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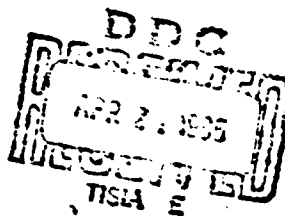
**Field Strengths of Some VLF Transmissions
and Atmospheric Noise Measured in
European and Asian Areas
June 1962 Through May 1963**

[Unclassified Title]

W. E. GARNER, F. J. RHODES, AND R. L. SCHAEFER

*Communication Branch
Radio Division*

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U.S. NAVAL RESEARCH LABORATORY
Washington, D.C.

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ABSTRACT
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The Naval Research Laboratory is conducting an investigation of very-low-frequency (VLF) radio wave propagation at great distances and over a long period of time. The statistical relationship of the field strength of various VLF transmissions and atmospheric noise and the signal-to-noise ratios with the time of day and season of the year is being investigated. Between December 1958 and approximately March 1964 the subject propagation data has been recorded at the following sites: Hammerfest, Bodø and Varhaug, Norway; Rome, Italy; Haifa, Israel; and Karachi, West Pakistan.

This is the fourteenth in a series of quarterly reports, covering the fifteenth through the eighteenth quarters since the program began. During the period covered by this report, June, 1962 through May, 1963, Karachi was in operation the entire time and Hammerfest was in operation through May, 1963.

PROBLEM STATUS

This is an interim report on one phase of the problem. Work is continuing on this and other phases.

AUTHORIZATION

NRL Problem P01-33
BUSHIPS PROJECT SR 008-01-01

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FIELD STRENGTHS OF SOME VLF
TRANSMISSIONS AND ATMOSPHERIC NOISE
MEASURED IN EUROPEAN AND ASIAN AREAS
JUNE, 1962 THROUGH MAY, 1963

INTRODUCTION

The Naval Research Laboratory is conducting an investigation of very-low-frequency (VLF) radio wave propagation at great distances and over a long period of time. For this investigation, the field strengths of various VLF transmissions and atmospheric noise have been continuously recorded at several sites on the coasts of Europe and the Near East from December 1958 through March 1964. Extension of the project through the spring of 1964 was primarily intended for obtaining coverage data on the Navy's new VLF transmitting facility at Cutler, Maine which commenced operation in January 1961.

The routine output data is being published in installments covering each quarter of the year, grouped according to the seasons. This series of reports will not contain an analysis of the data. Analysis and correlation of the data with various geophysical phenomena will be the subject of other reports. This report is the fourteenth in the series of these installments and covers the fifteenth through the eighteenth quarters, June 1962 through May, 1963. Reference 1 covered two quarters.

TRANSMISSION PATHS

During the period covered in this report, field strengths of VLF transmissions and atmospheric noise were recorded at Hammerfest, Norway, and Karachi, Pakistan. The precise locations of these recording sites are given in Table 1. The locations of the U. S. Navy VLF transmitters are given in Table 2.

A VLF recording site was installed in Karachi, West Pakistan in June 1961 and was operated through March, 1964. However, due to the severe environmental conditions, other local problems, and the use of the unreliable instrumentation discussed above, many equipment outages resulted. As a consequence, consistent, usable data were

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not obtained for continuous periods of sufficient duration to justify processing until March 1962.

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TABLE I

Locations of Data Recording Stations and Periods of Operation

<u>Station</u>	<u>Location</u>		<u>Period of Operation</u>
	<u>Latitude</u>	<u>Longitude</u>	
Sode	37° 16.5'N	14° 21.4'E	Dec 1958 - Sep 1960
Varhaug	33° 37.5'N	5° 37.3'E	Dec 1958 - Mar 1962
Rome	42° 52' N	12° 40' E	Dec 1958 - Aug 1960
Hammerfest	70° 39' N	23° 37' E	Jun 1959 - Dec 1959 Mar 1961 - Mar 1963
Haifa	32° 46' N	35° 2' E	Jun 1959 - May 1962
Karachi	24° 54' N	67° 2' E	Jun 1961 - Mar 1964

TABLE 2

Locations of U. S. Navy VLF Transmitters

<u>Station</u>	<u>Location</u>	
<u>Call Letters</u>	<u>Latitude</u>	<u>Longitude</u>
NSS	36° 59.1'N	76° 27.2'W
NPG	46° 12' N	121° 55' W
NFM	21° 25.5'N	158° 9.7'W
NDT	34° 58.3'N	137° 1.3'E
NAA	44° 33.9'N	67° 16.9'W
NBA	9° 3.3'N	70° 38.9'W

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DATA RECORDING AND PROCESSING METHODS

All field strength data reported herein were recorded using a 10-foot, vertical, ferrite (whip) antenna. One such antenna is installed at each data recording station. A broadband antenna coupler is used to couple the antenna to AN/URV-133 and AN/URV-6 field strength meters which drive Esterline-Angus strip chart recorders. The whip antenna system is calibrated periodically using a loop antenna.

The U. S. Navy transmitters "locked key" for three minutes and, immediately preceding or following, are "off" for three minutes once each hour. It is during these periods that the subject data were recorded.

Atmospheric noise

The atmospheric noise field strengths reported are average values recorded once each hour during the three minute "off" period of the transmitters discussed above. The AN/URV-133 equipments have a nominal noise bandwidth of 40 cps while the noise bandwidth of the AN/URV-6 equipment varies between about 100 and 200 cps depending upon the frequency to which it is tuned. All atmospheric noise field strengths have been normalized to a bandwidth of 100 cps.

Signal Field Strengths

The signal field strengths given in this report are average values over the three minute "locked key" period recorded once each hour, and normalized to a radiated power of one kilowatt. The signal field strengths are calculated from the measurements of the average signal plus noise and the average noise made during the locked-key and off periods of the transmitters. The radiated power during each locked-key period is determined from a measurement of the average transmitting antenna current during each period and the average radiation resistance of the antenna. The radiation resistance values used for each transmitter are given in Table 1. The radiation resistance of each transmitting station is periodically measured and the value appropriately changed if necessary. Although the radiation resistance of NPO appears to have a seasonal dependency, an average value is used throughout

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the year since the effect on the radiated power is slight.

TABLE 3

AVERAGE RADIATION RESISTANCE FOR VLF TRANSMITTERS

Station	Frequency kc	Radiation Resistance ohms
NAA	14.7	0.078
NDA	18.0	0.069
NPG	18.8	0.079
NPM	19.8	0.072
NSS	22.3	0.134

Signal-to-Noise Ratios

The signal to atmospheric noise ratios for each hourly locked-key and off period reported are the ratios of the locked-key field strengths normalized to a radiated power of one kilowatt, to the average atmospheric noise field strengths normalized to a 100 cps bandwidth.

Transmitter Radiated Power

As previously stated, the field strengths of all transmissions reported herein have been normalized to a radiated power of one kilowatt. The radiated power during each field strength measurement is calculated by squaring the average transmitting antenna current measured during each locked-key period and multiplying by the average value of radiation resistance (Table 3). To determine the various propagation effects, it is necessary to normalize the data to a constant radiated power. However, for planning communication circuits

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and determining the reliability of the circuits, it is necessary to know the radiated power capability of each transmitting facility.

In Tables 1 and 2 the average radiated power for each transmitter for each month is given along with the number of monthly periods during which the locked-key test was not transmitted. For approximately six hours each week, NAA operates with only half of its transmitting system for routine maintenance. Although these periods have been referred to as "half-power" transmissions, the reduction in radiated power during such operation is considerably more than 1 db. These "half-system" transmitting periods were not used in determining the average radiated power from NAA because normally the signal is undetectable at all data recording stations during these periods. The NAA transmitter also operates periodically from half of the system at a reduction in radiated power of approximately 1 db. Since these "half-power" transmissions can be received at all of the data recording stations, they are not omitted in computing the monthly average radiated power, as is the case with NBB. In Table 3 the monthly average radiated power is computed separately for the full and "half-power" transmissions.

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TABLE 6
MONTHLY AVERAGE RADIATED POWER FOR HAA

STATION	F.L. No.	MONTHLY	AVERAGE RADIATED POWER IN KW		NUMBER OF LOCKED KEYS	
			1st	2nd	Full Power	Half Power
HAA	19.7	Jan 62	1010.9	30.0	81	0
		Jul 62	874.8	29.7	482	26
		Aug 62	868.1	29.4	520	90
		Sep 62	901.7	29.6	485	134
		Oct 62	798.7	29.0	8	101
		Nov 62	897.8	29.5	36.8	161
		Dec 62	896.0	29.5	534	244
		Jan 63	900.0	29.5	549	152
		Feb 63	838.1	29.5	446	145
		Mar 63	319.1	25.0	0	161
		Apr 63	746.0	28.7	537	483
		May 63	901.6	29.6	619	93
						52

* First Column Indicates Average Power During Full Power Locked Keys
Second Column Indicates Average Power During Half Power Locked Keys

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Table 3
MONTHLY AVERAGE RADIATED POWER FOR HRA, HPG, HTP

STATION	FREQUENCY KC	MONTH YEAR	AVERAGE RADIATED POWER DB ABOVE		NUMBER OF LOCKED-KEY PERIODS	
			KW	1 FM	Transmitted	Spilled
HRA	18.0	Jun 62	18.6	12.7	681	39
	18.0	Jul 62	17.4	12.4	718	26
	18.0	Aug 62	17.7	12.5	680	24
	18.0	Sep 62	17.4	12.4	674	46
	18.0	Oct 62	18.4	12.7	693	51
	18.0	Nov 62	18.3	12.6	669	51
	18.0	Dec 62	18.0	12.5	690	54
	18.0	Jan 63	17.9	12.5	692	52
	18.0	Feb 63	17.0	12.3	635	85
	18.0	Mar 63	16.7	12.2	653	91
	18.6	Jun 62	182.7	22.6	573 (34)*	133
	18.6	Jul 62	169.9	22.3	617 (25)*	107
HPG	18.6	Aug 62	139.6	21.5	263 (0)*	481
	18.6	Oct 62	159.5	22.0	404 (7)*	333
	18.6	Nov 62	153.1	21.9	528 (8)*	184
	18.6	Dec 62	154.6	21.9	476 (3)*	265
	18.6	Jan 63	154.6	21.9	340 (5)*	135
	18.6	Feb 63	174.0	22.4	182 (5)*	77
	18.6	Mar 63	167.4	22.3	476 (1)*	233
	18.6	Apr 63	172.5	22.4	439 (9)*	236
	19.6	Jun 62	82.4	19.2	337	383
	19.8	Aug 62	79.1	19.0	137	607
	19.8	Mar 63	82.4	19.2	528	616

* HALF POWER LOCKED-KEYS

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RESULTS

The data are reported in several forms as follows:

1. The mean plus and minus one standard deviation for the signal and the atmospheric noise field strengths and the signal-to-noise ratios for each hour of one day for a period of one month.

2. The mean for the signal field strengths and the signal-to-noise ratios for each hour of the day over approximately ten day periods of each month.

3. The probability distribution of the signal and the atmospheric noise field strengths and the signal-to-noise ratios for a period of one month.

NOTE: The probability distribution presented in the signal and noise data, separately, are not time correlated. That is, a high signal level did not necessarily occur simultaneously with a high noise level. Therefore, these two sets of data cannot be used for determining the signal-to-noise probability distribution. Graphs showing the true, signal-to-noise probability distribution are presented, however.

In processing the data included in this report, atmospheric noise field strengths are computed only for the hours during which a signal field strength is computed from a recorded locked key transmission. Ideally this occurs once an hour, every hour. Priority traffic and scheduled maintenance at the transmitter and emergence maintenance at the transmitting and receiving sites thwart efforts to attain the ideal situation. The actual number of recorded, locked key transmissions is indicated above each hourly plot on the monthly signal-to-noise ratio curves. These numbers apply to the signal and atmospheric noise field strengths as well as the signal-to-noise ratio calculations.

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During the period covered by this report, XAA, NBA, and NPB received good coverage at both Hammerfest and Karachi. NPM was not detectable often enough to provide meaningful data for most of the months covered.

NBA was off the air and NPB switched frequencies from 19.6 Mc to 19.0 Mc during the latter part of January and all of February, 1963. The radiation resistance reported for NPB in Table 3 was used for both NPB frequencies.

Additional information about atmospheric noise at many locations around the world and for the same period covered by this report may be found in references 3, 4, 5, and 6.

Figures 1 and 2 may be removed from the report and used for interpolation of the appropriate graph scales.

In March, 1962 new antenna couplers were installed at the Hammerfest and Karachi sites. The method used for determining the antenna factor with the new coupler was different than the method used with the old coupler by a factor of 6 db. Unfortunately this change was not incorporated in the computer program. As a consequence, all of the signal and noise field strengths from those stations are in error from that date. The correction factors are noted on the affected curves. THE SIGNAL-TO-NOISE RATIO CURVES ARE, OBVIOUSLY, NOT AFFECTED. THIS HAS BEEN REPORTED IN REFERENCE 7.

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TABLE 6
FLOOD RECORD INDEX OF THE ATLANTIC OCEAN

	HA 14.7 PC	HA 14.0 PC	HA 14.0 PC	HA 14.0 PC	HA 14.0 PC
NOVEMBER 1967					
11/1	24 - 30	3 - 9	10 - 16	17 - 23	
11/2	44 - 51	57 - 68	68 - 77		
11/3	54 - 65	66 - 77			
11/4	71 - 79	80 - 86			
11/5	87 - 93	94 - 100	101 - 107		
11/6	108 - 114	115 - 121	122 - 128		
11/7	129 - 135		130 - 147		
DECEMBER 1967					
12/1		150 - 156		143 - 149	157 - 161
JANUARY 1968					
1/1	164 - 169	164 - 175	164 - 17		
1/2	172 - 178	179 - 183	184 - 188		
1/3	180 - 186	196 - 200	201 - 207		203 - 204
1/4	204 - 211	212 - 216			
1/5	214 - 221	224 - 229	229 - 235		
1/6	224 - 231	234 - 247	248 - 254		
1/7	234 - 241	244 - 257	258 - 275		
1/8	244 - 251	252 - 264	264 - 275	290 - 291	
1/9	254 - 261		276 - 294	299 - 305	
1/10	264 - 271				
1/11	274 - 281				
1/12	284 - 291				
1/13	294 - 301				
1/14	304 - 311				
1/15	314 - 321				
1/16	324 - 331				
1/17	334 - 341				
1/18	344 - 351				
1/19	354 - 361				
1/20	364 - 371				
1/21	374 - 381				
1/22	384 - 391				
1/23	394 - 401				
1/24	404 - 411				
1/25	414 - 421				
1/26	424 - 431				
1/27	434 - 441				
1/28	444 - 451				
1/29	454 - 461				
1/30	464 - 471				

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REFERENCES

1. NPL Memo Report 1-73 - 5 December 1963, by W. E. Garner, F. J. Rhoads, F. T. Elwood, III, and F. L. Schauer.
2. NPL Memo Report 1571 - 29 October 1964, by W. E. Garner, F. J. Rhoads, and F. L. Schauer.
3. "QUARTERLY Radio Noise Data - June, July, August 1962" by W. E. Crichton, F. T. Disney, and M. A. Jenkins, National Bureau of Standards Technical Note No. 19-15, dated 1 March 1963.
4. "QUARTERLY Radio Noise Data - September, October, November 1962" by W. E. Crichton, F. T. Disney, and M. A. Jenkins, National Bureau of Standards Technical Note No. 19-16, dated 15 June 1963.
5. "QUARTERLY Radio Noise Data - December, 1962; January, February 1963" by W. E. Crichton, F. T. Disney, and M. A. Jenkins, National Bureau of Standards Technical Note No. 19-17, dated 15 May 1963.
6. "QUARTERLY Radio Noise Data - March, April, May 1963" by W. E. Crichton, F. T. Disney, and M. A. Jenkins, National Bureau of Standards Technical Note No. 19-18, dated 25 July 1963.

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NORMALIZATIONS

The Field Strengths Of All Transmissions Are Normalized To A Radiated Power (P_r) Of One Kilowatt.

Atmospheric Noise Field Strengths Are Normalized To A Bandwidth of 100 Cycles Per Second.

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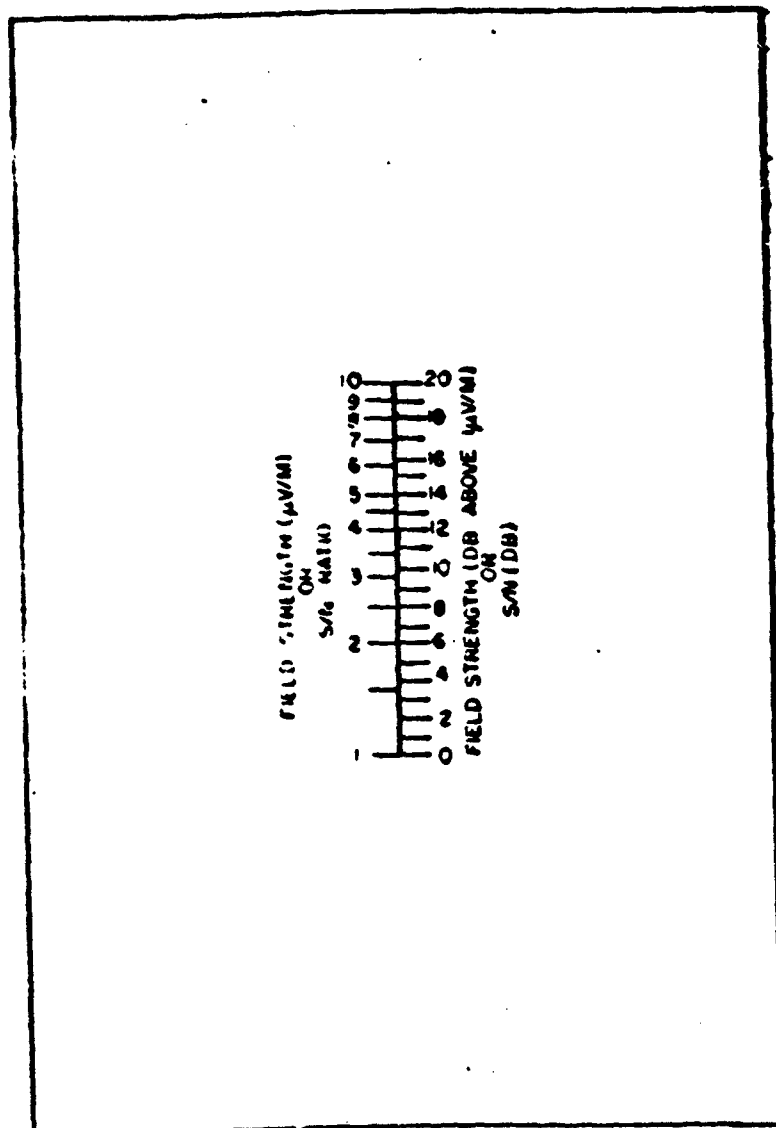


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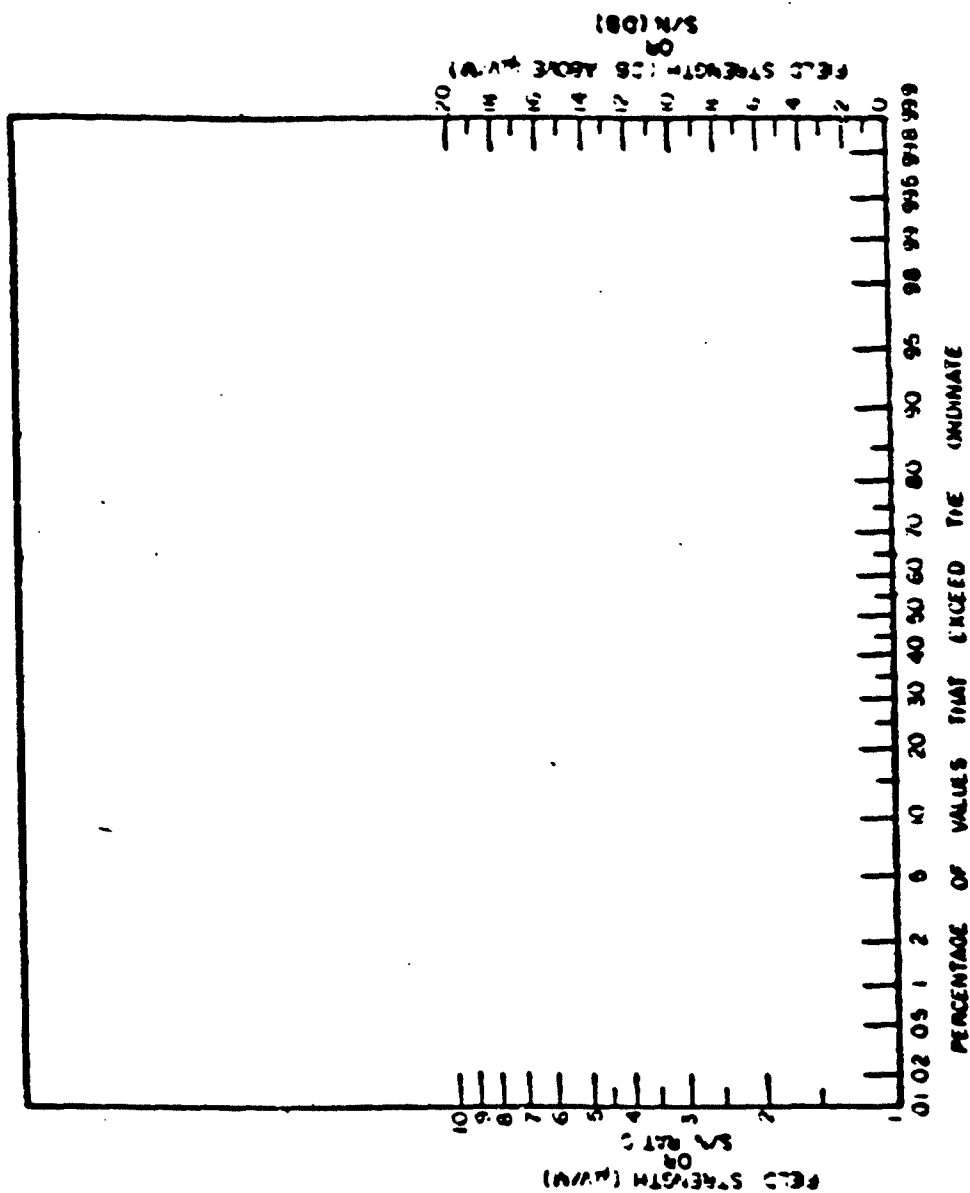


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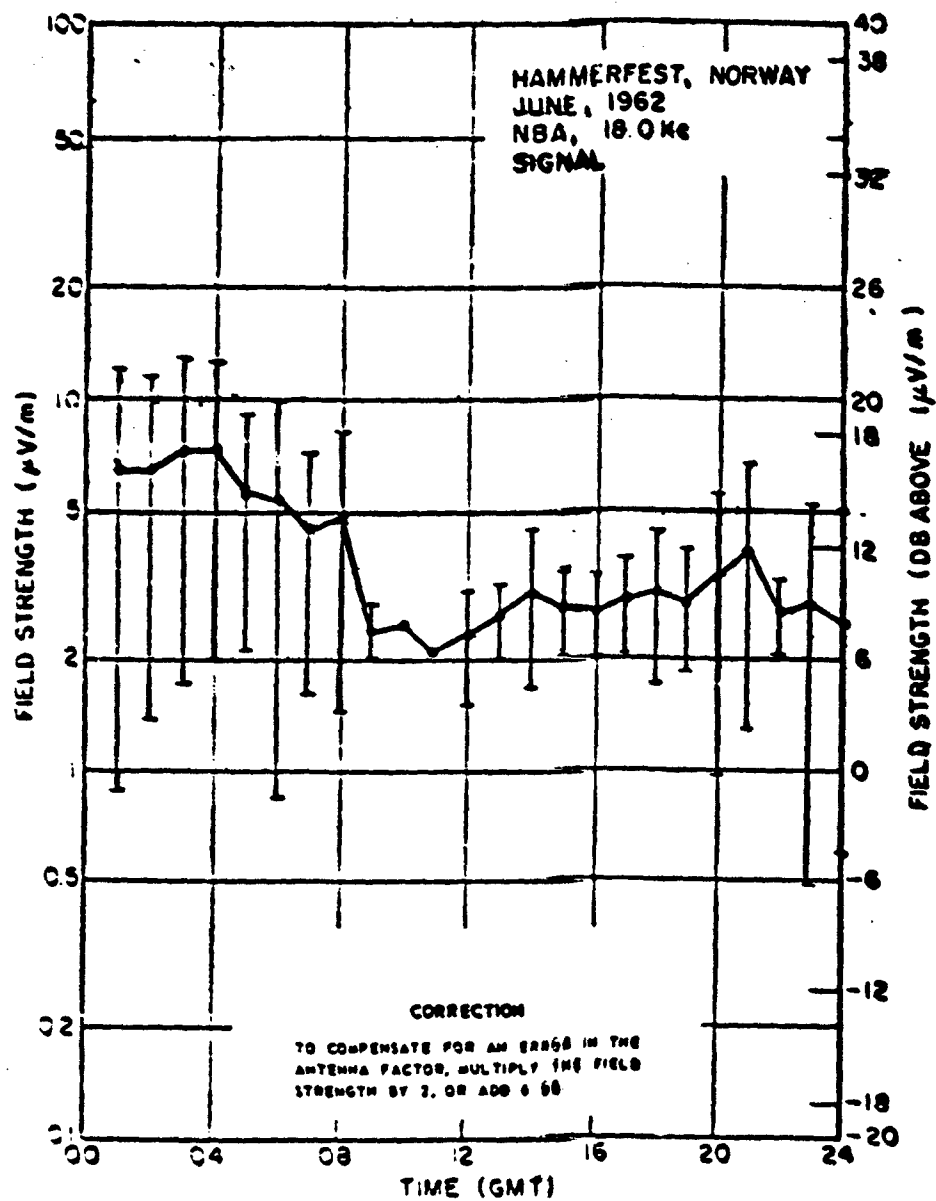


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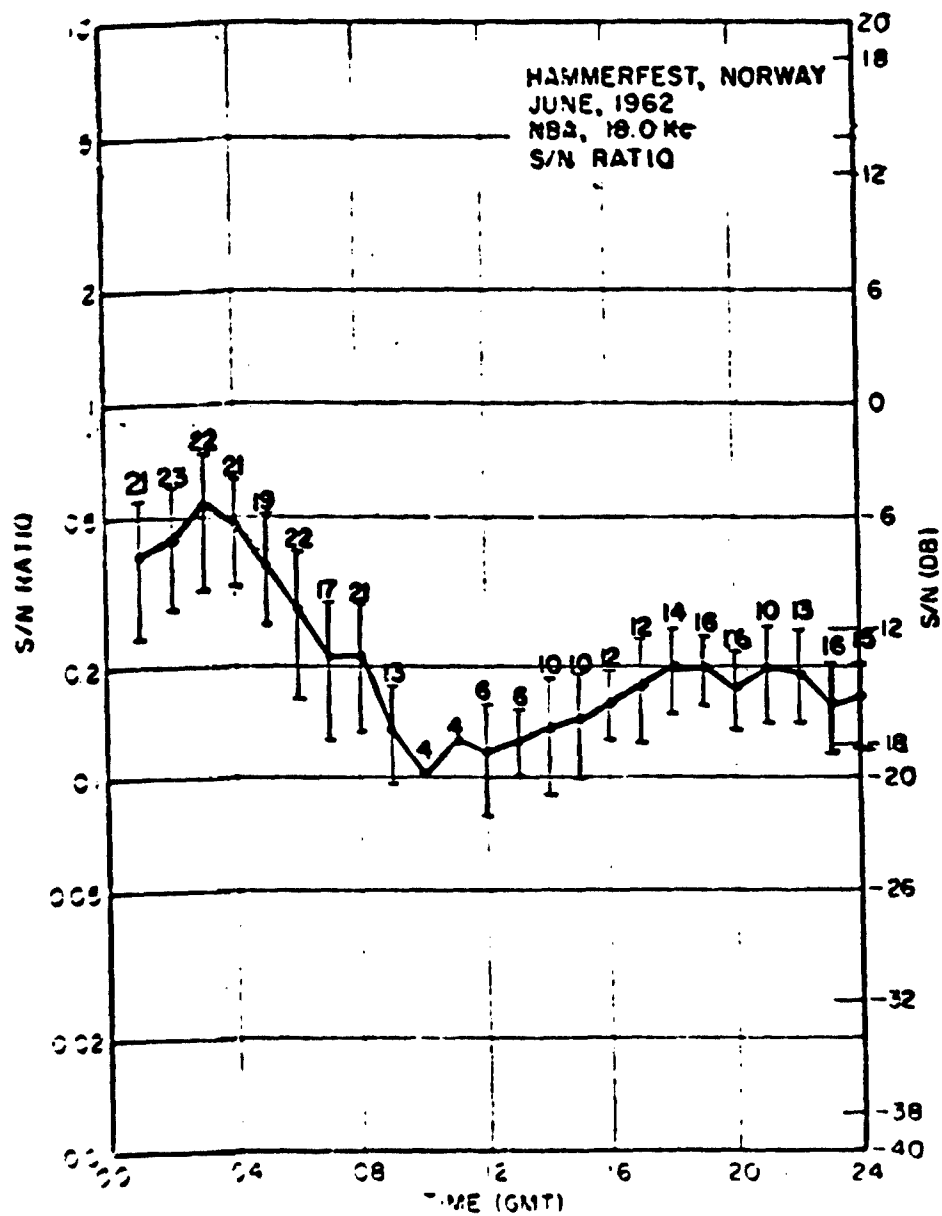


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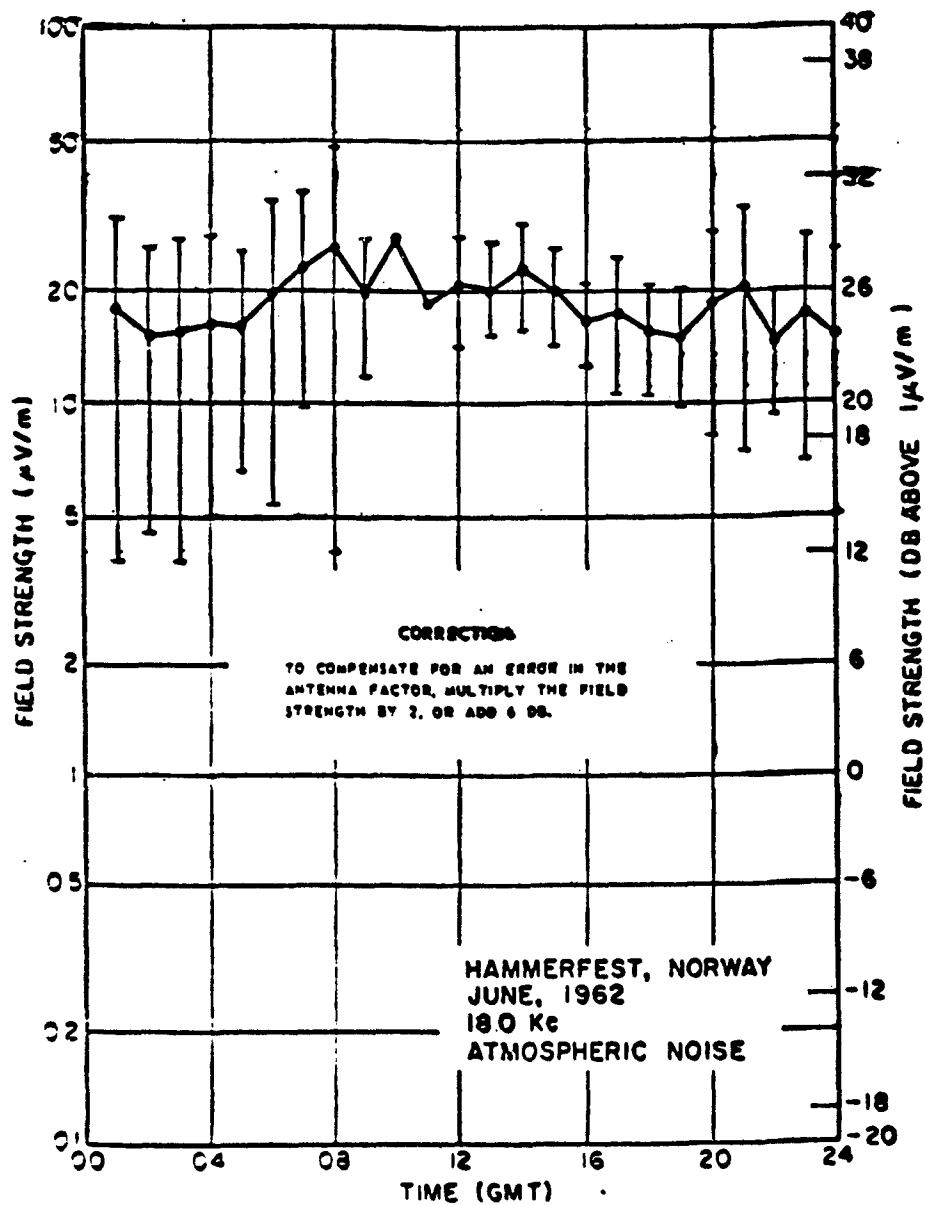


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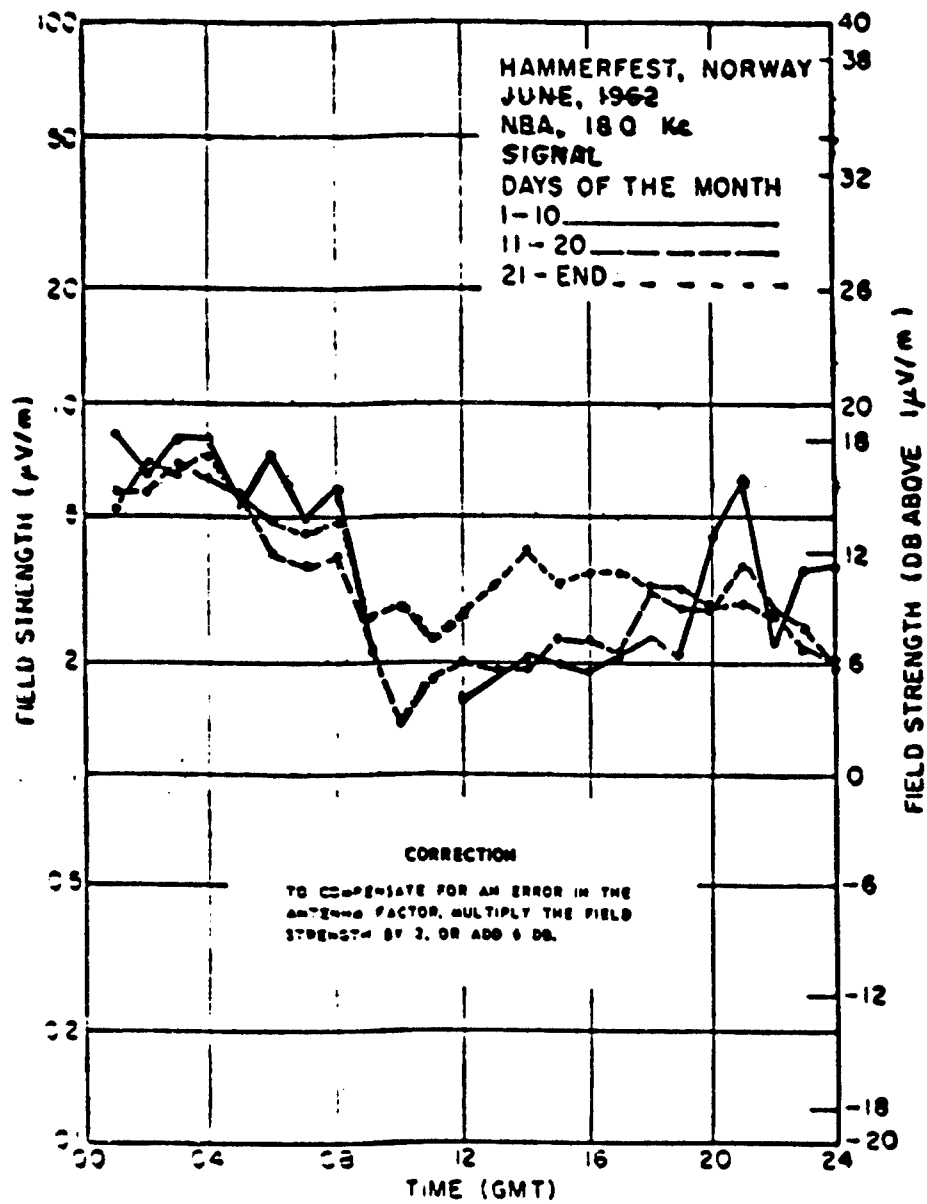


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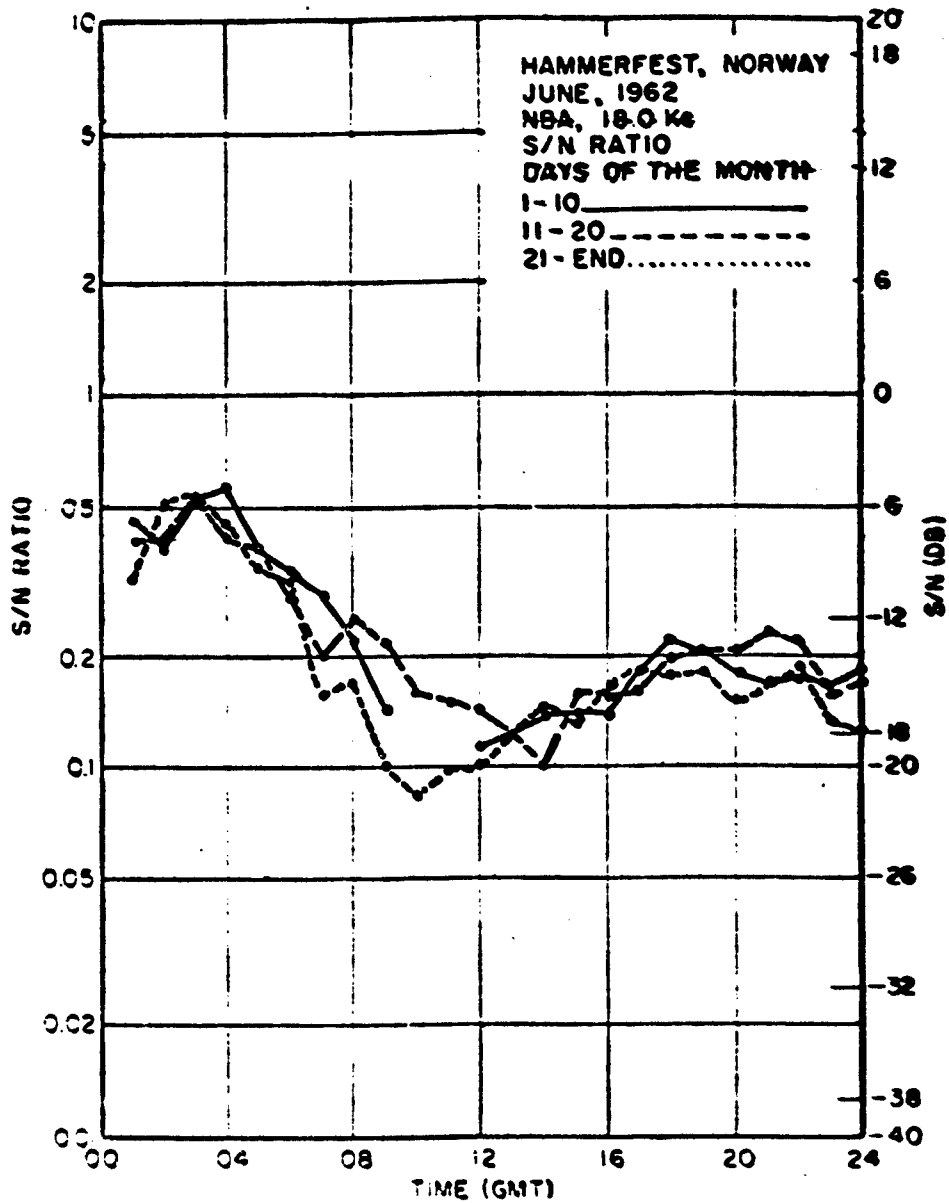


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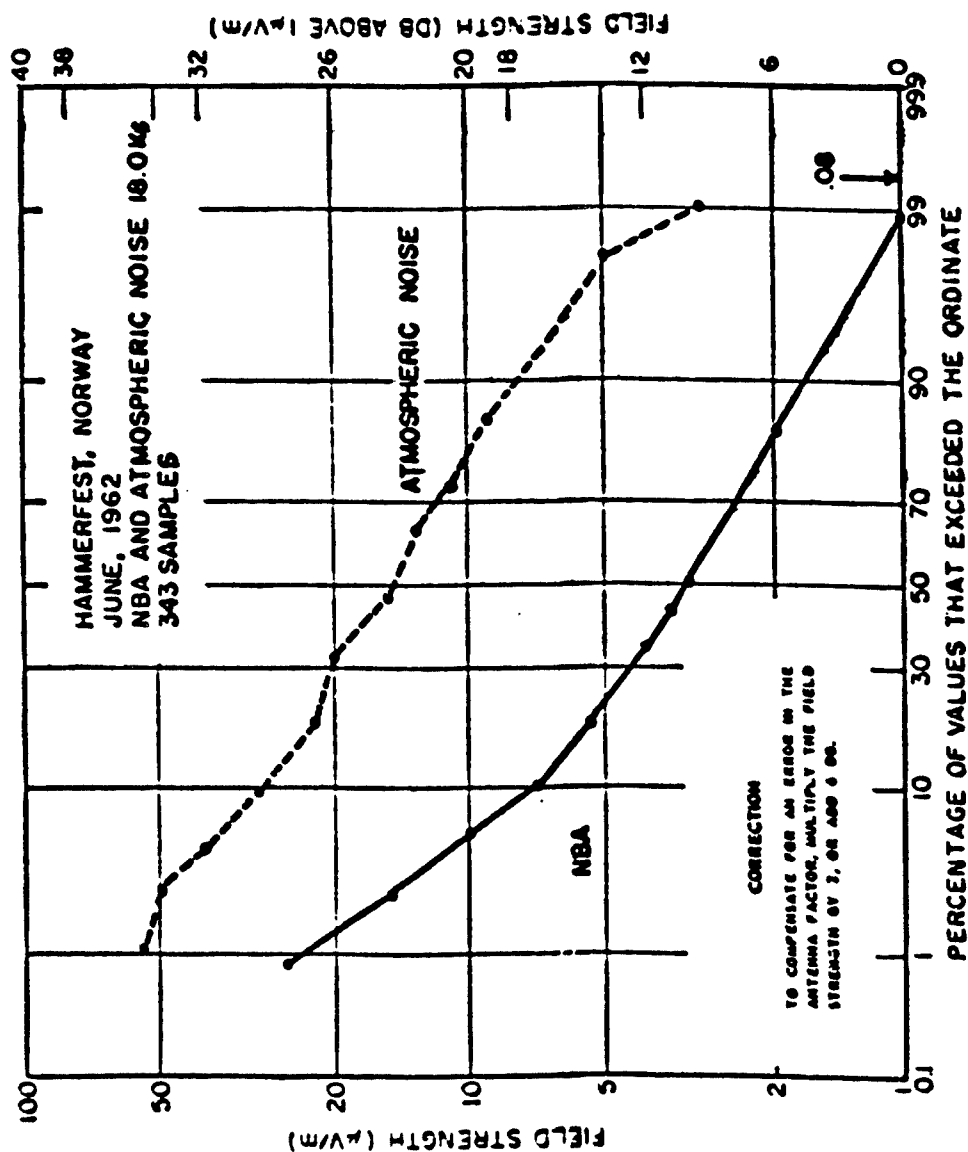


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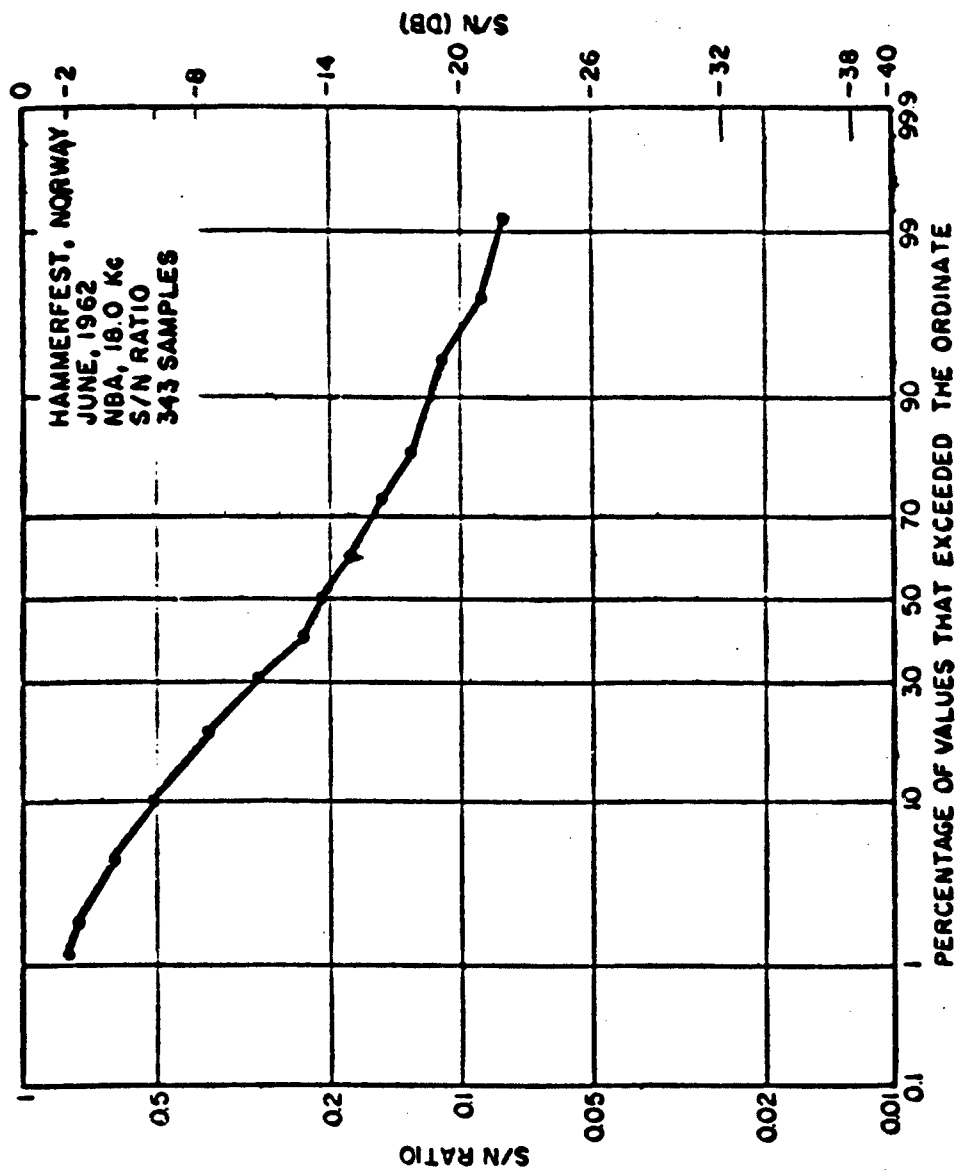


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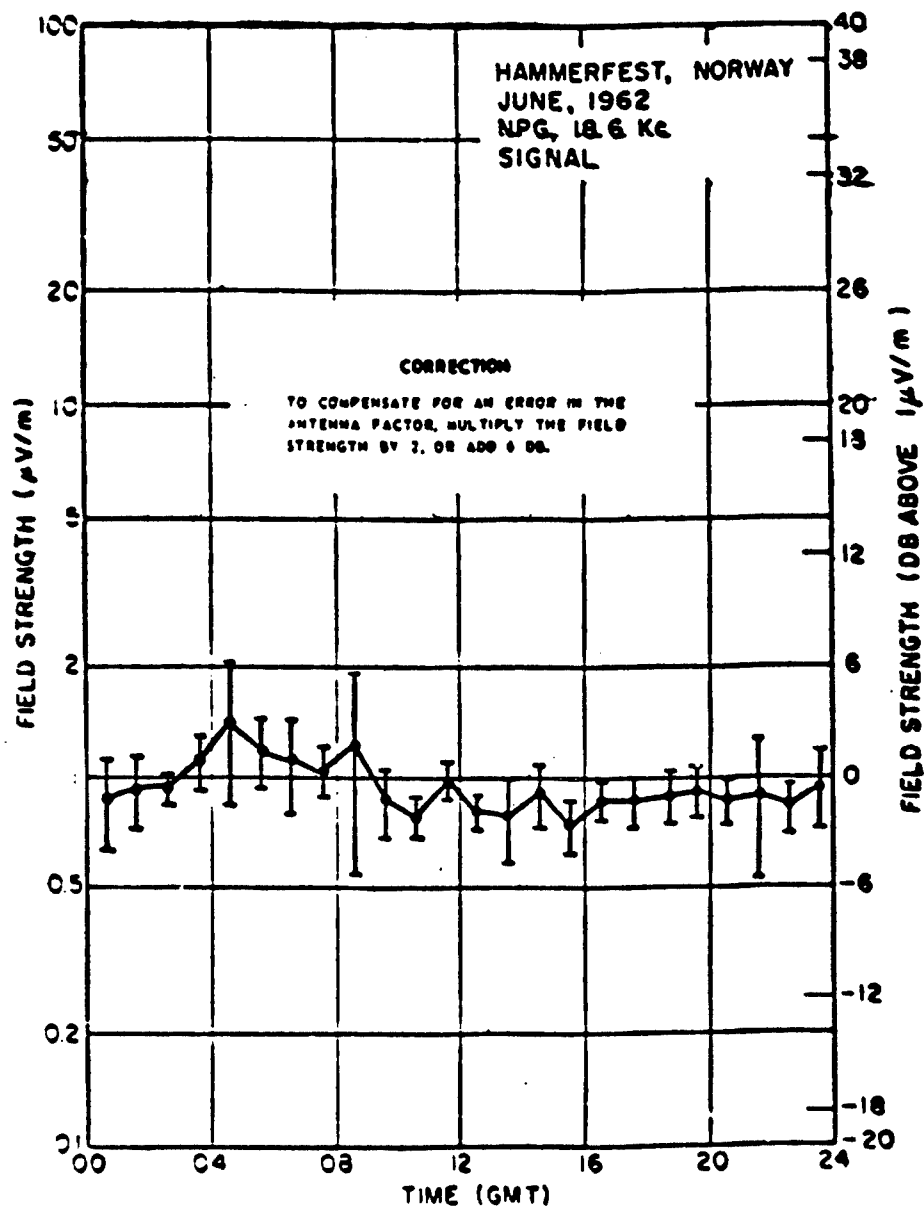


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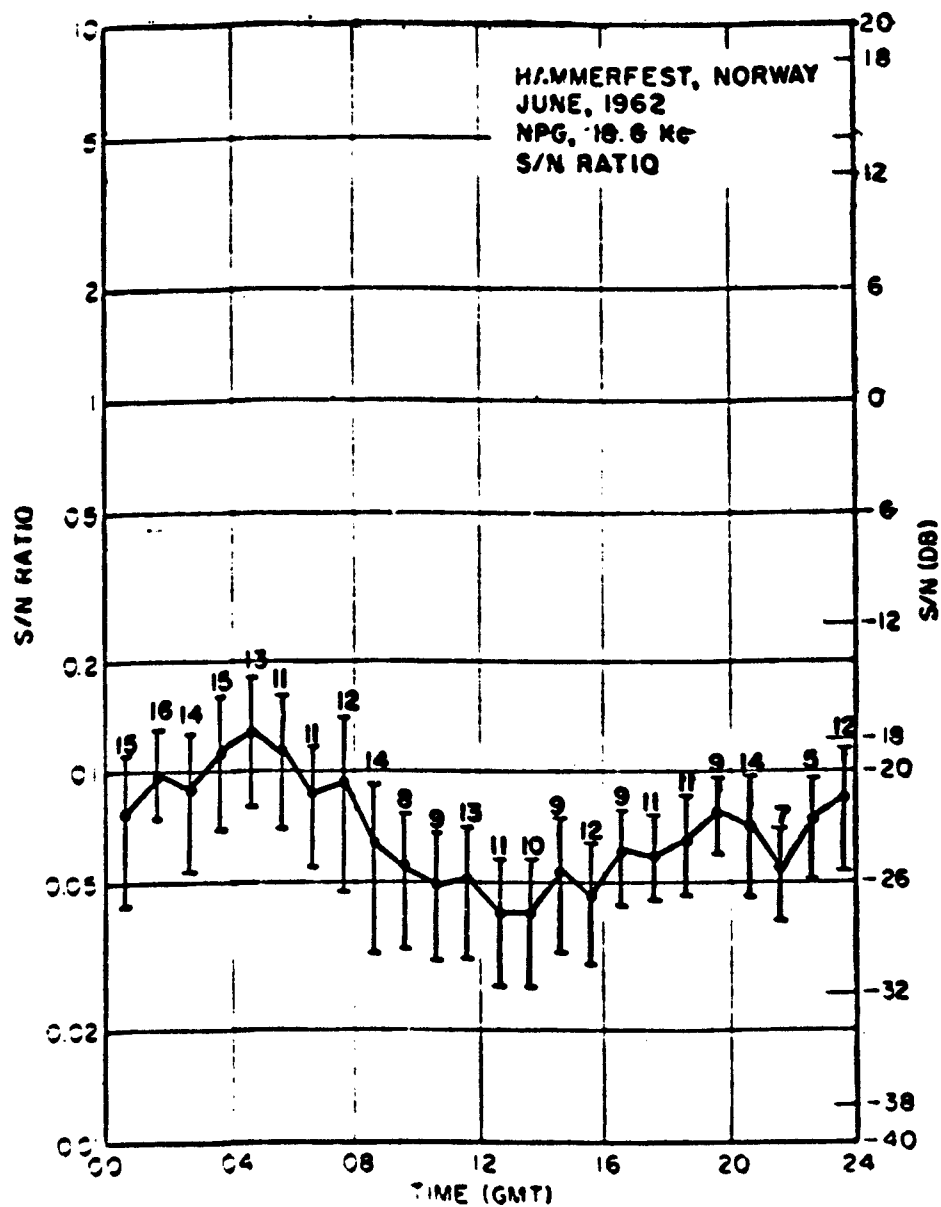


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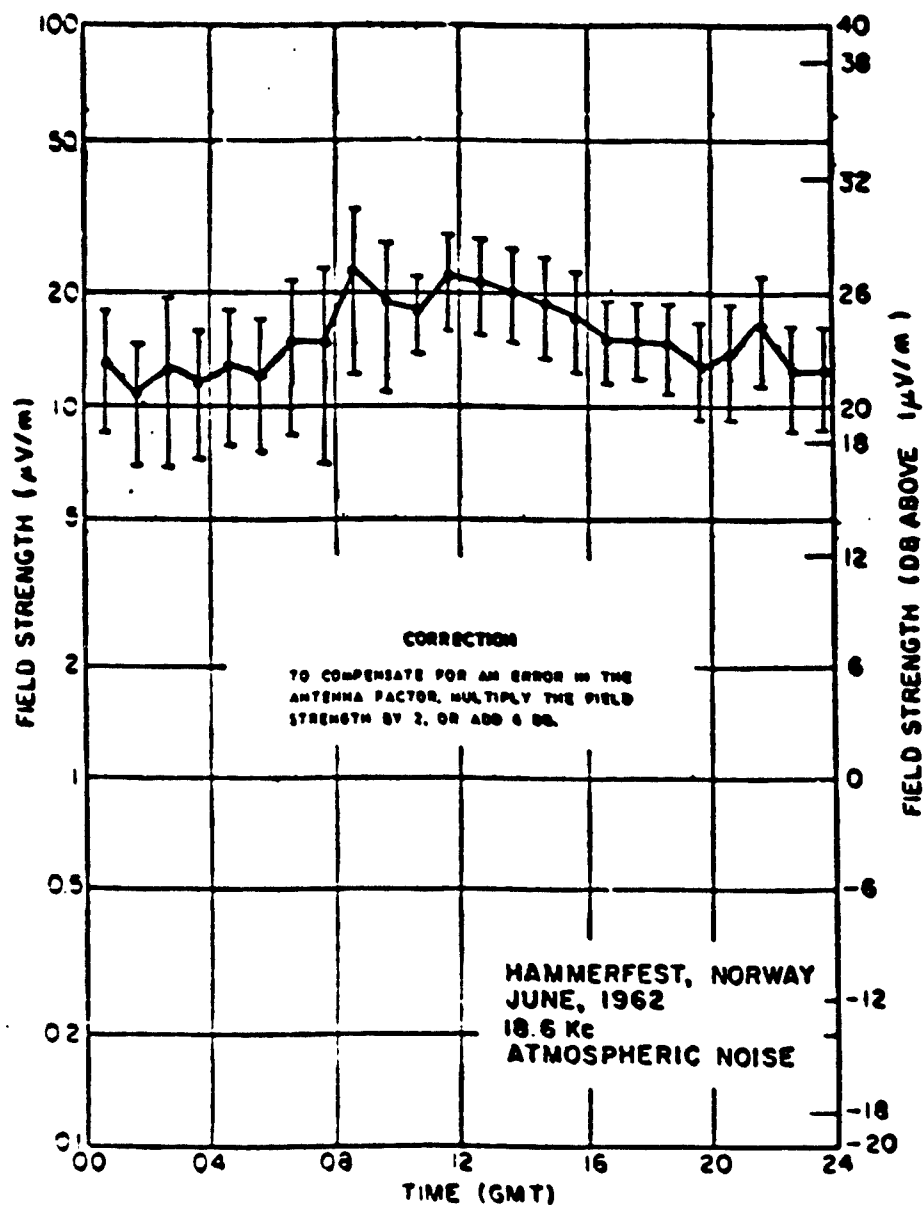


