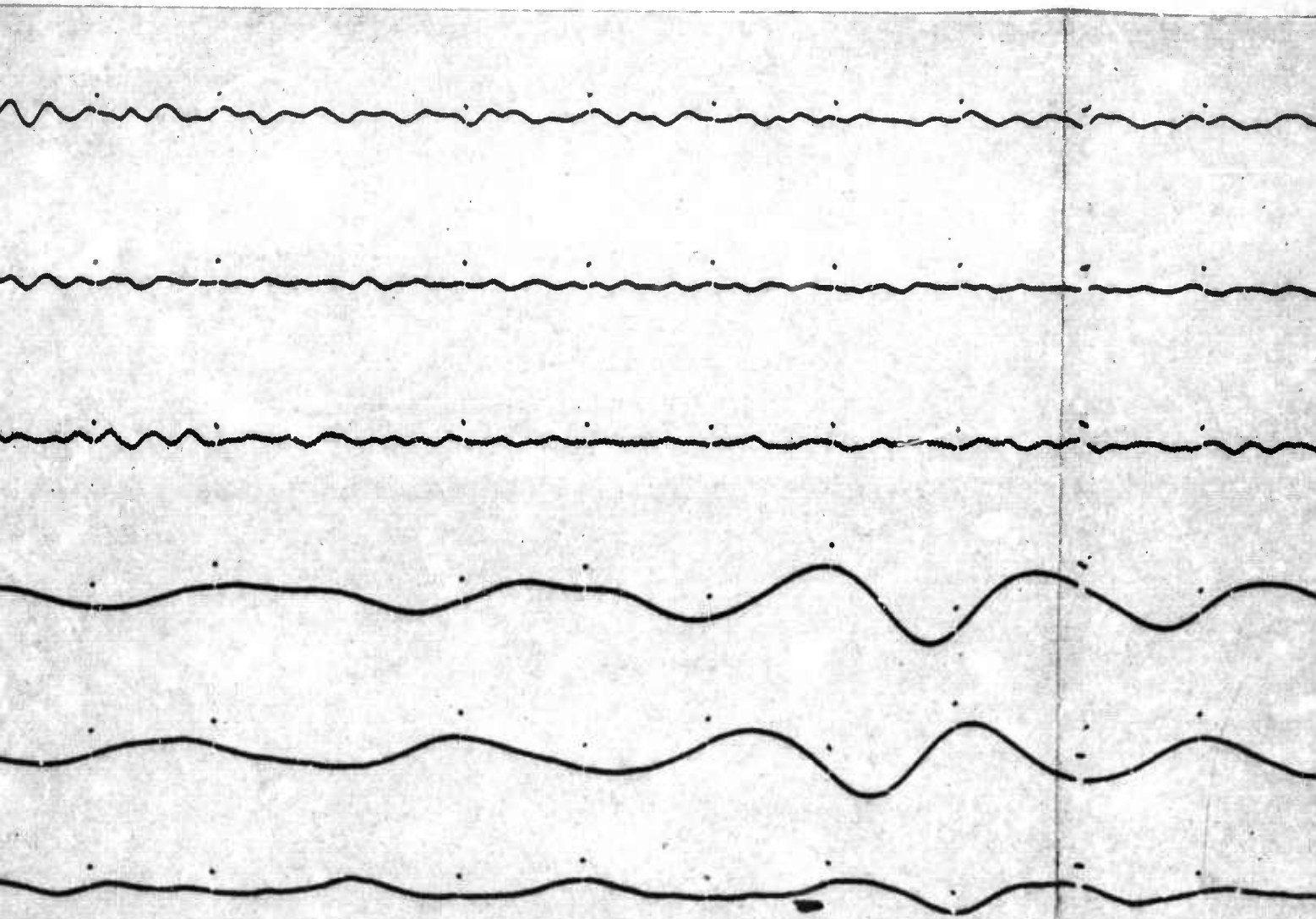












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