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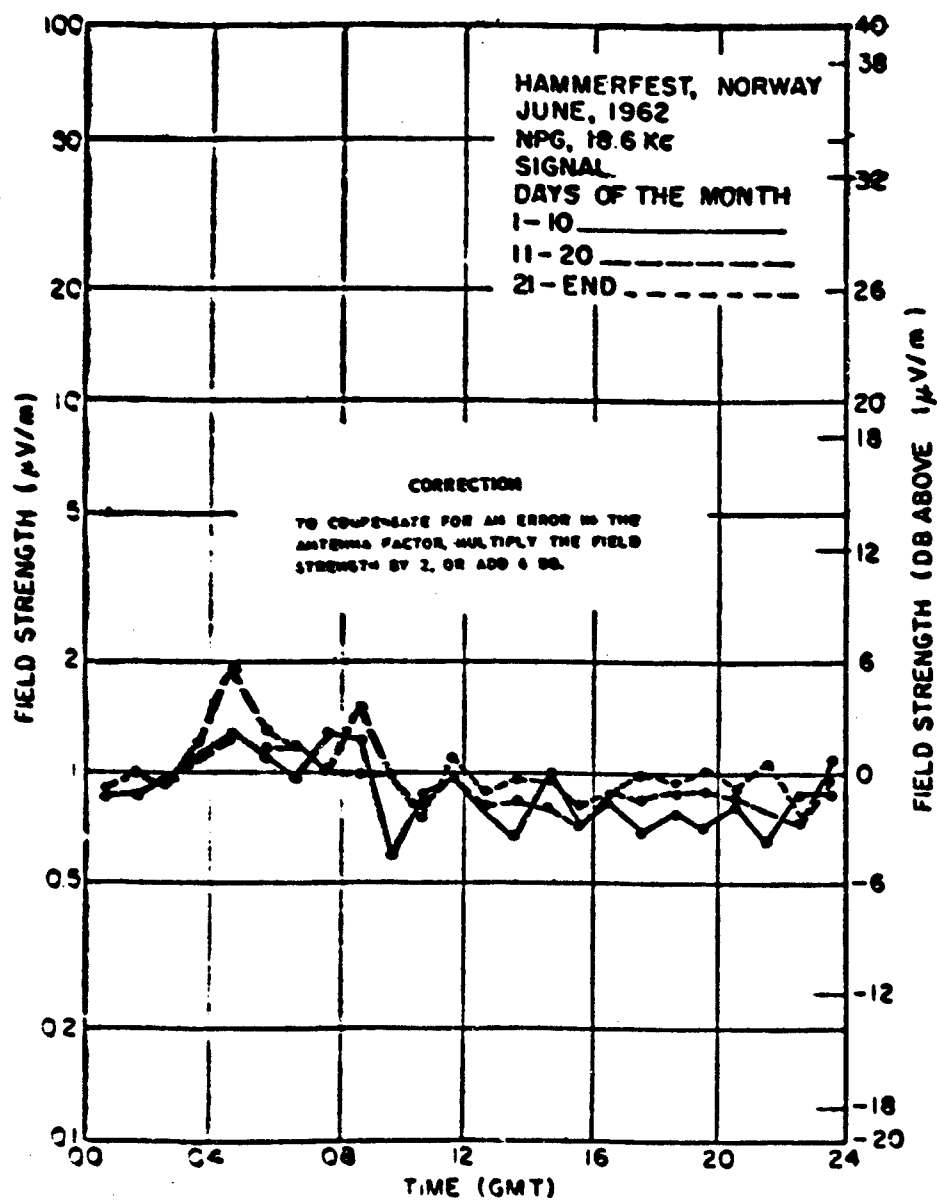


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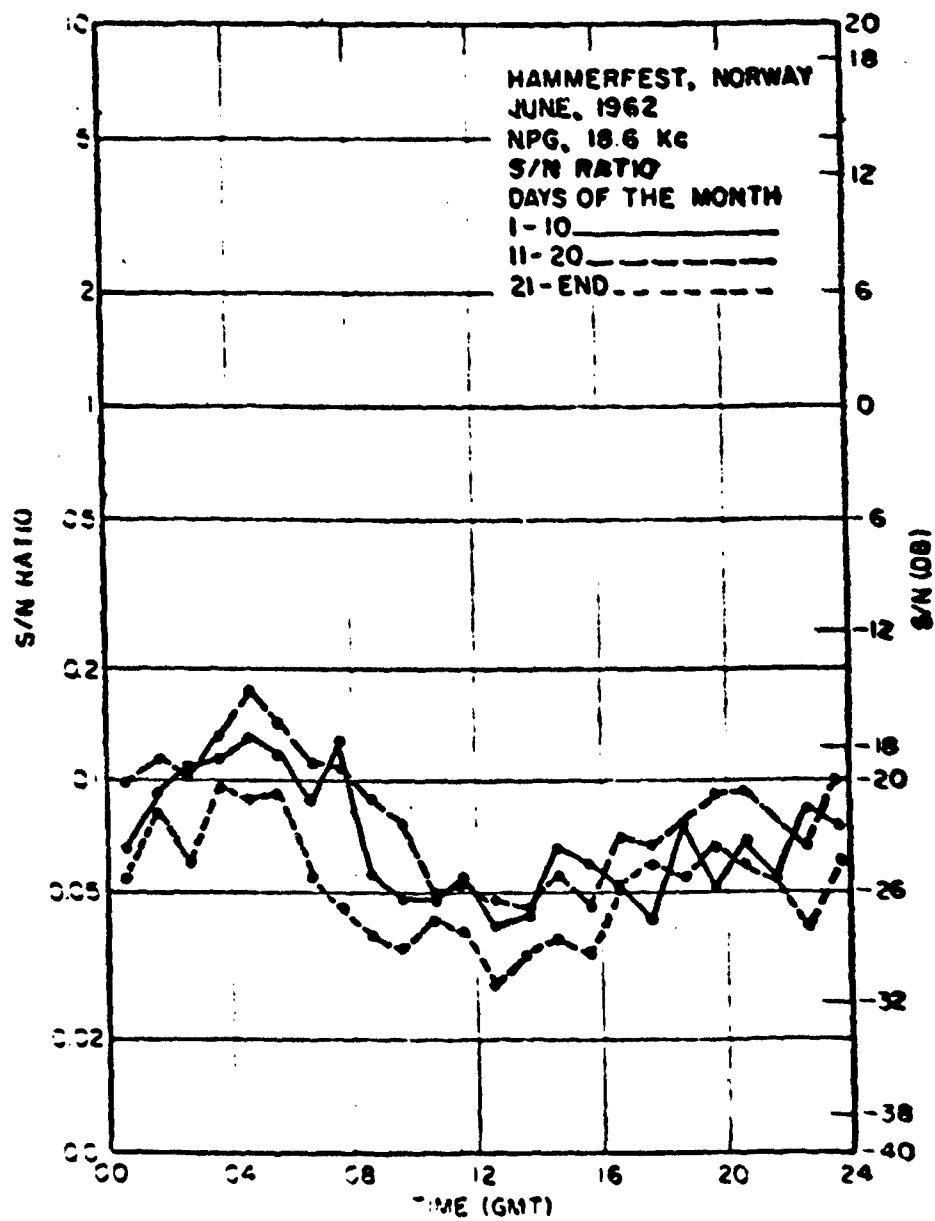


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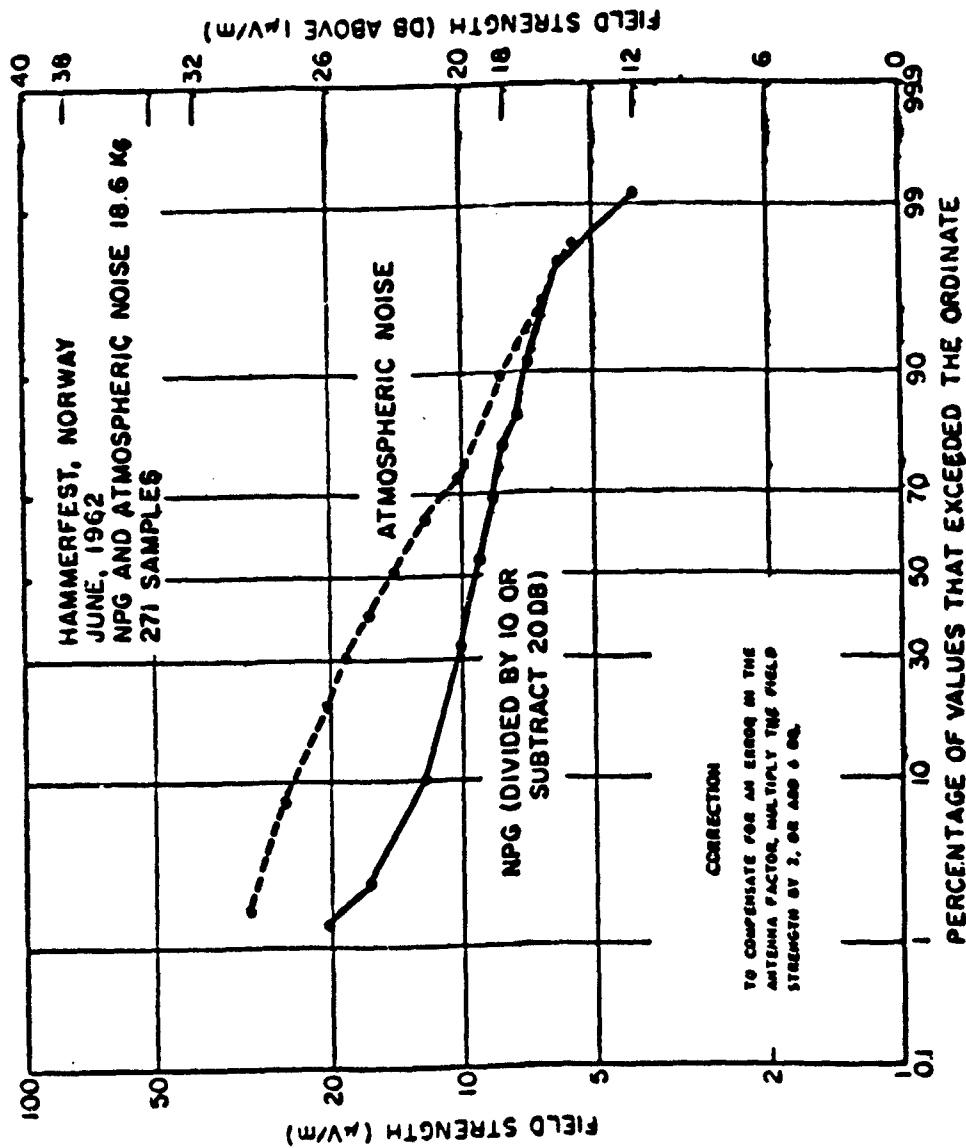


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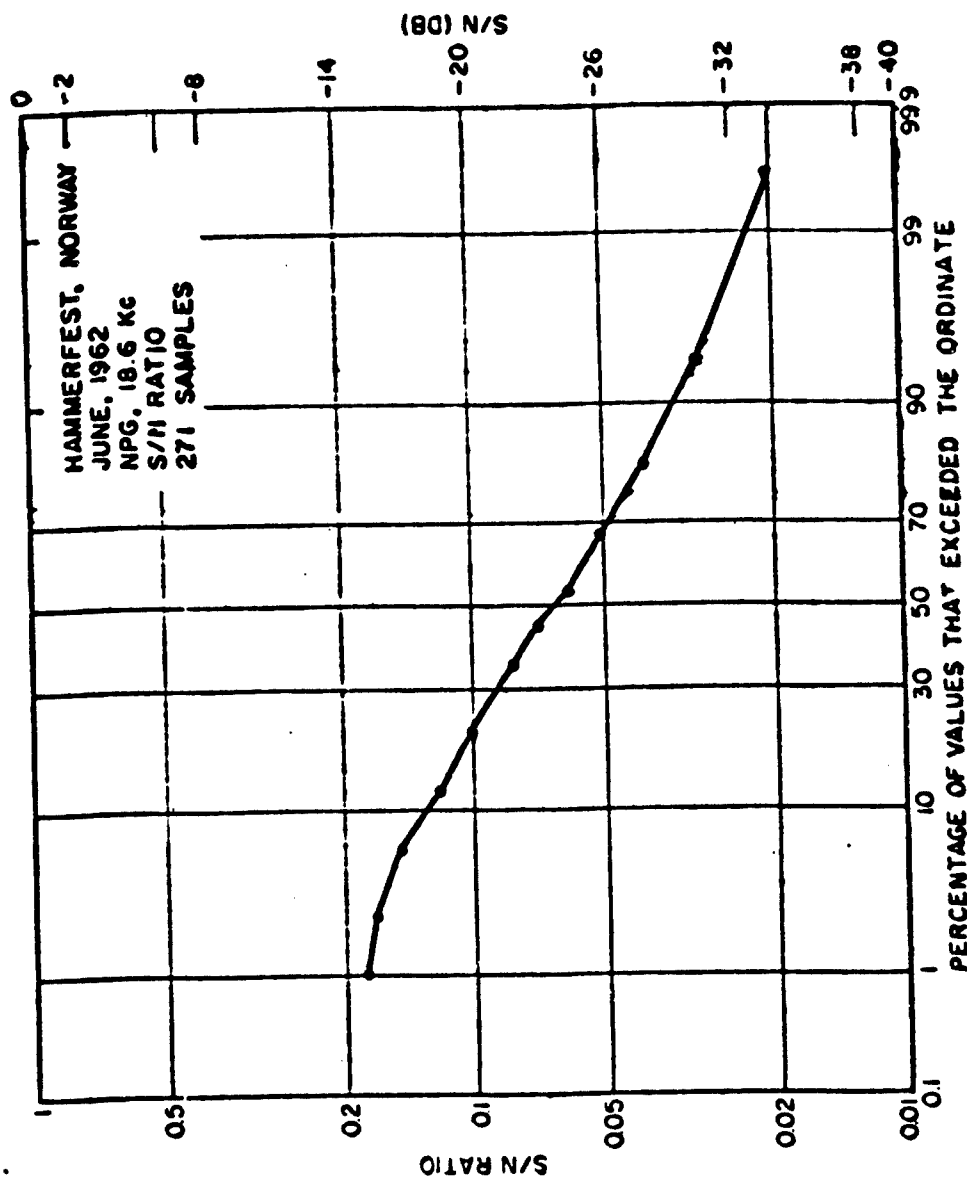


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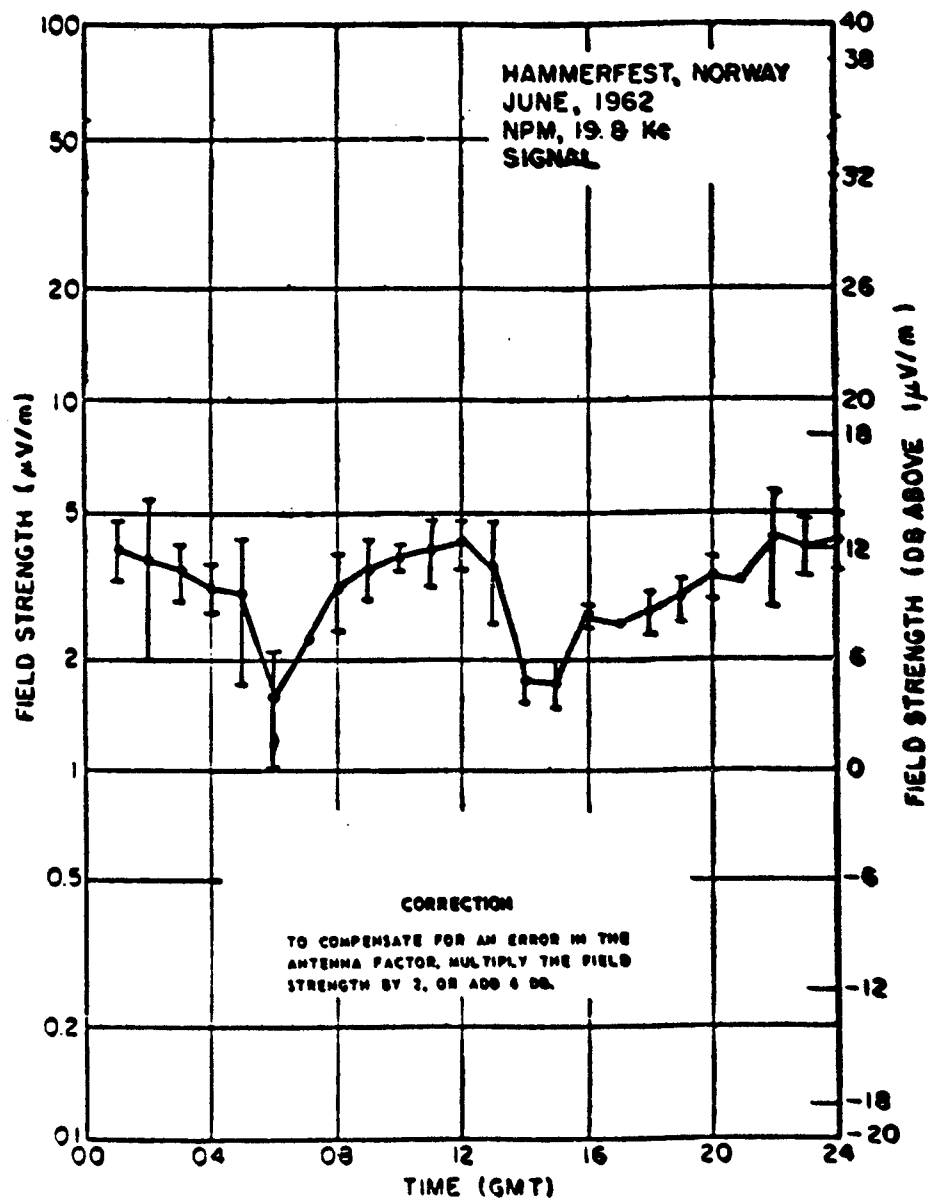


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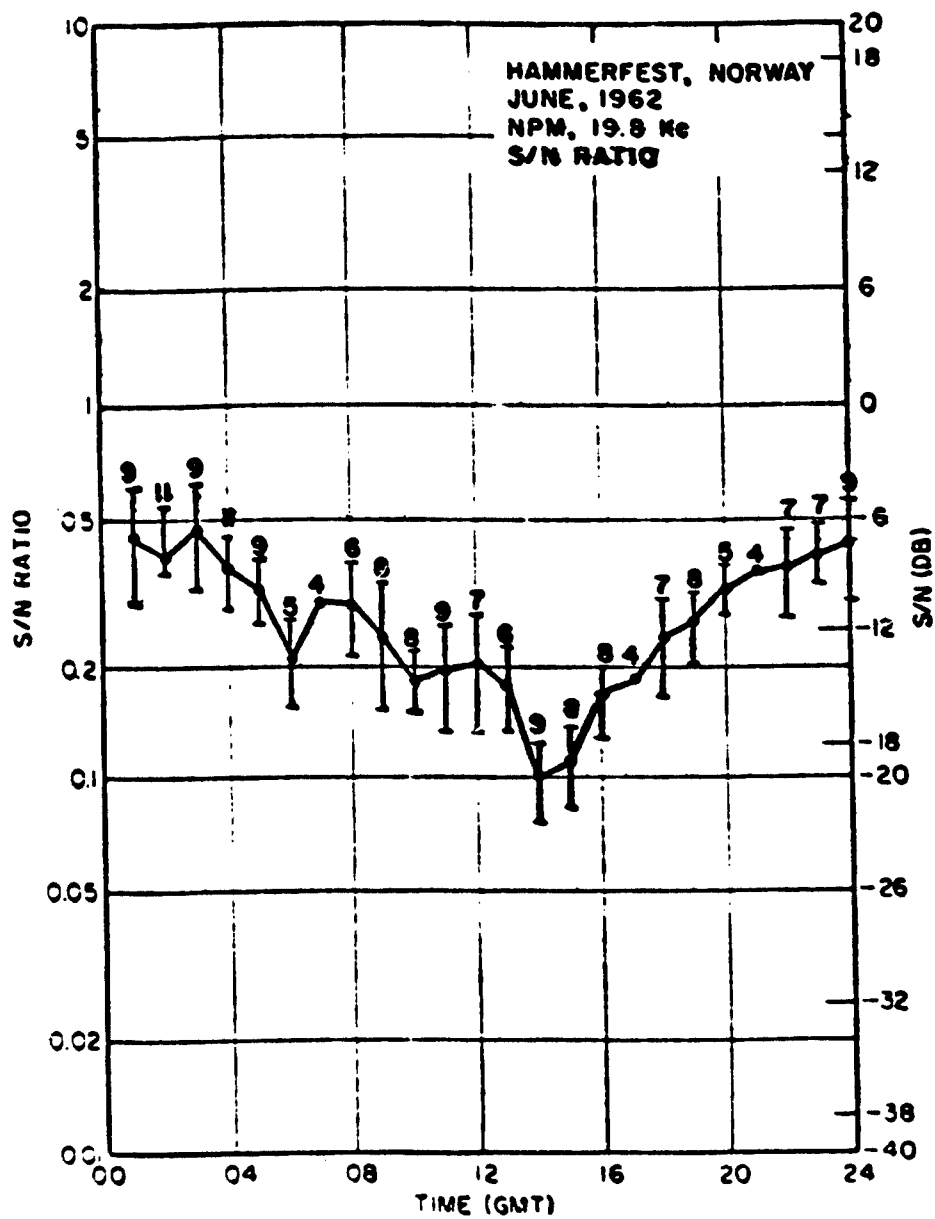


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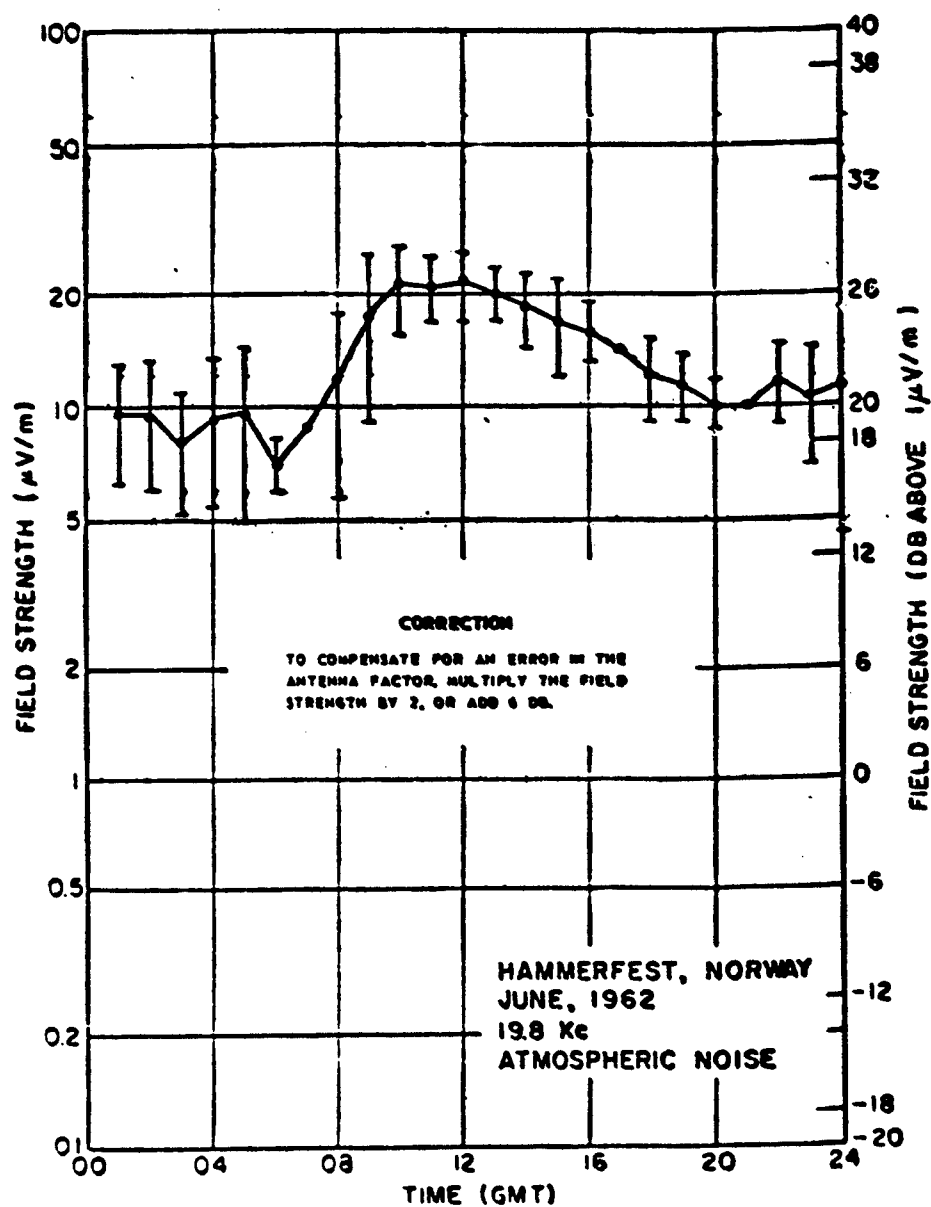


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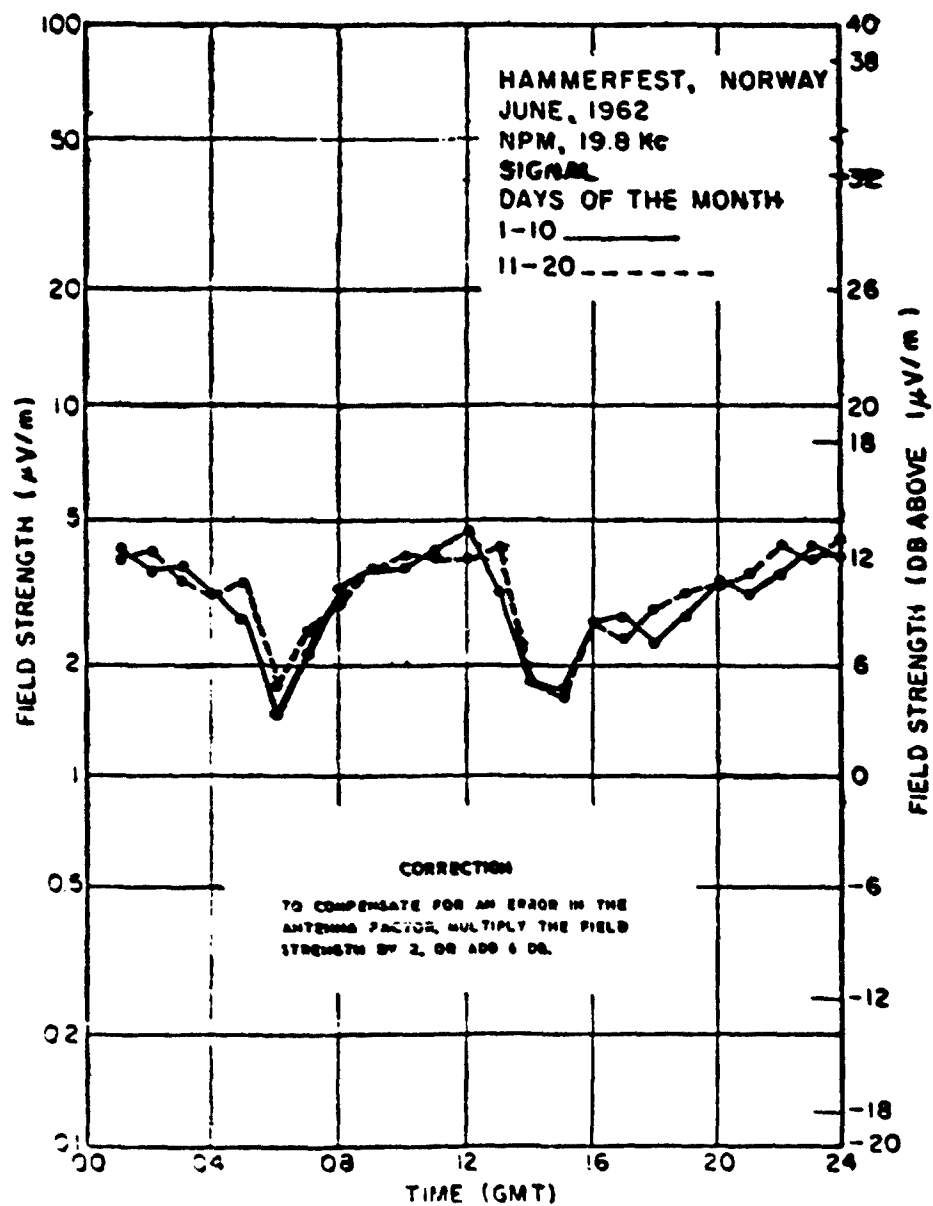


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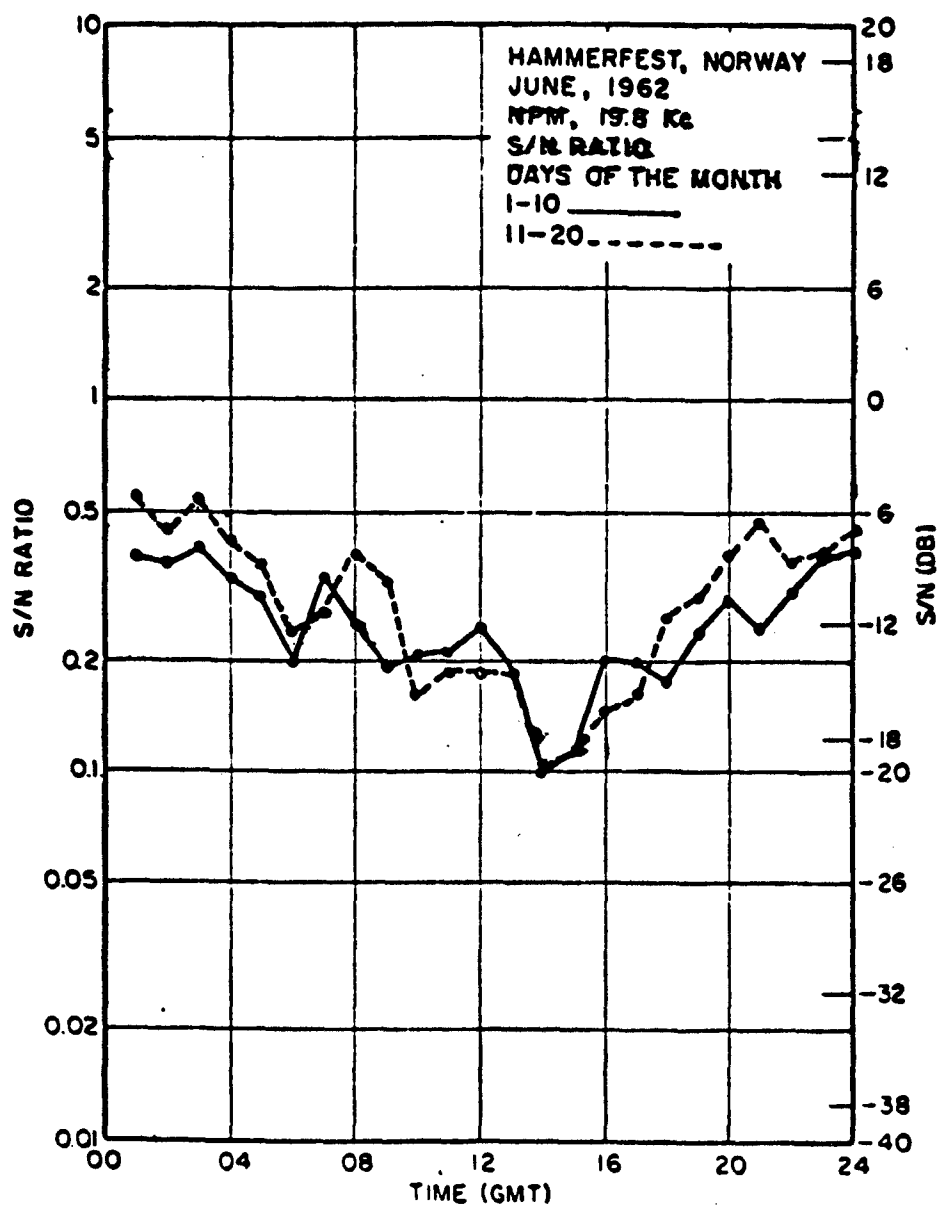


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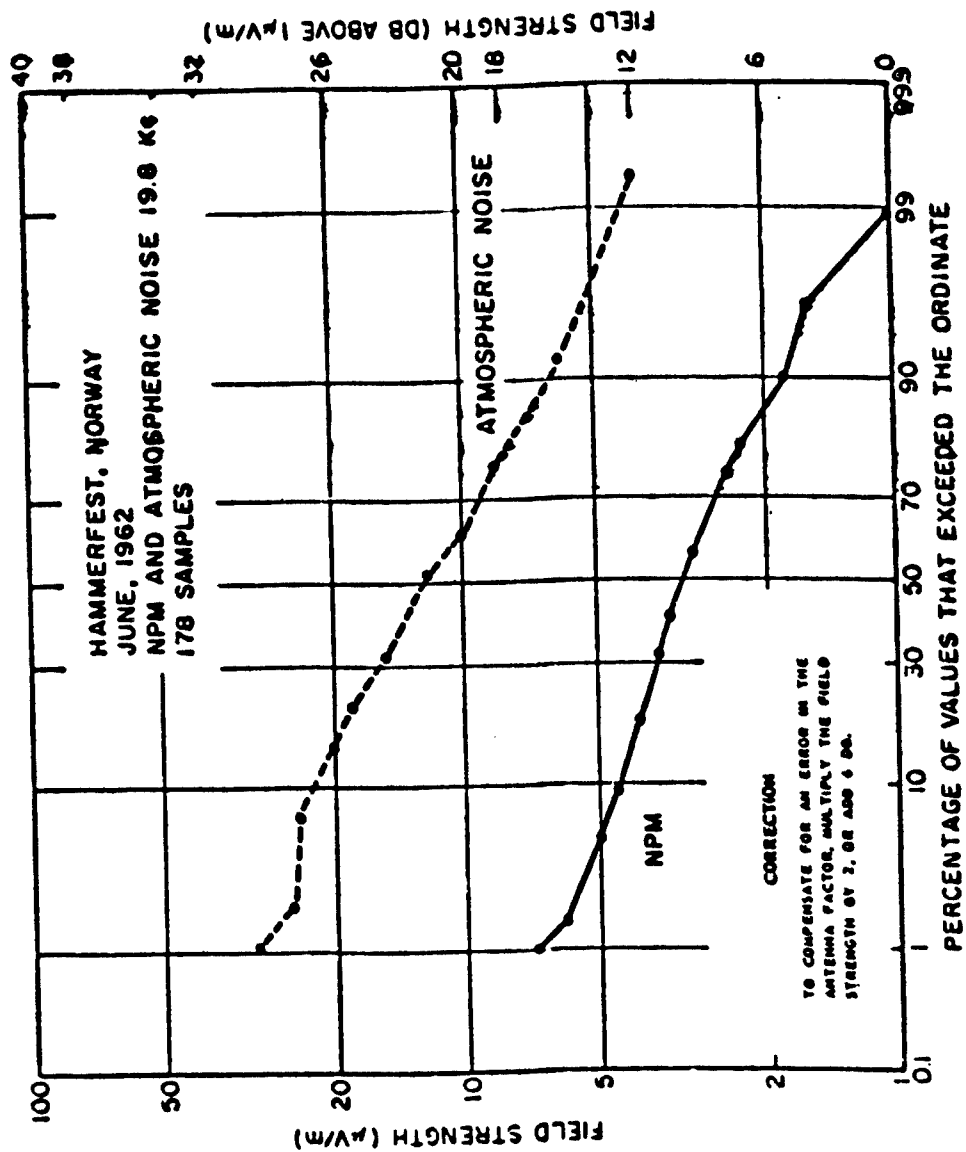


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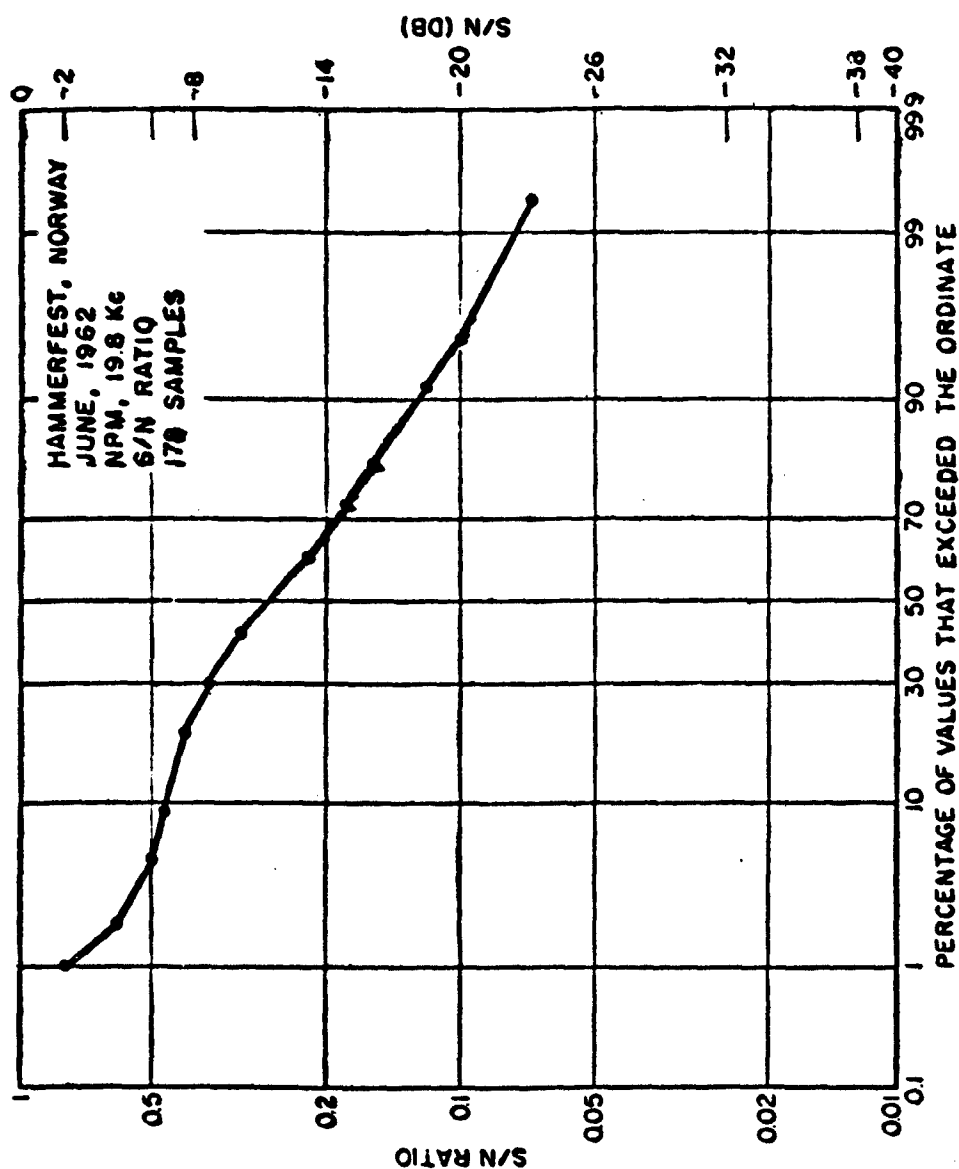


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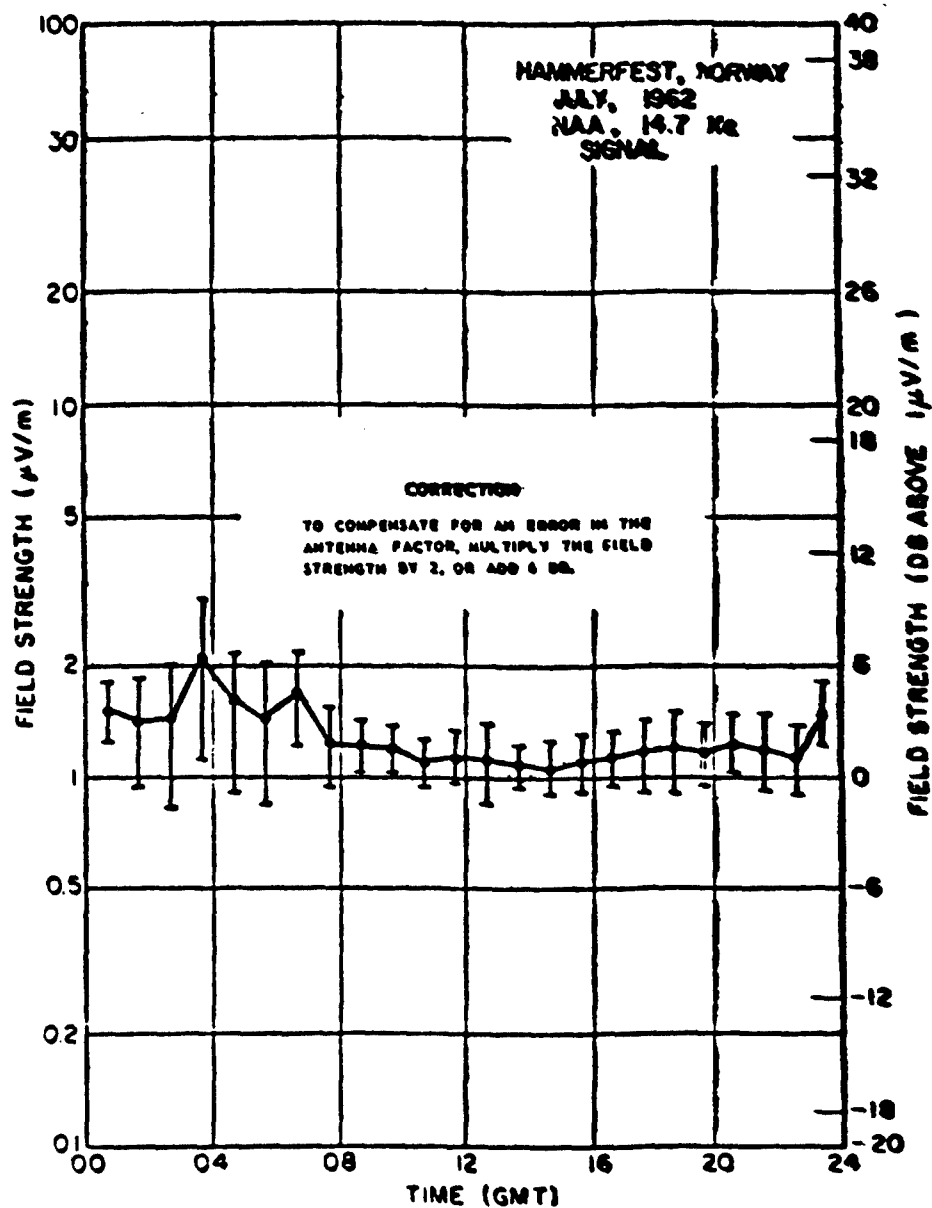


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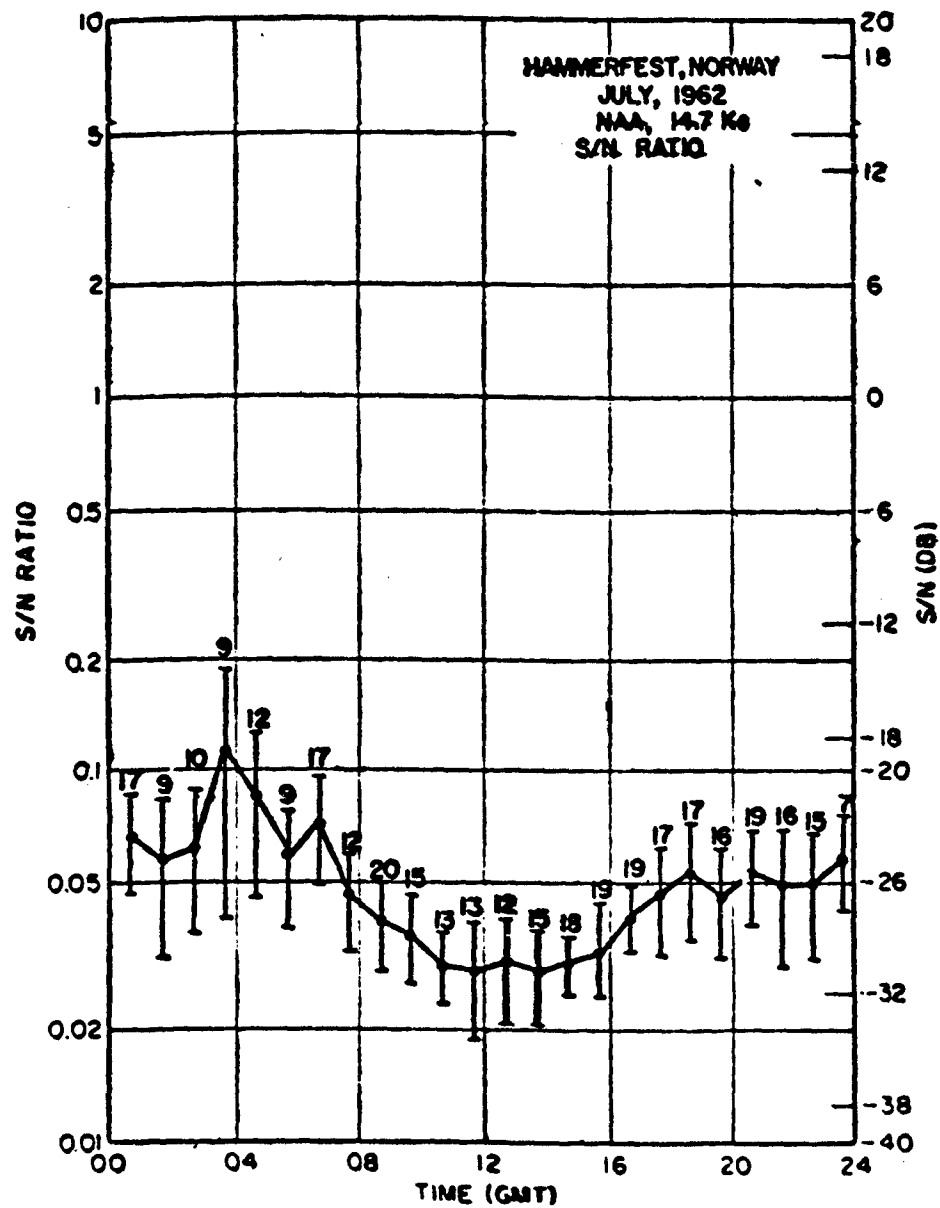


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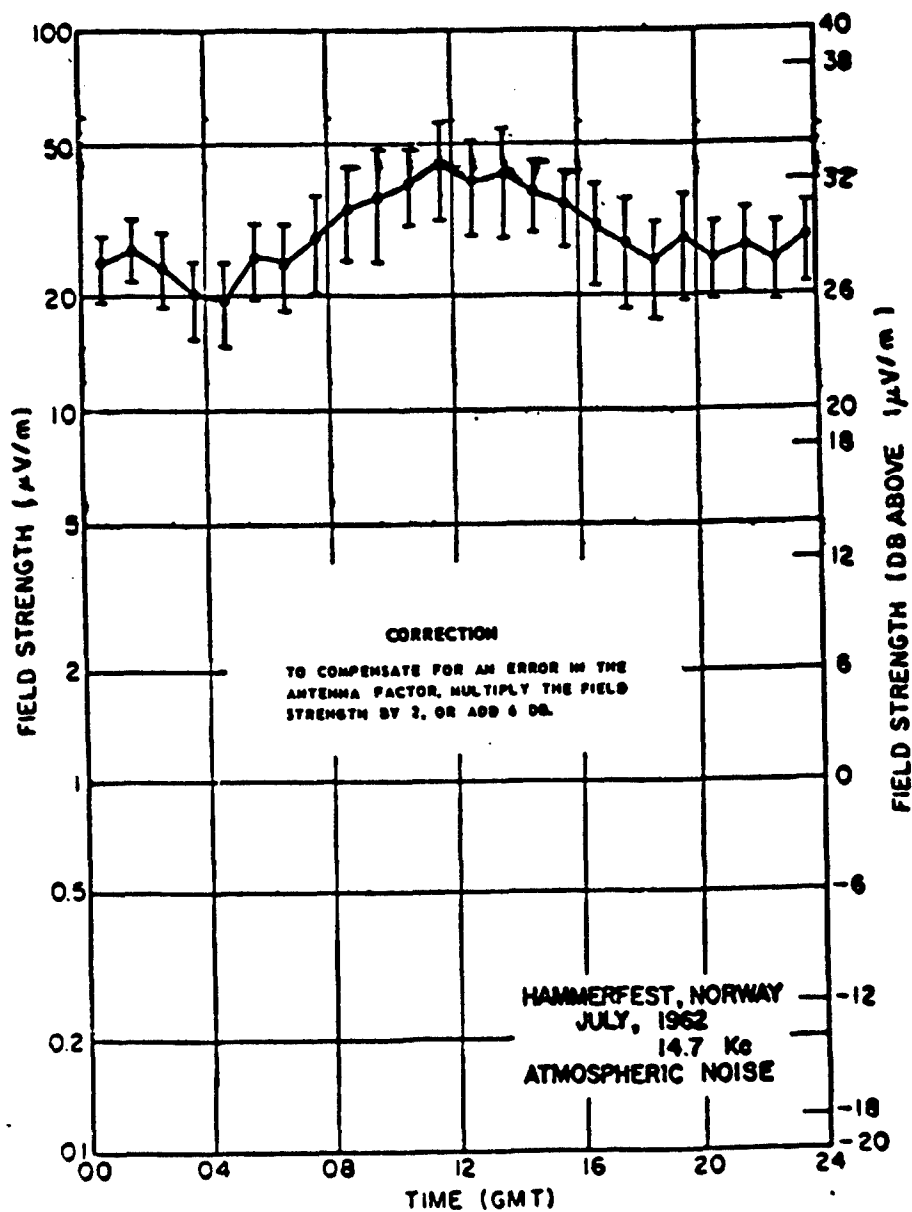


Figure 26

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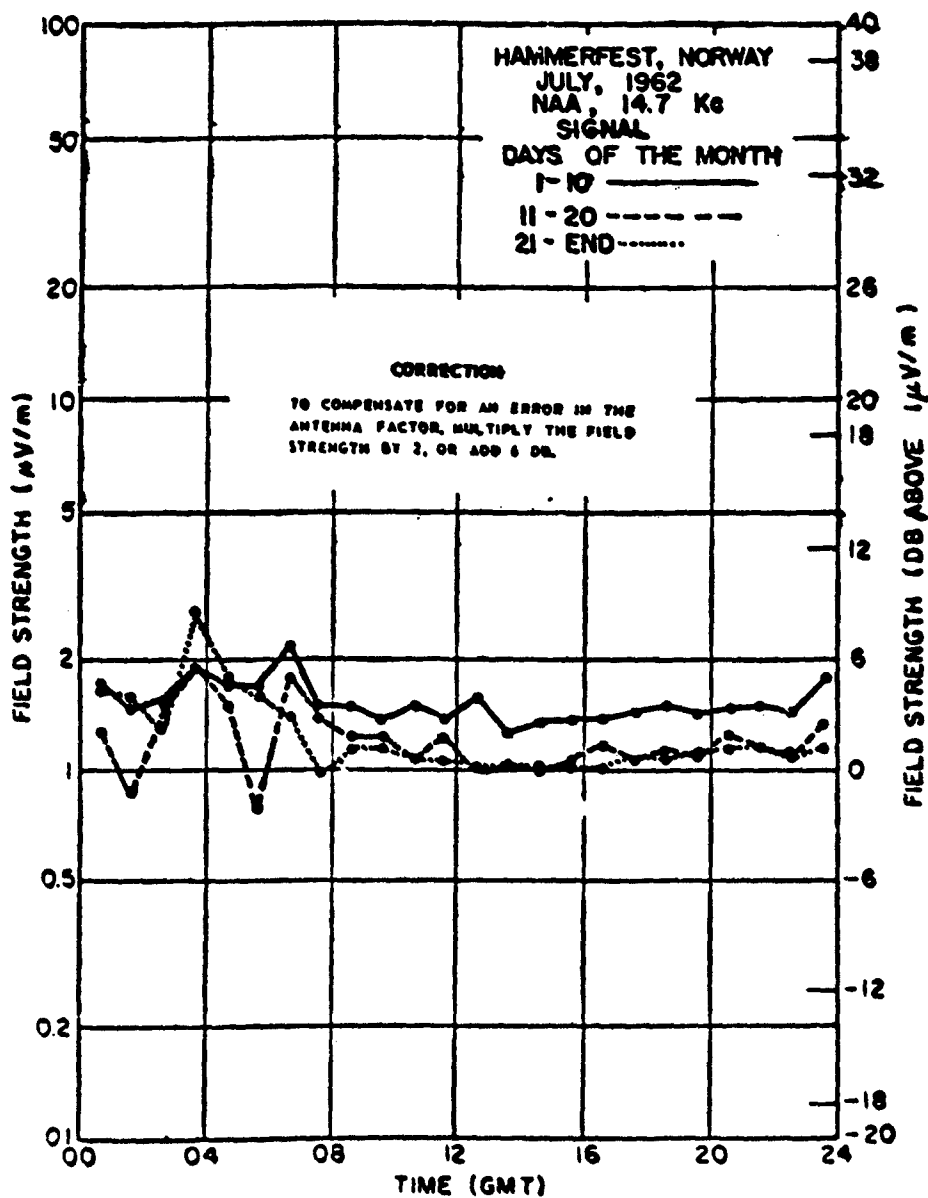


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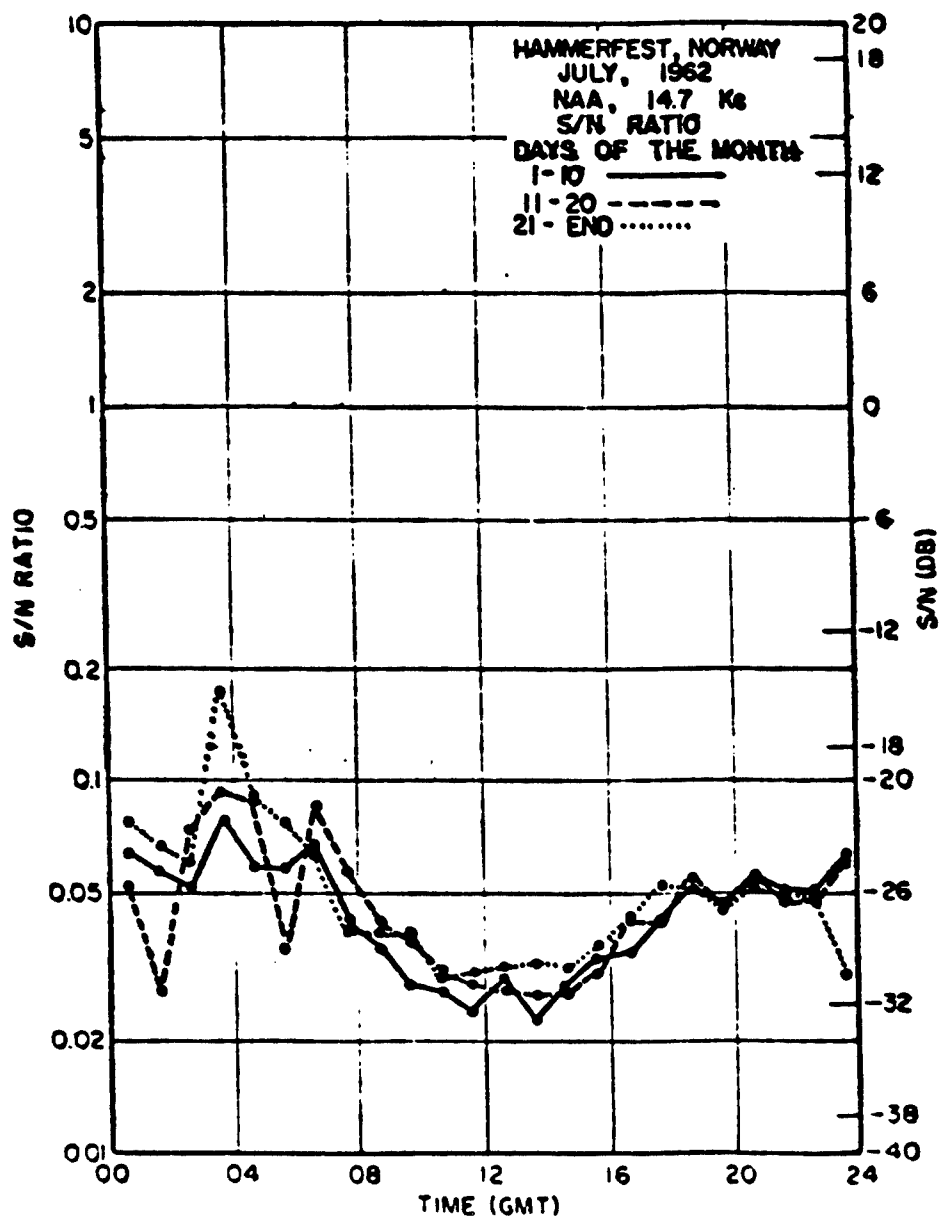


Figure 28

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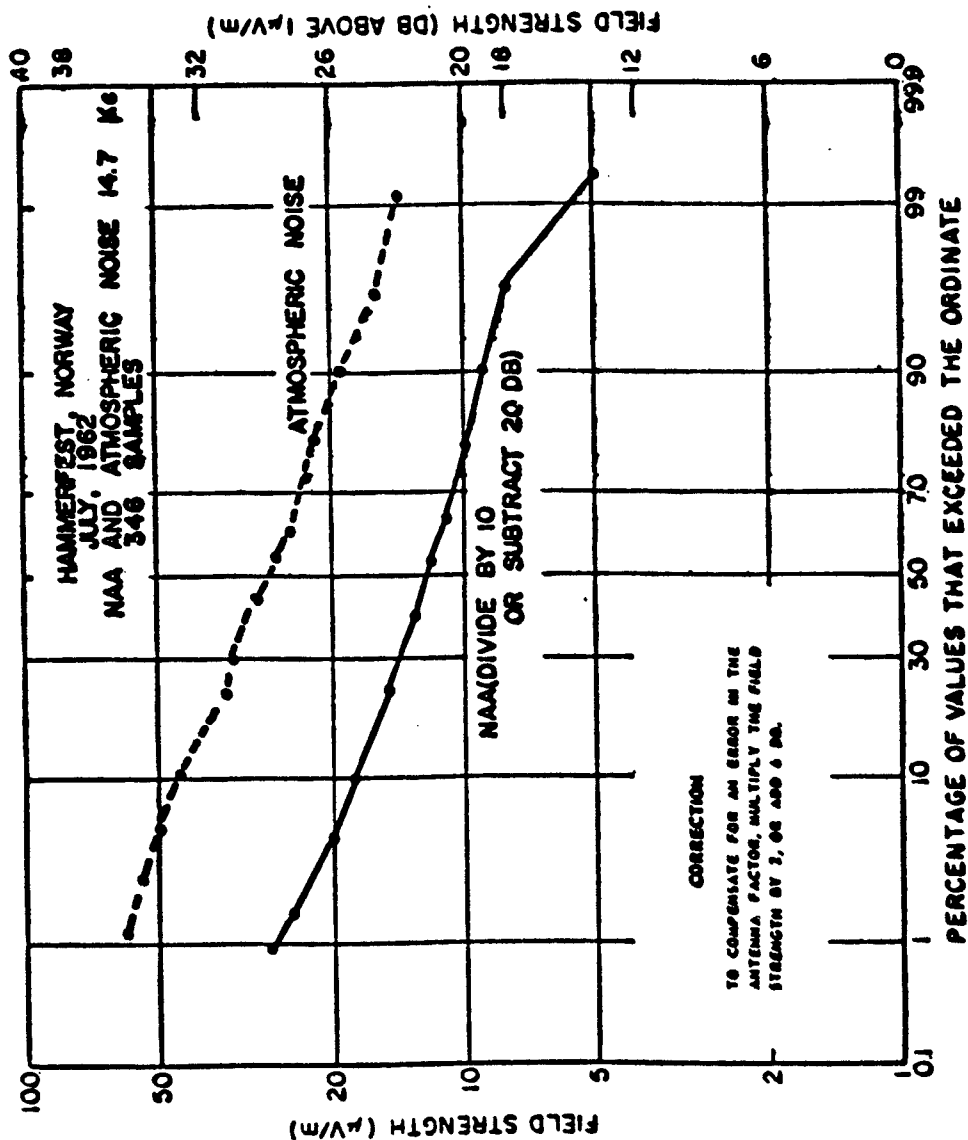


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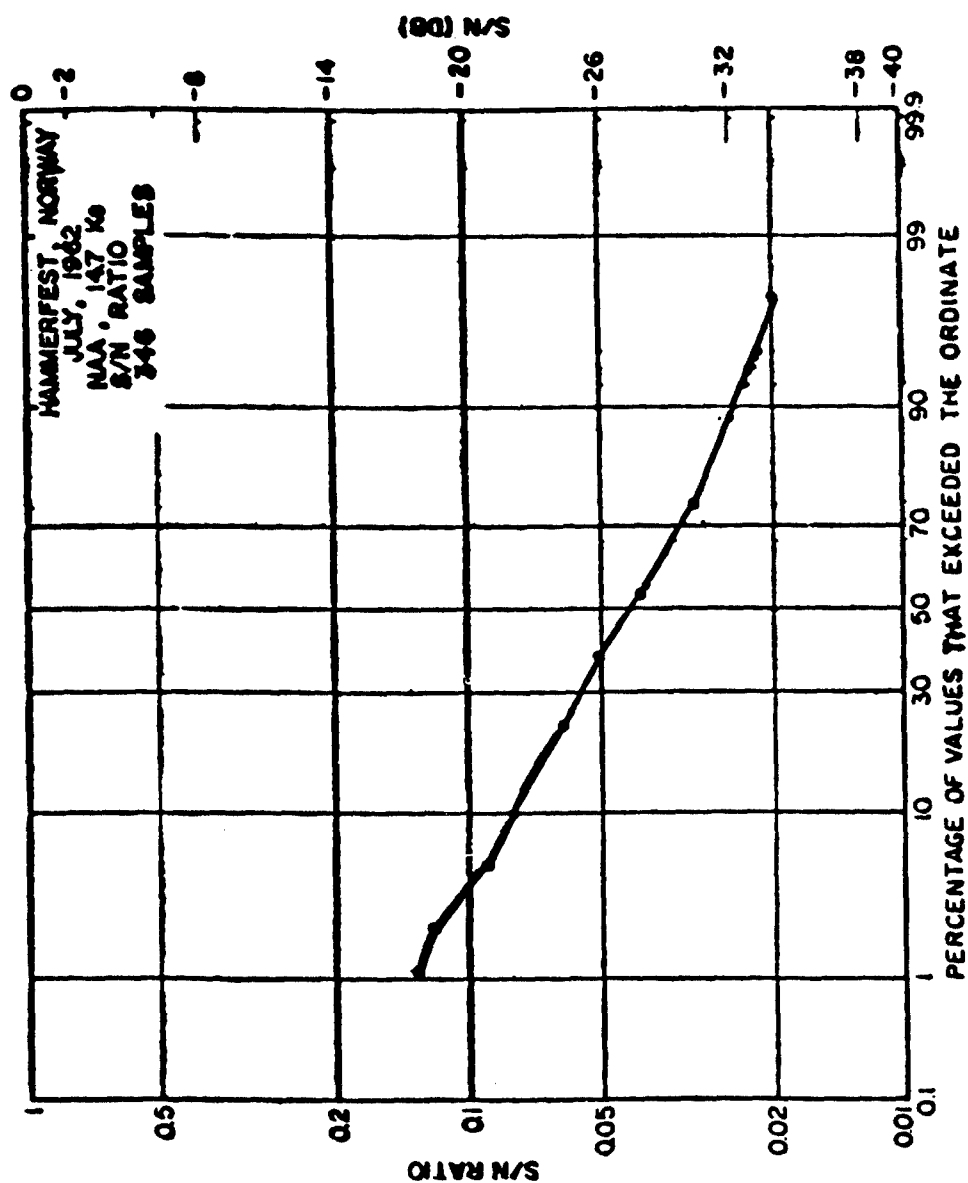


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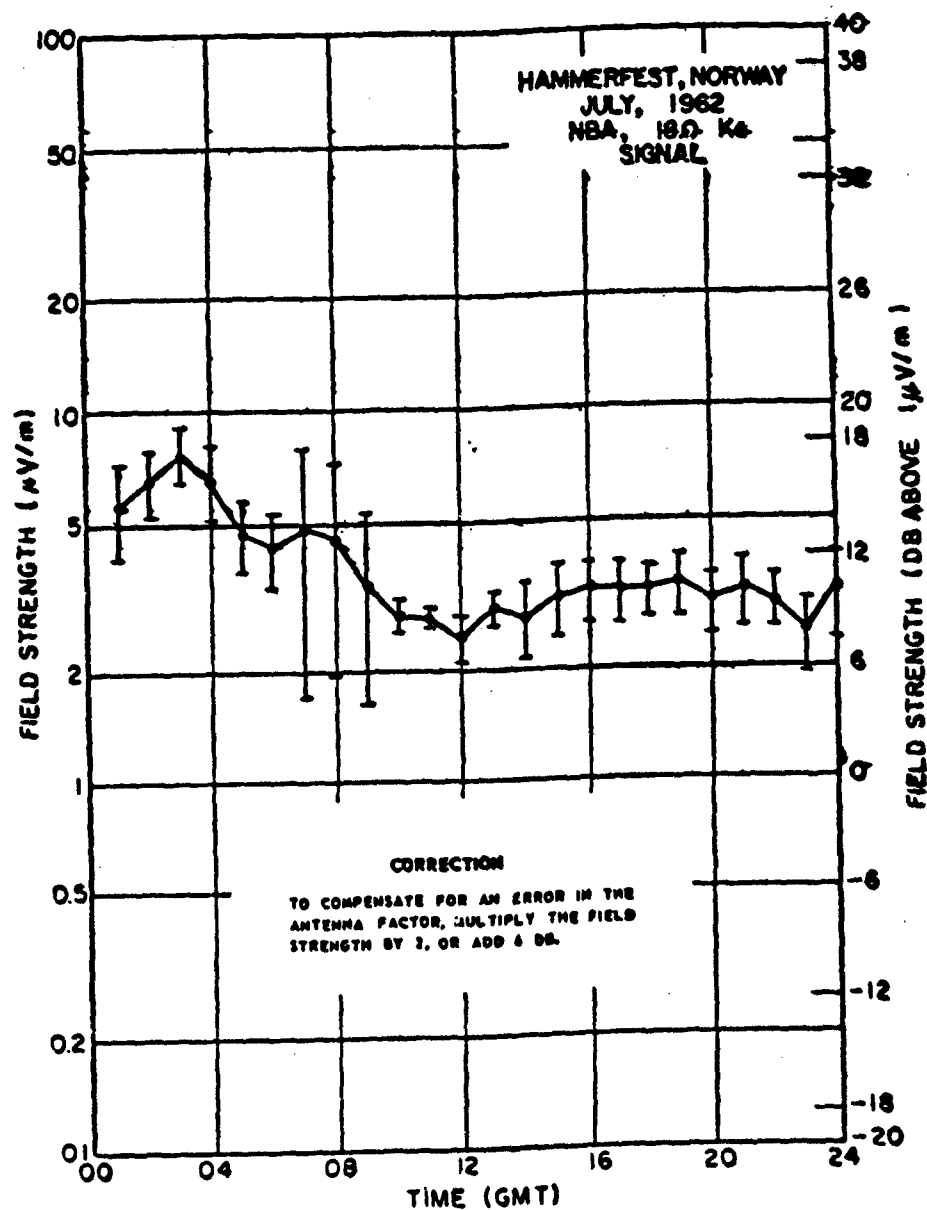


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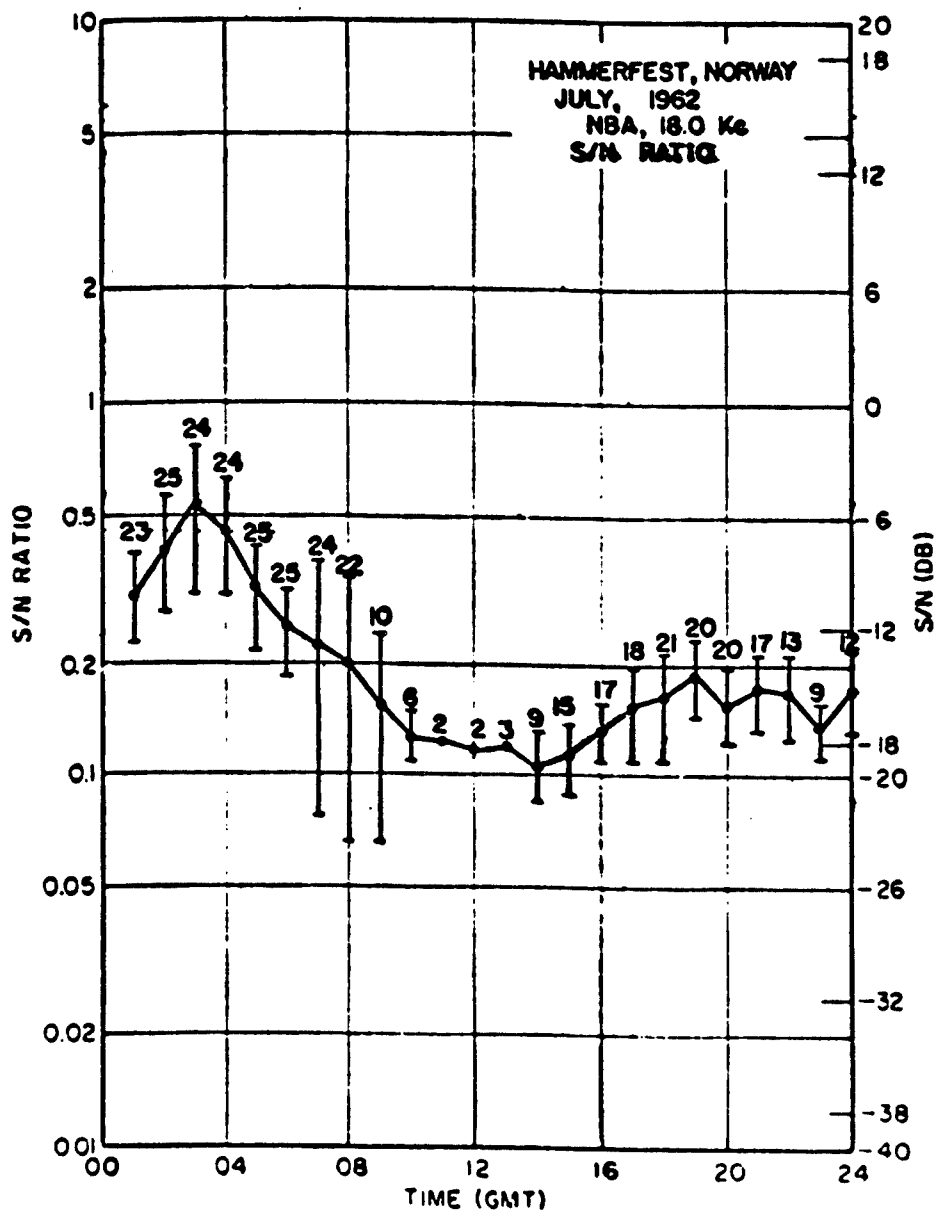


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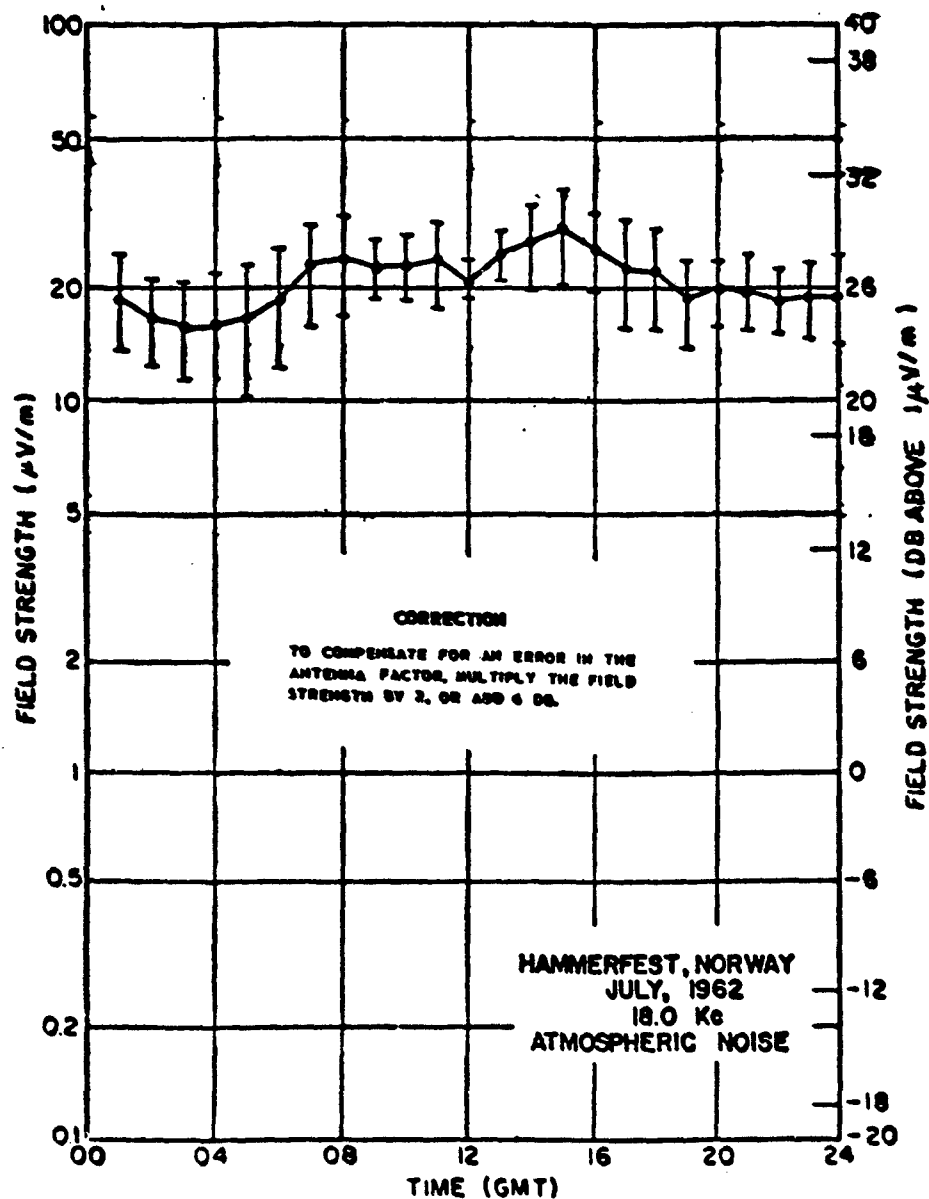


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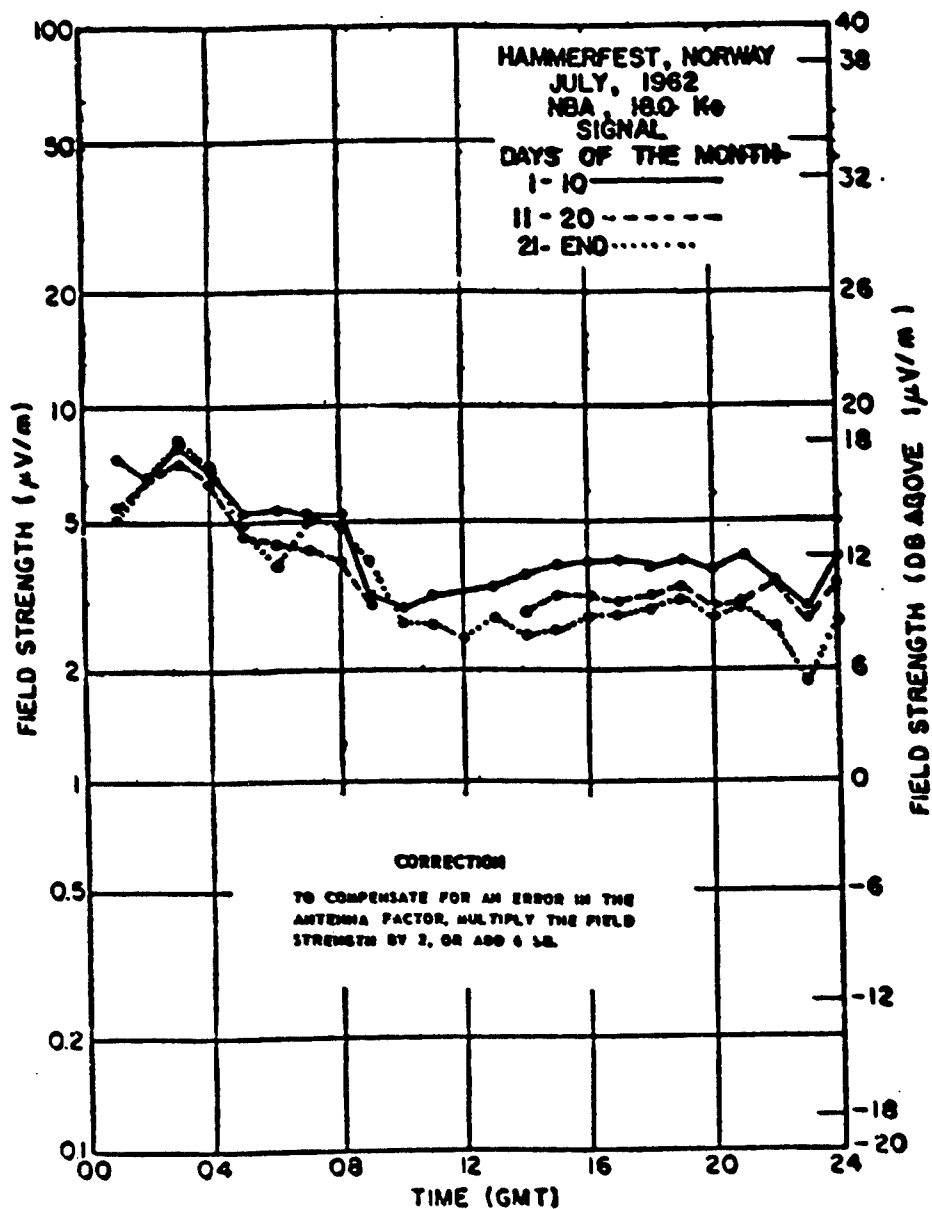


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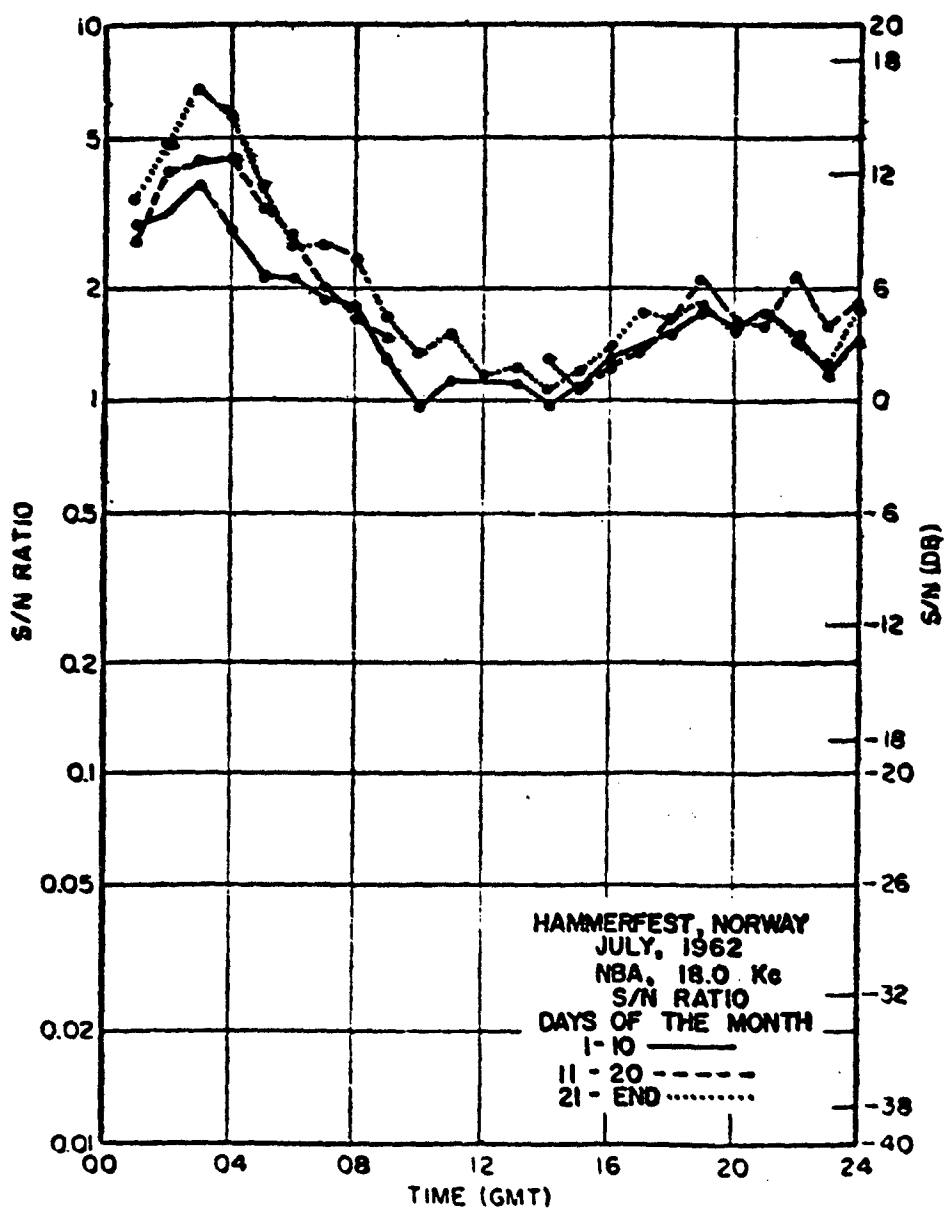


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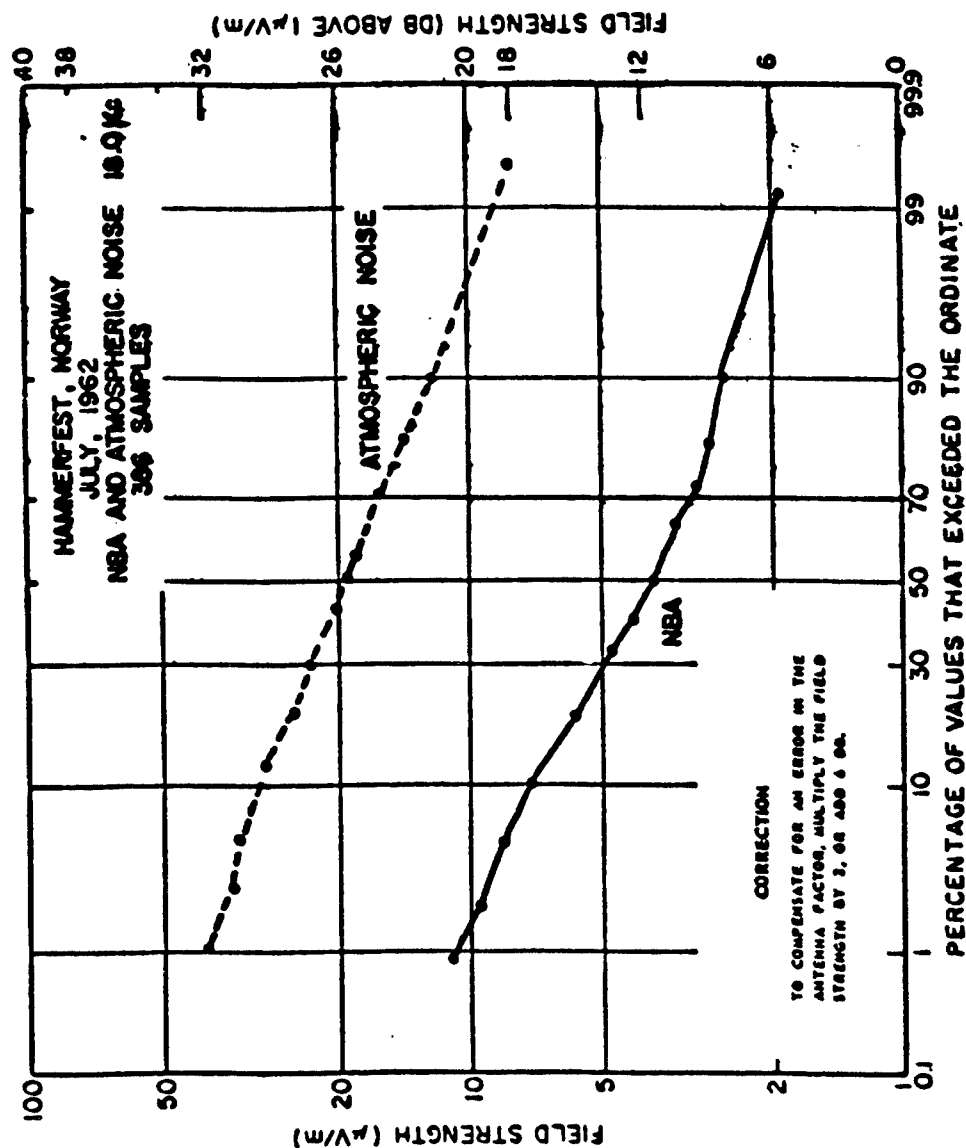


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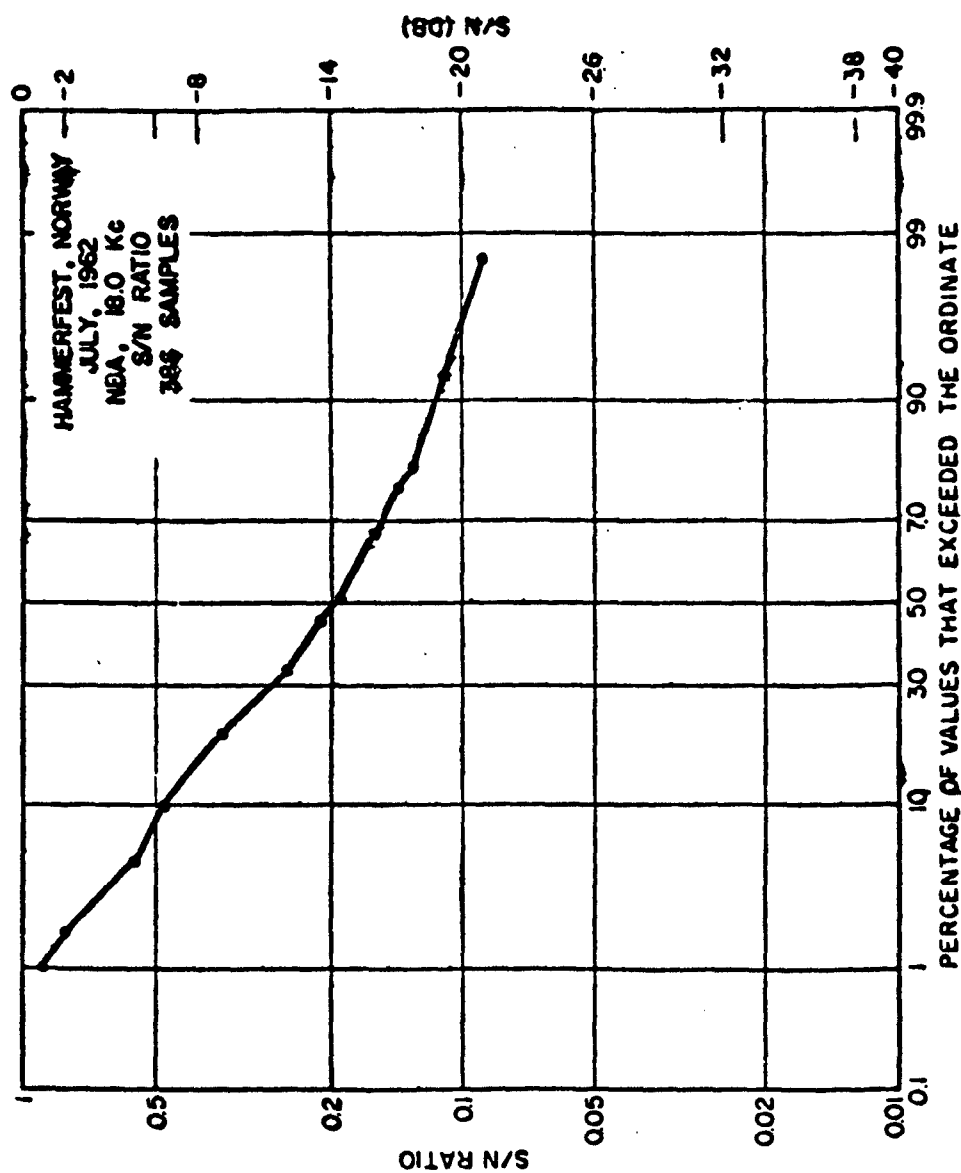


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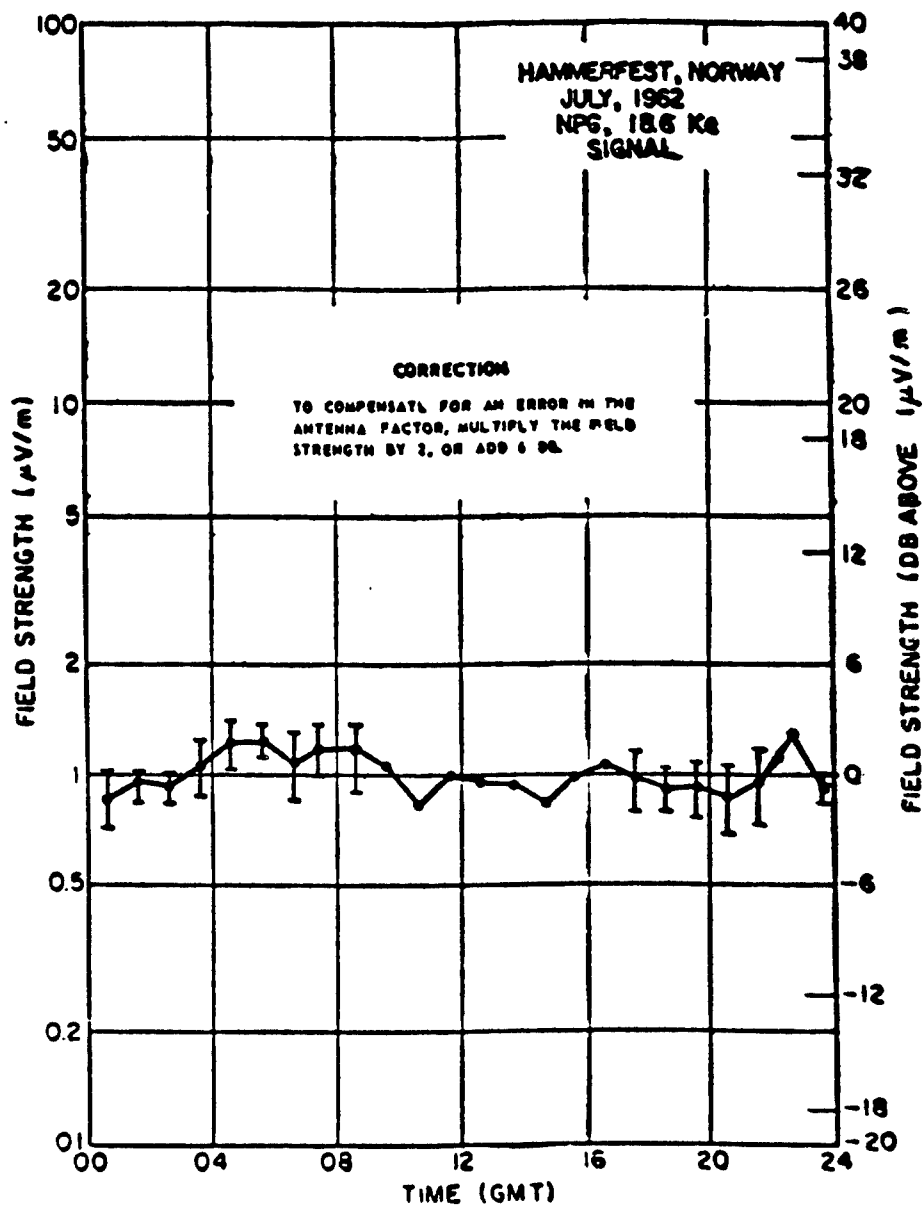


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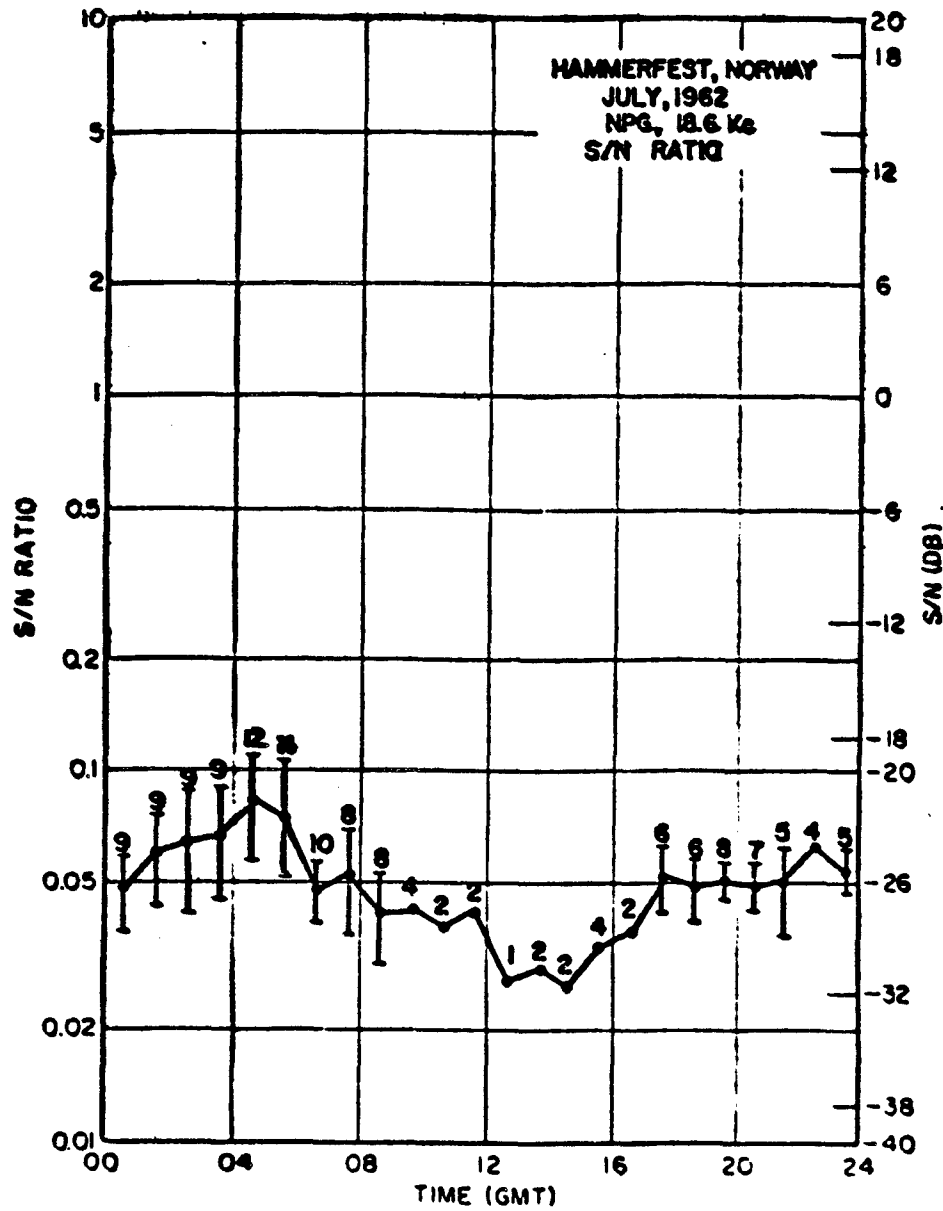


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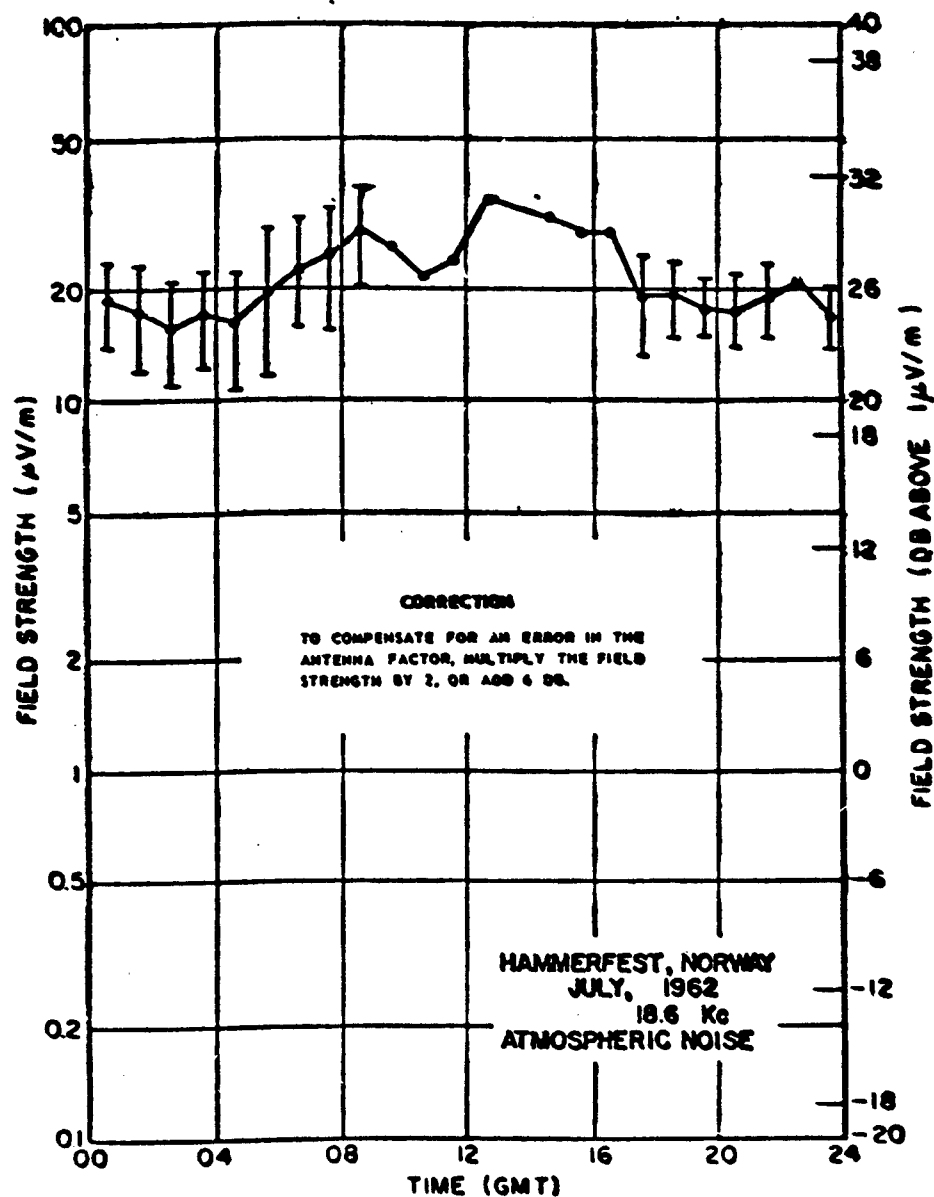


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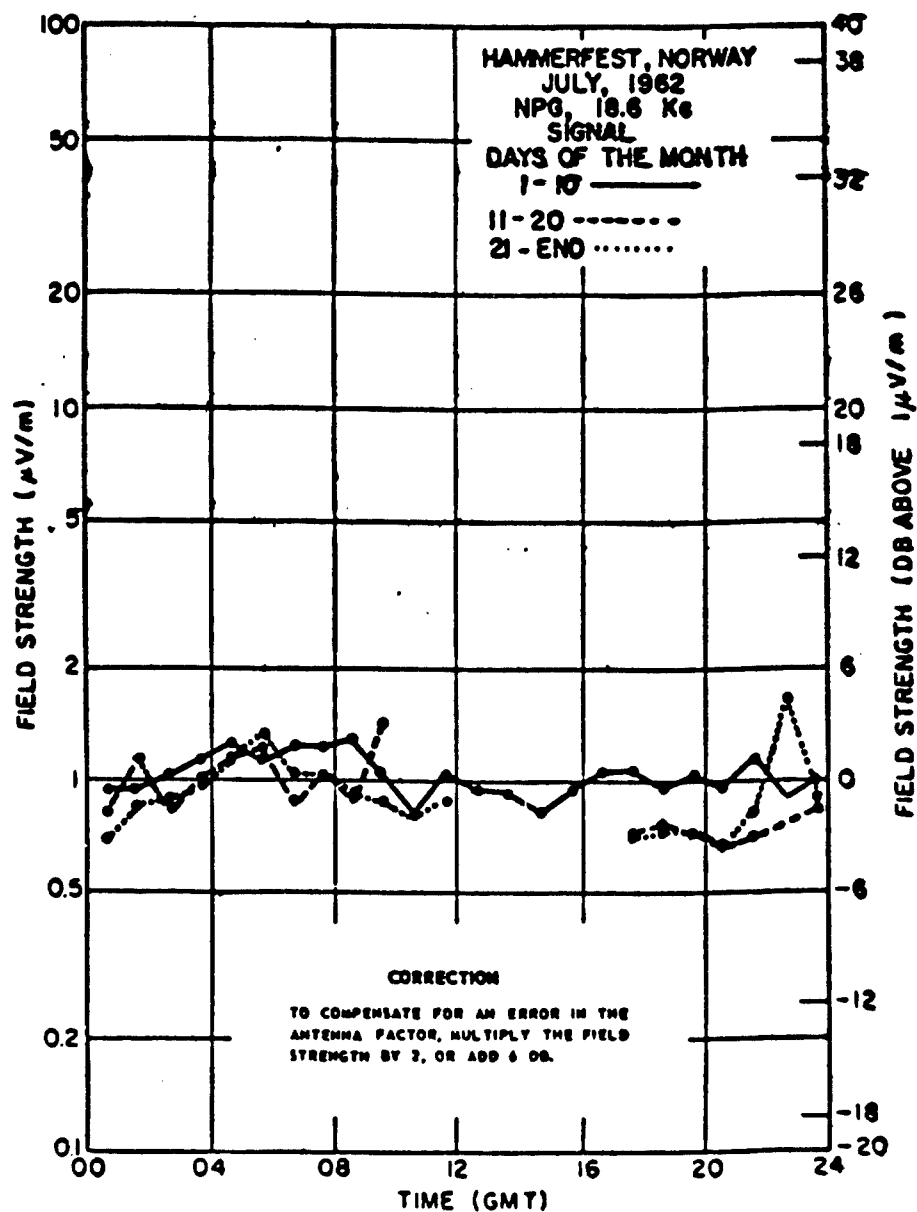


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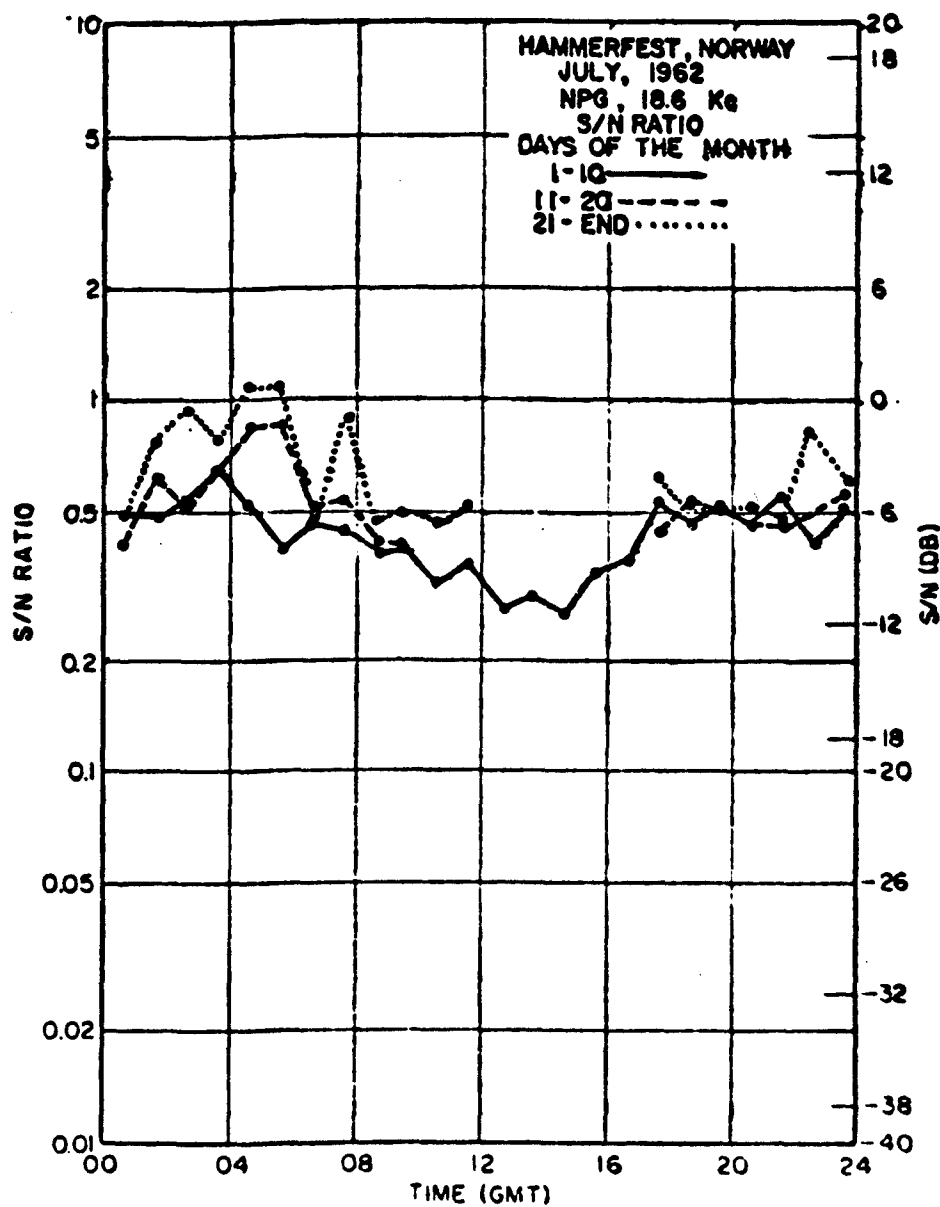


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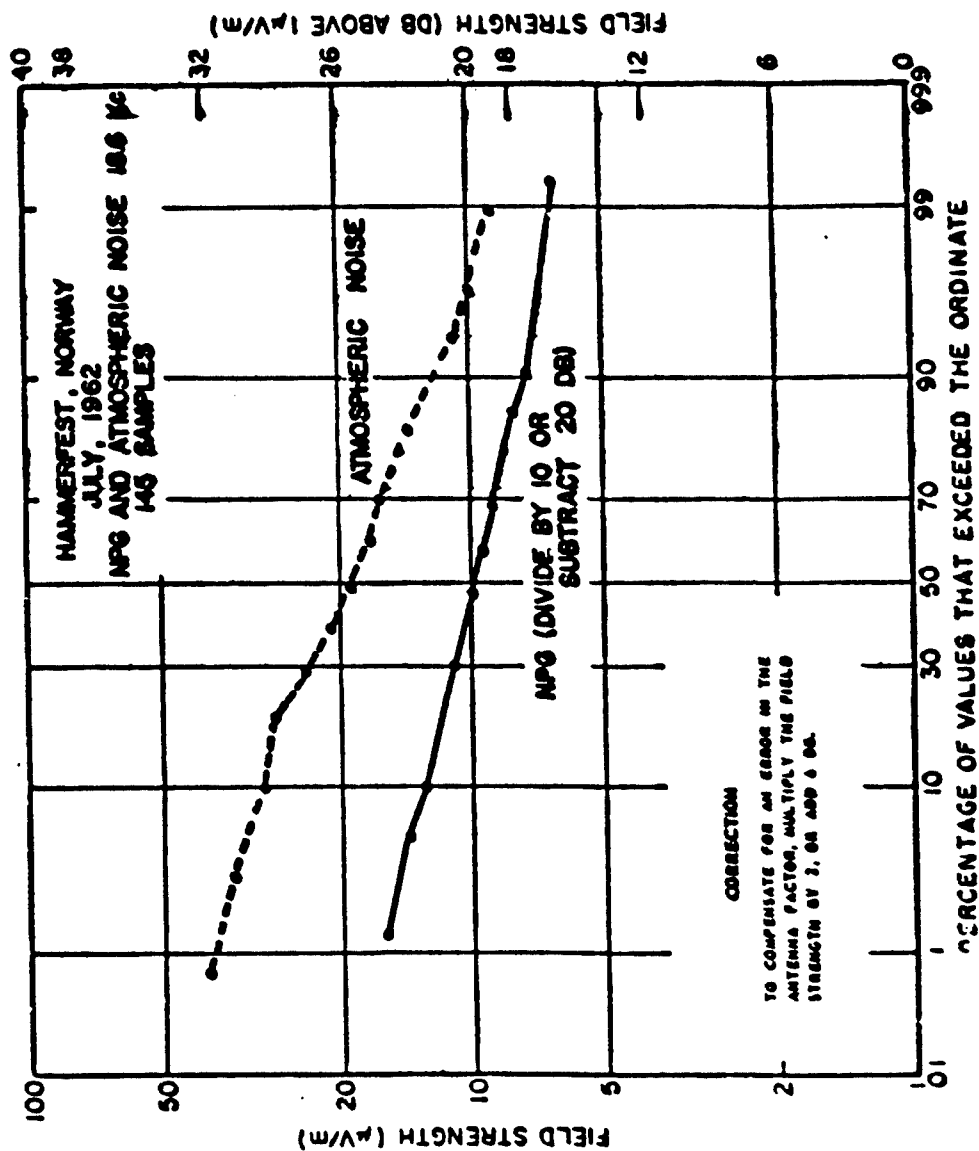


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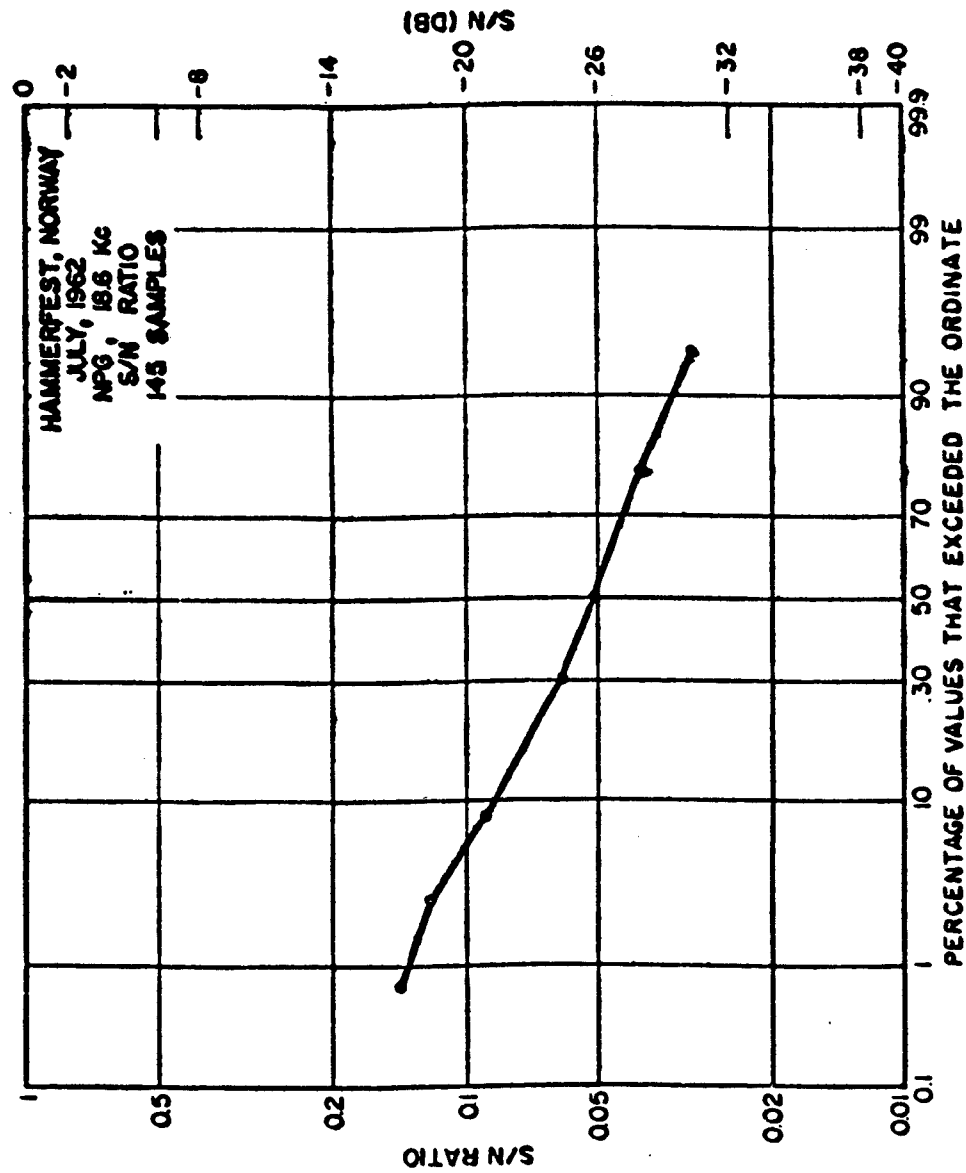


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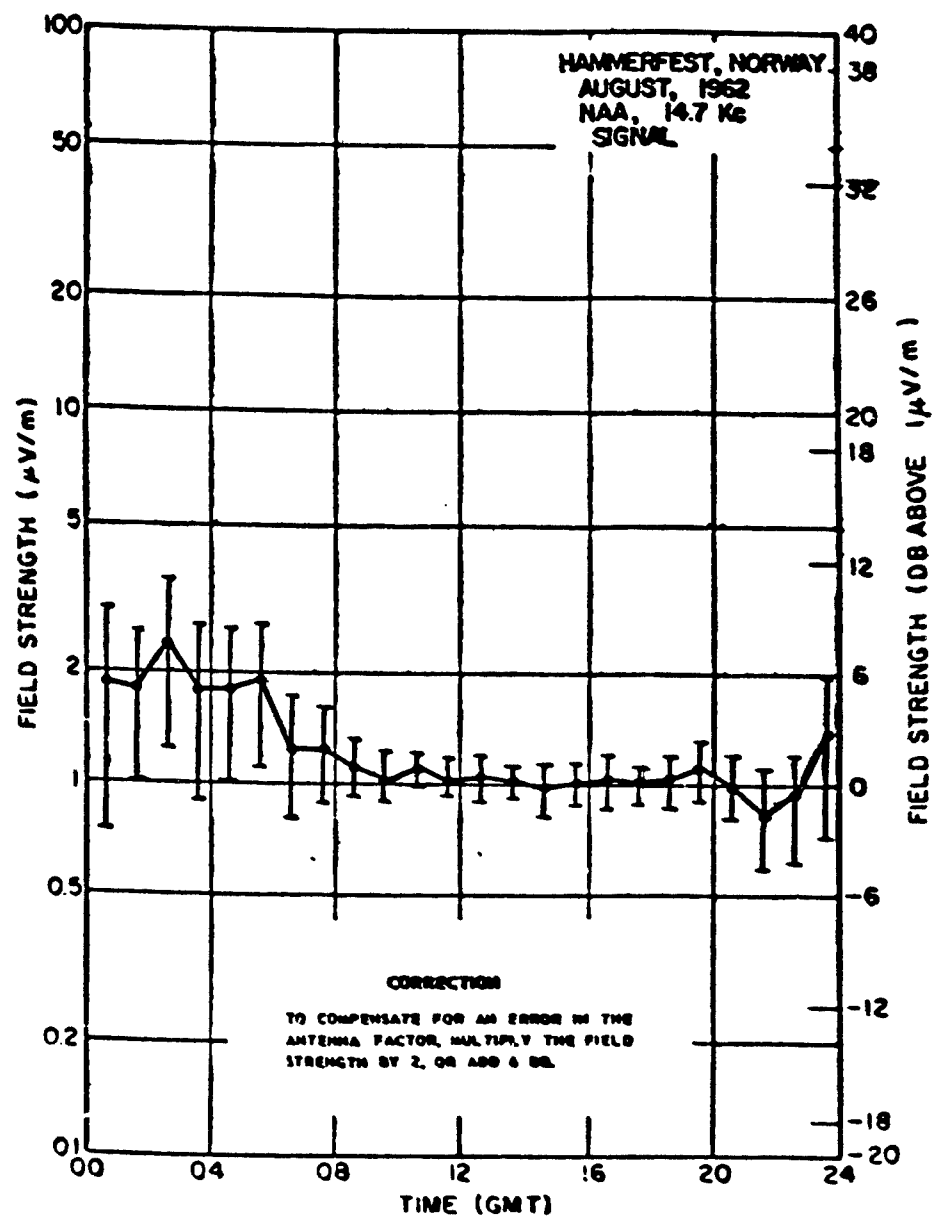


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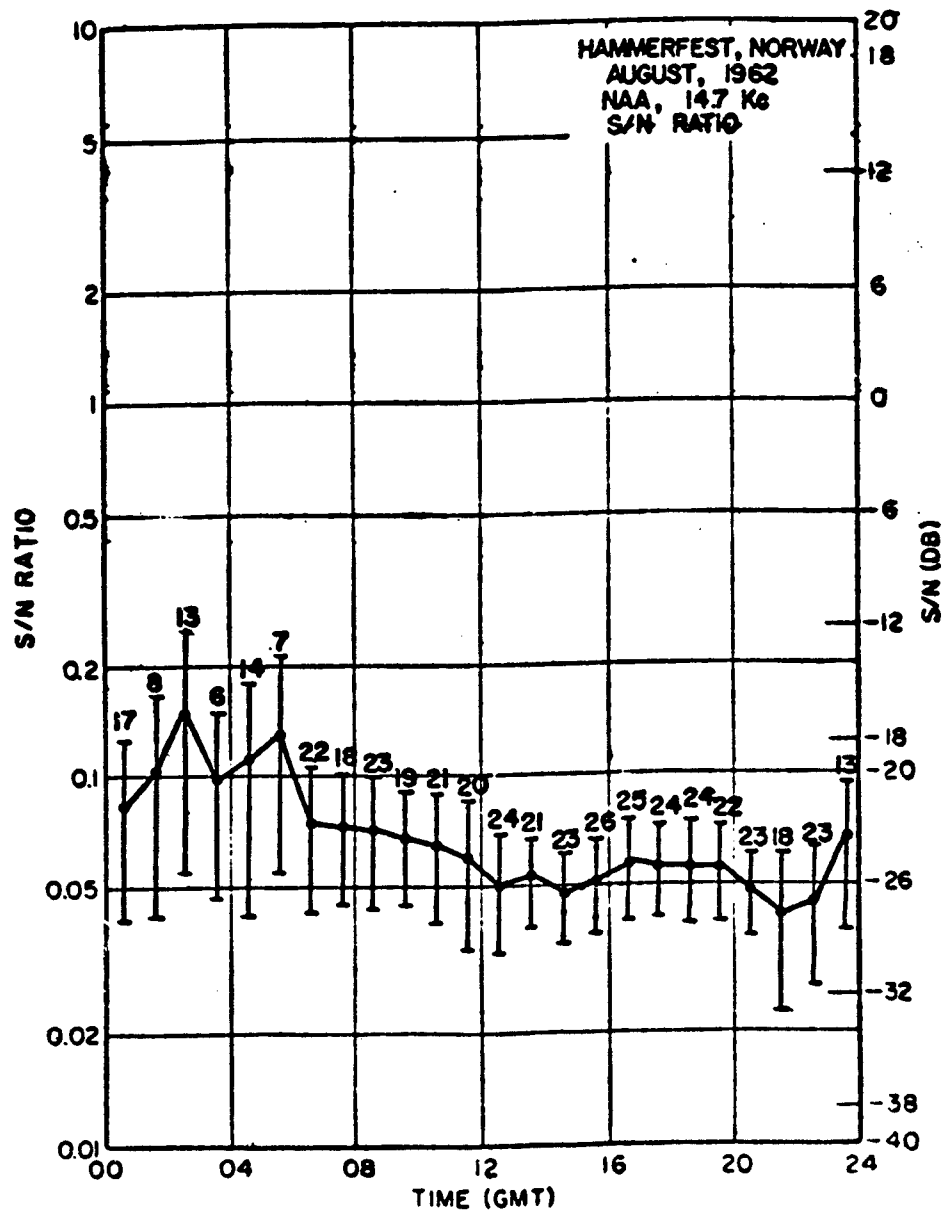


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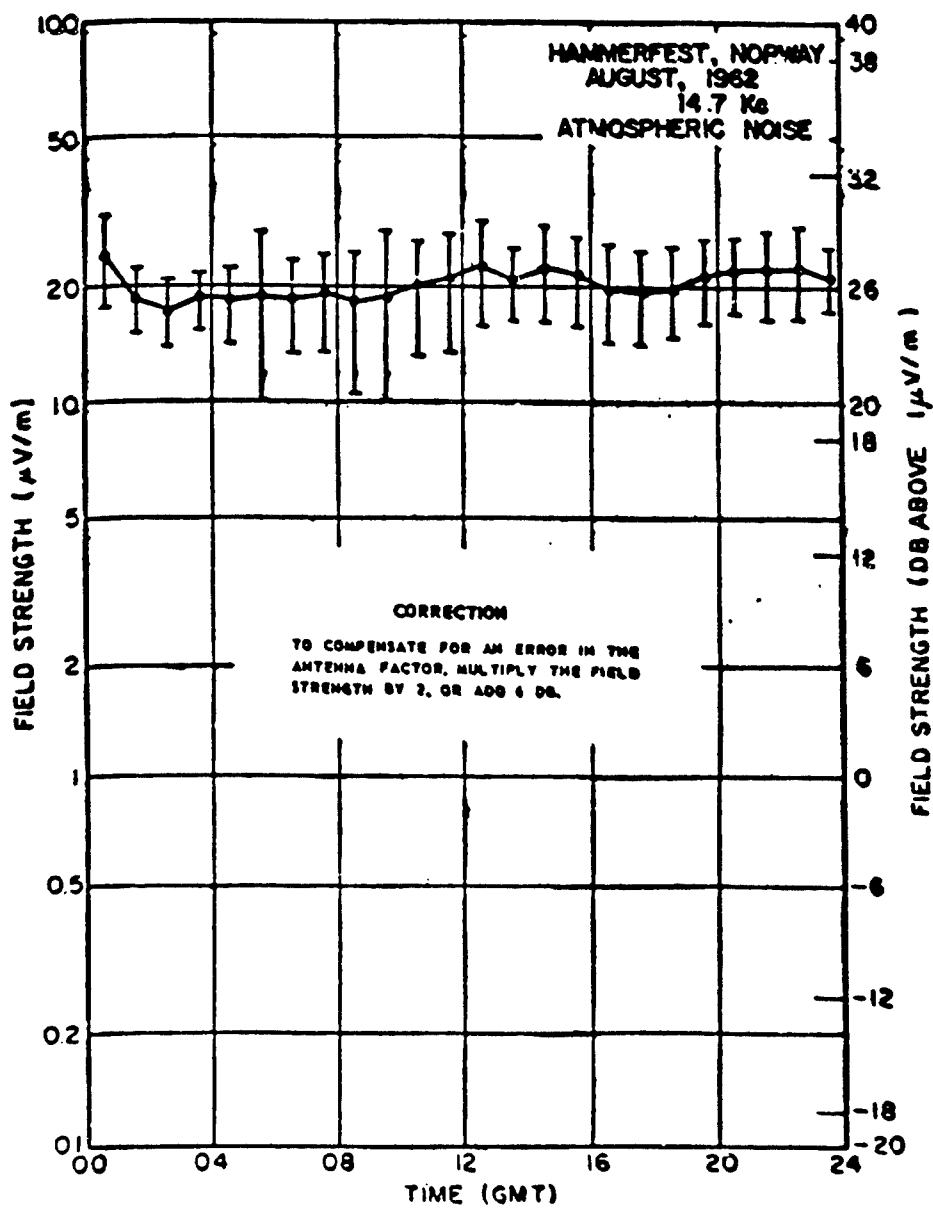


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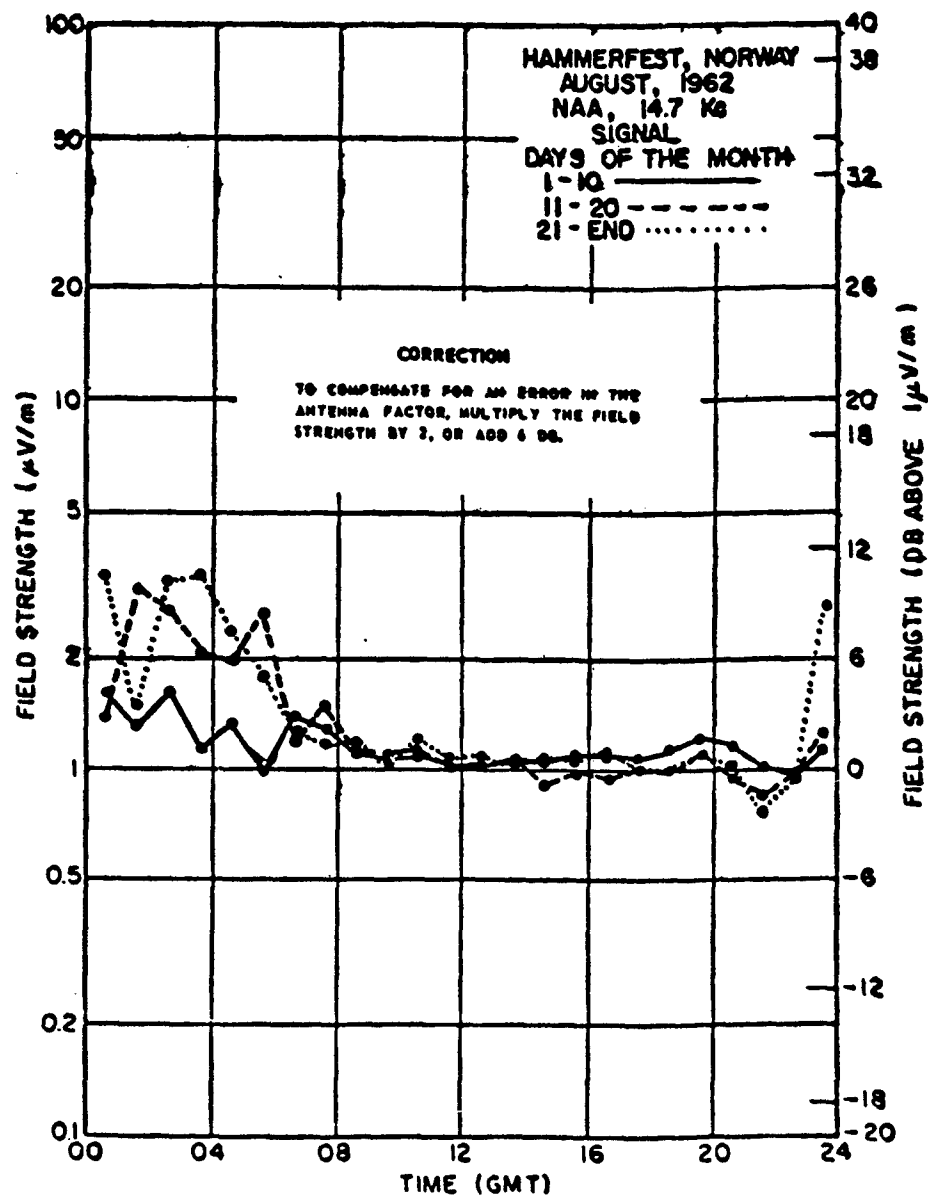


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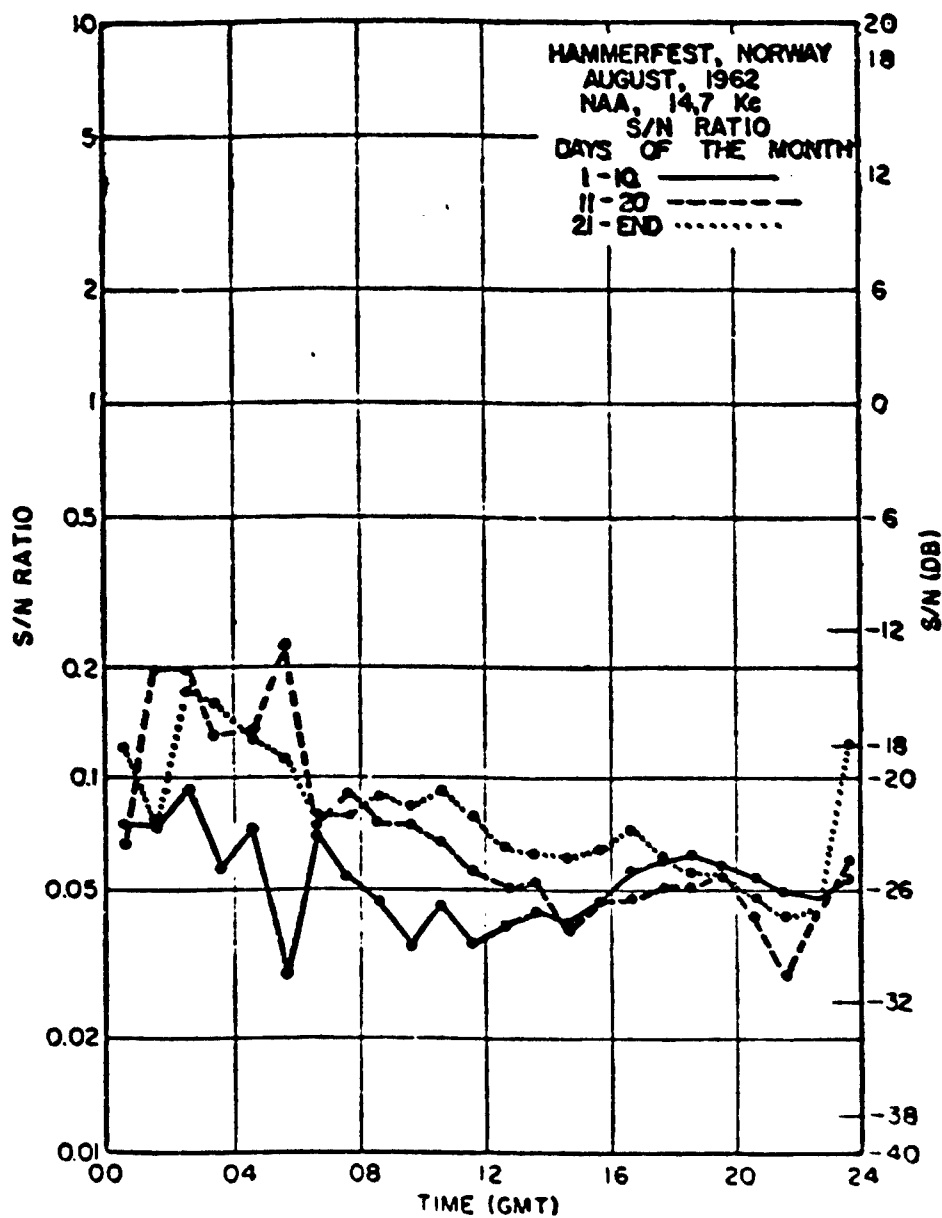


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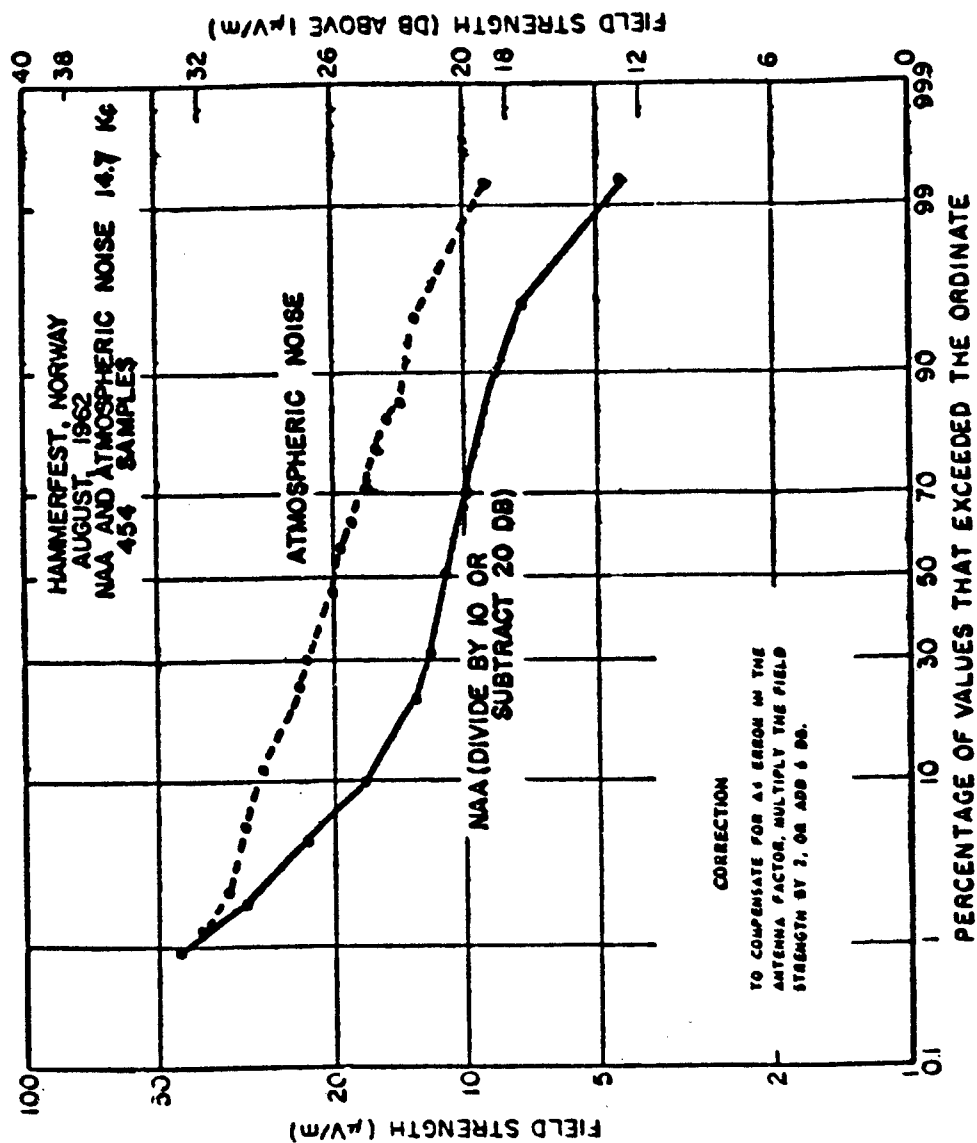


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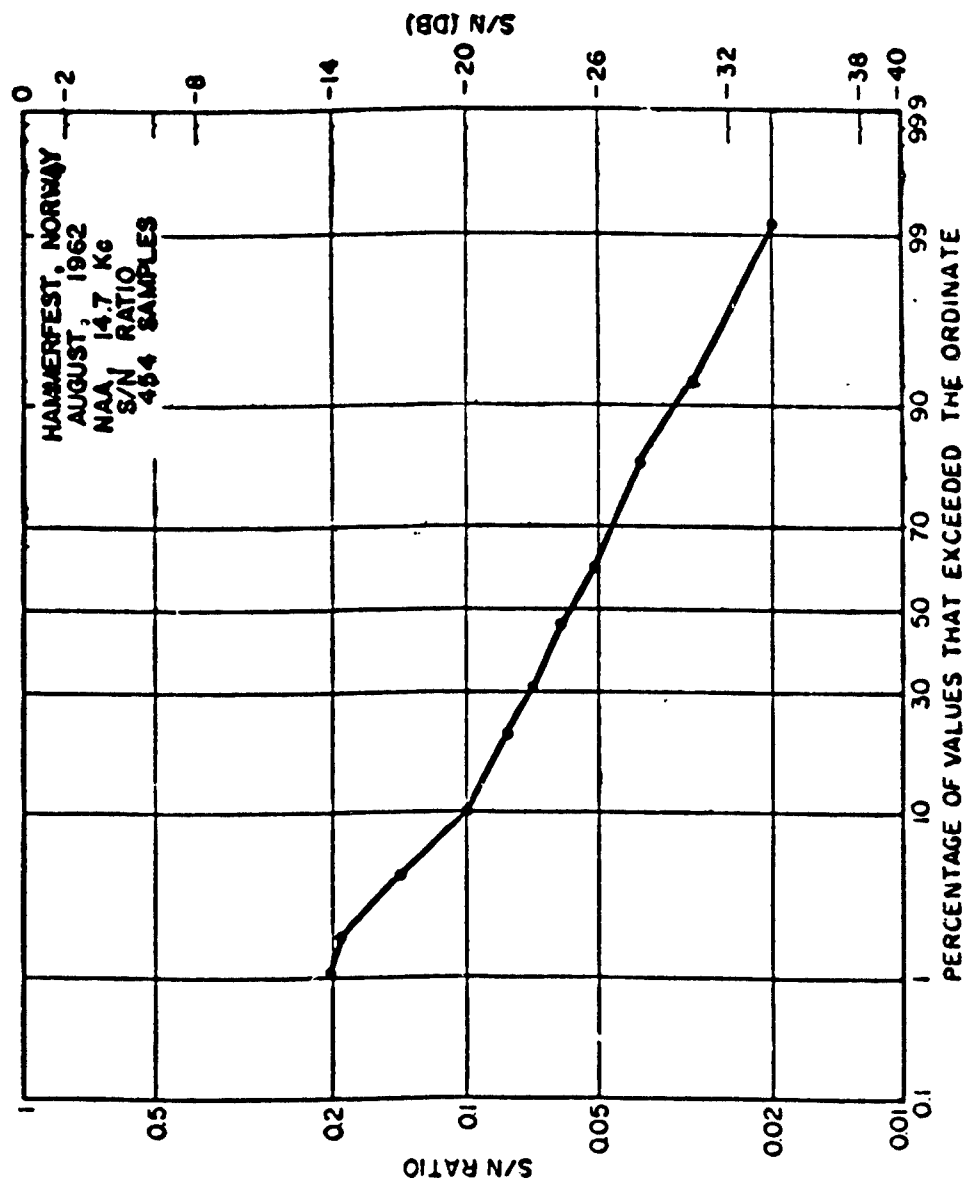


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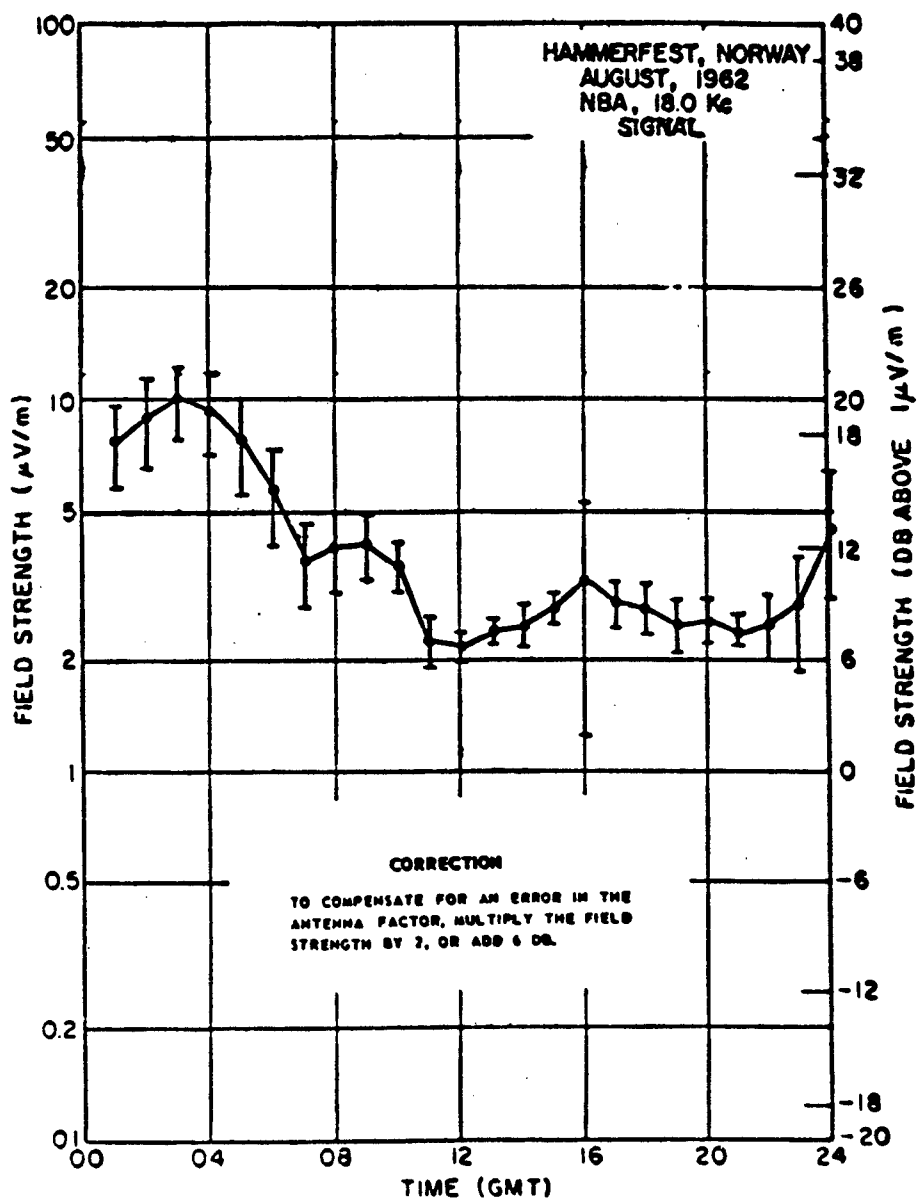


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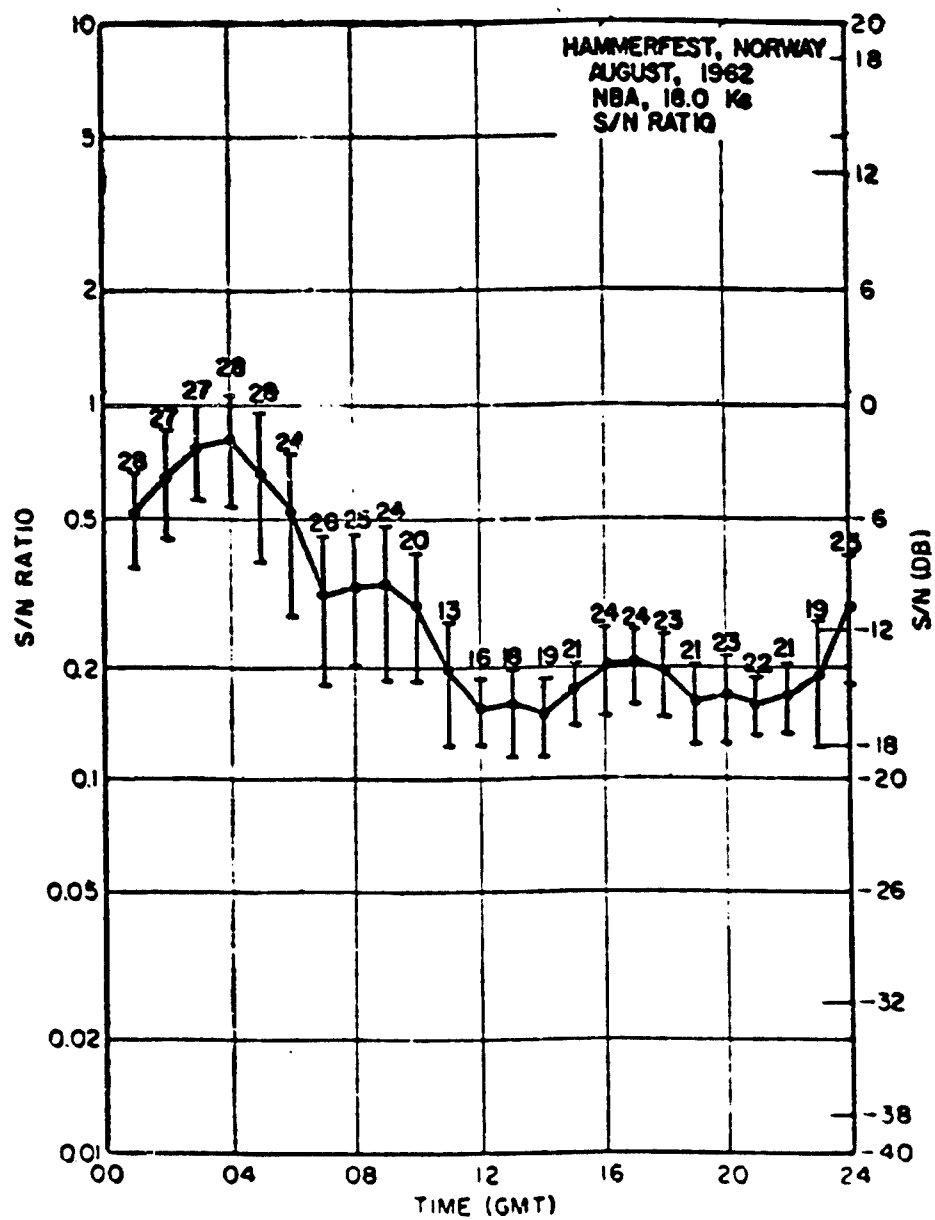


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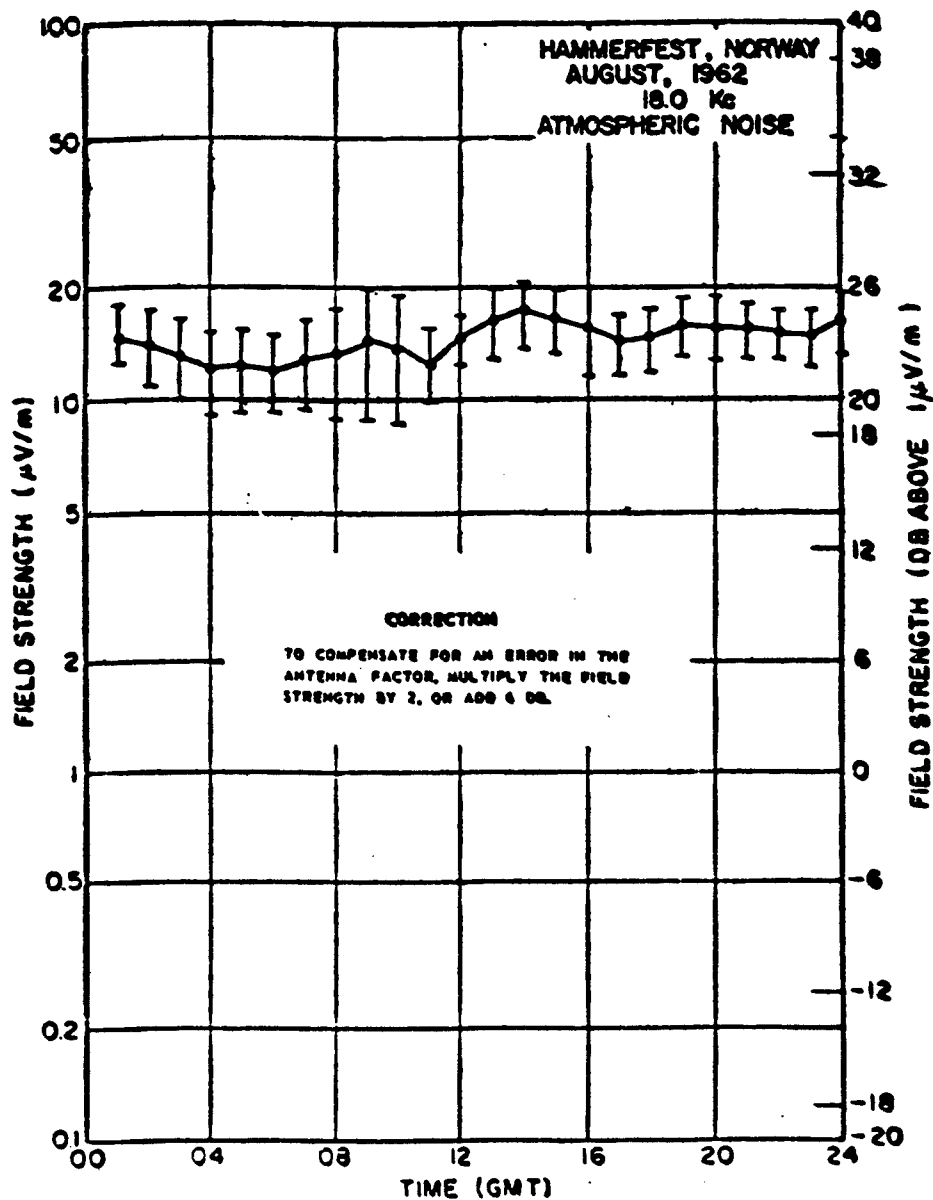


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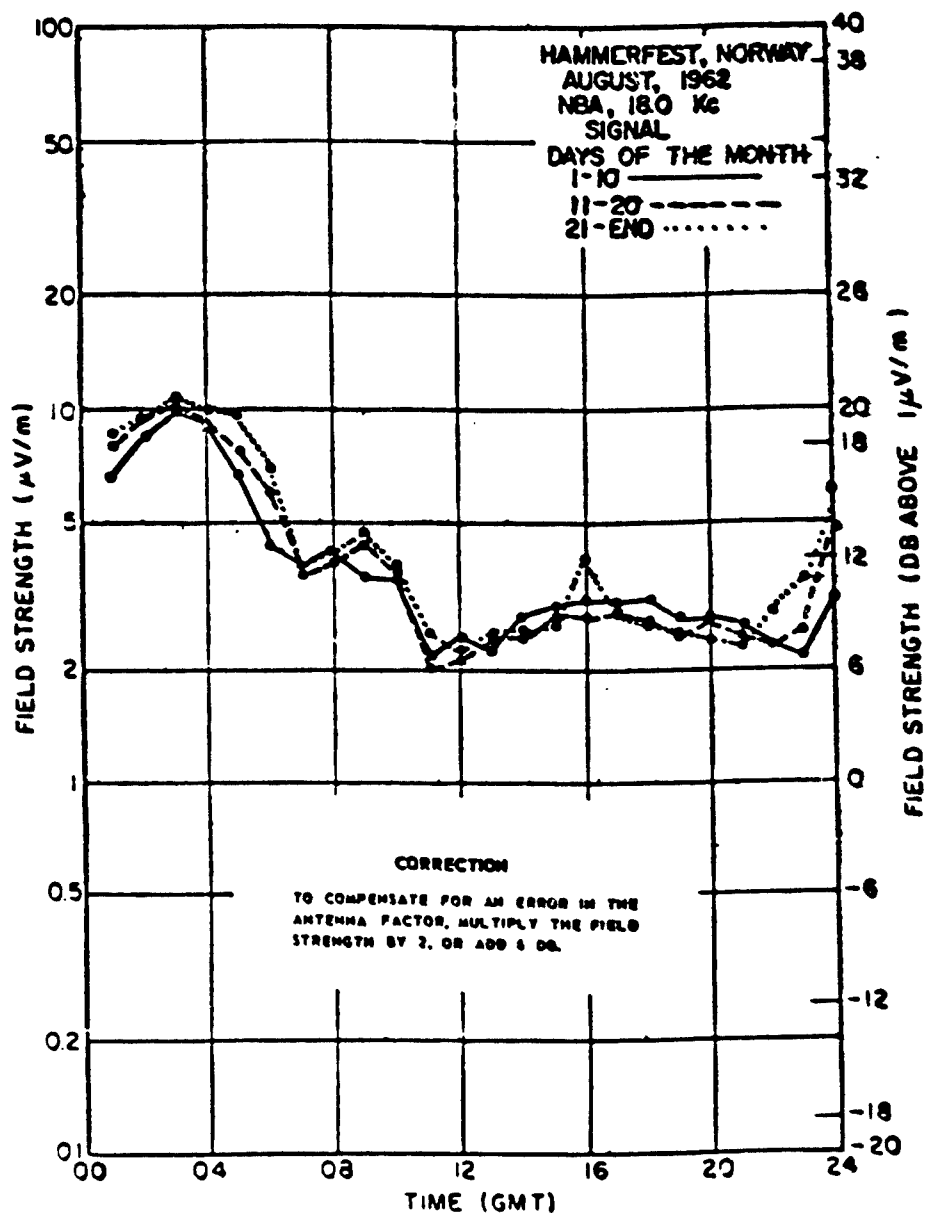


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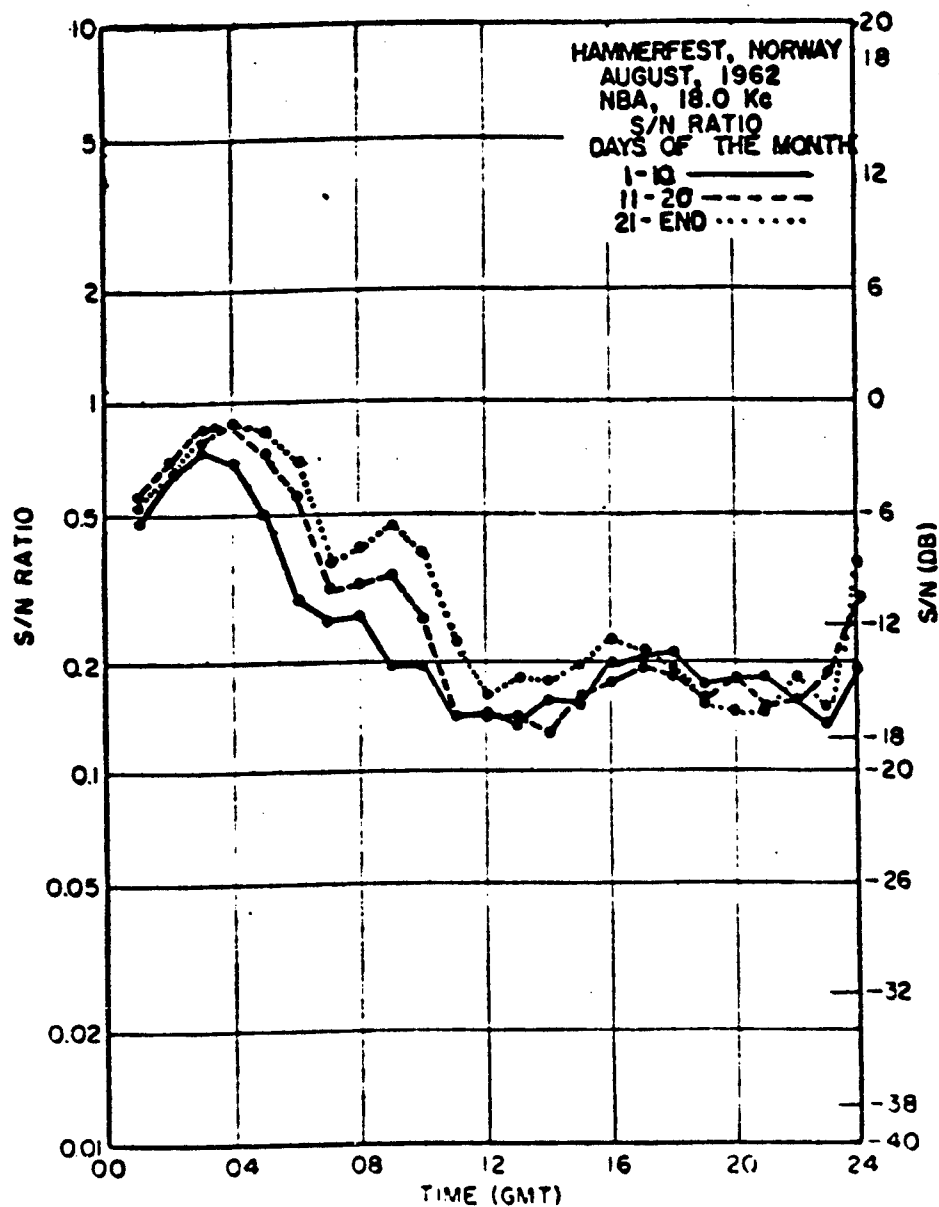


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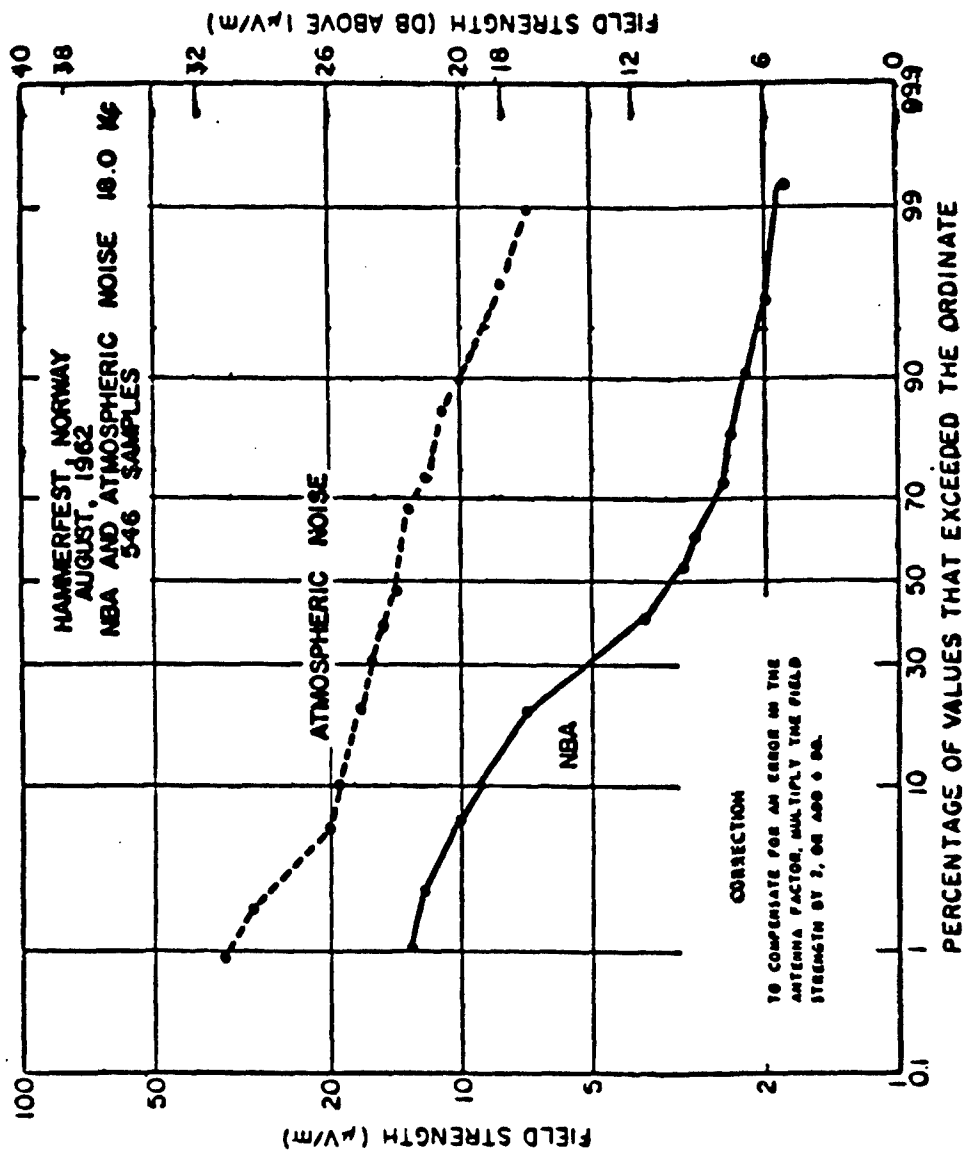


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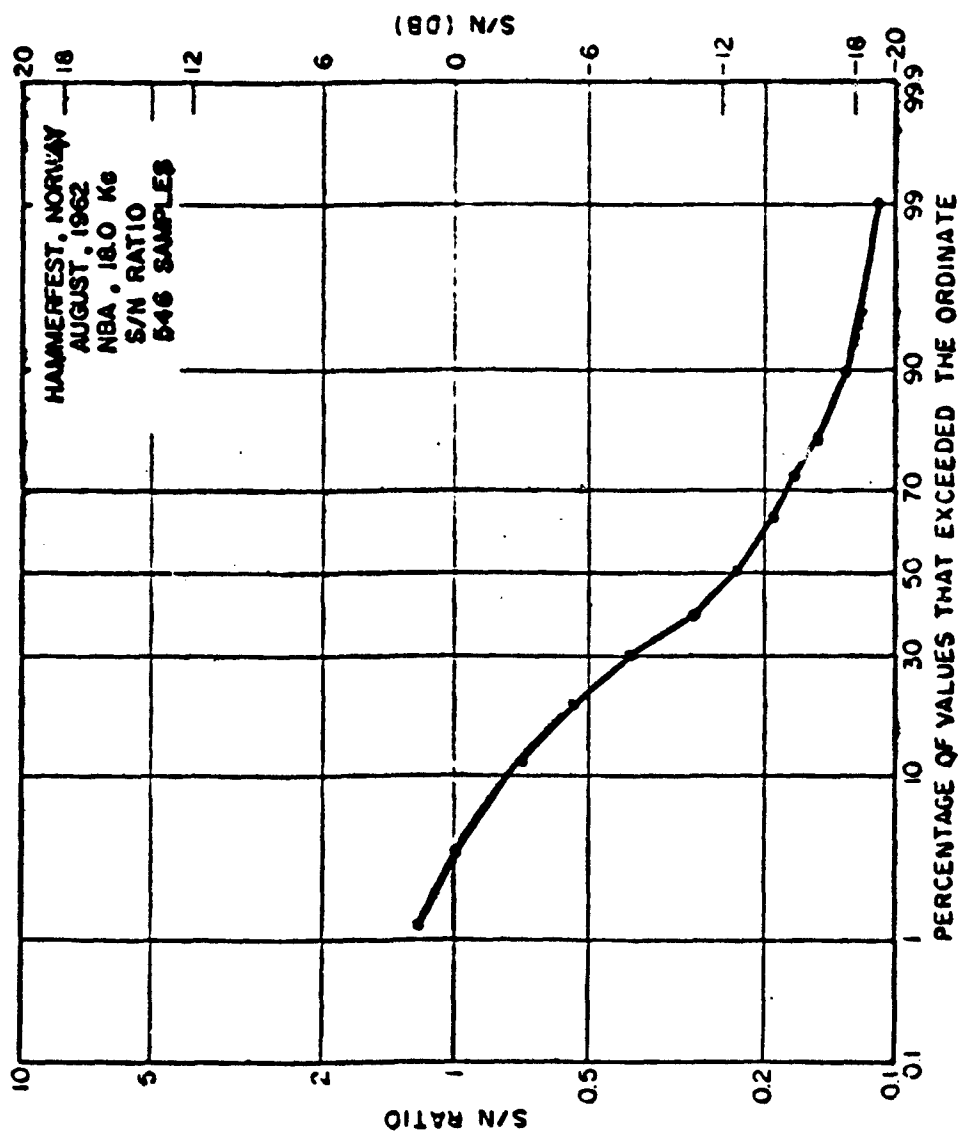


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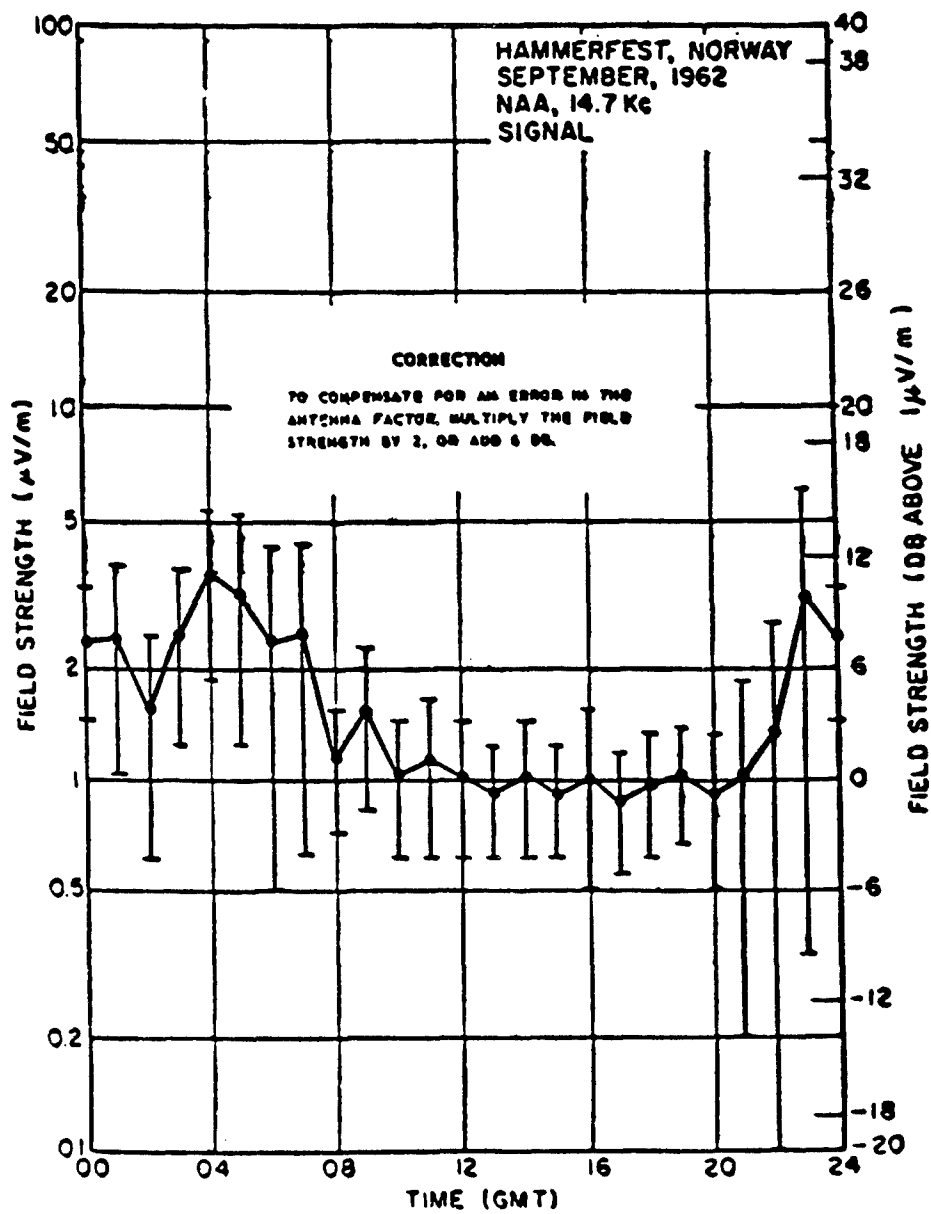


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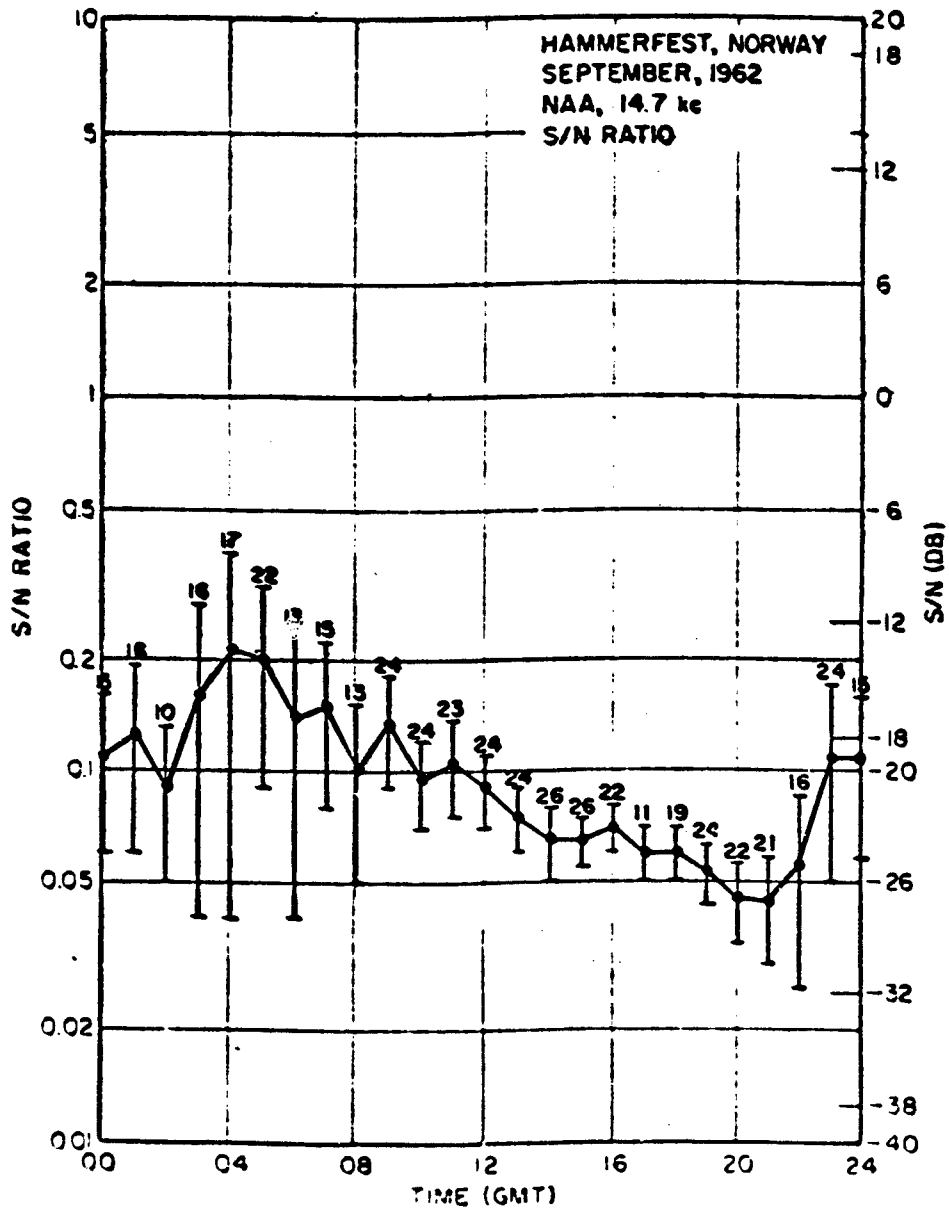


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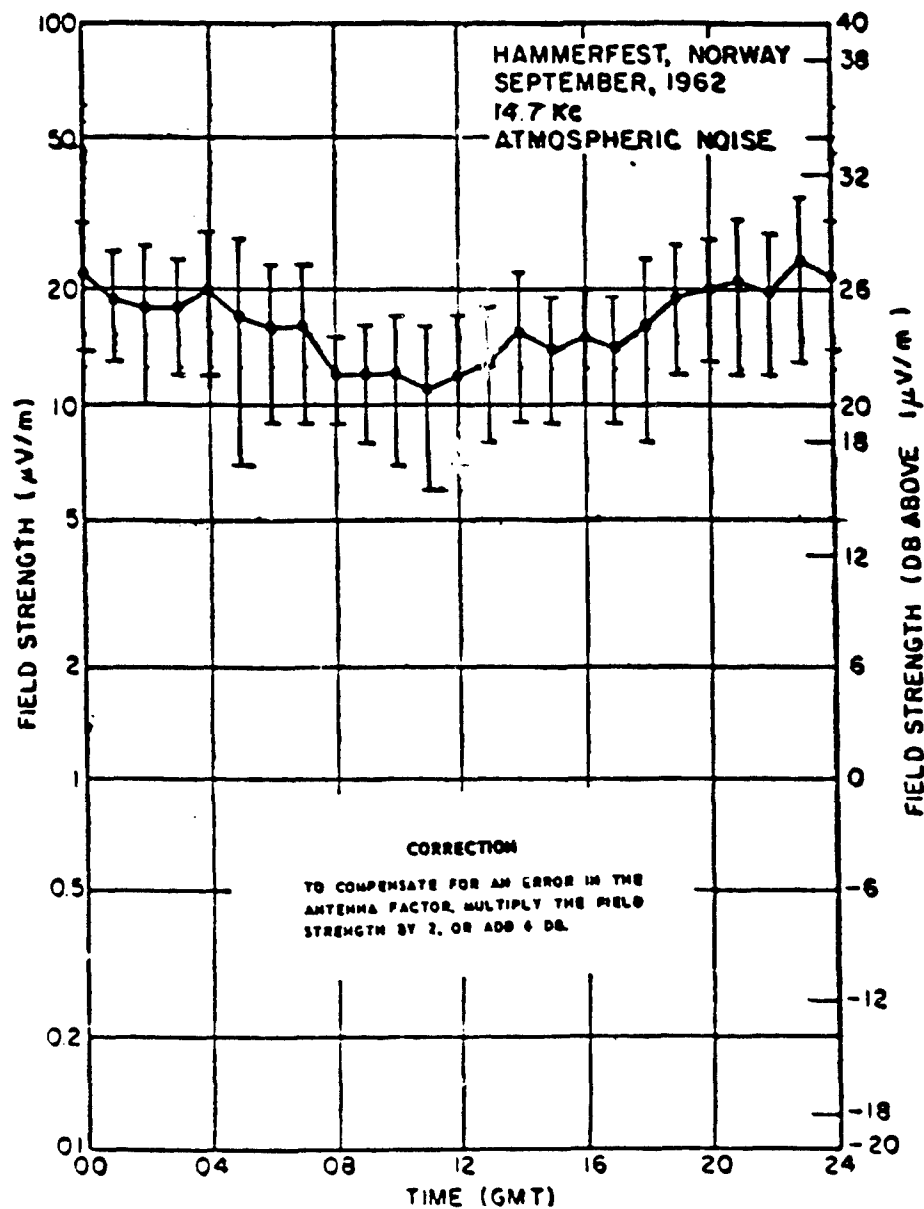


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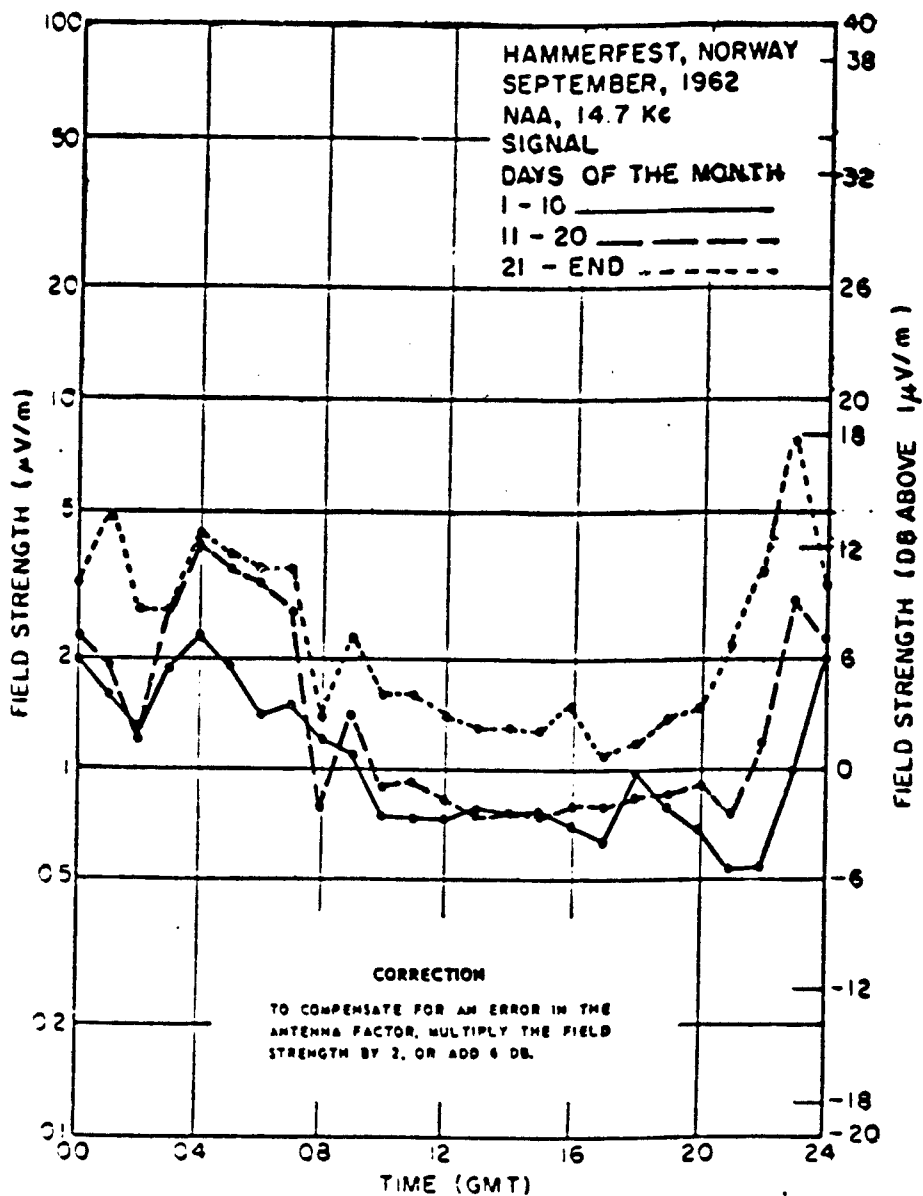


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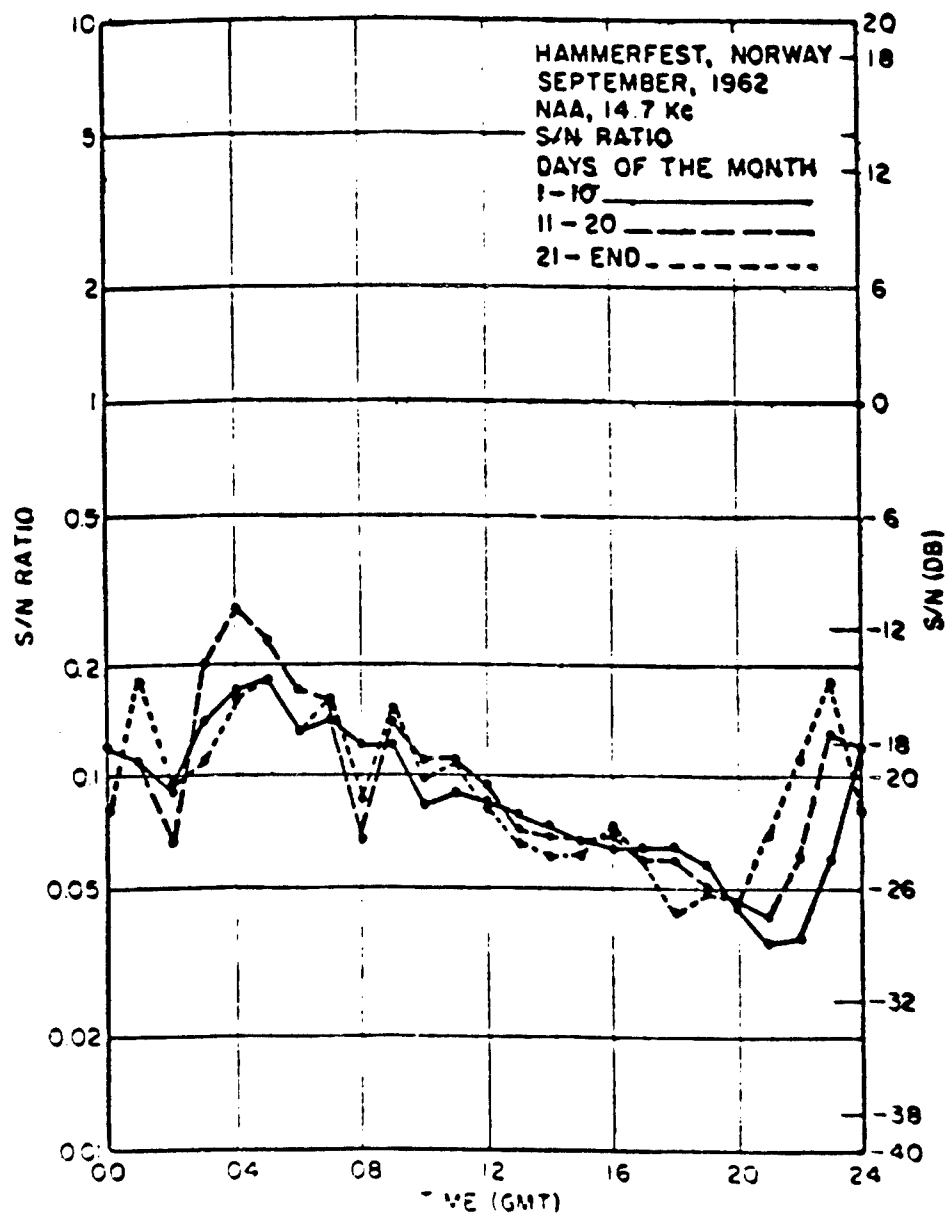


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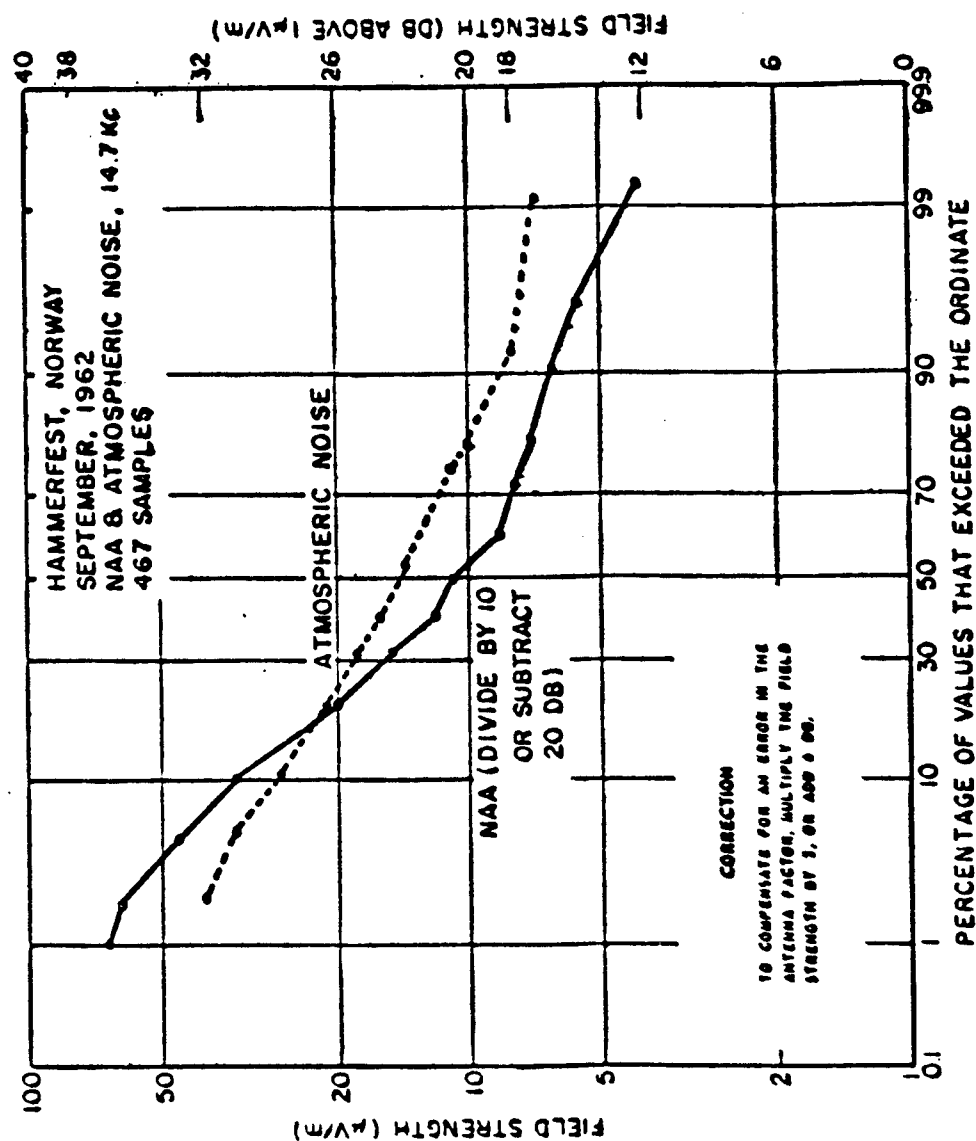


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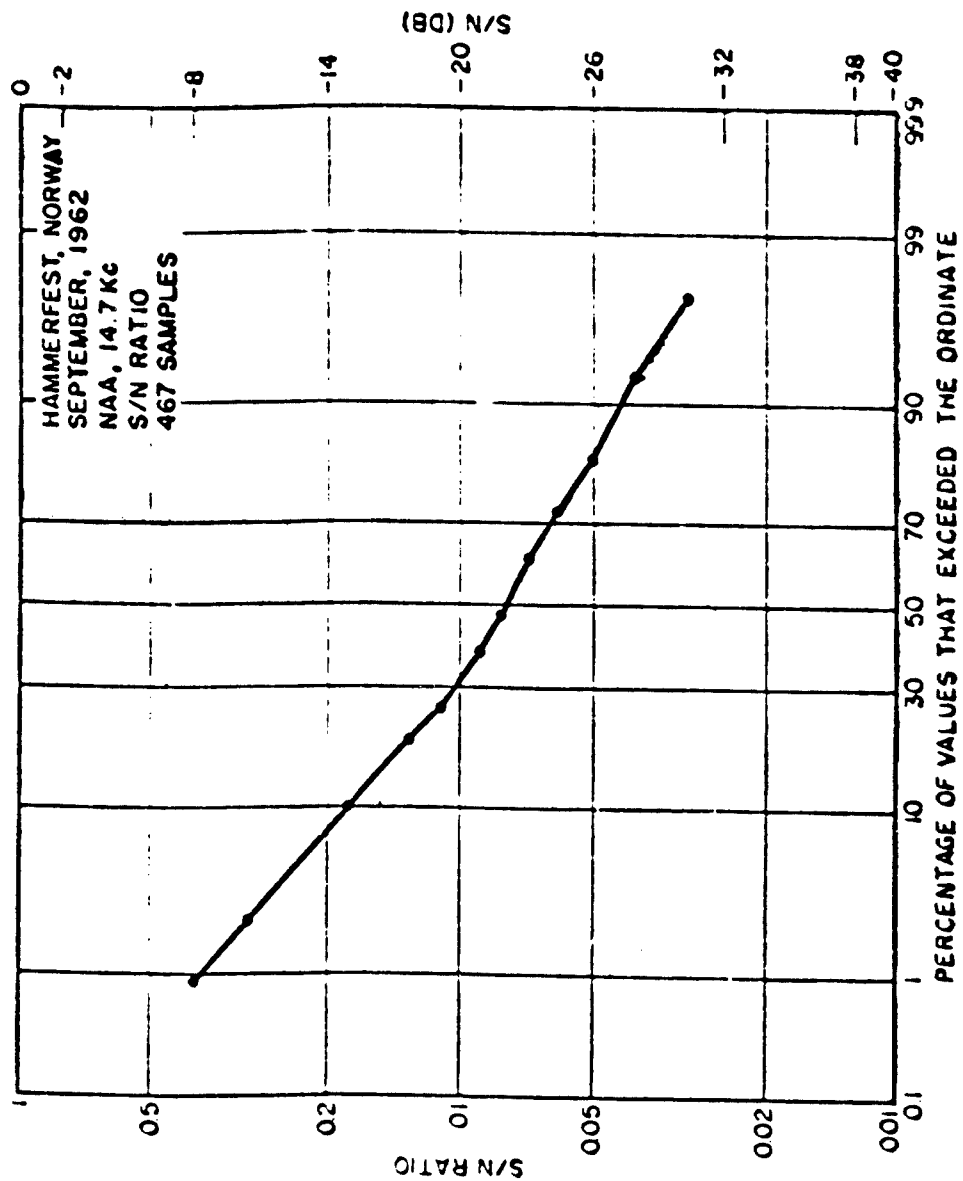


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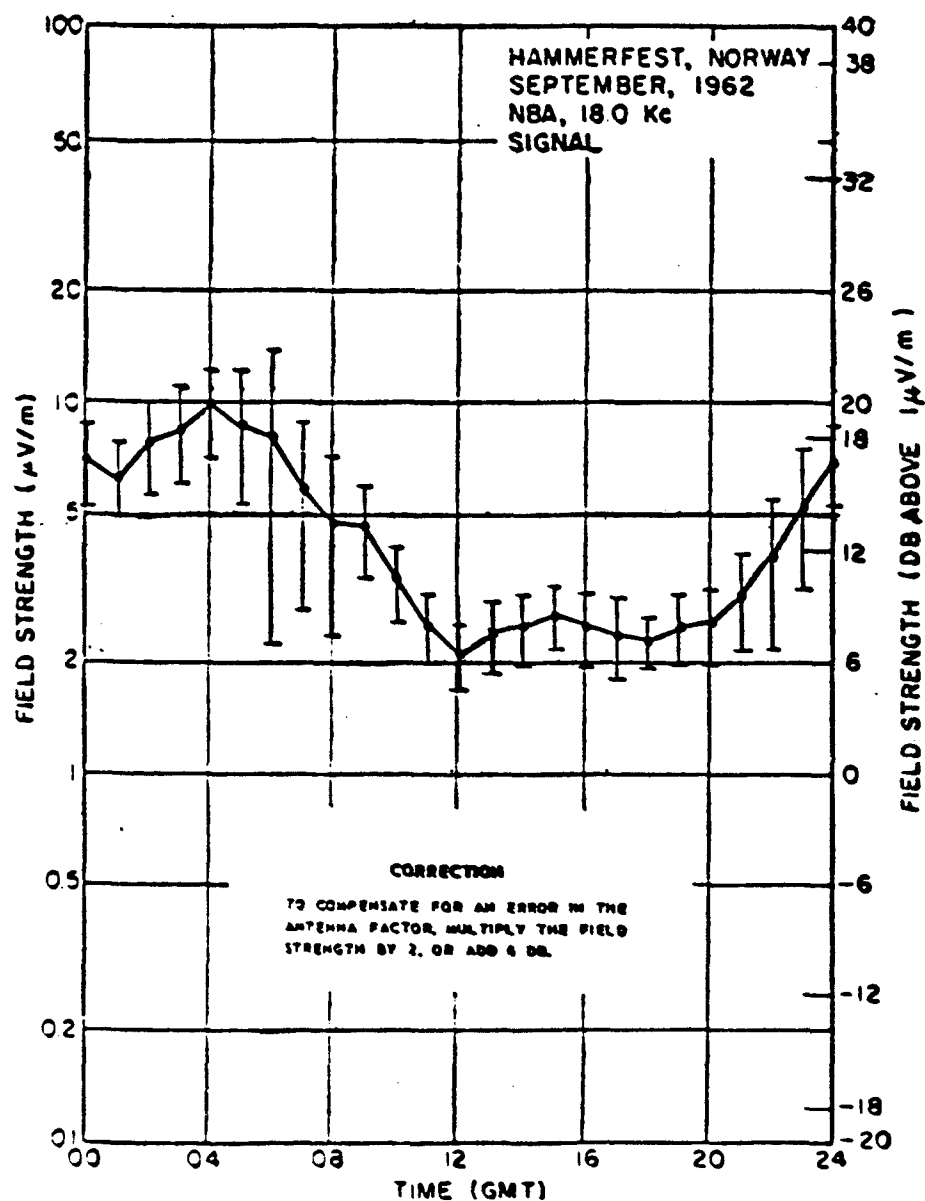


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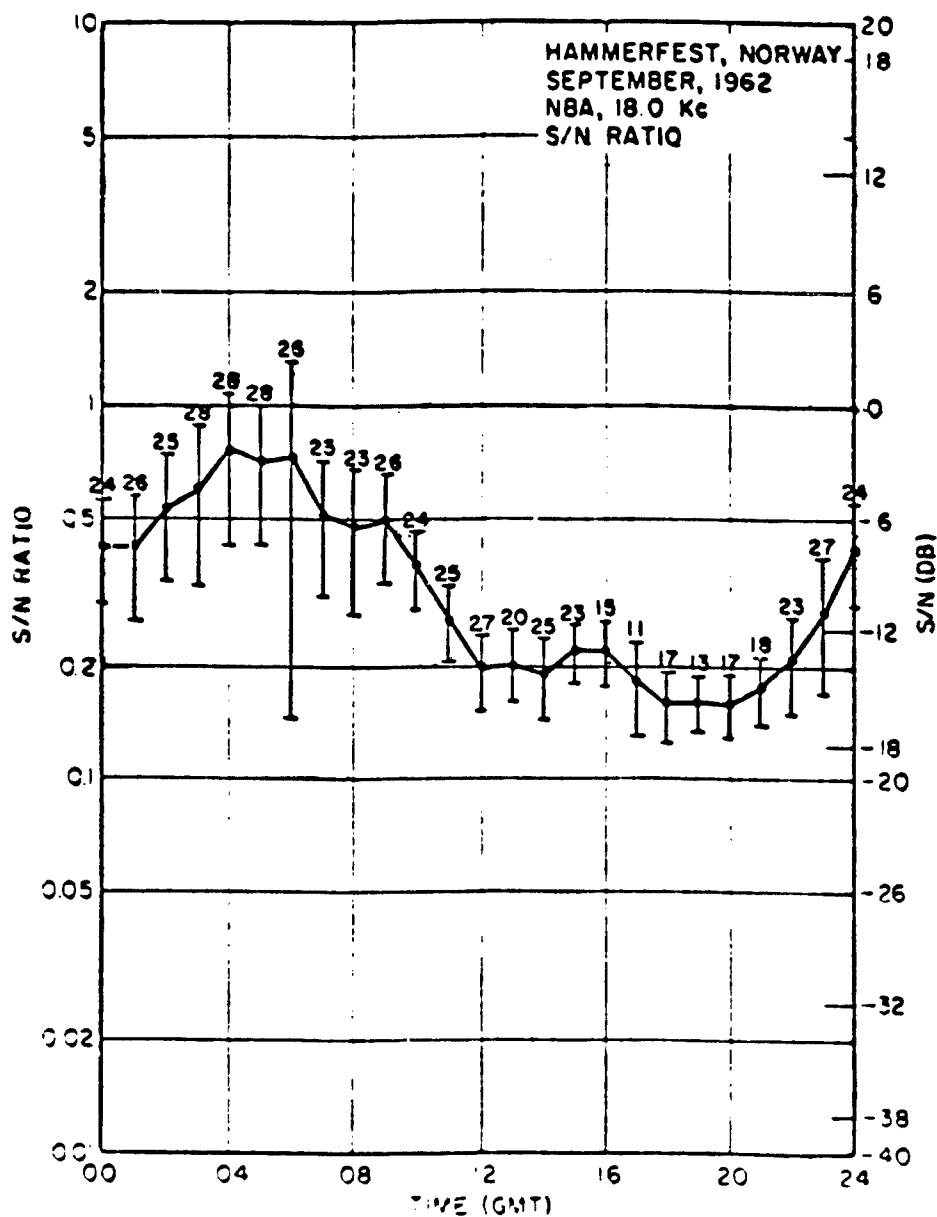


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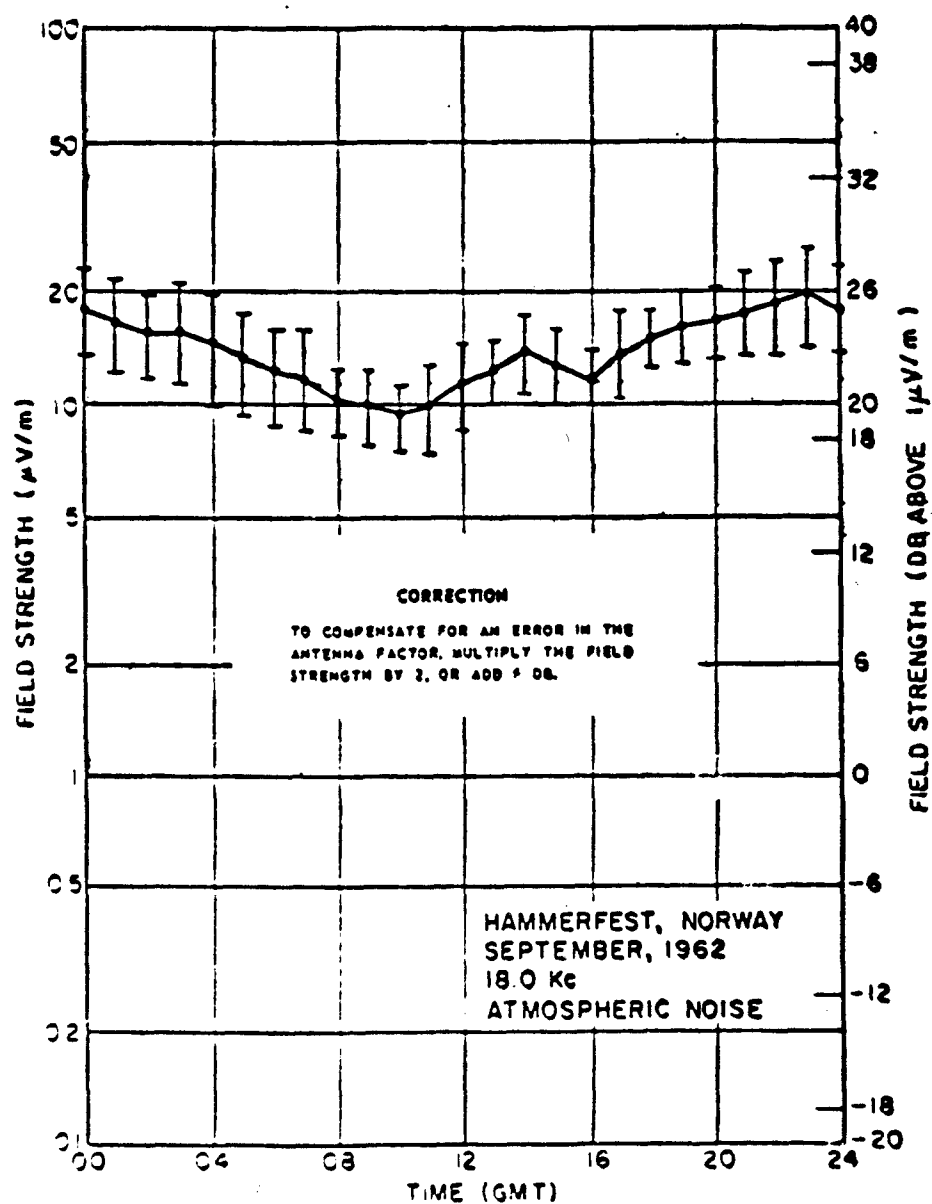


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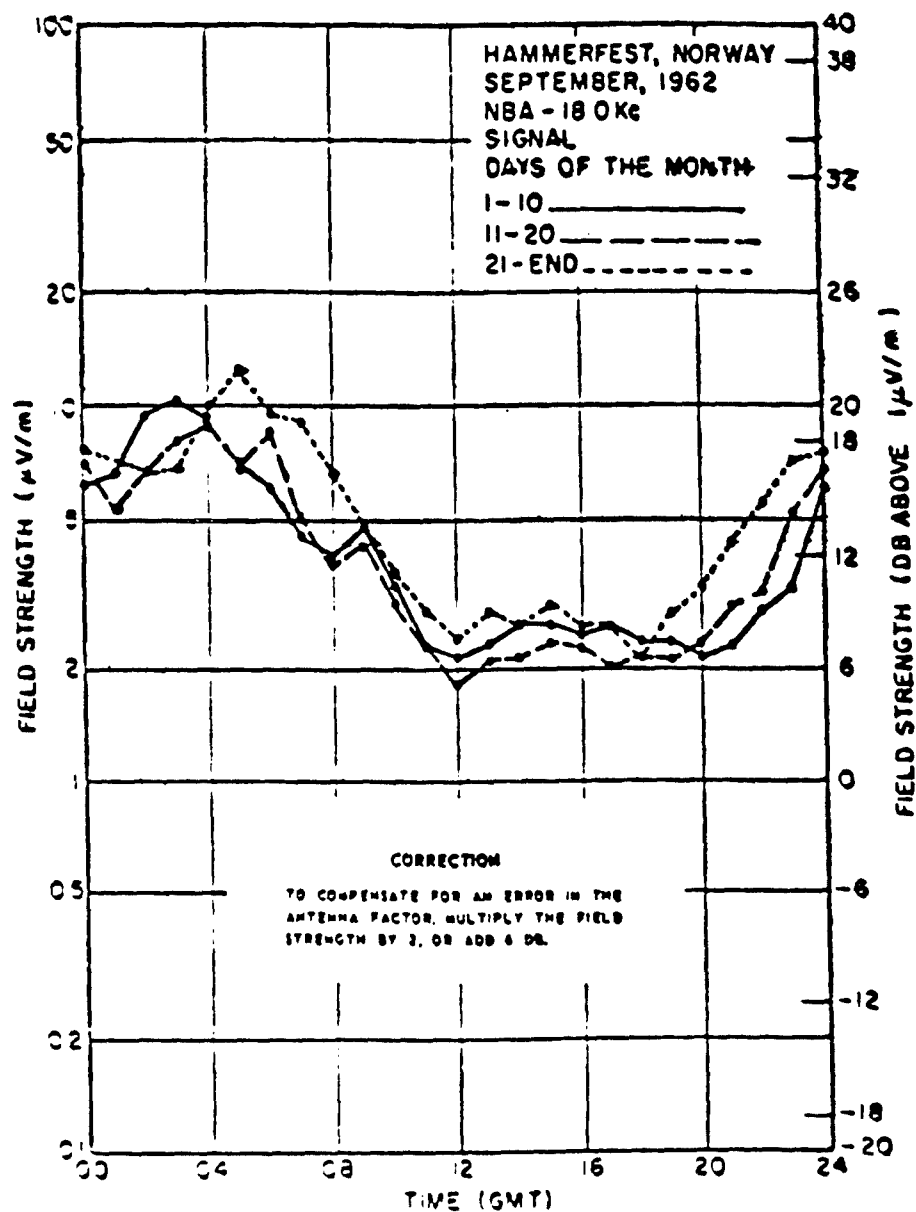


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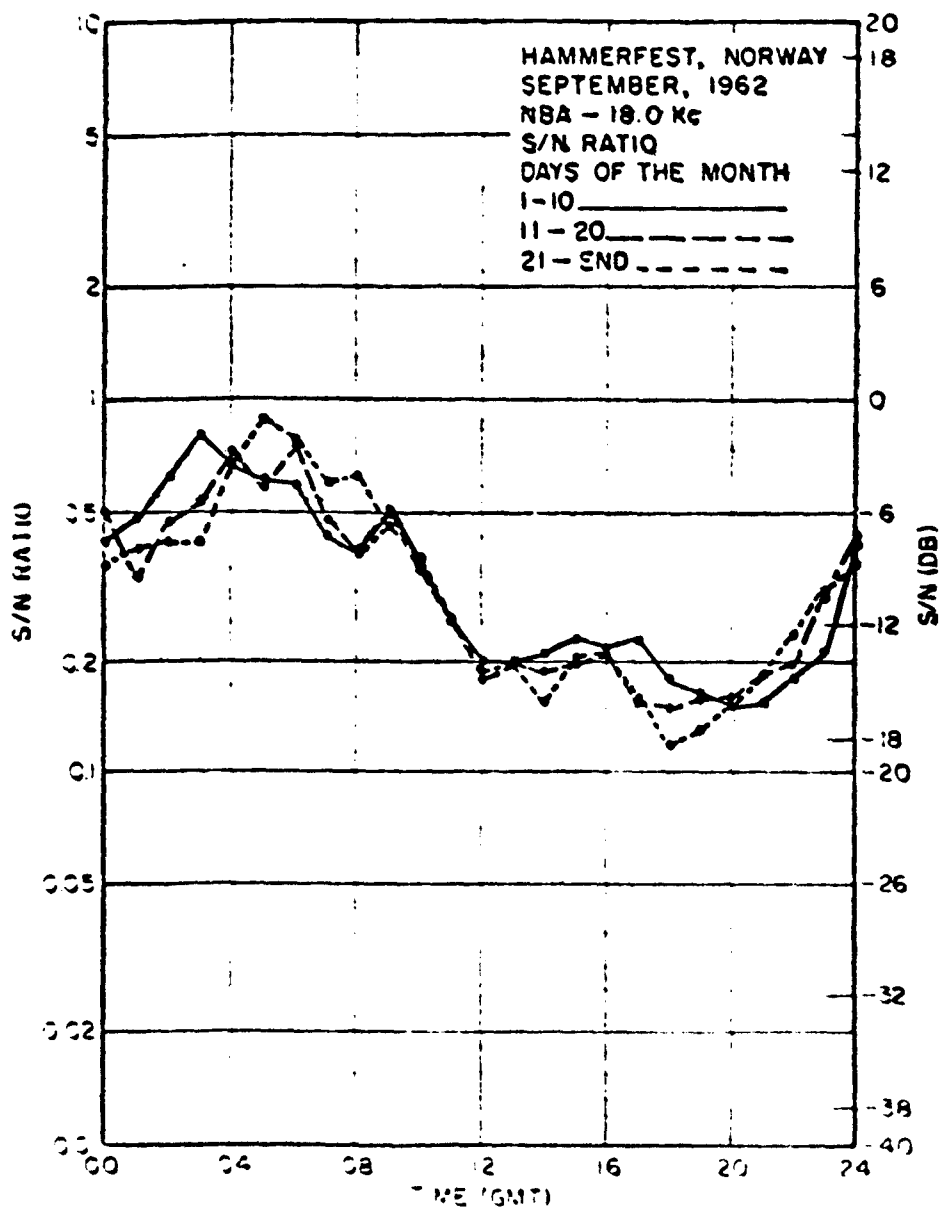


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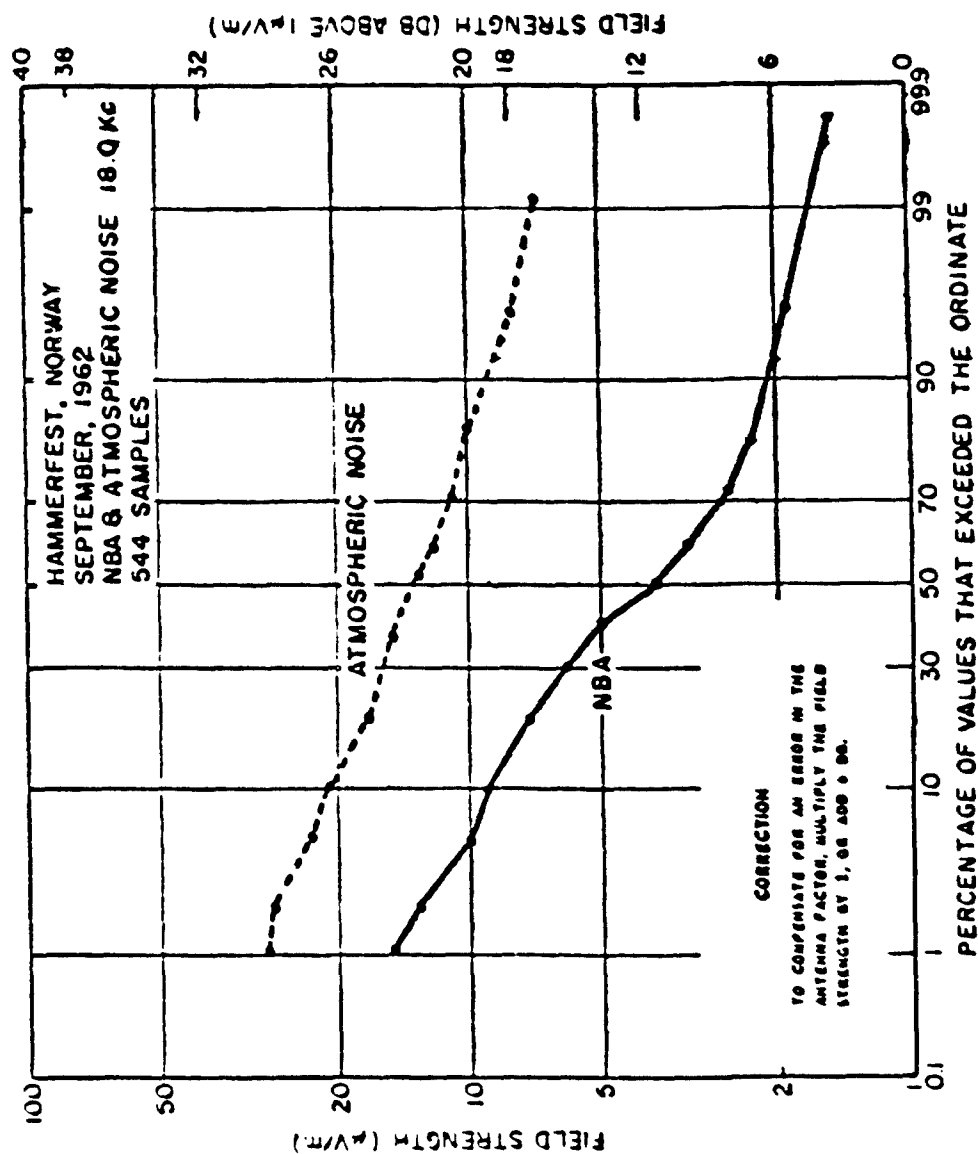


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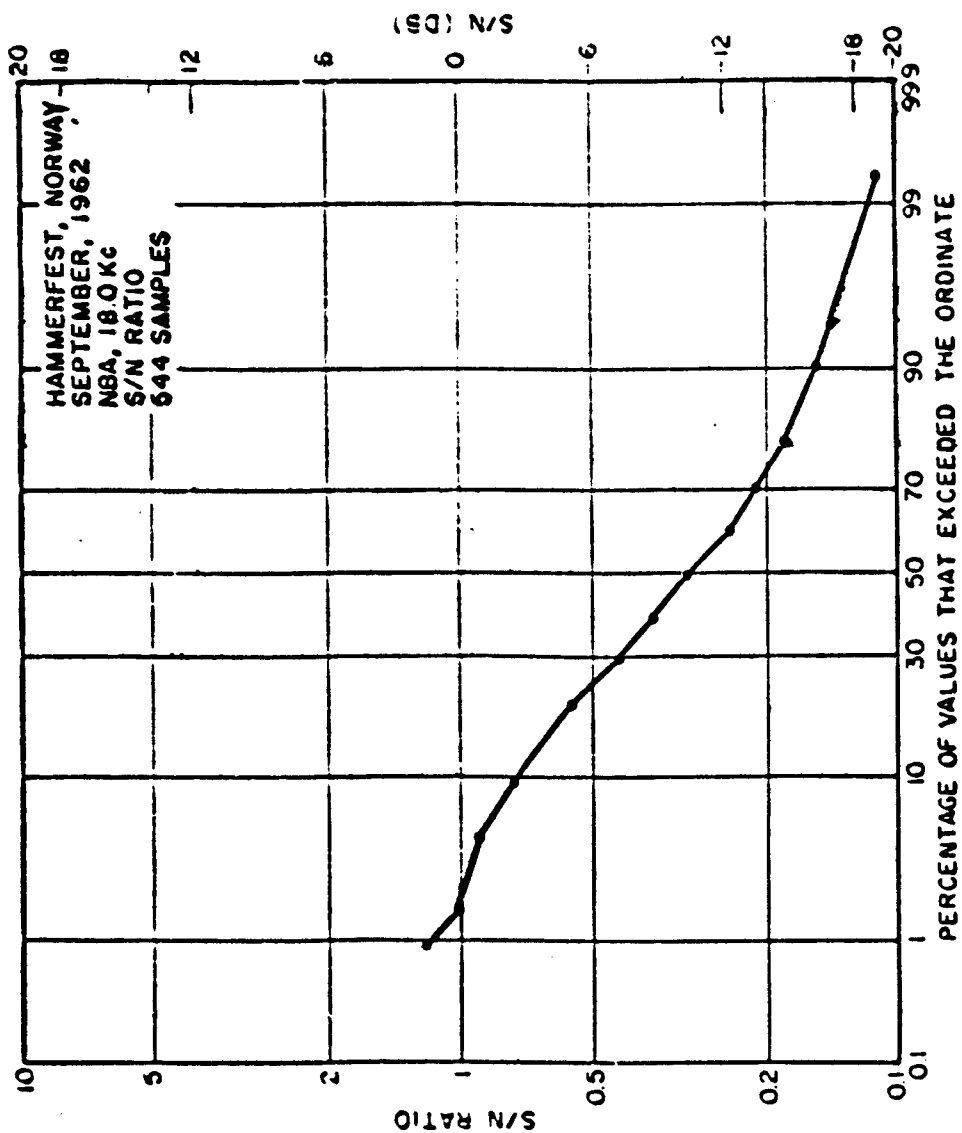


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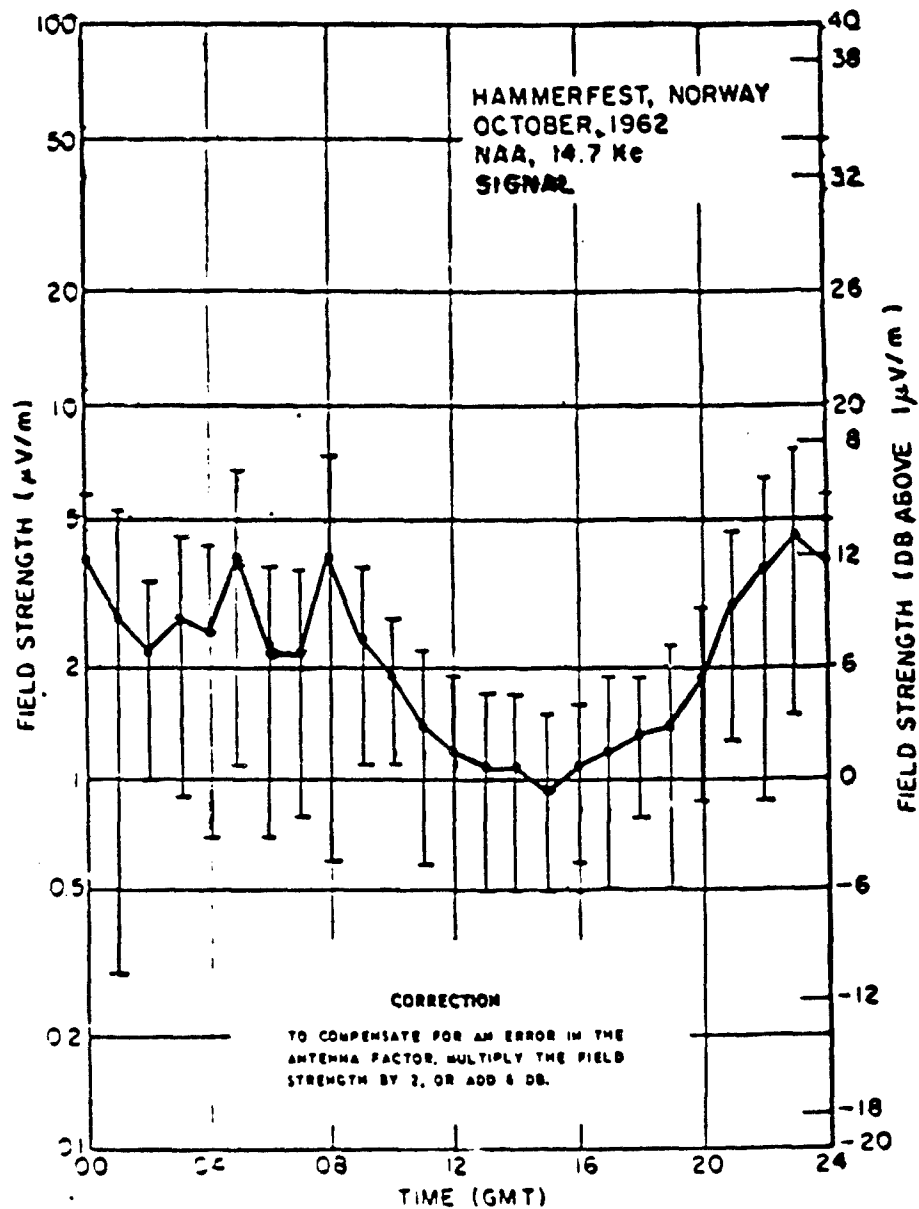


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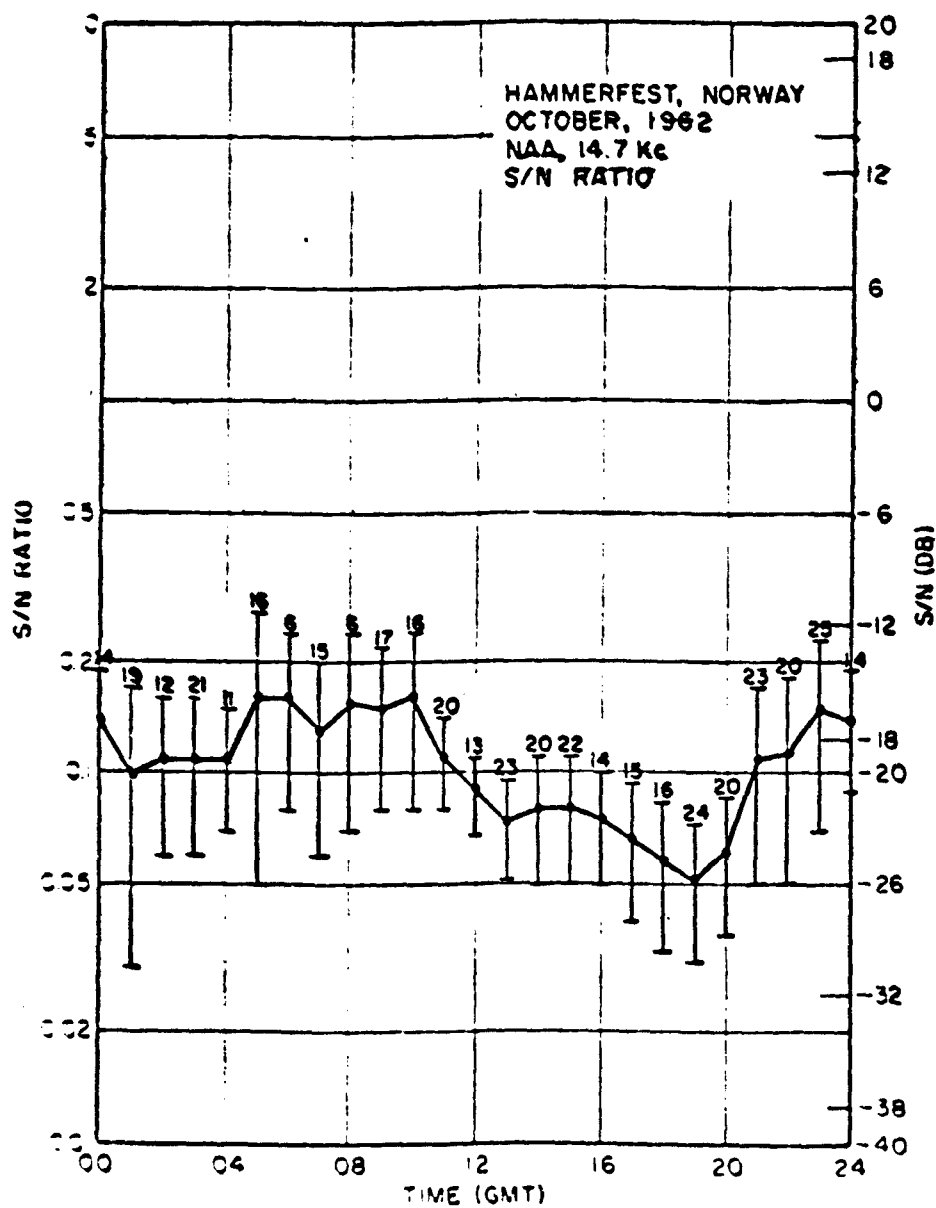


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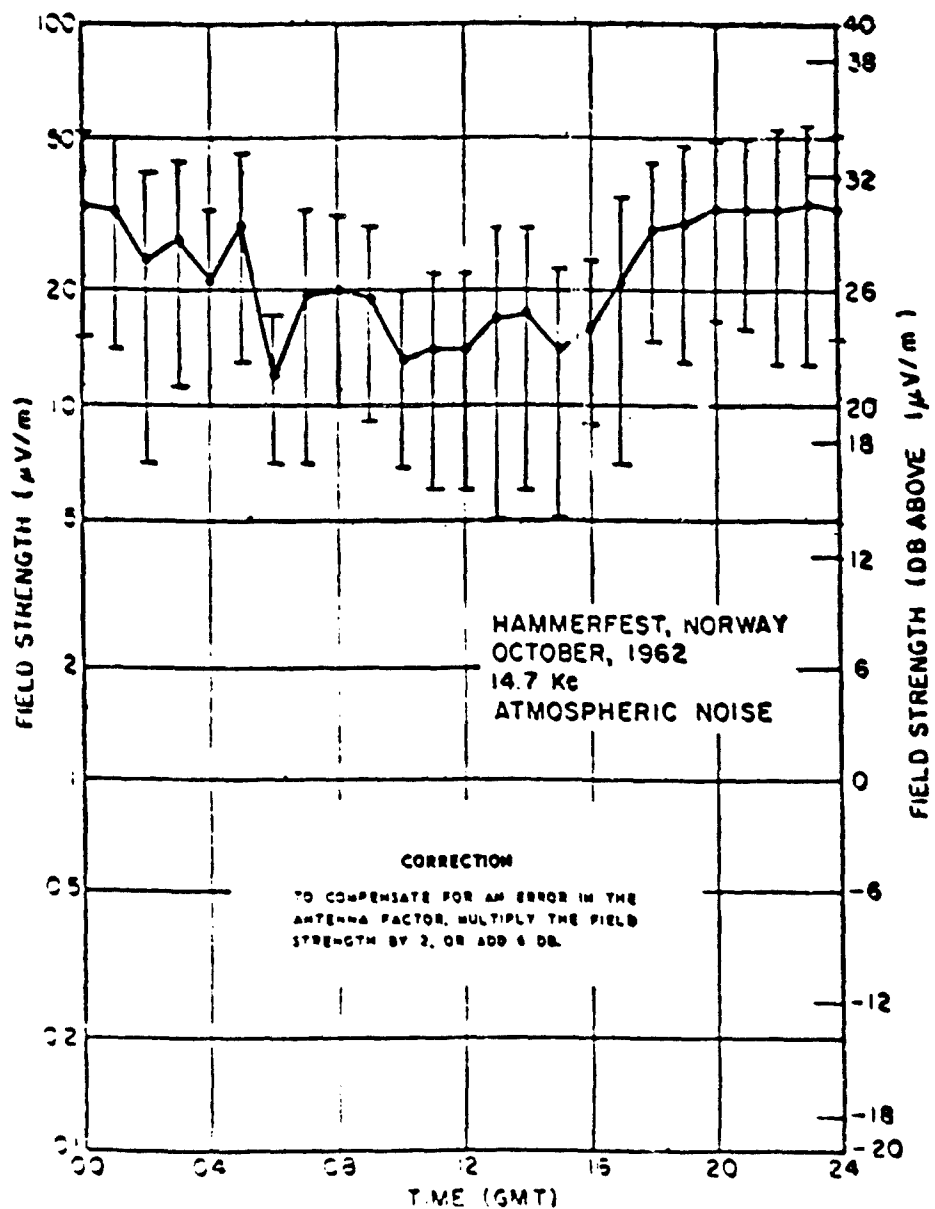


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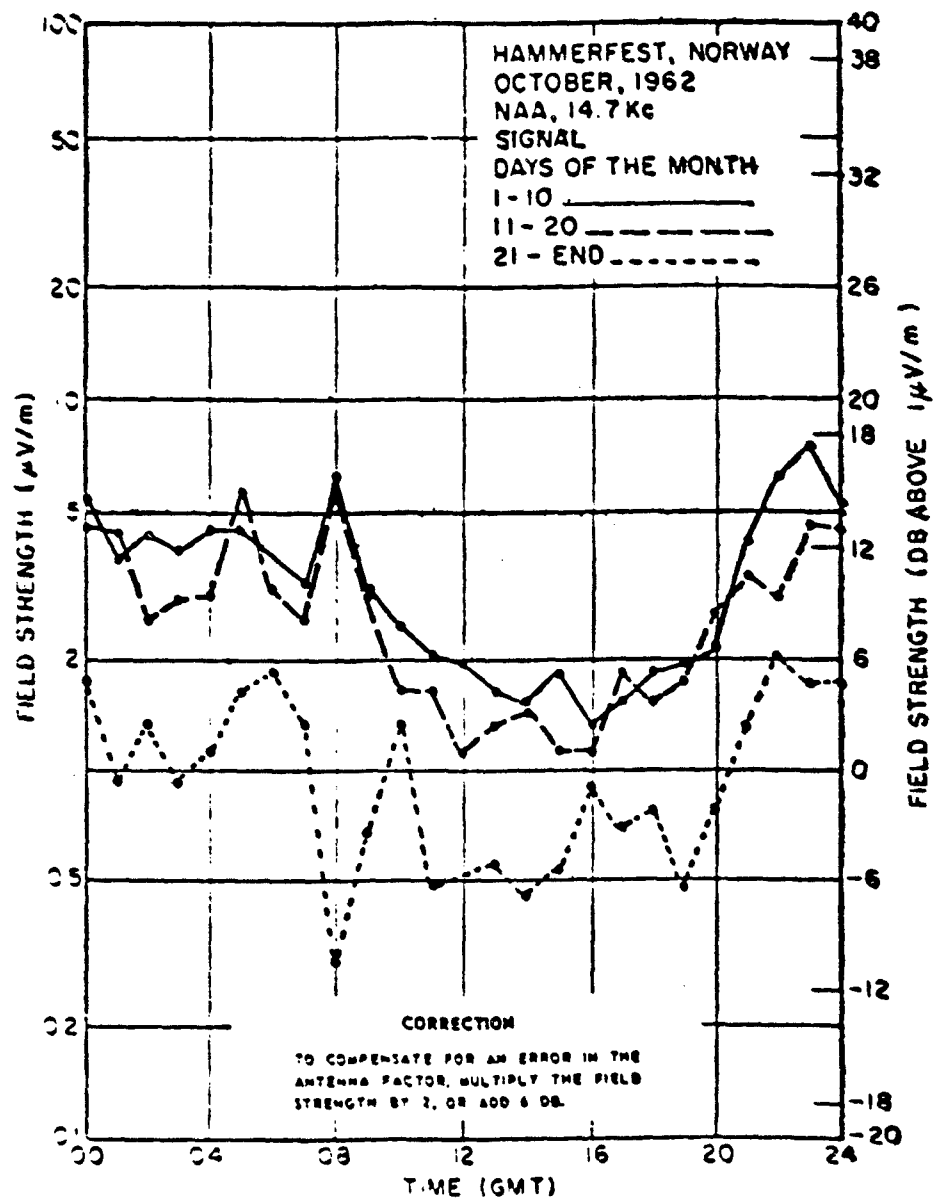


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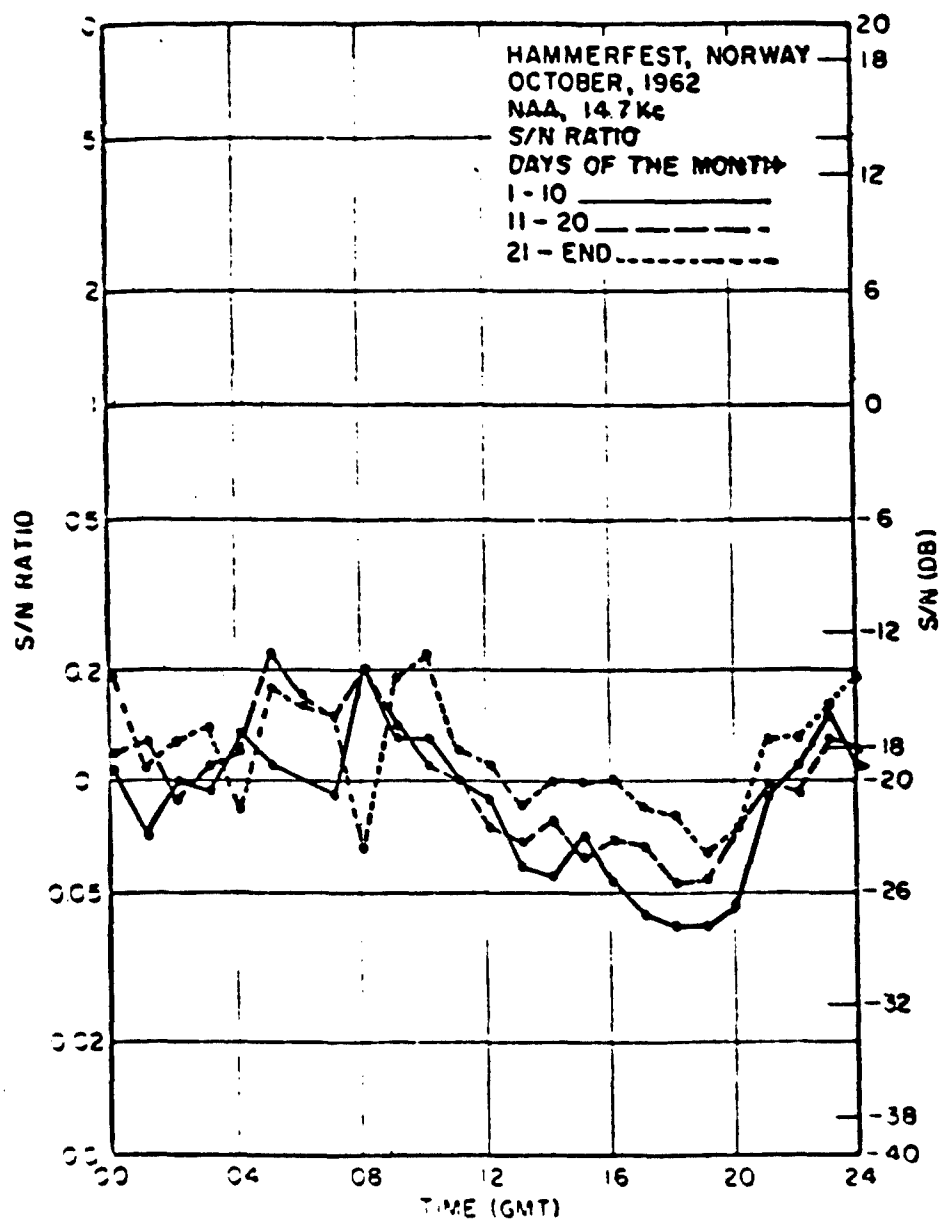


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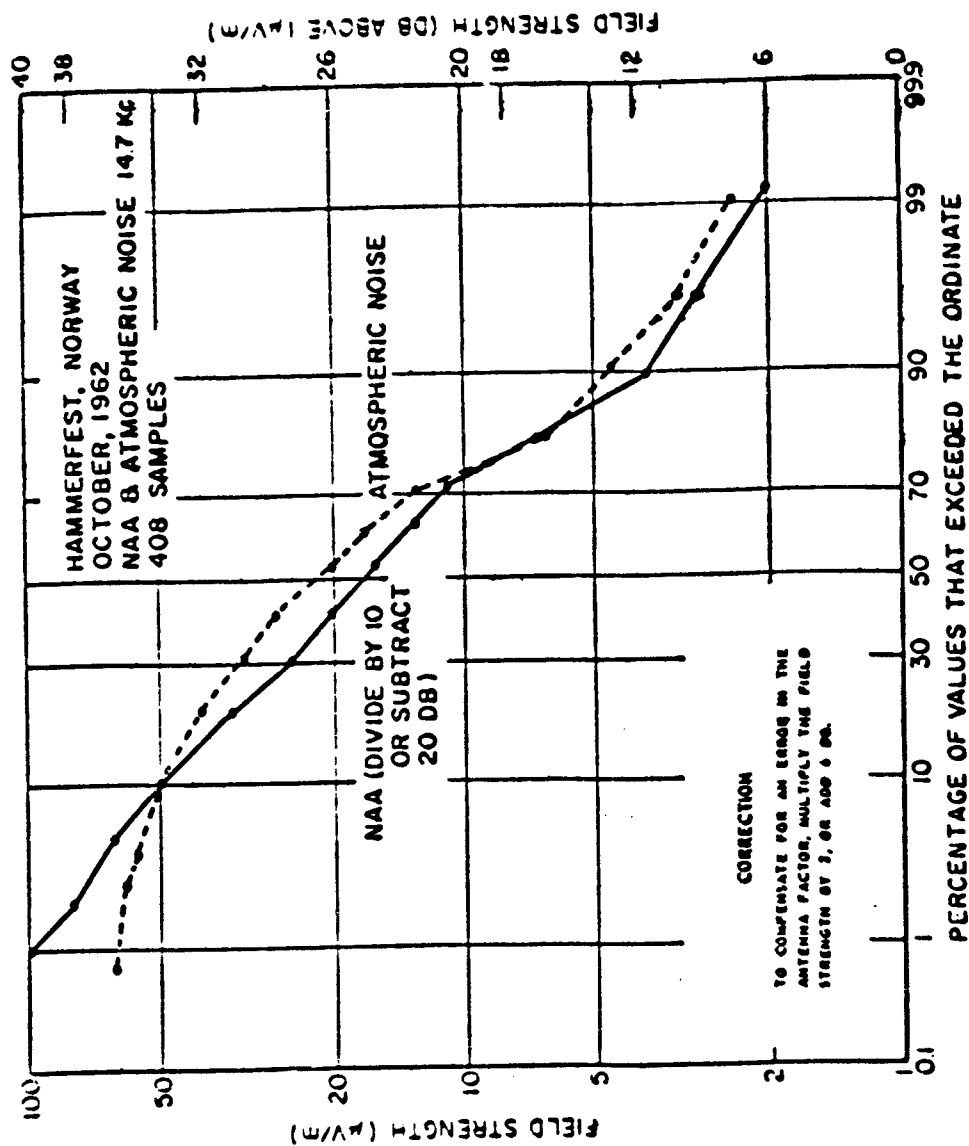


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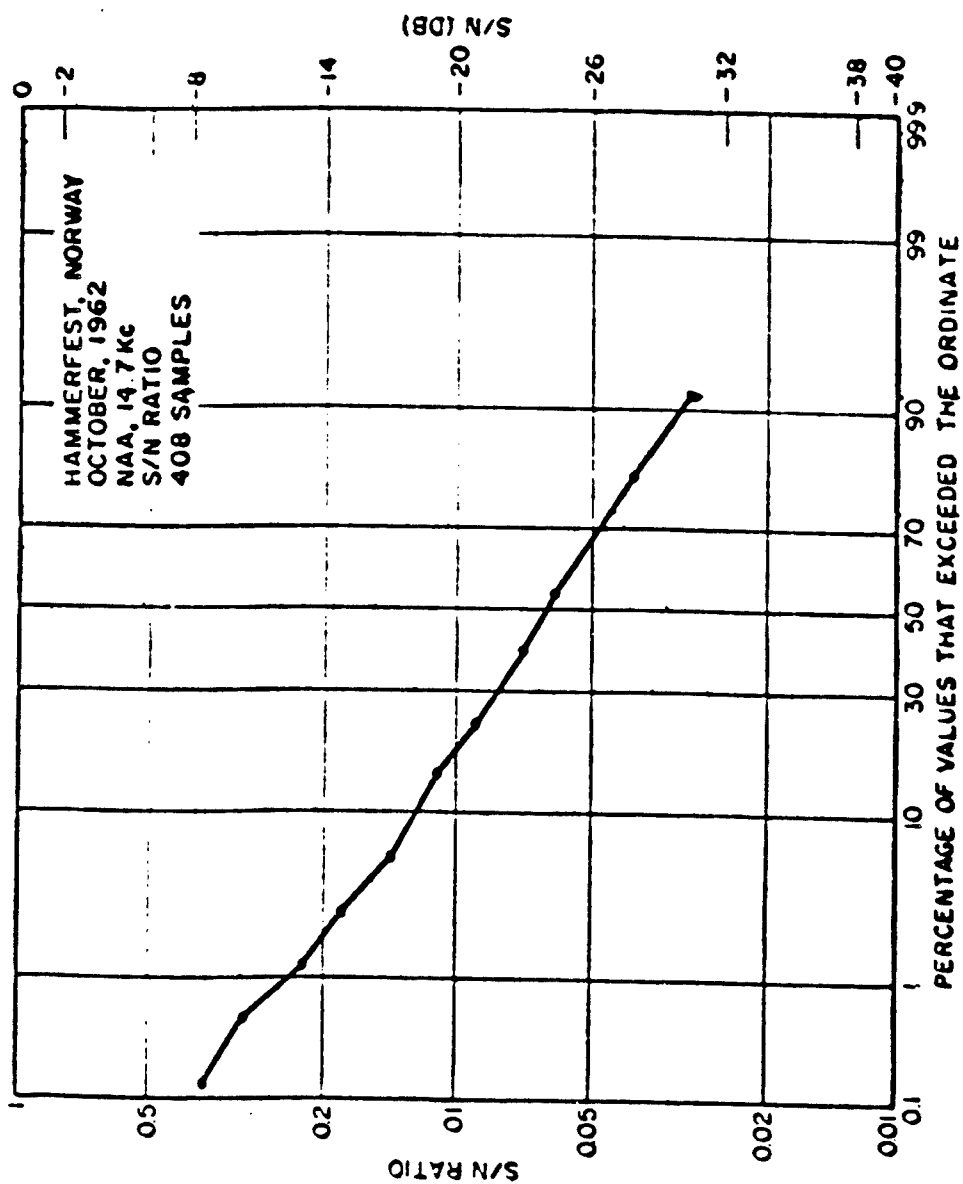


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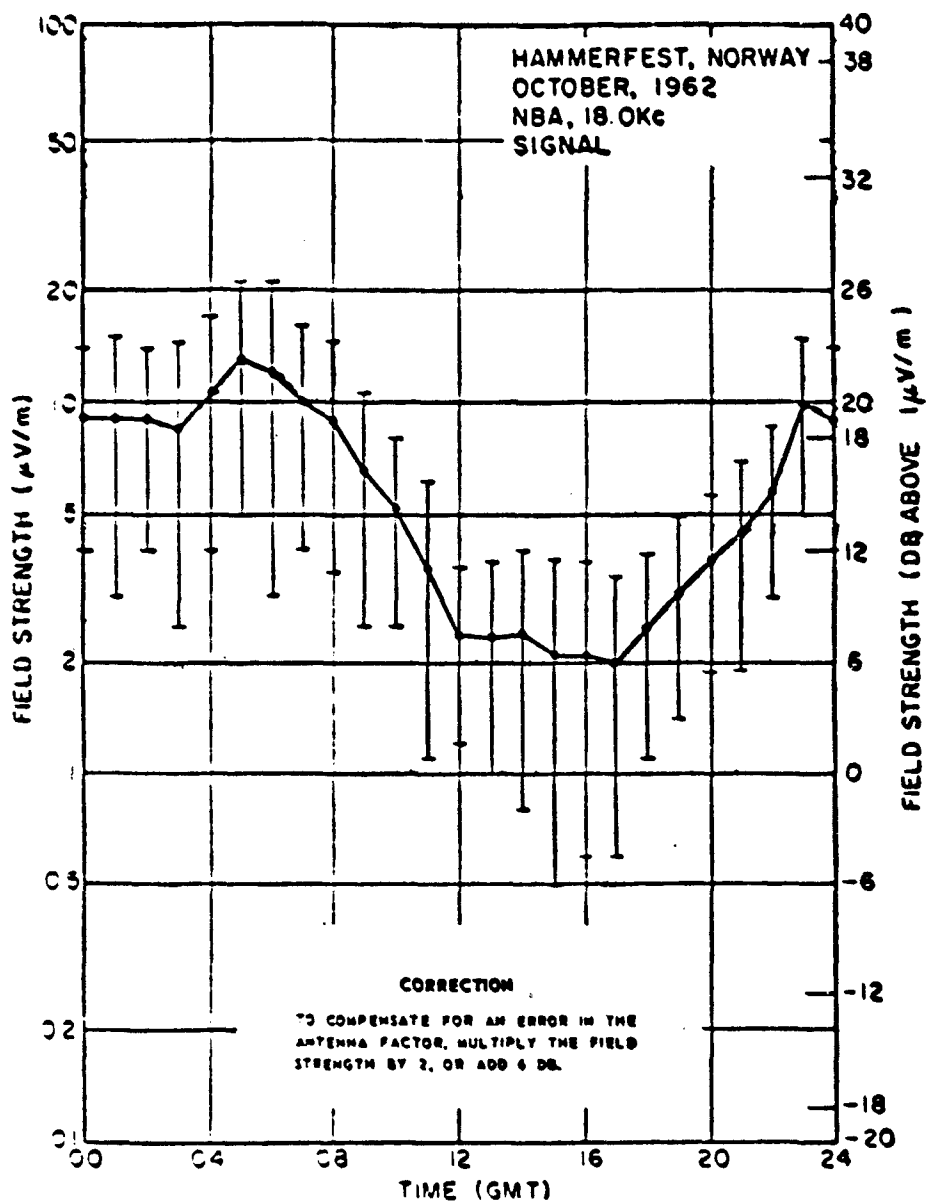


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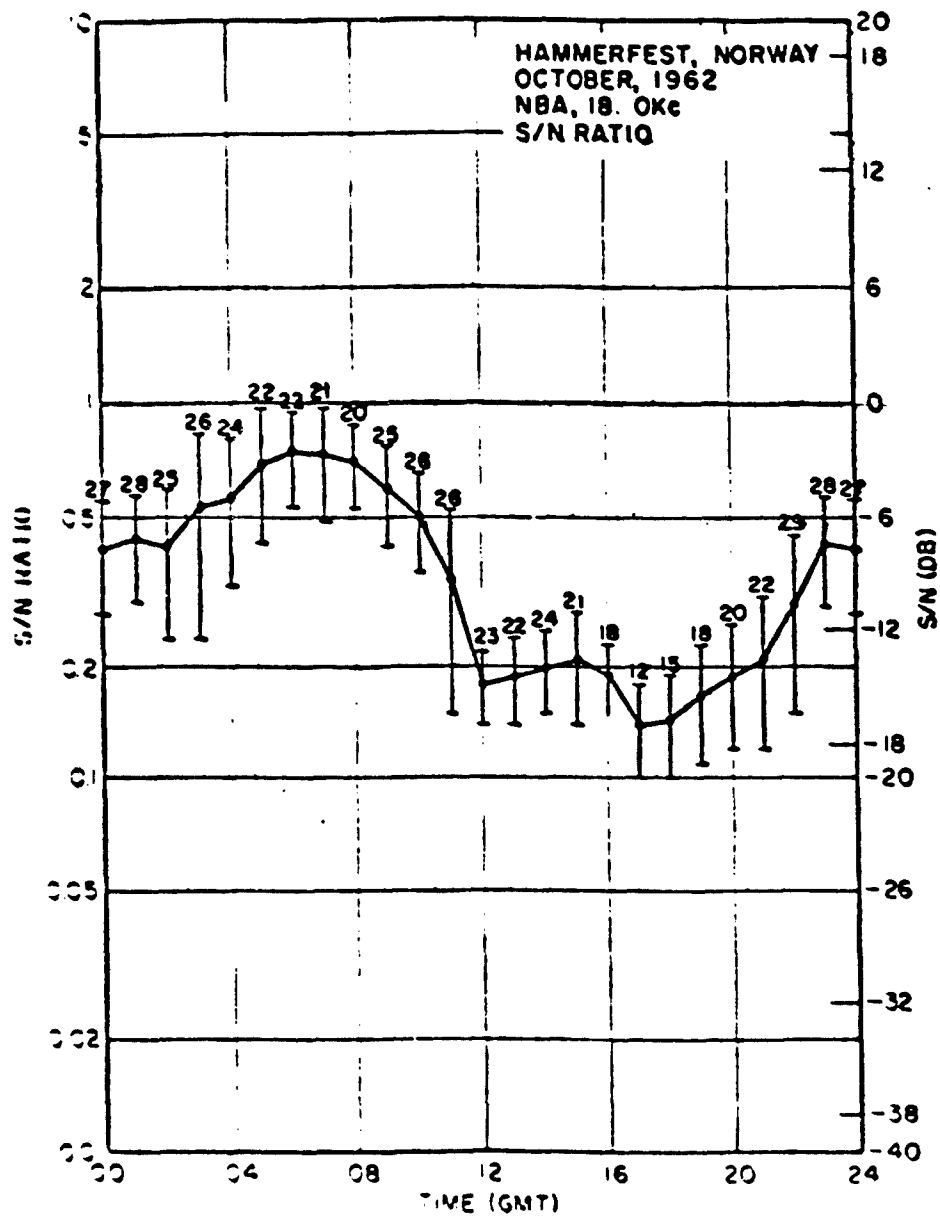


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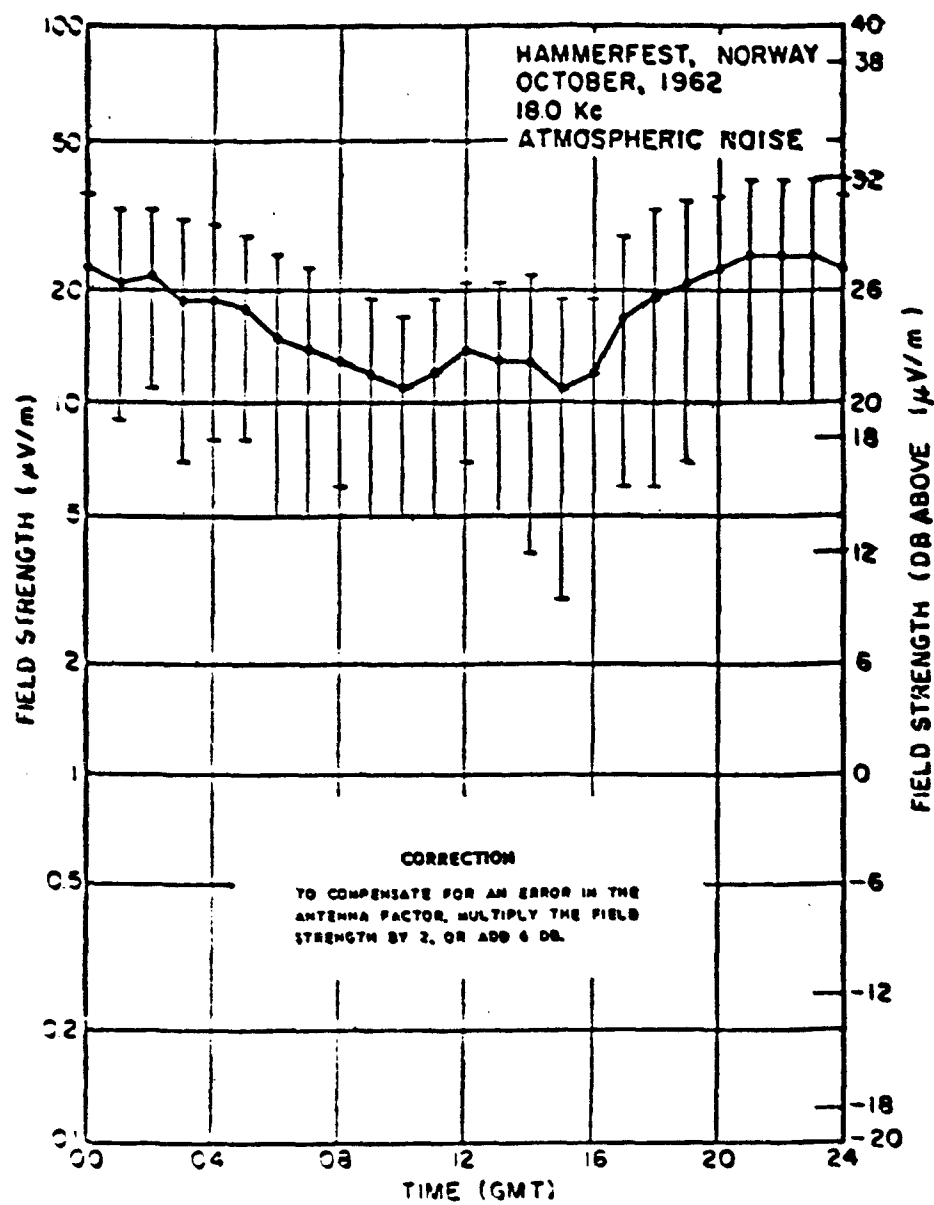


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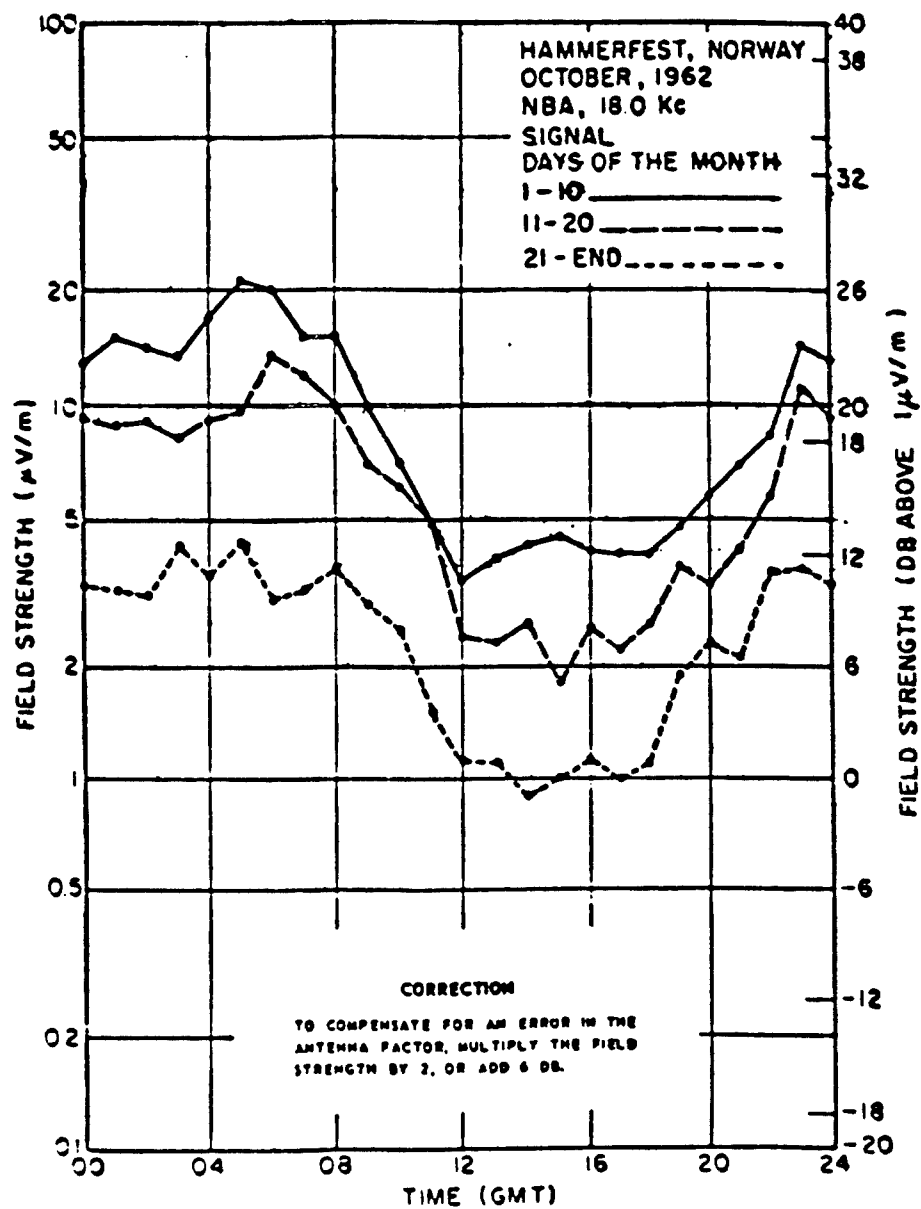


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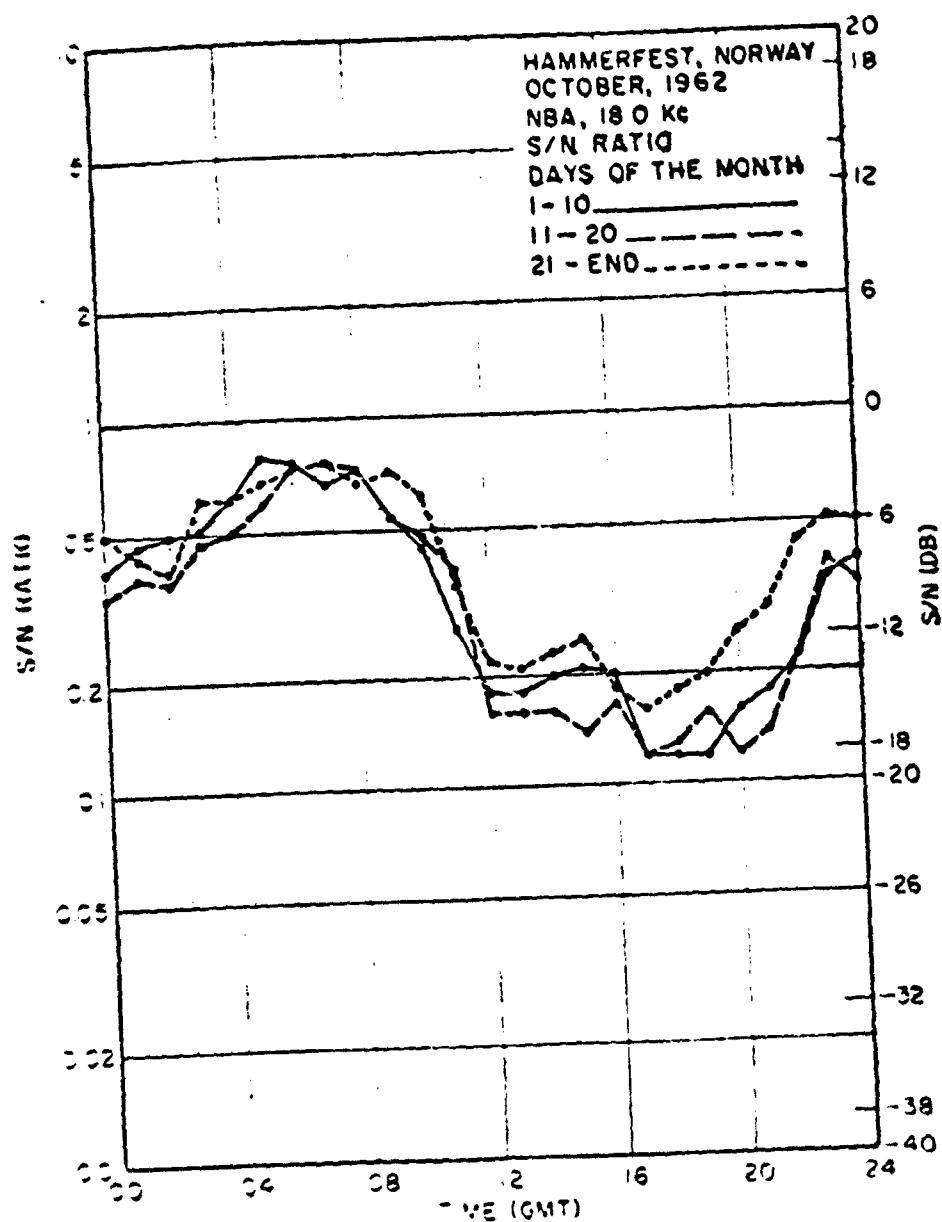


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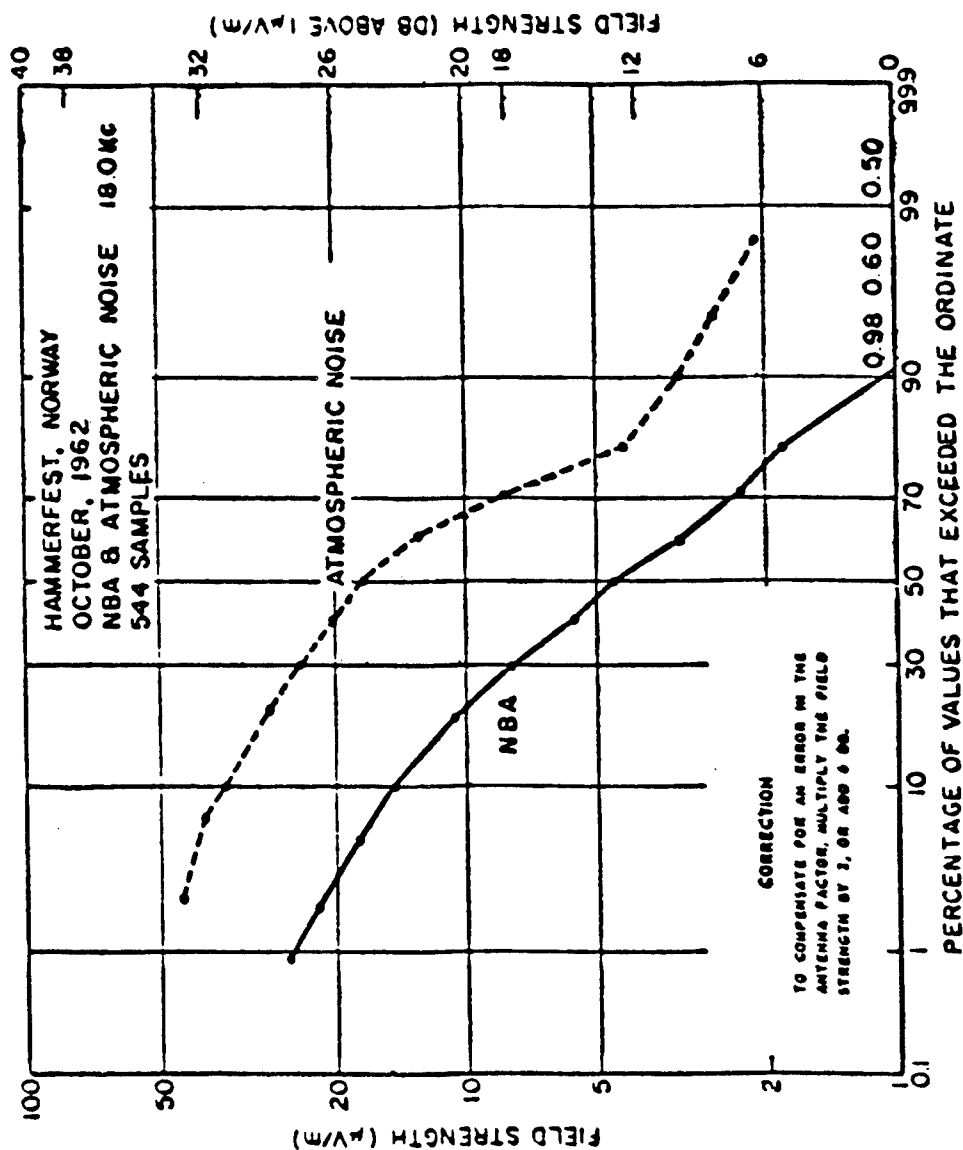


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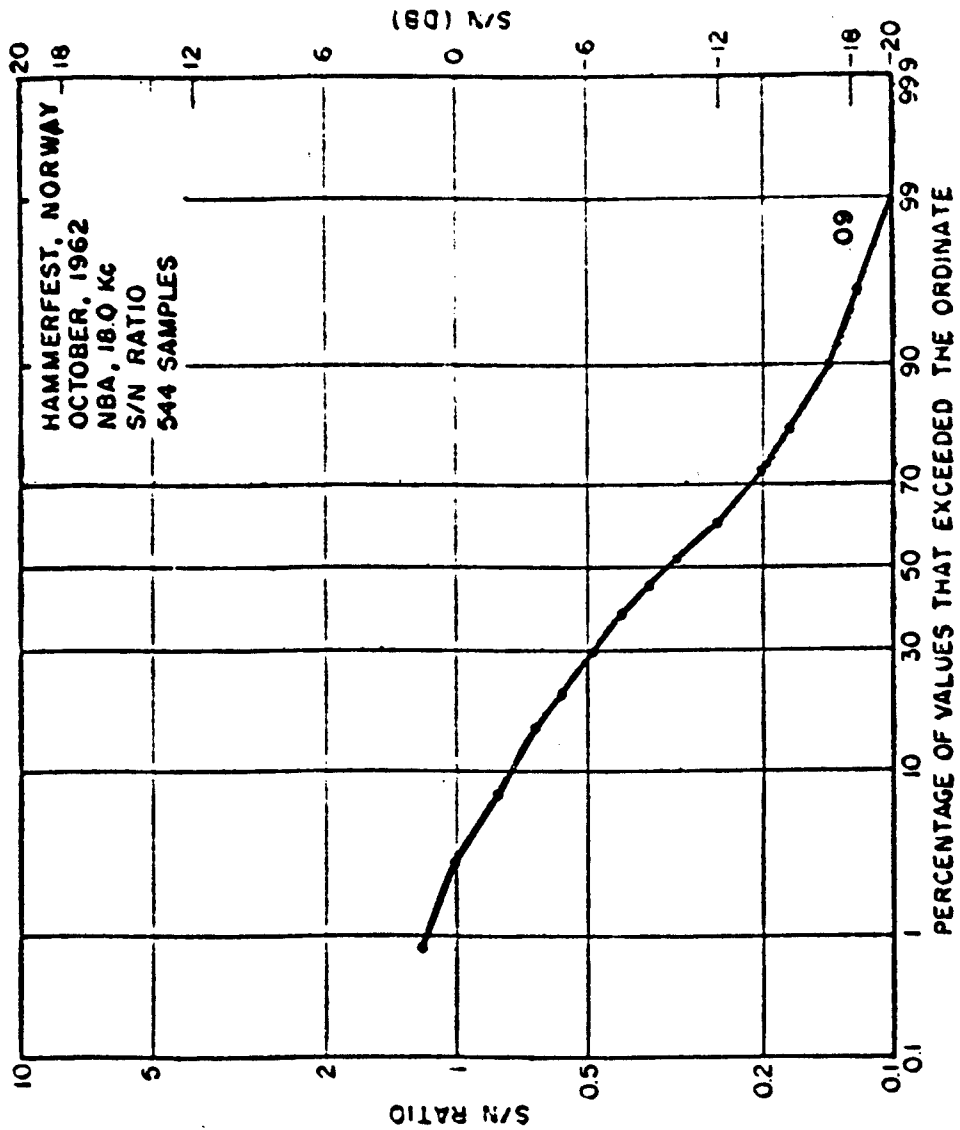


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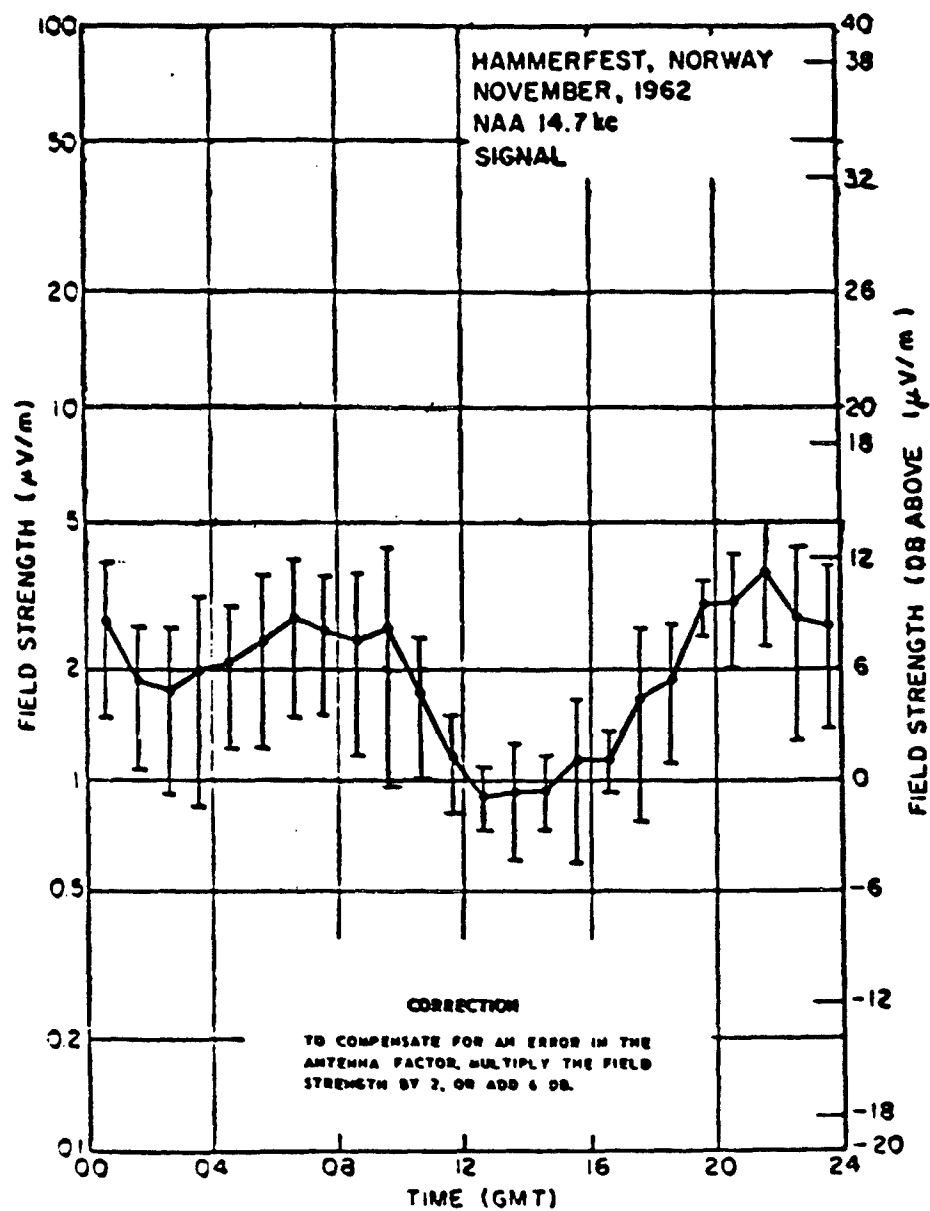


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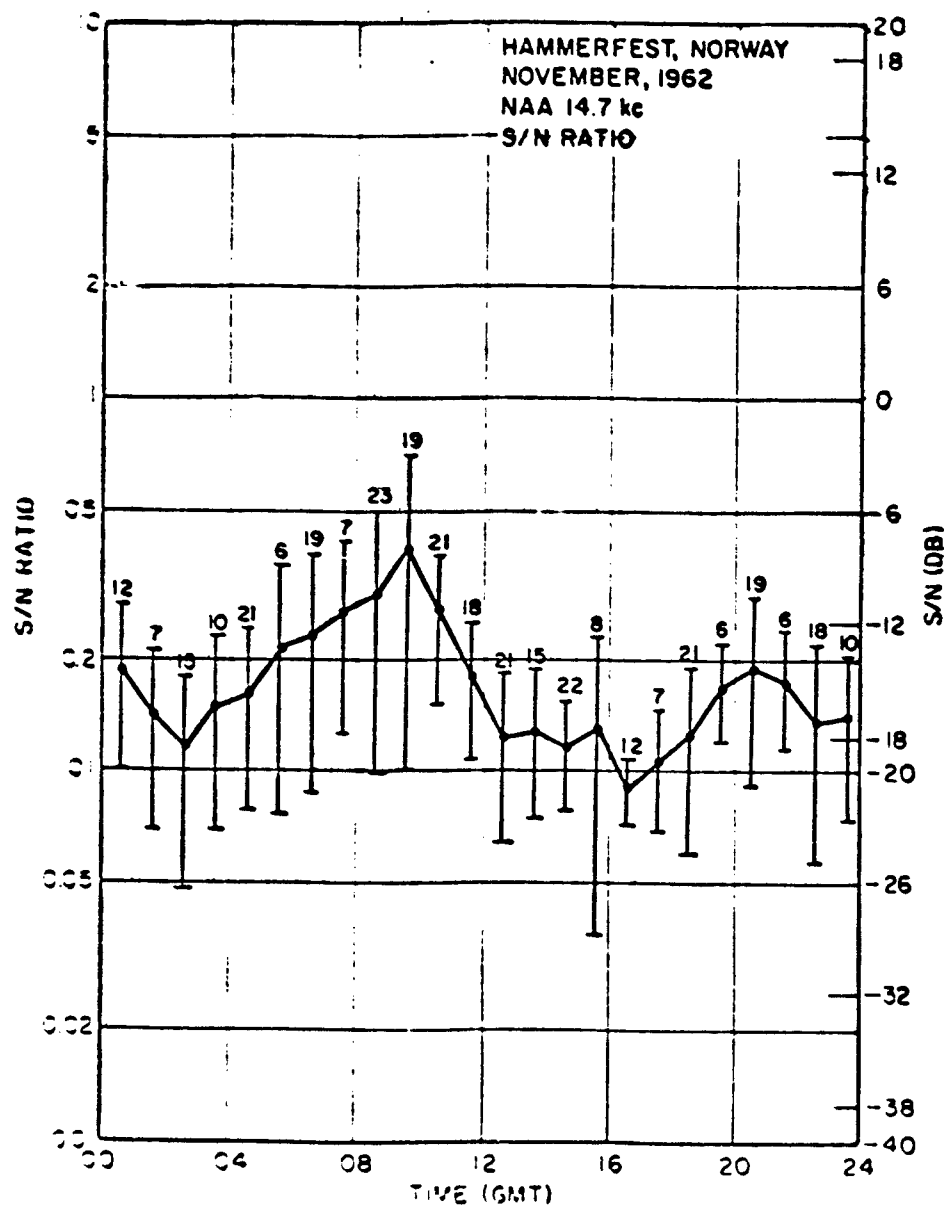


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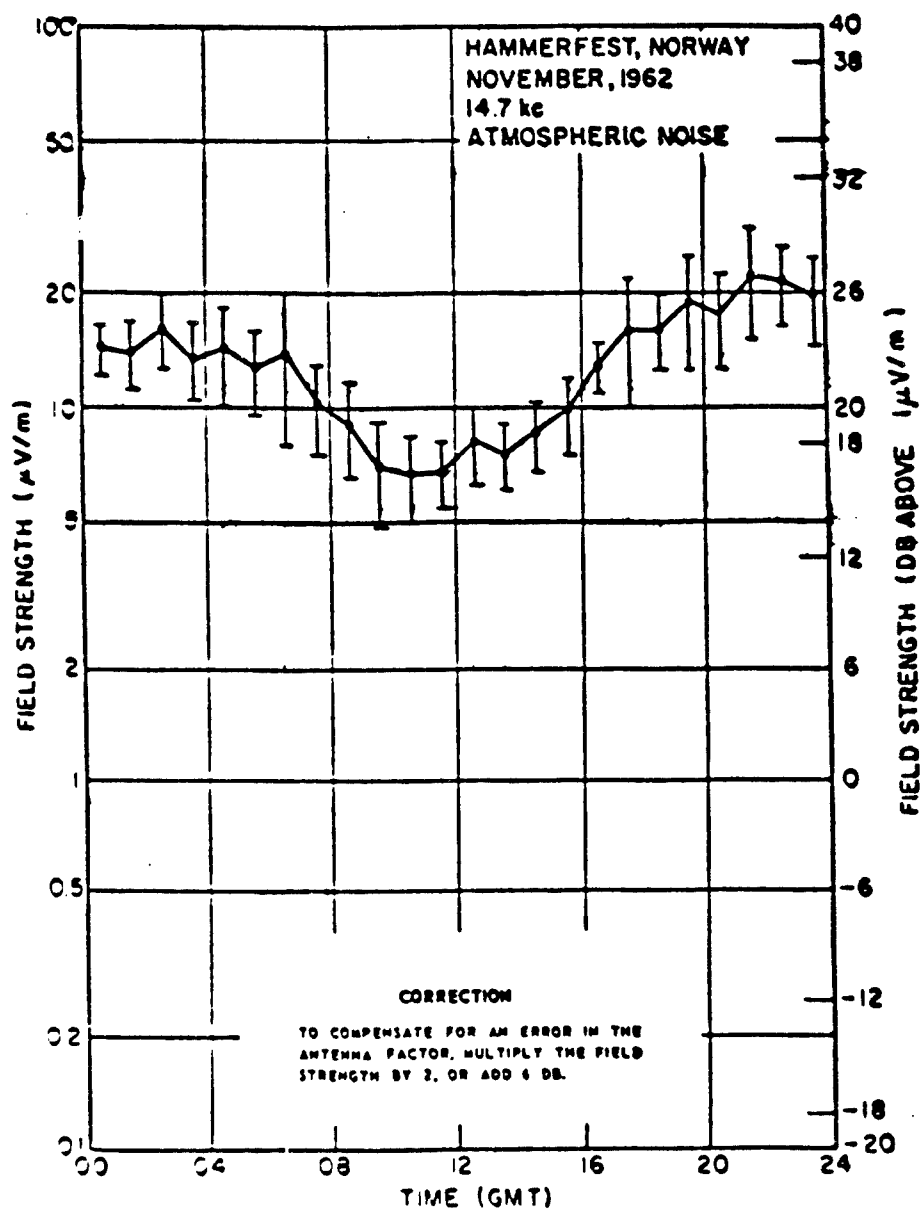


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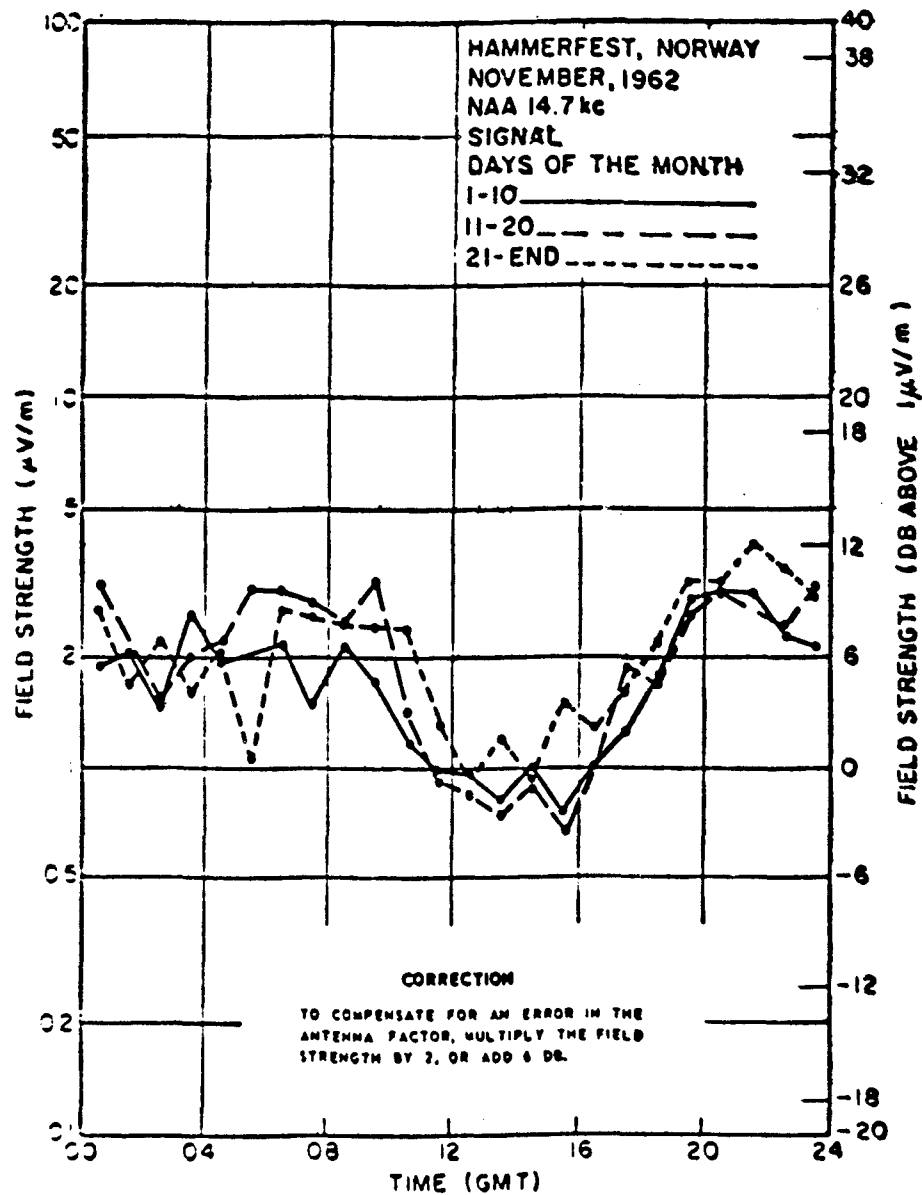


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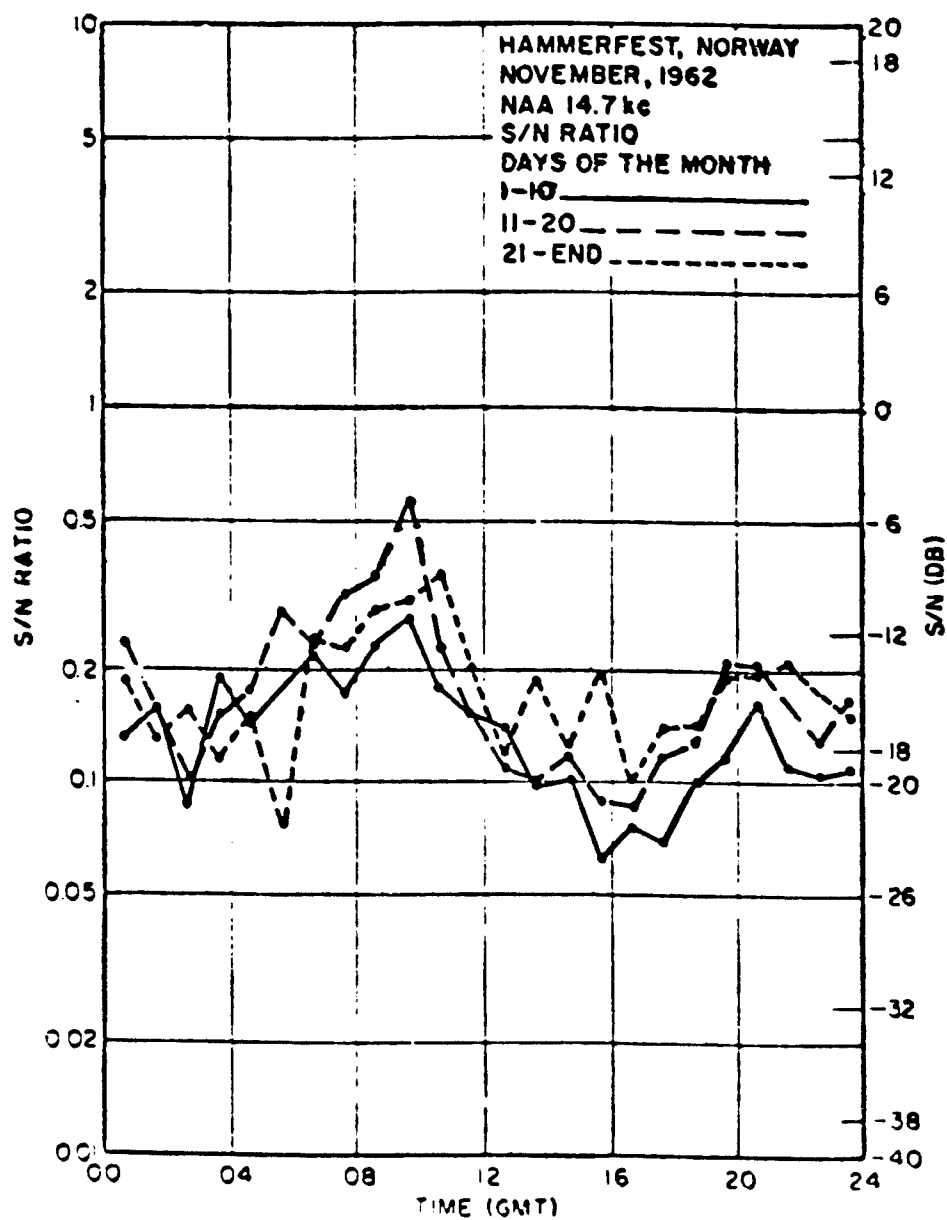


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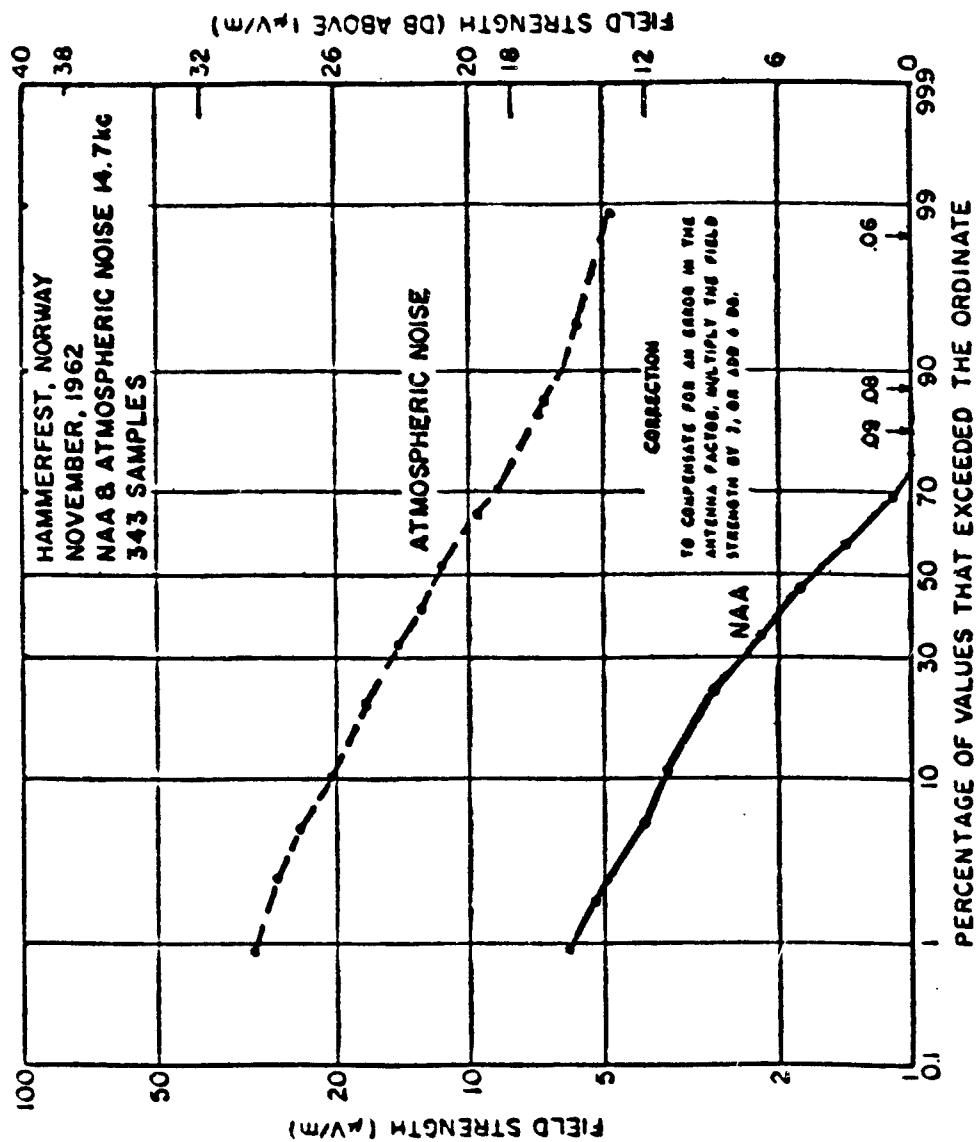


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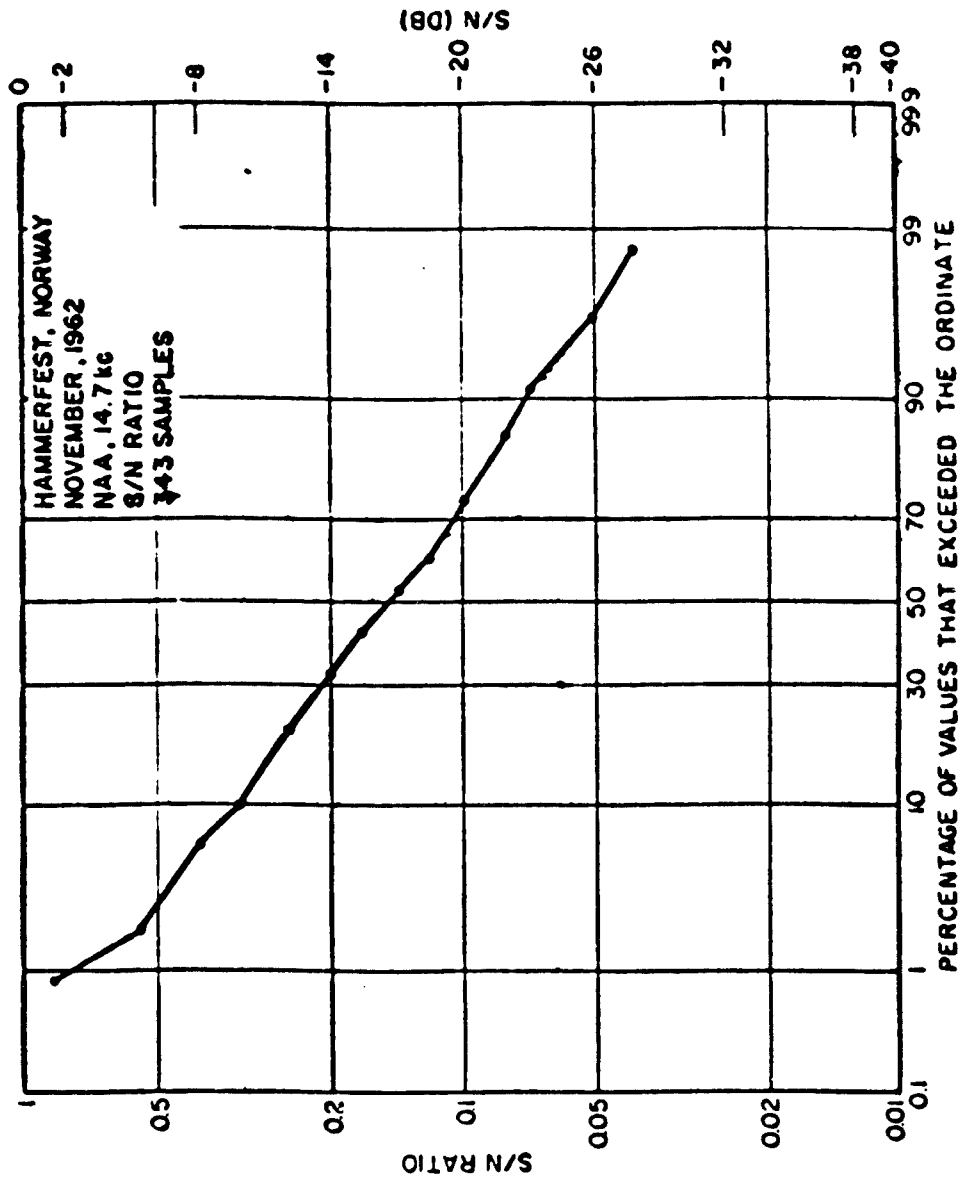


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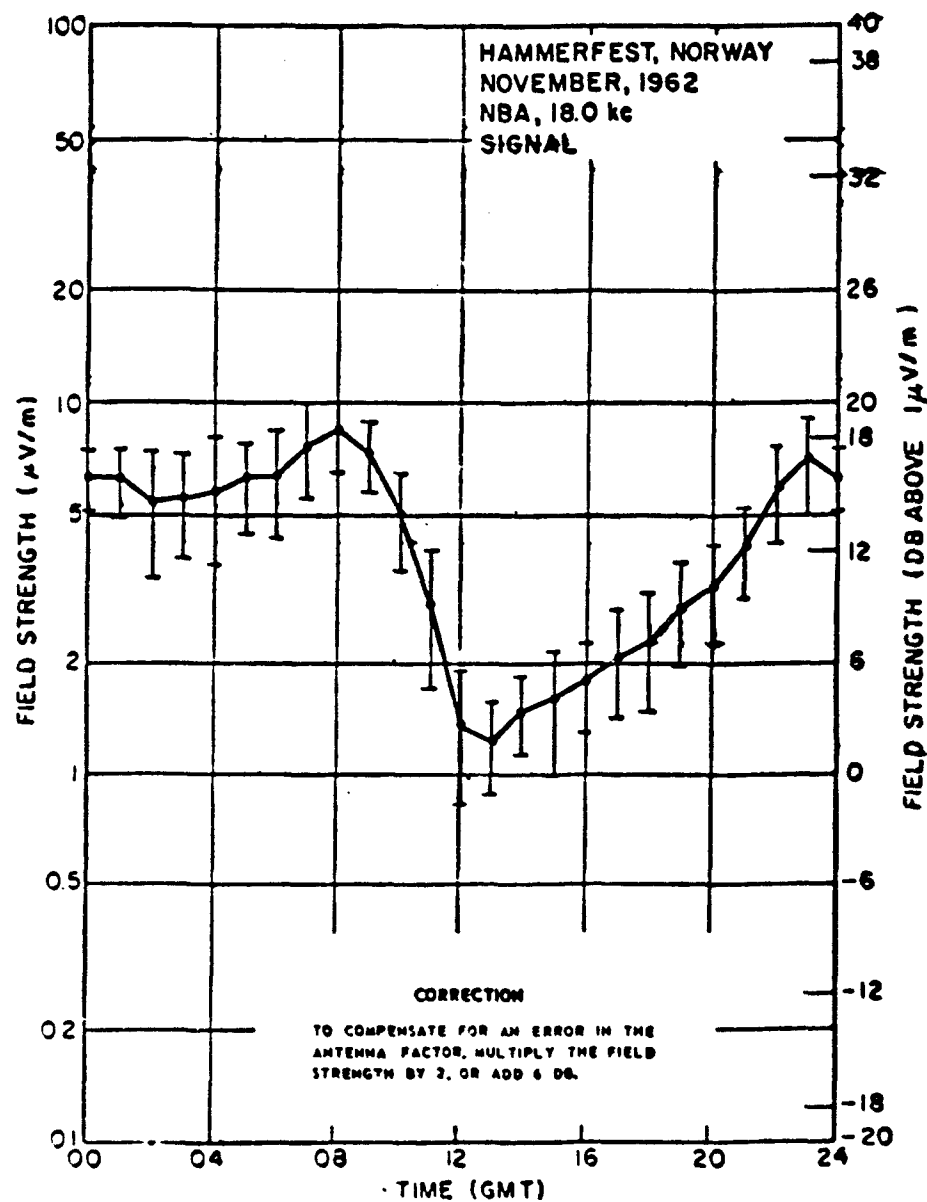


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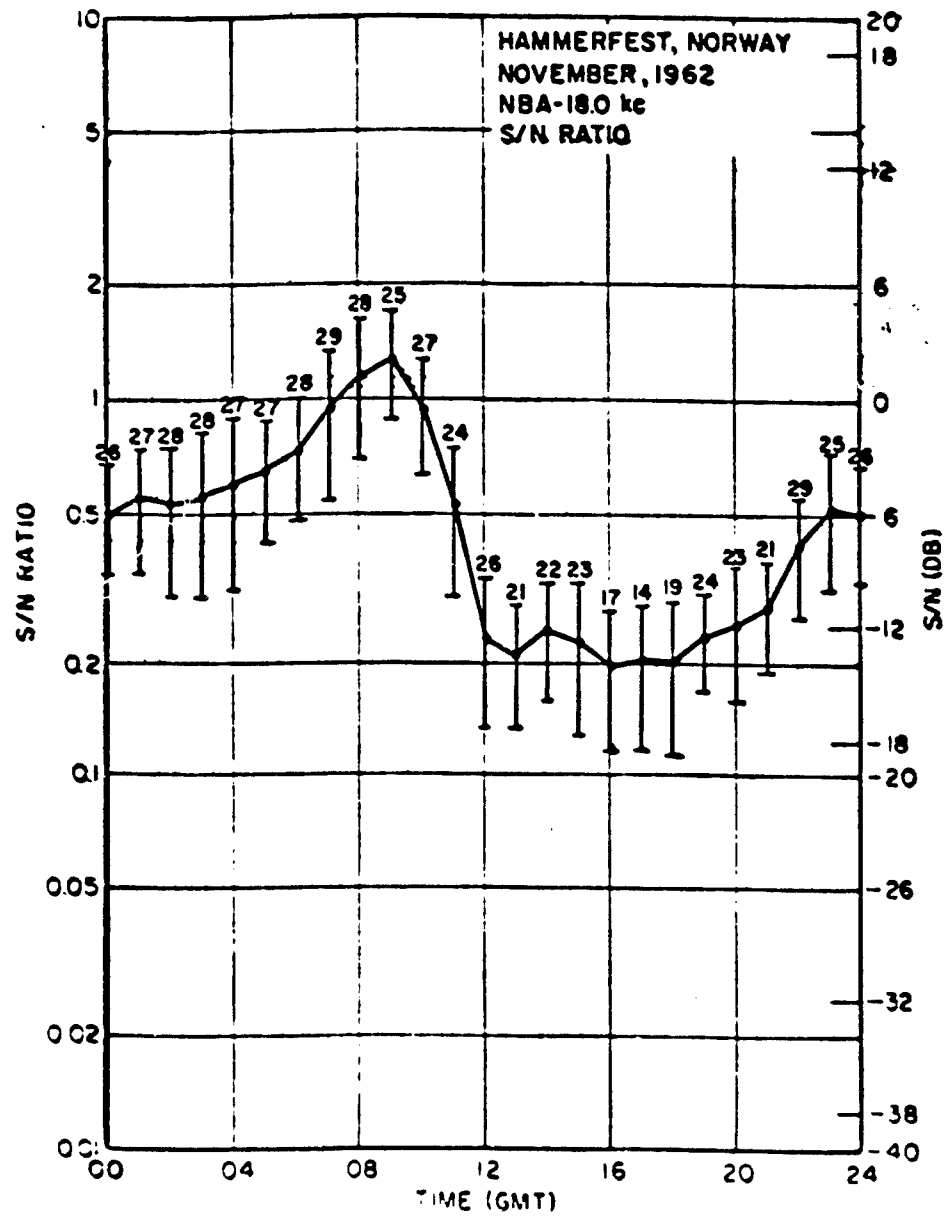


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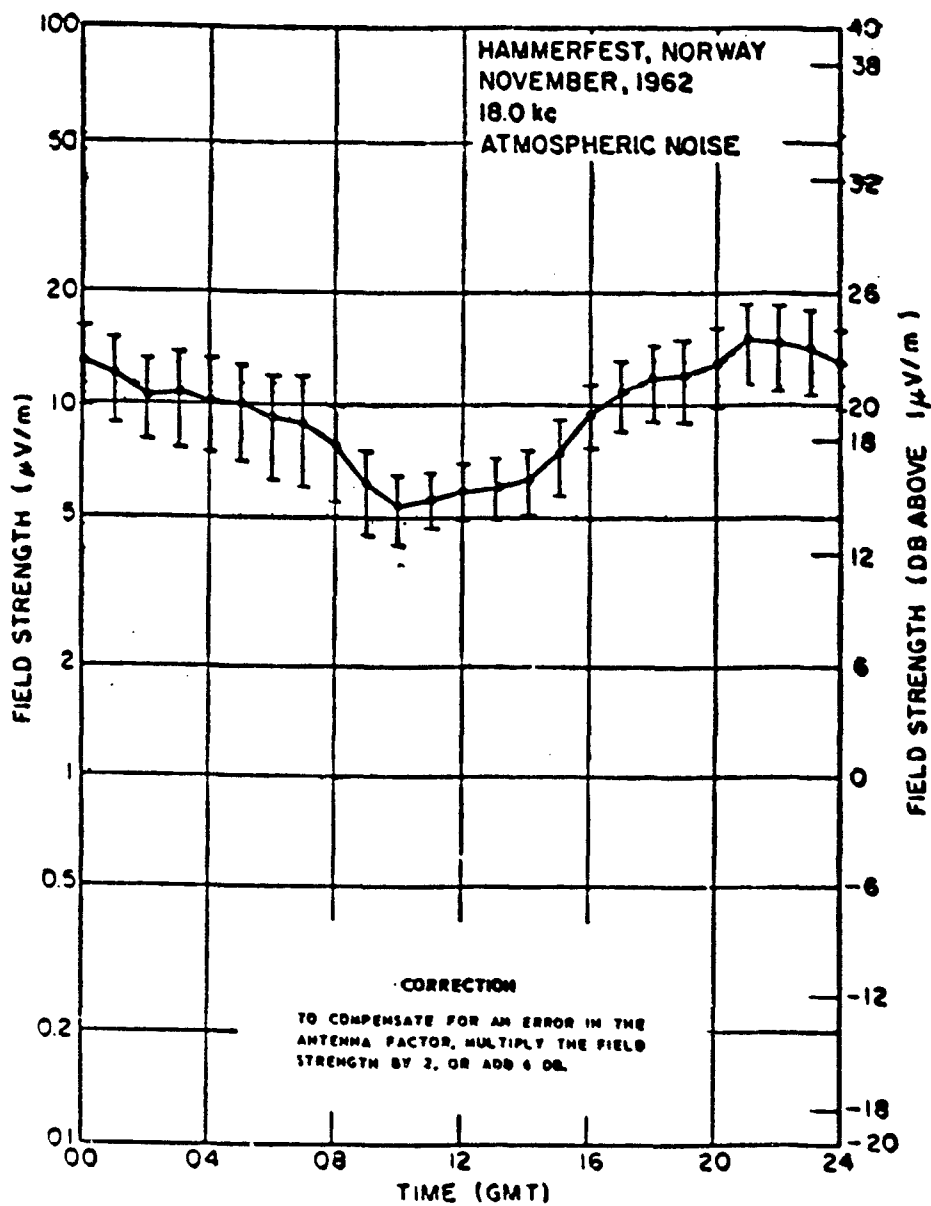


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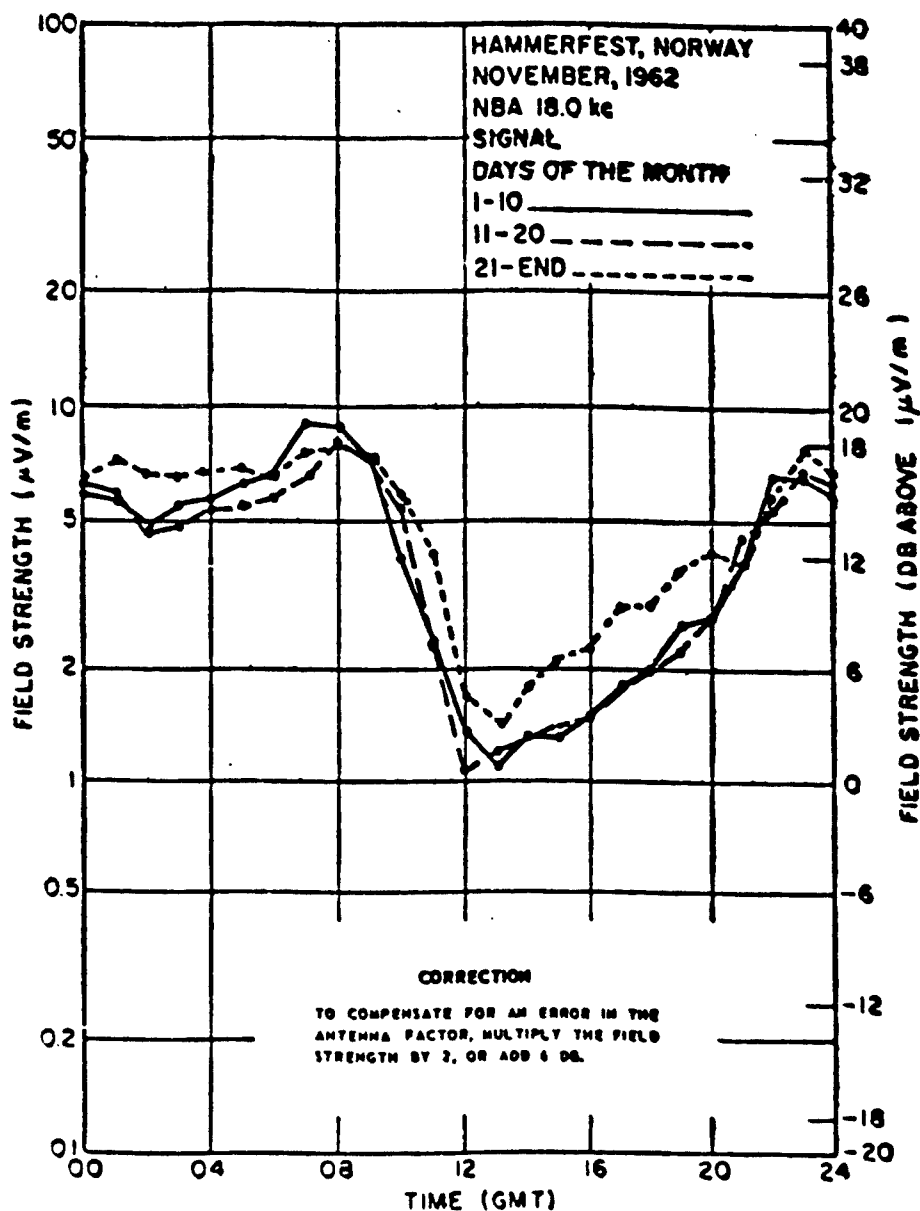


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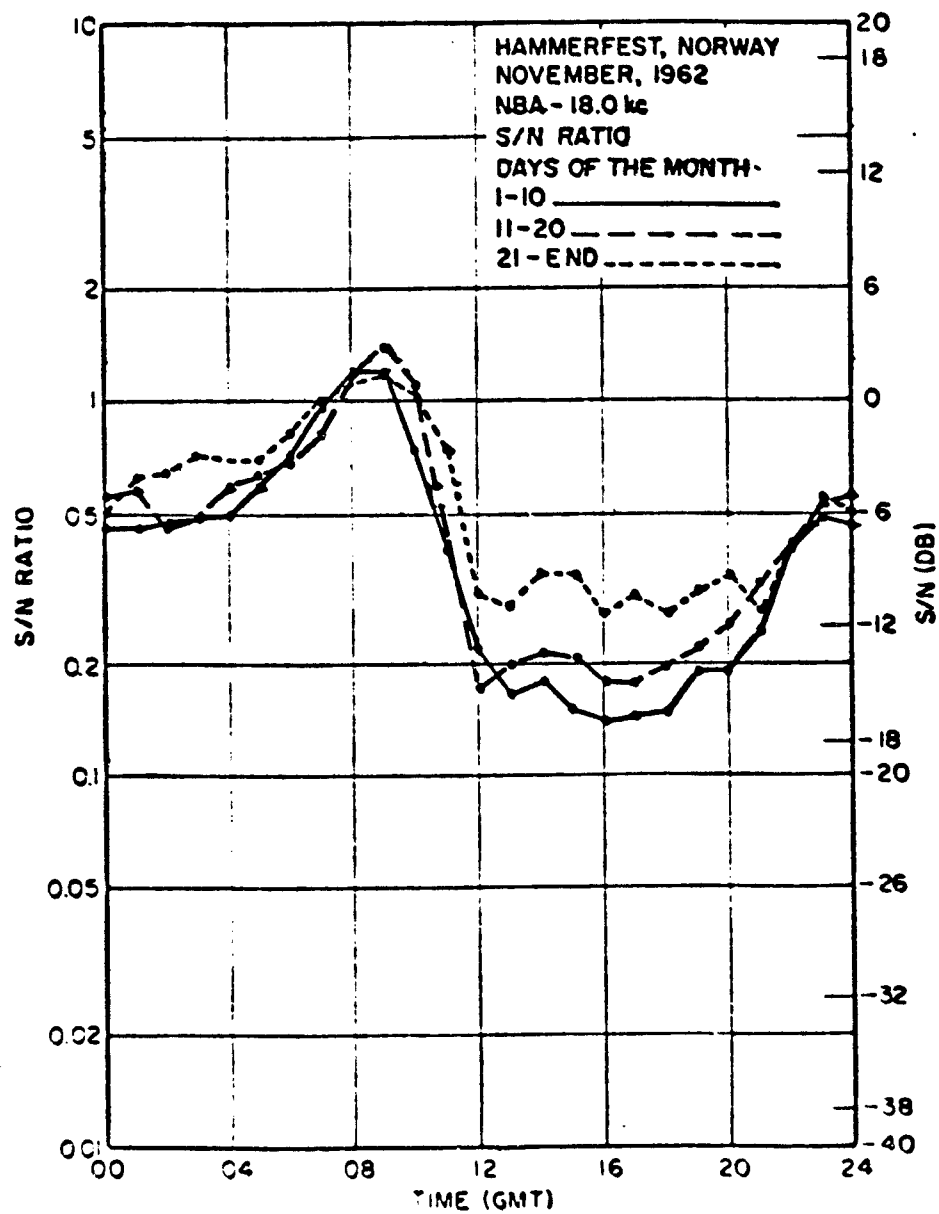


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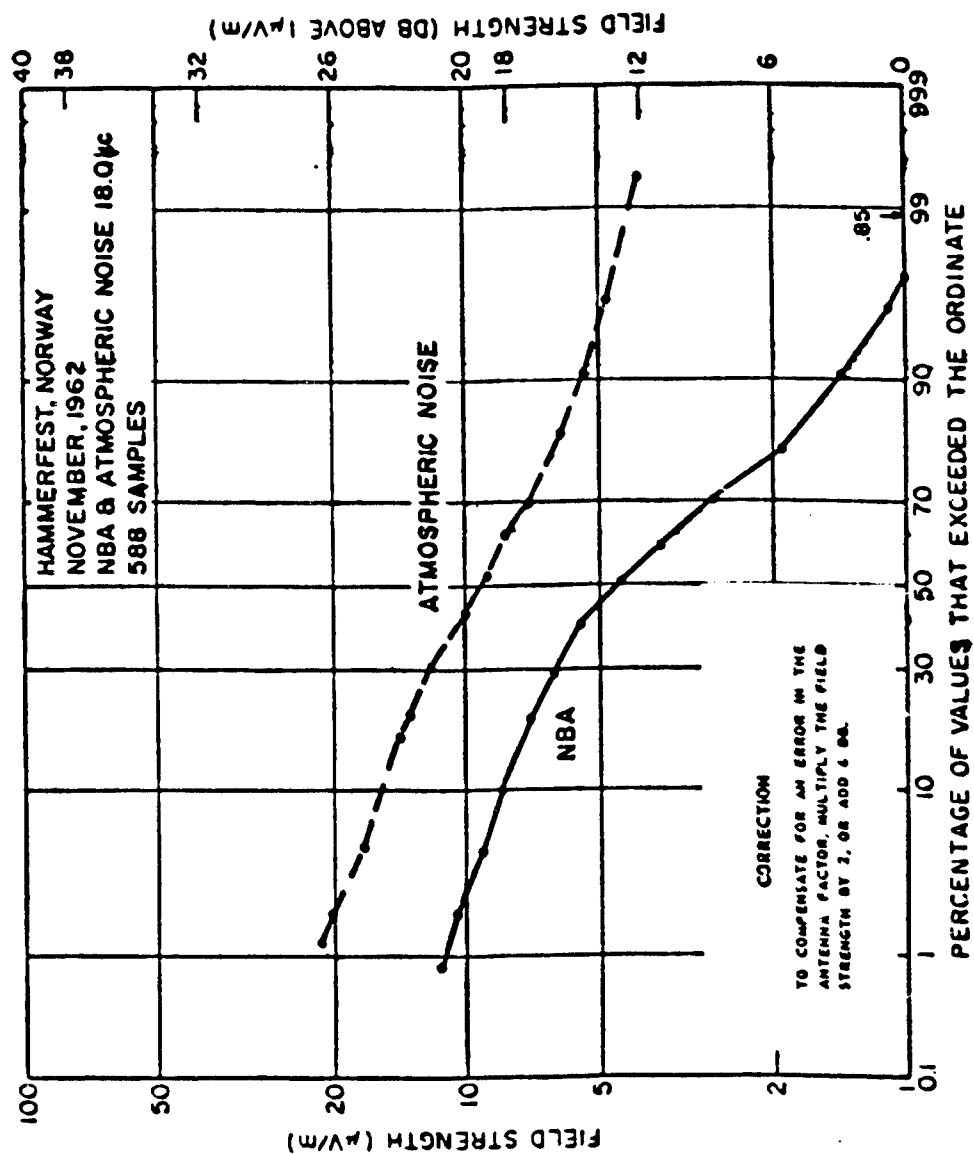


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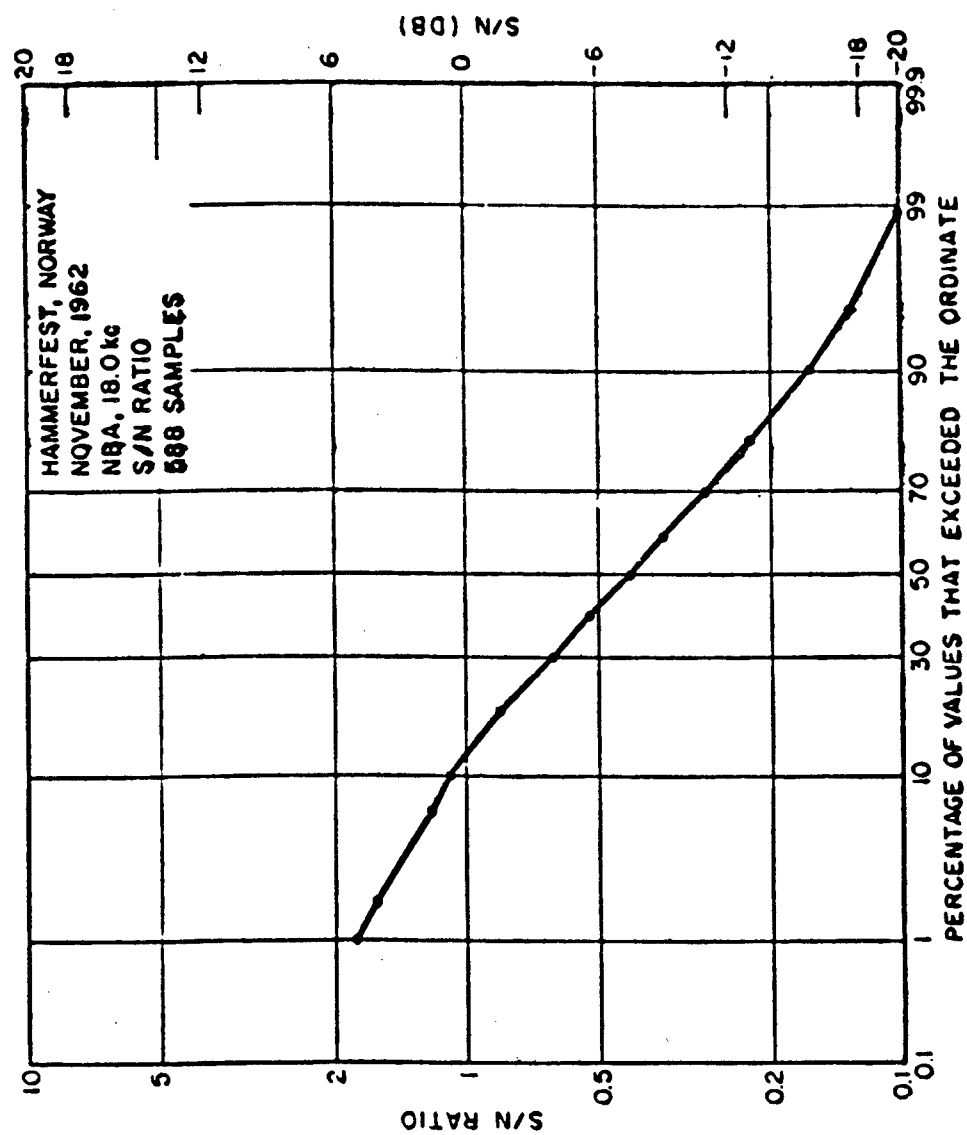


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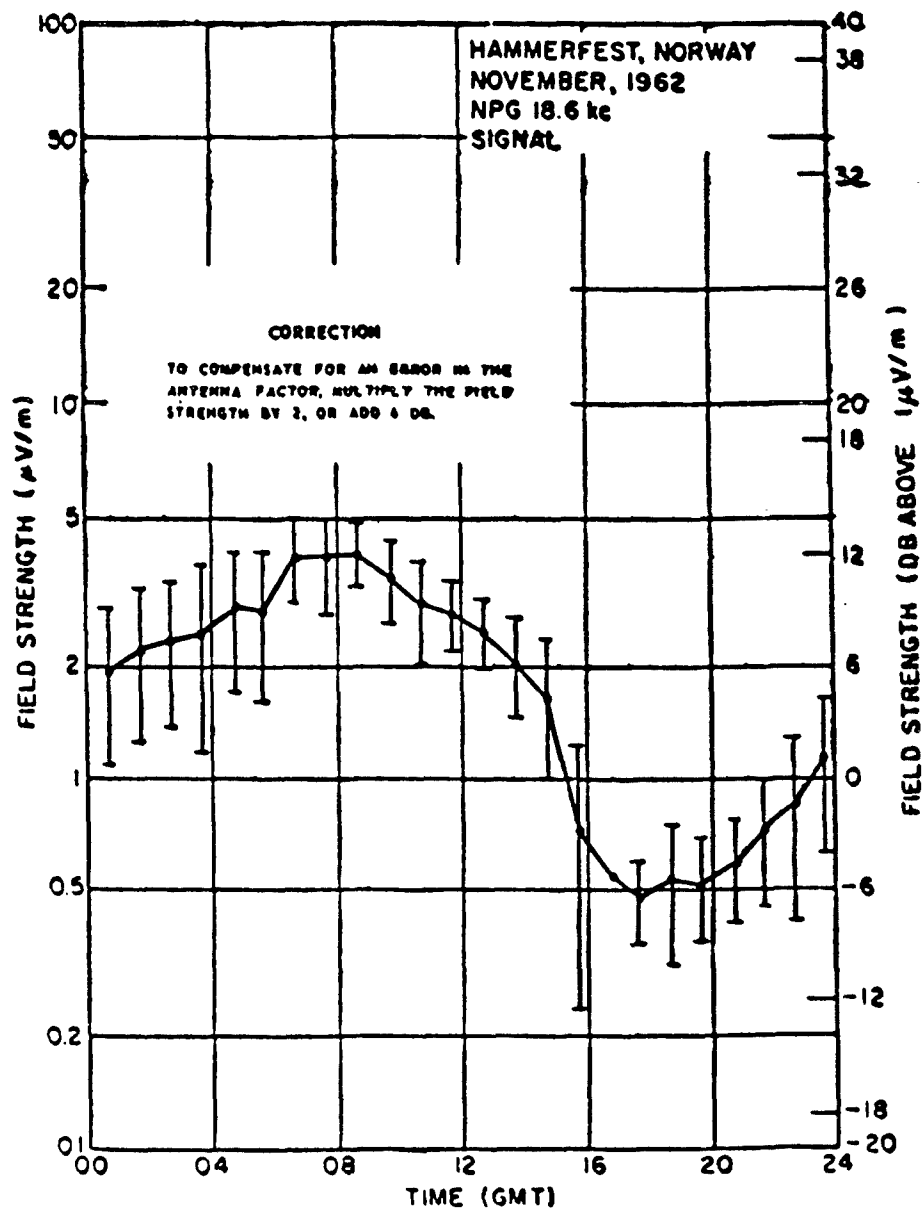


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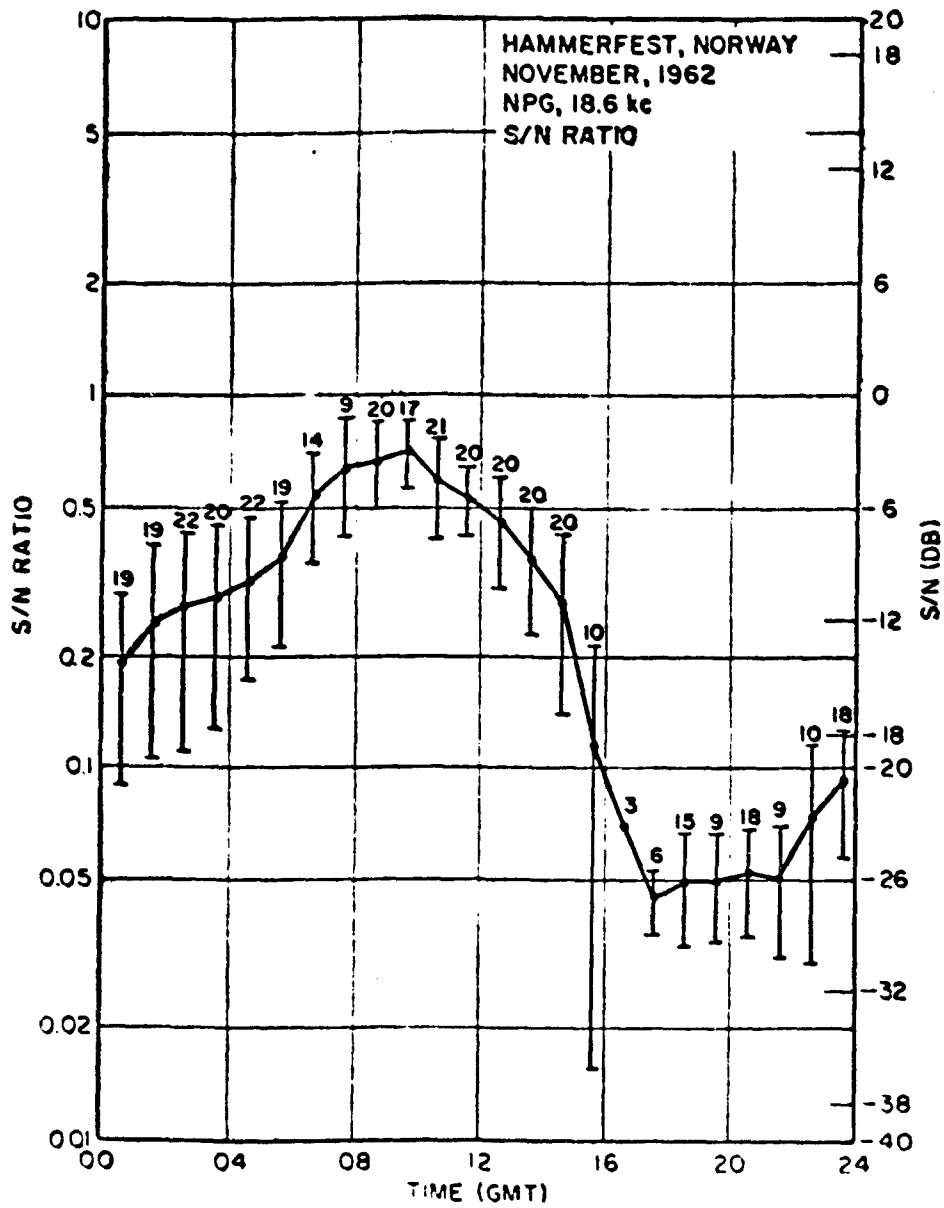


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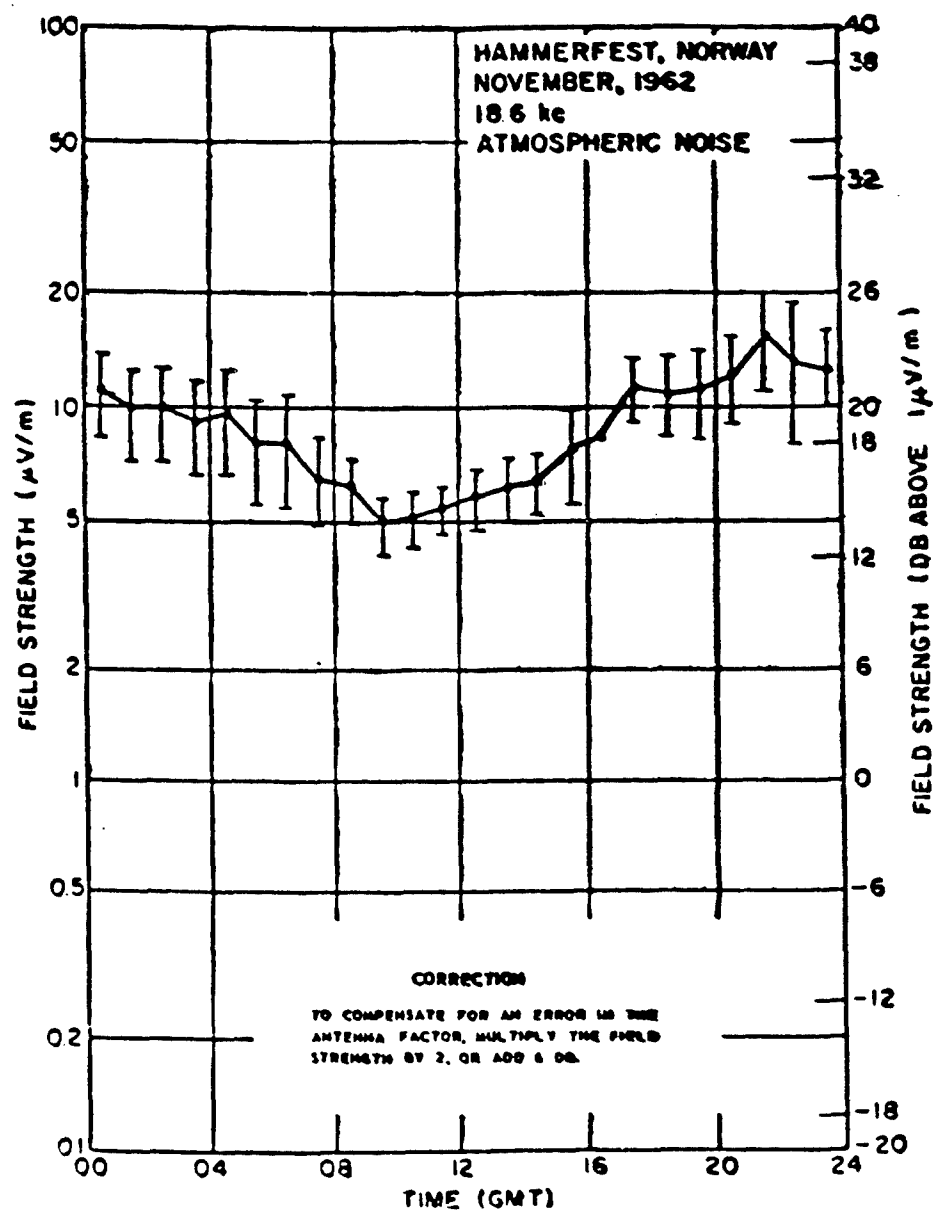


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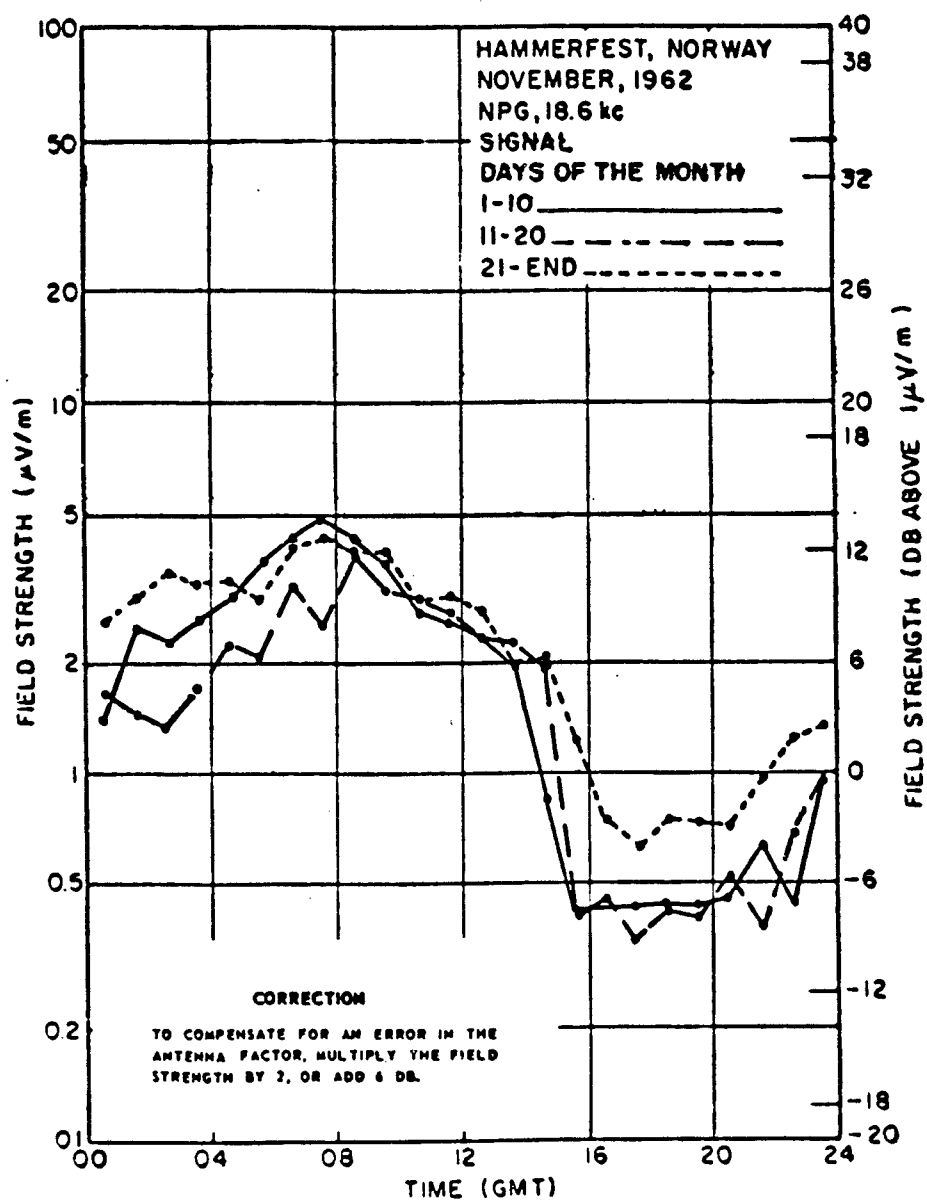


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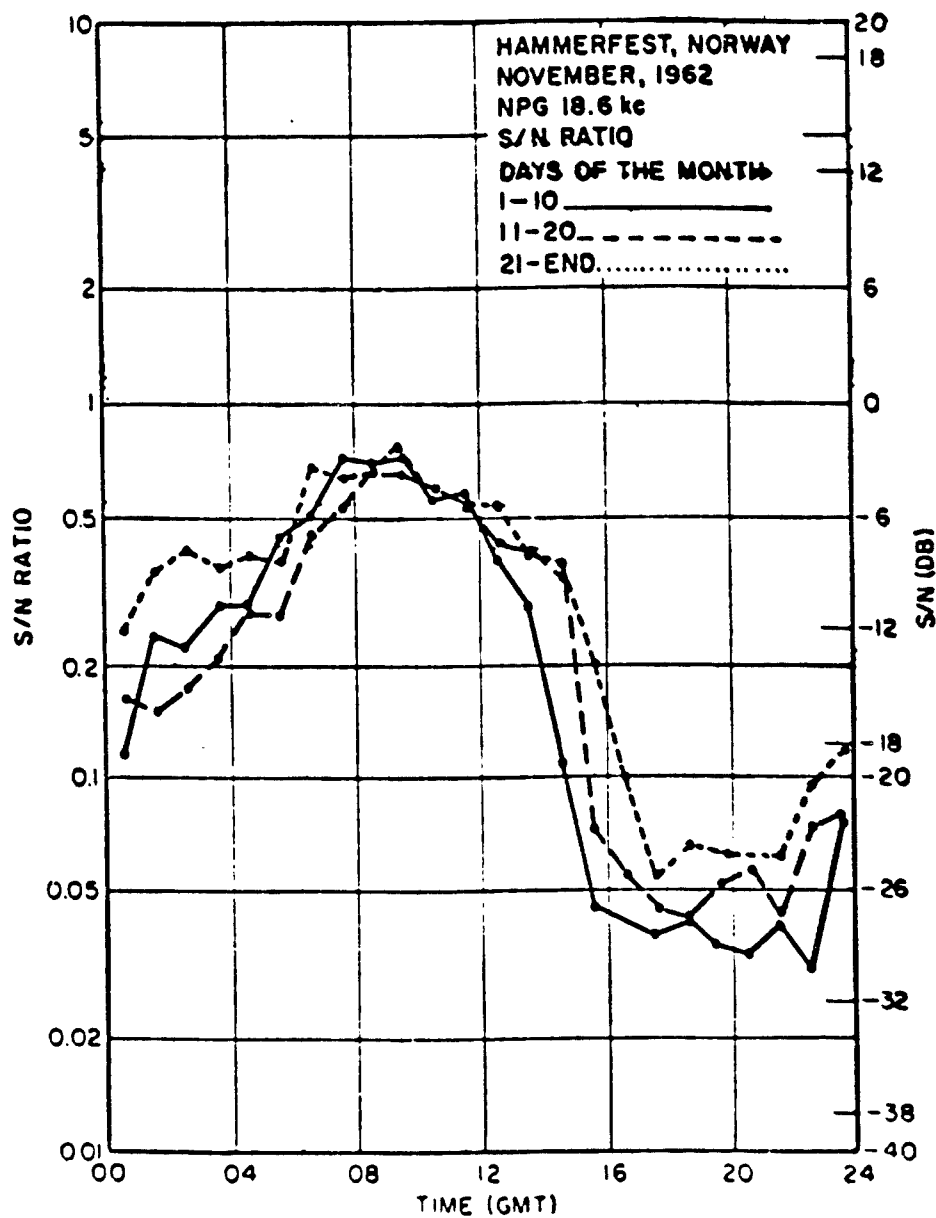


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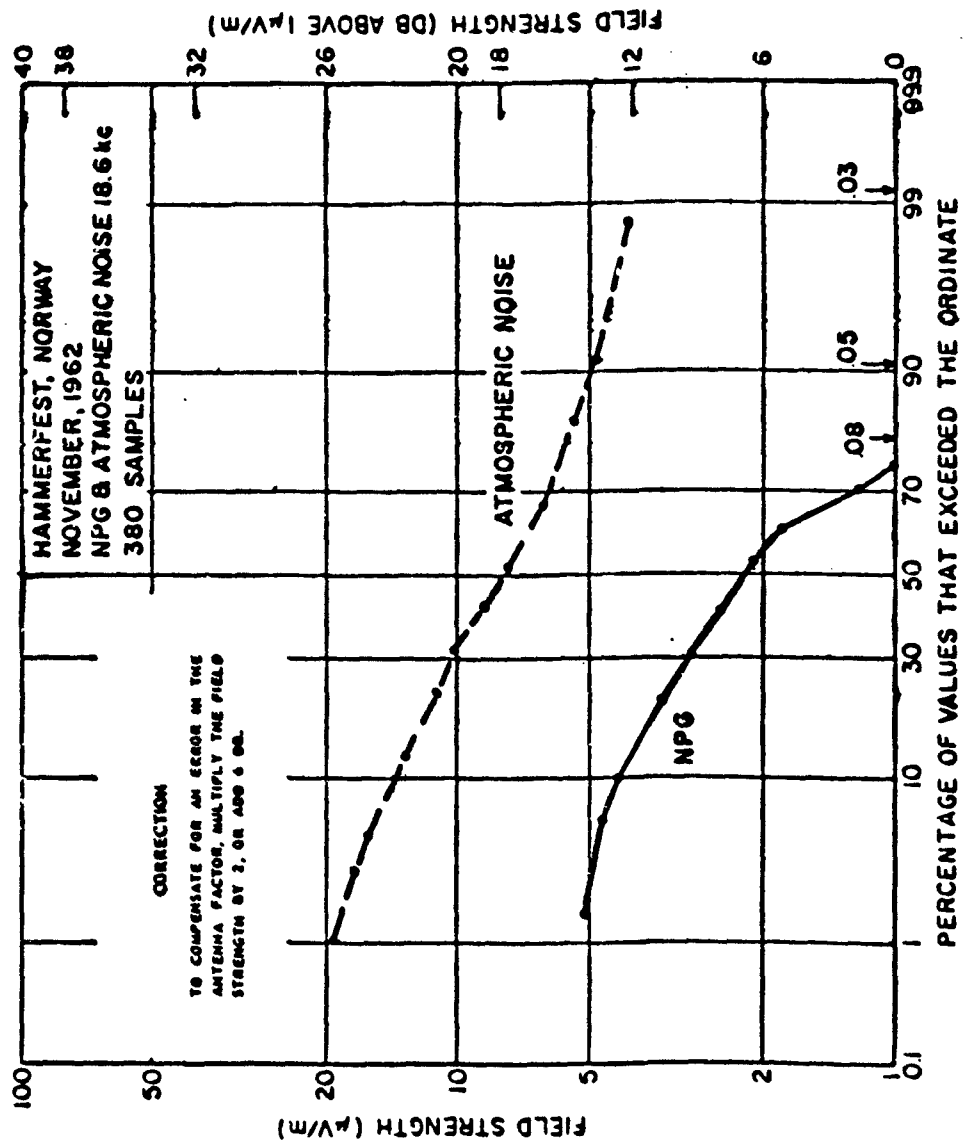


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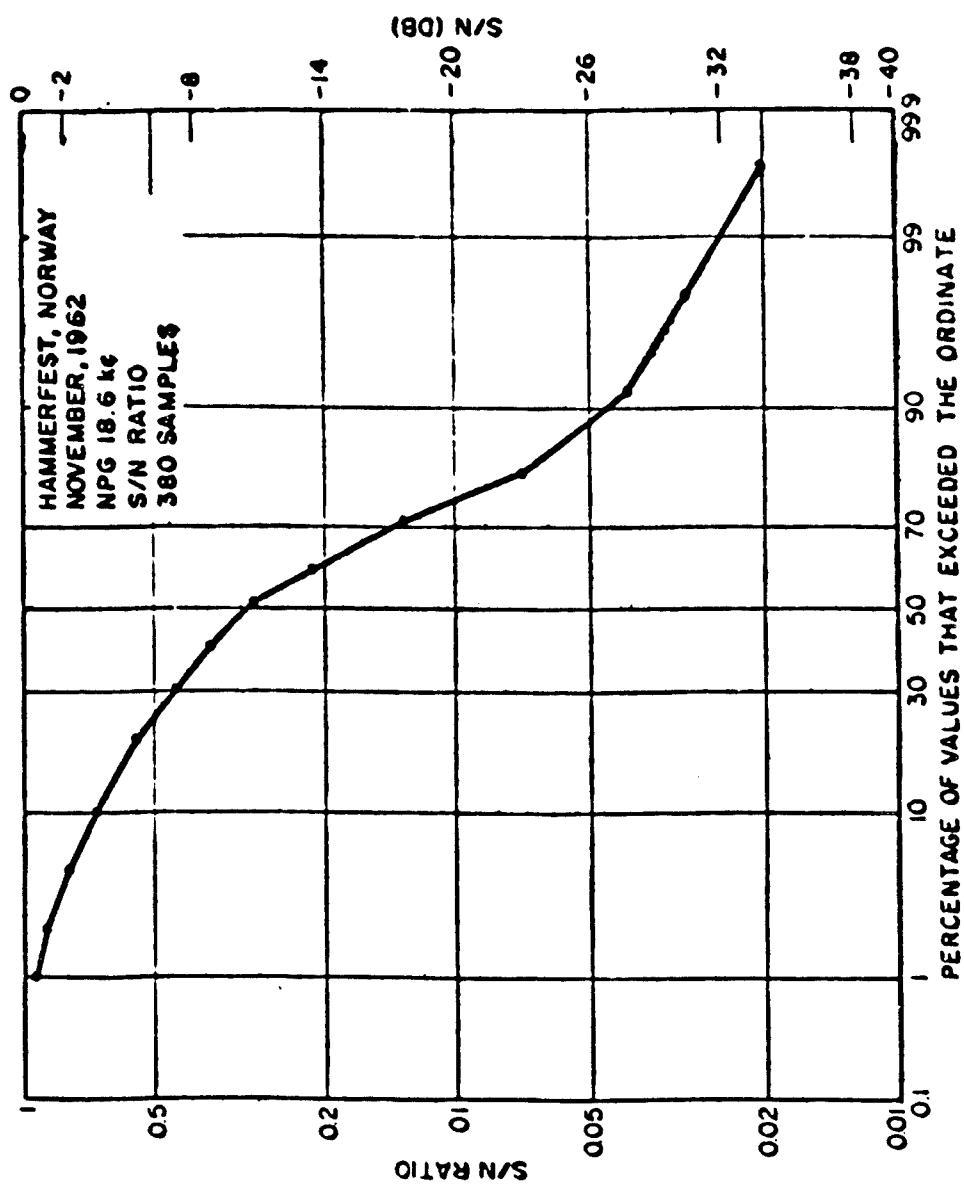


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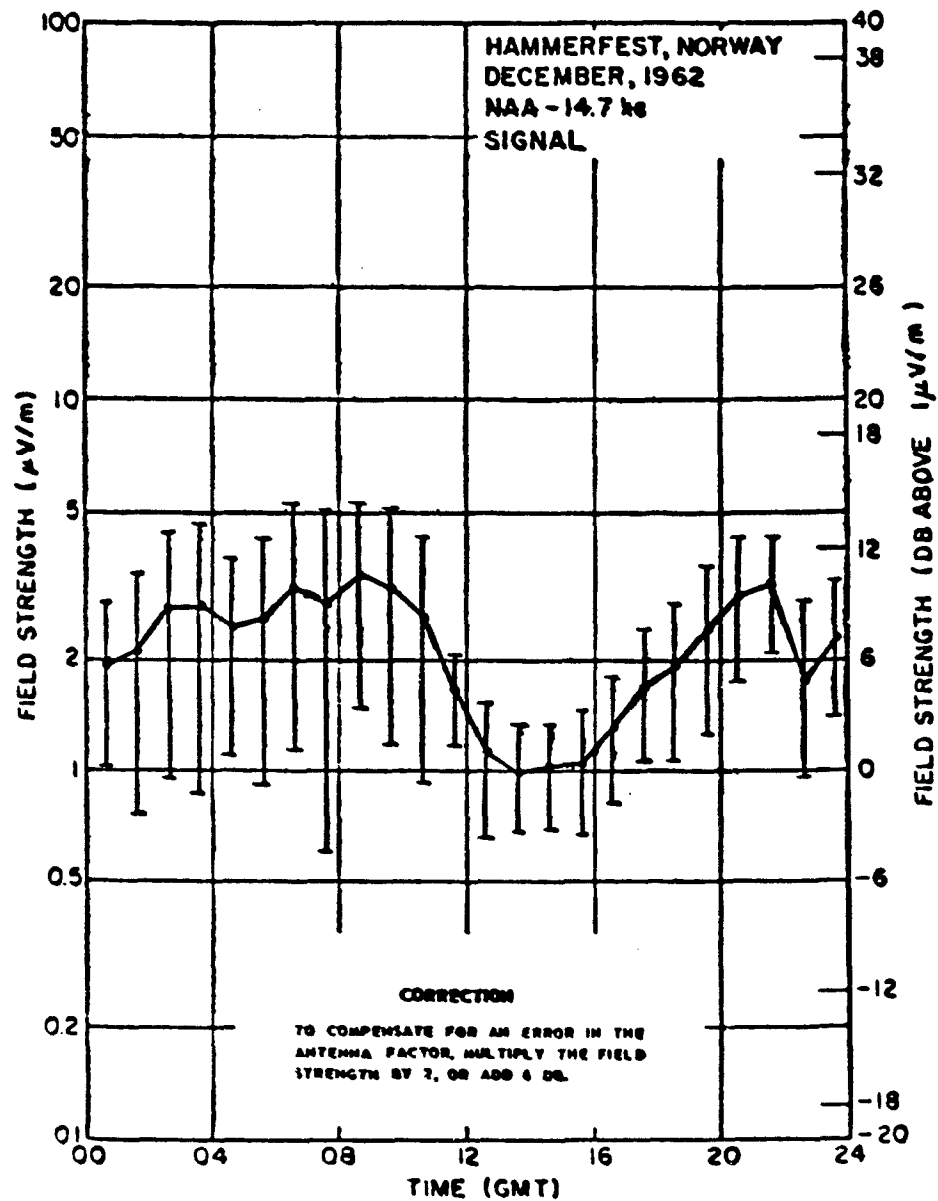


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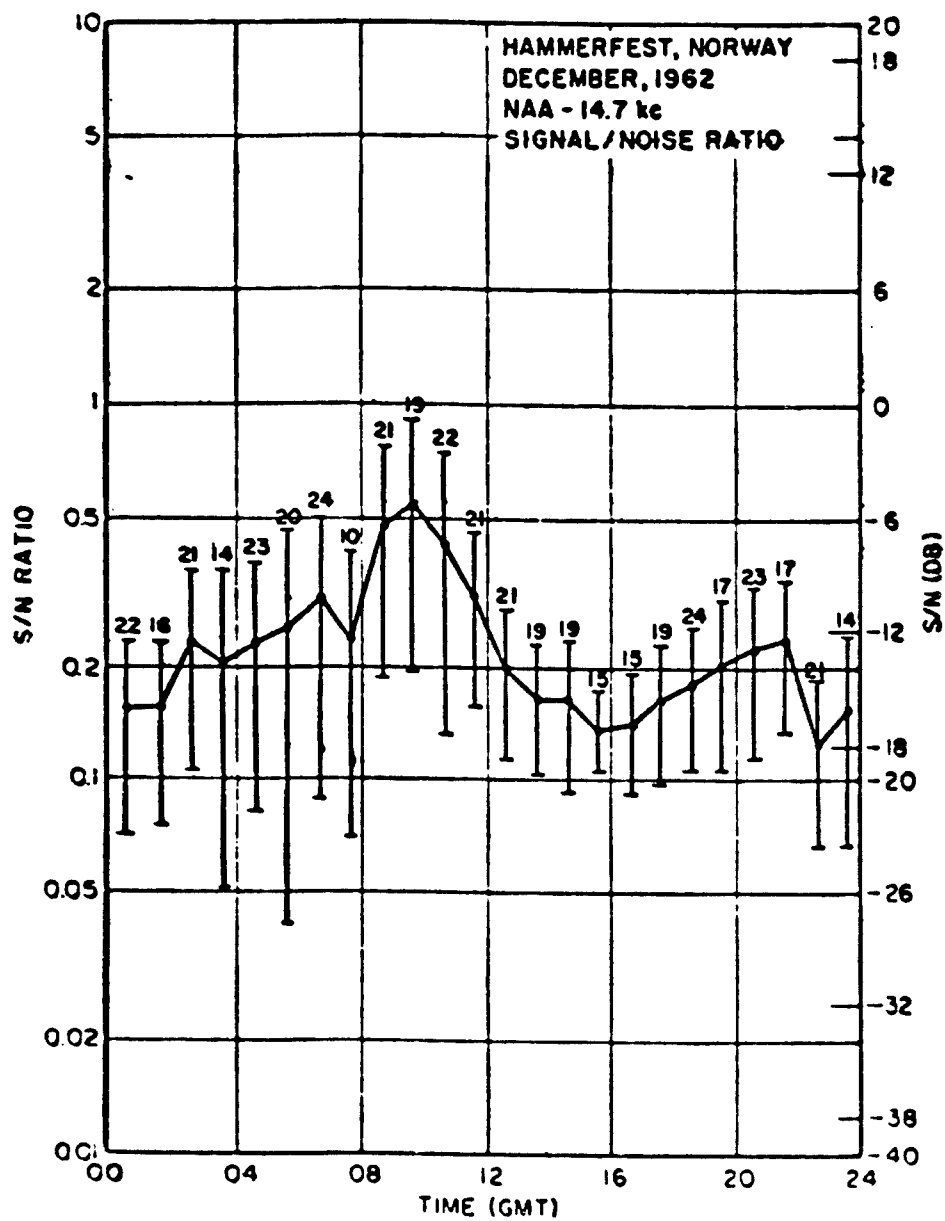


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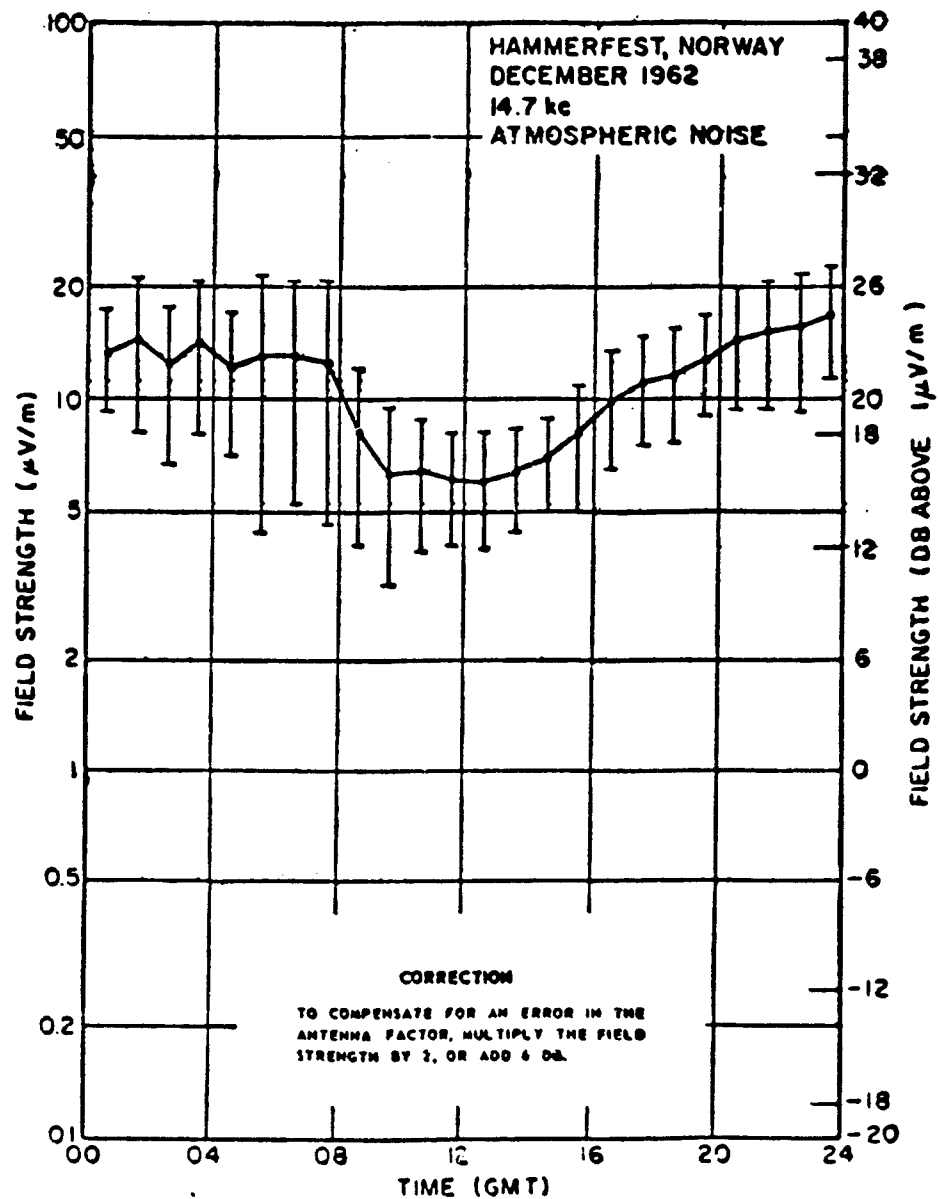


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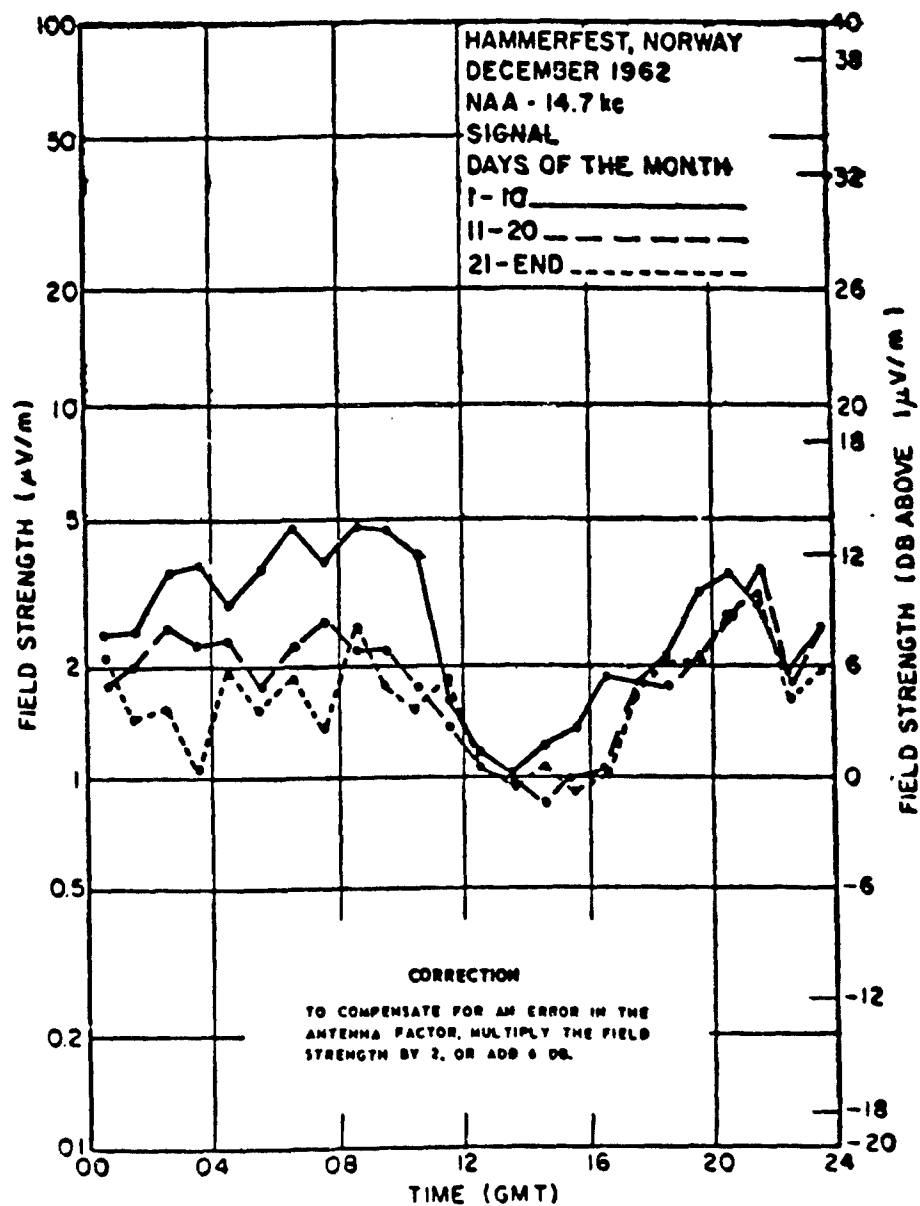


Figure 111

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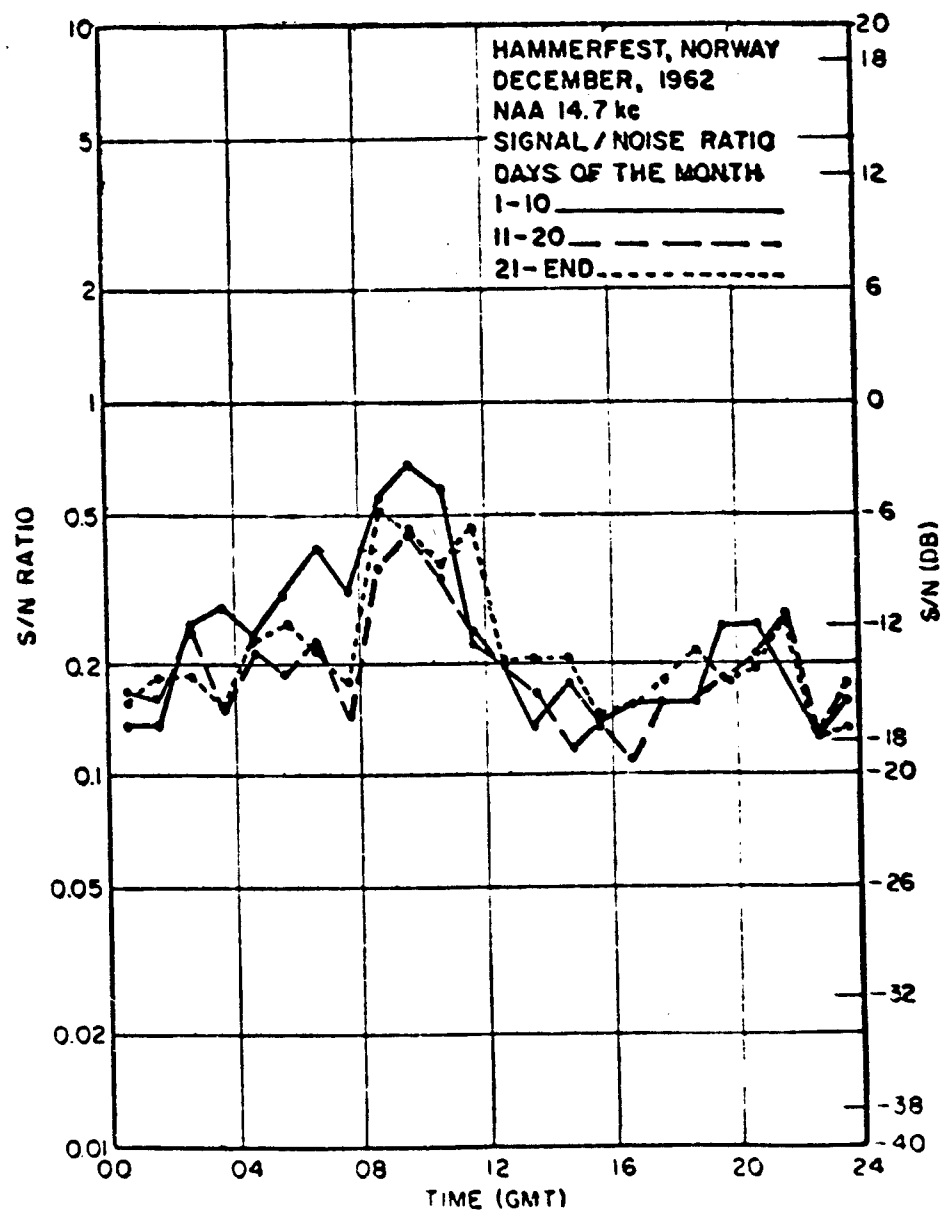


Figure 112

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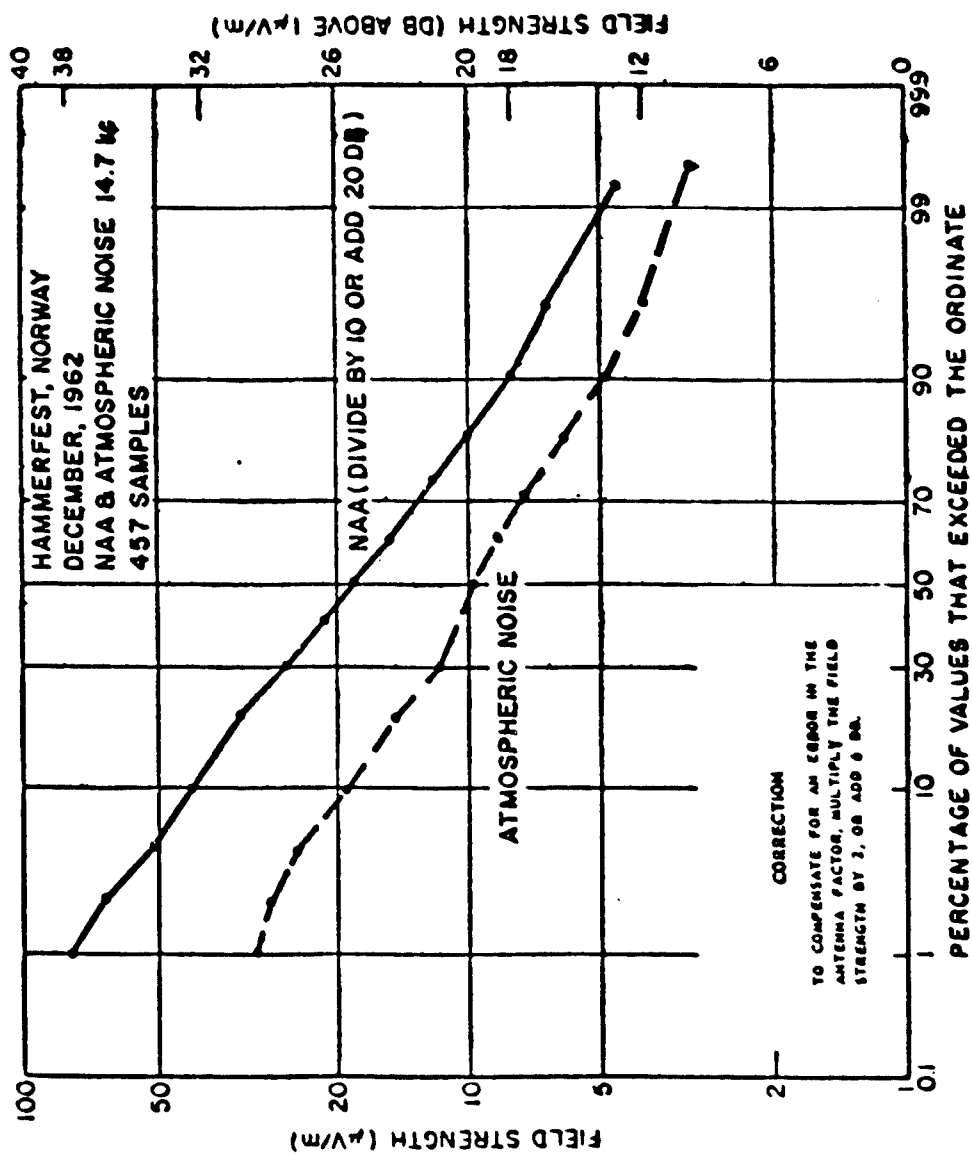


Figure 113

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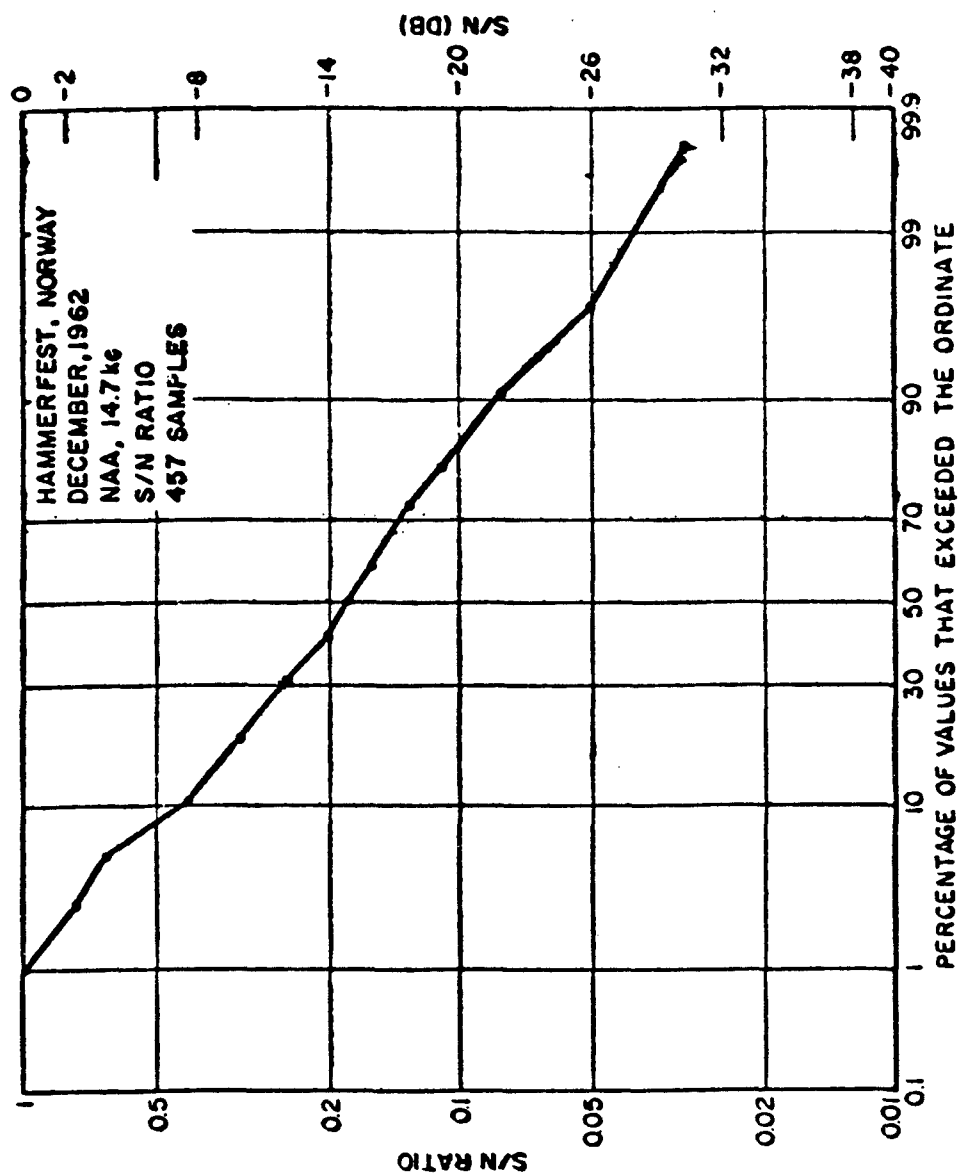


Figure 114

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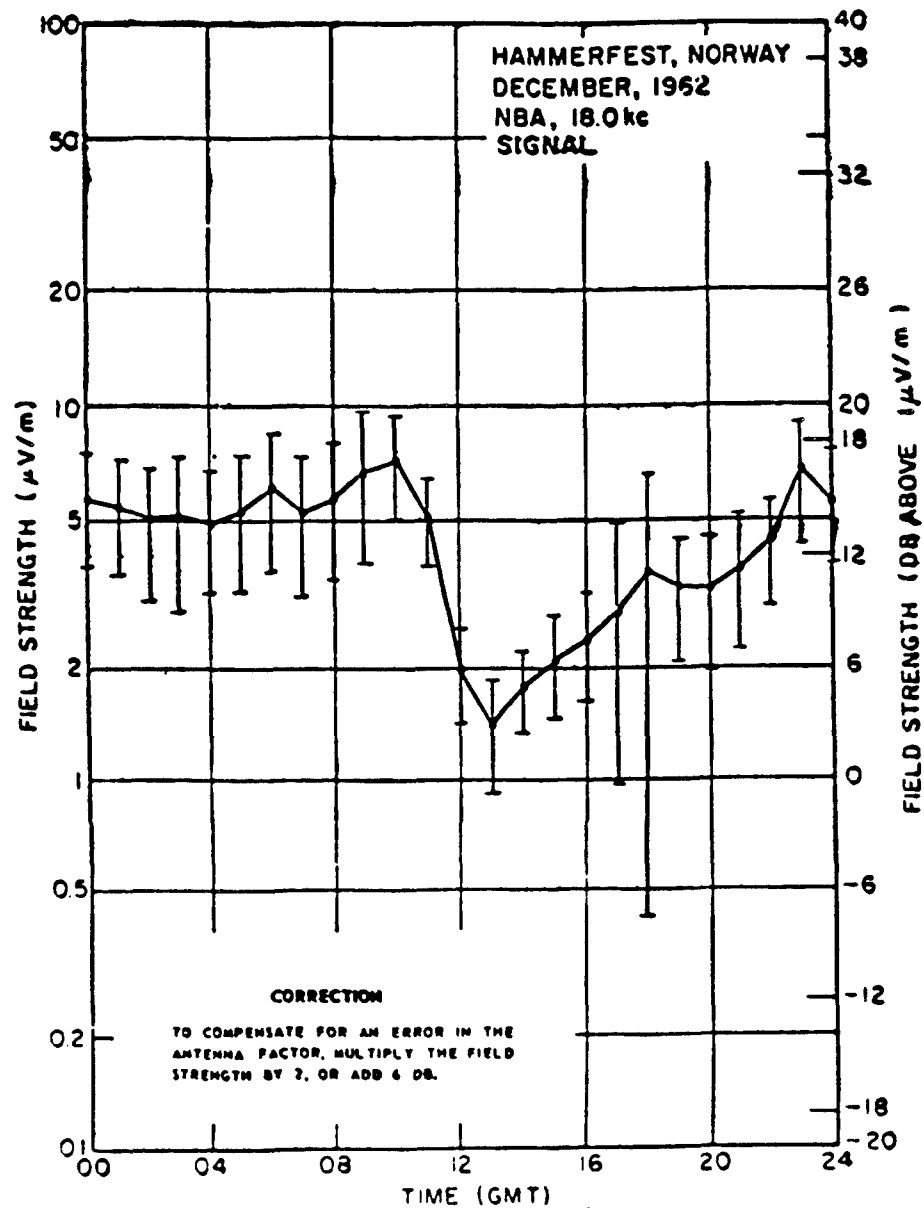


Figure 115

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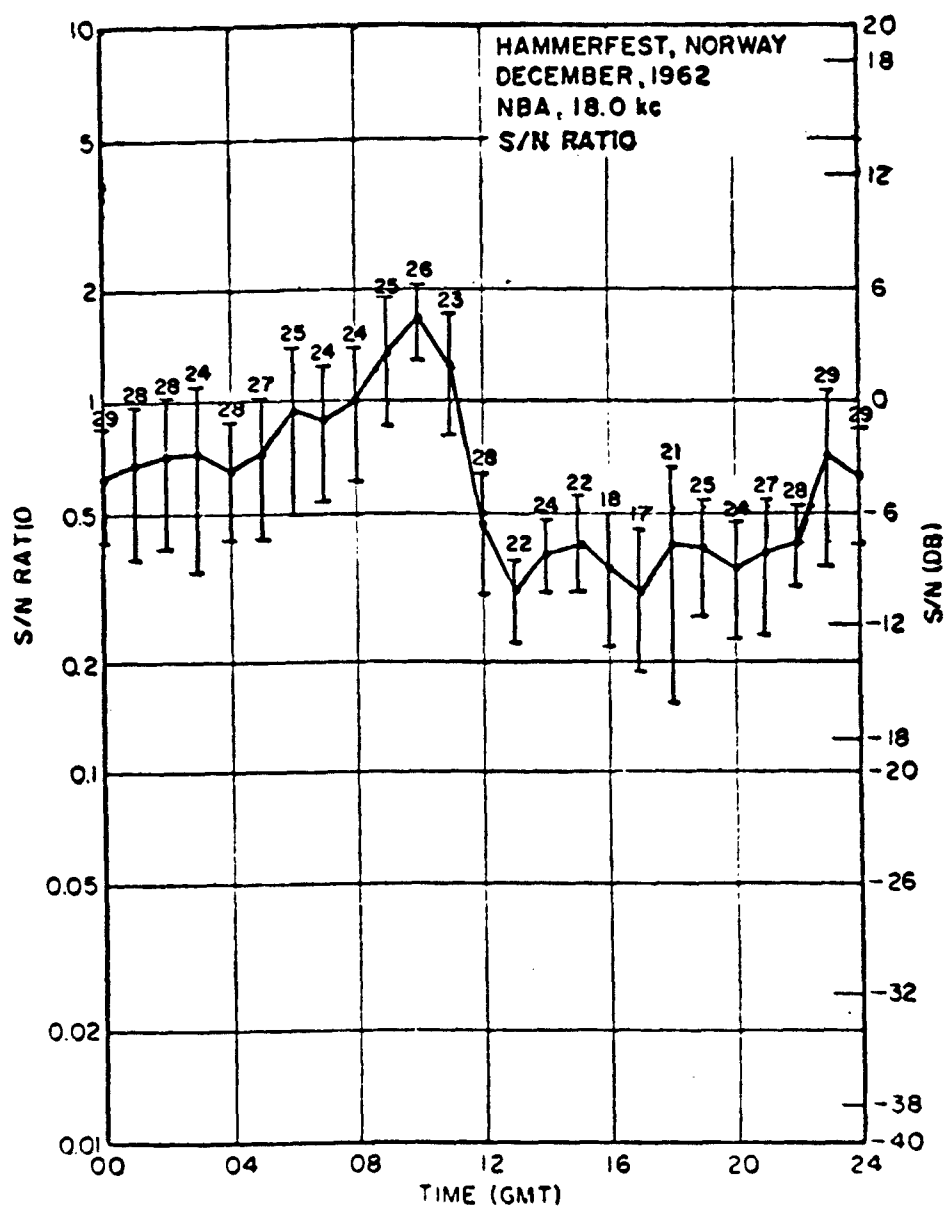


Figure 116

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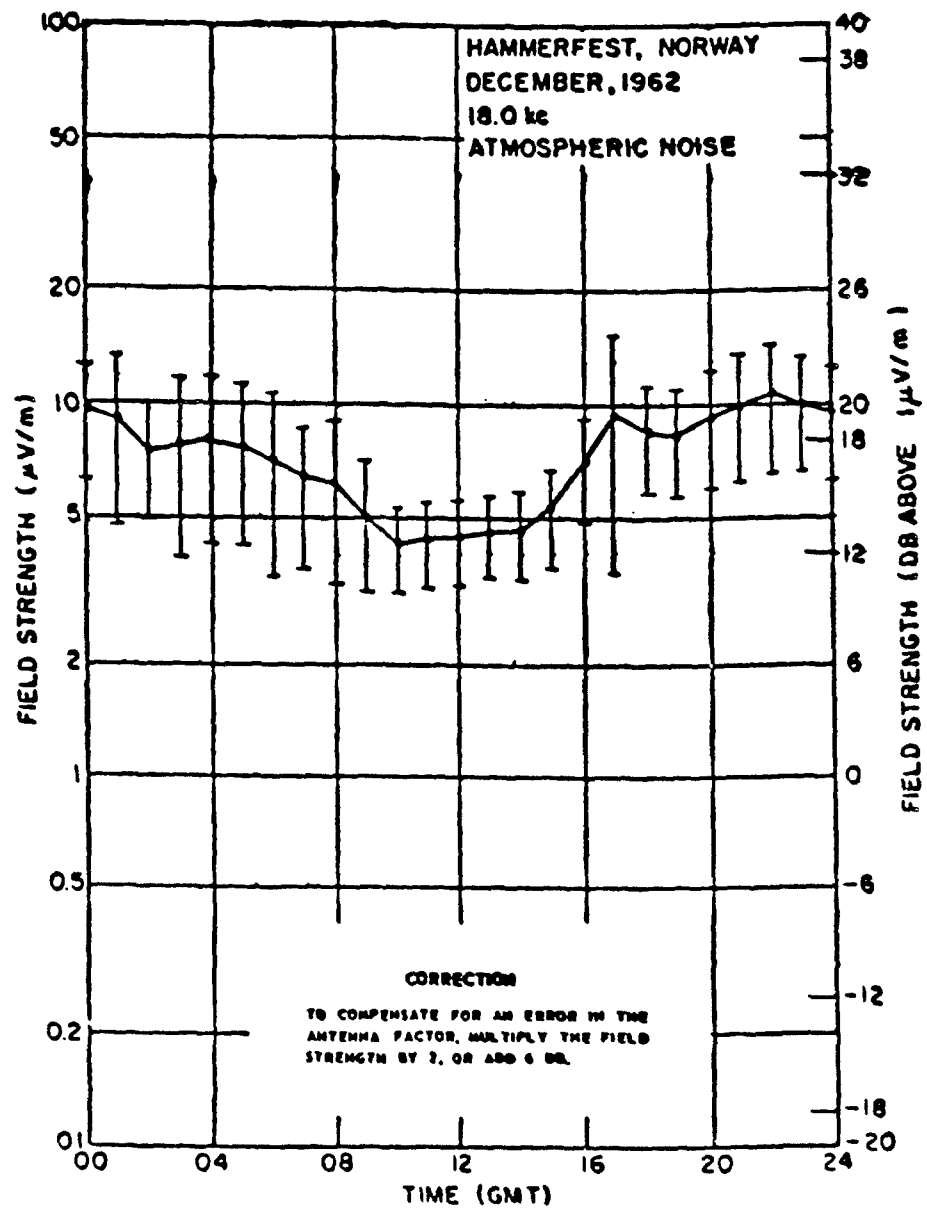


Figure 117

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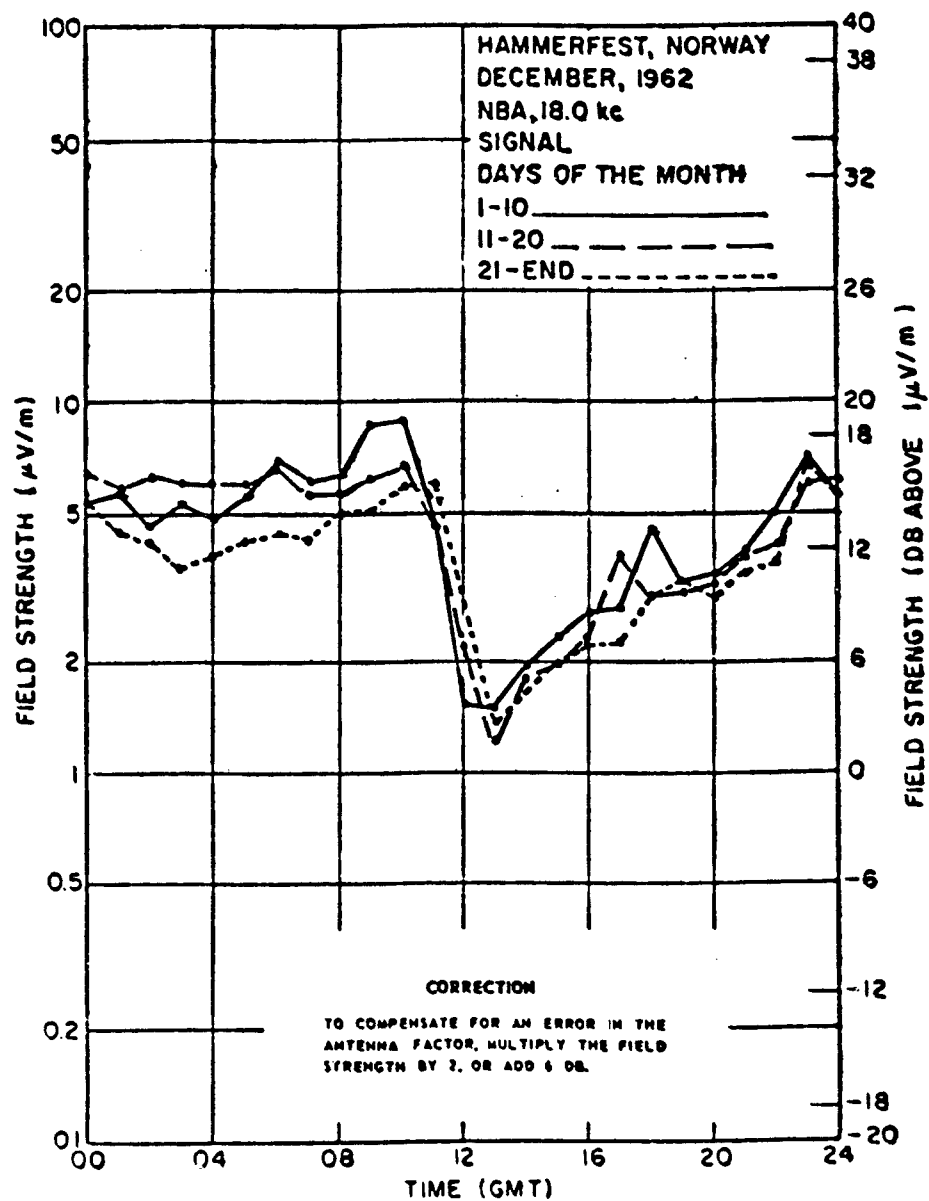


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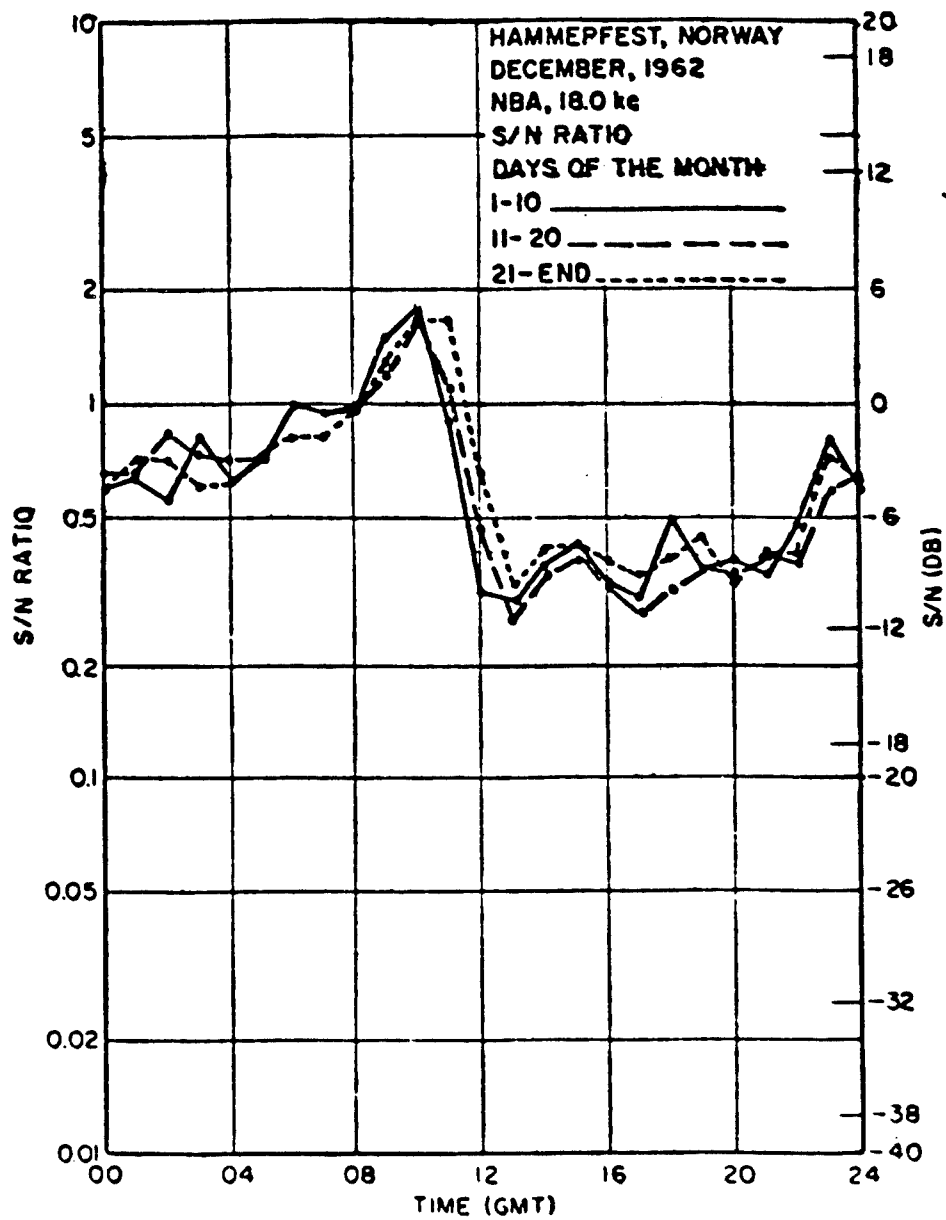


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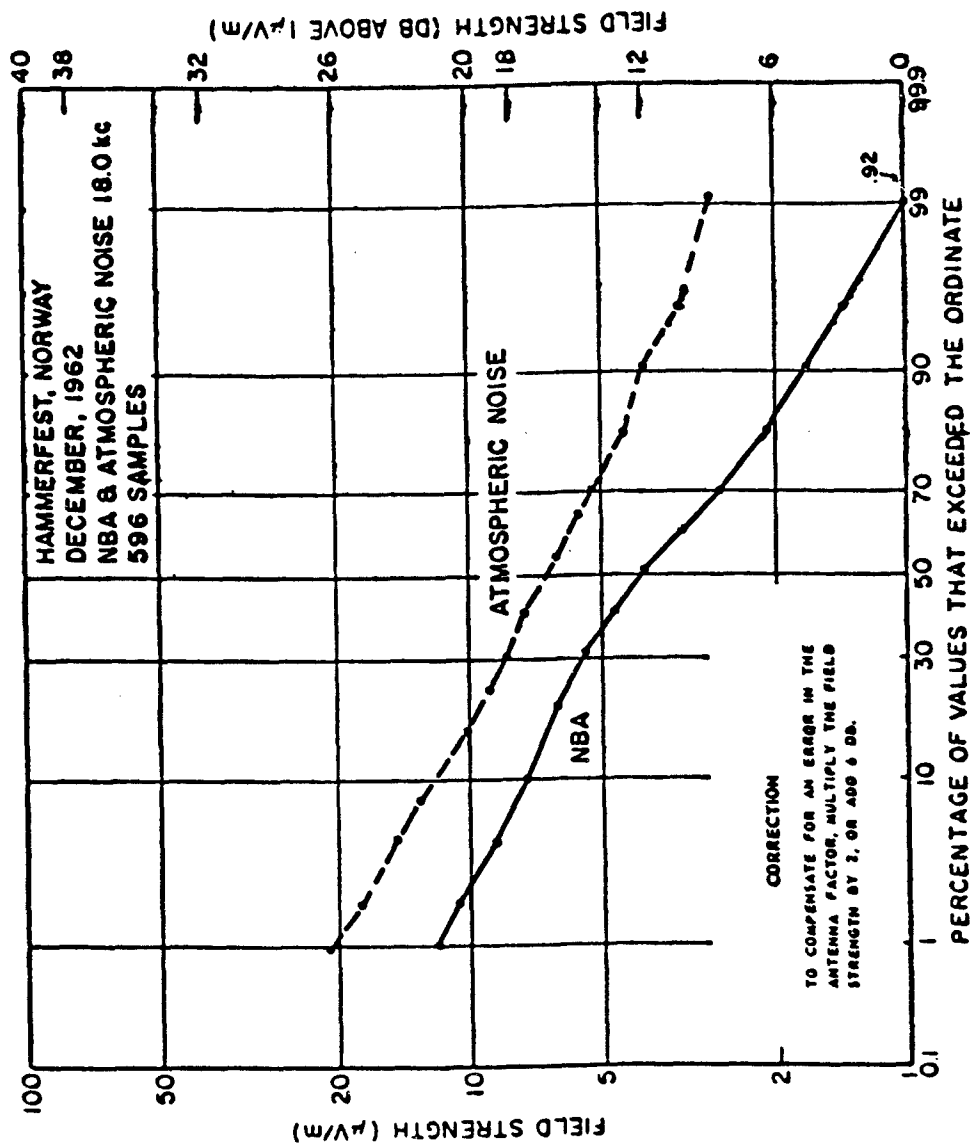


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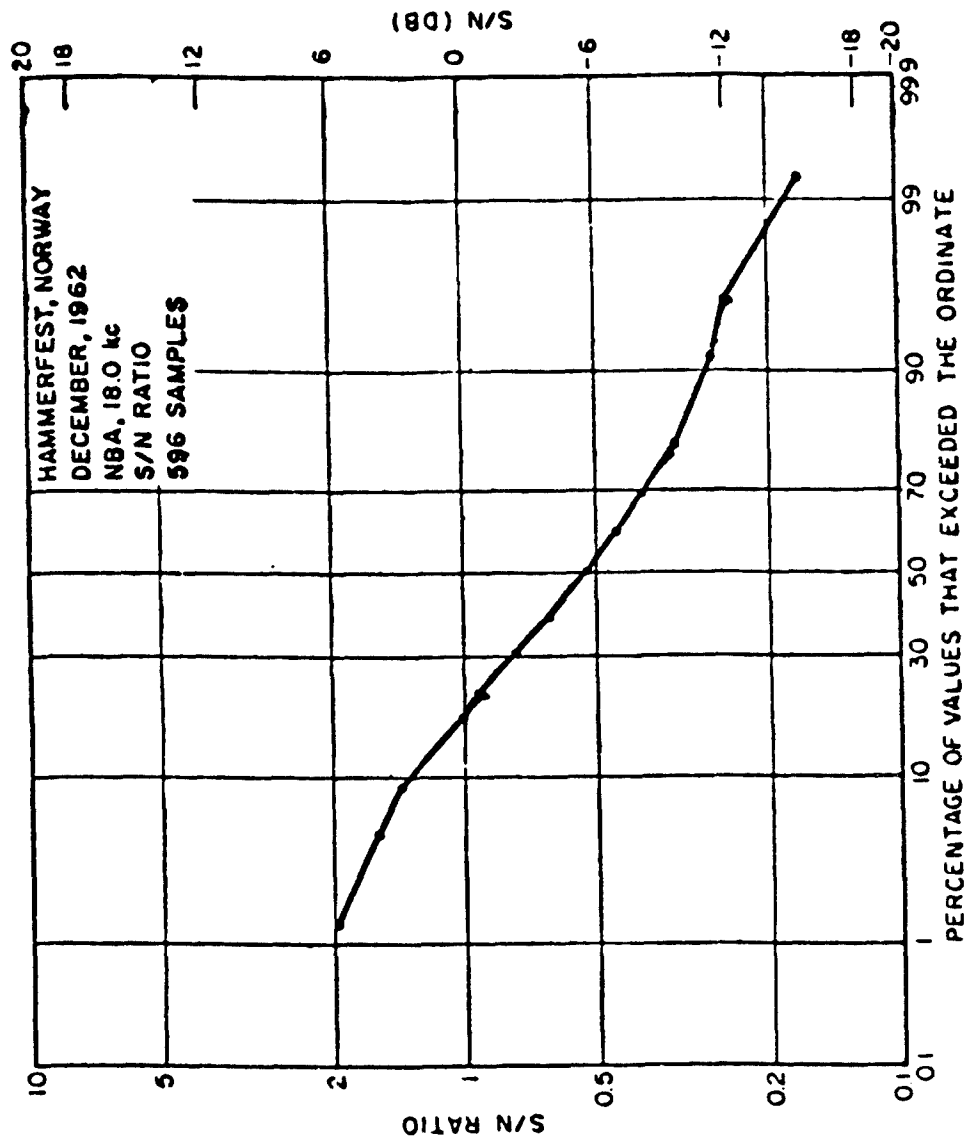


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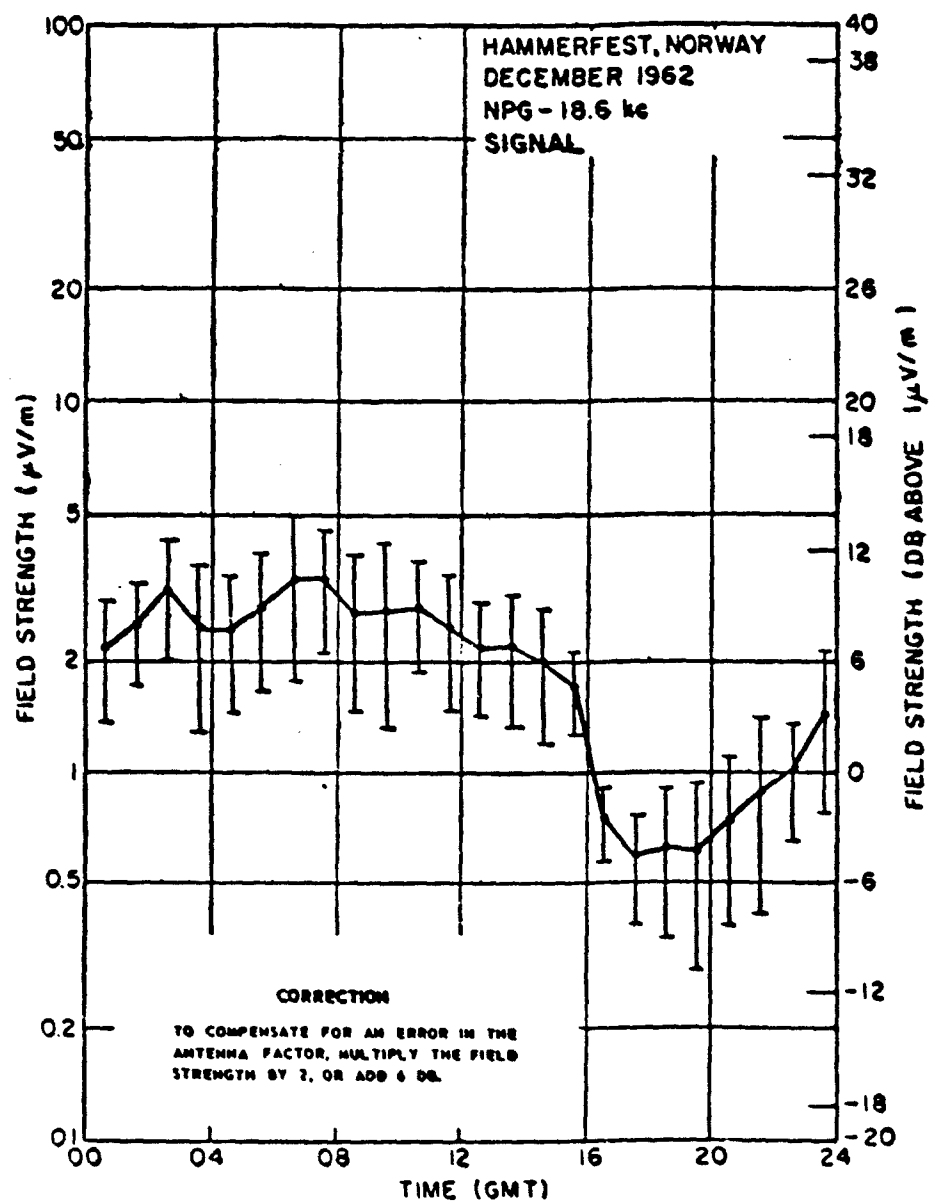


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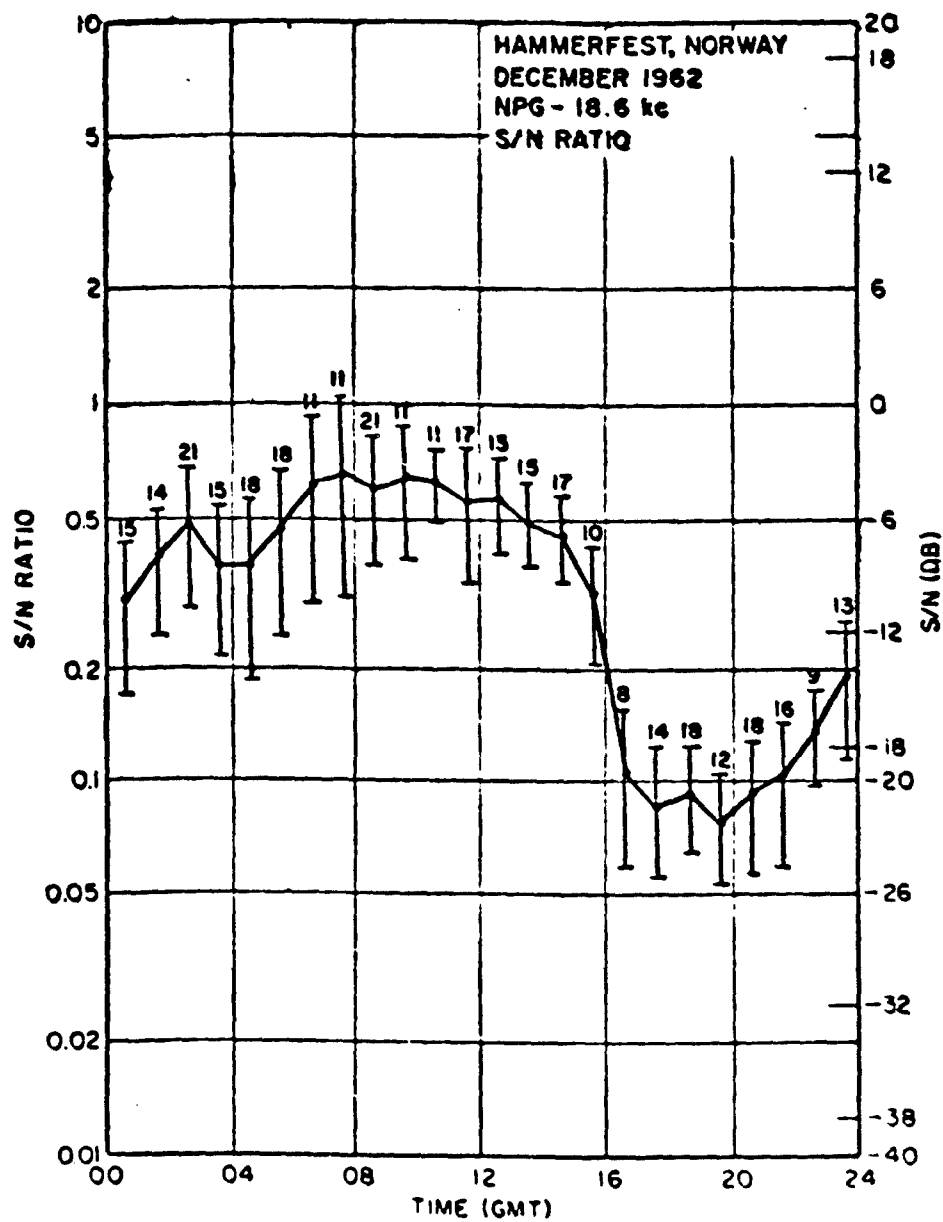


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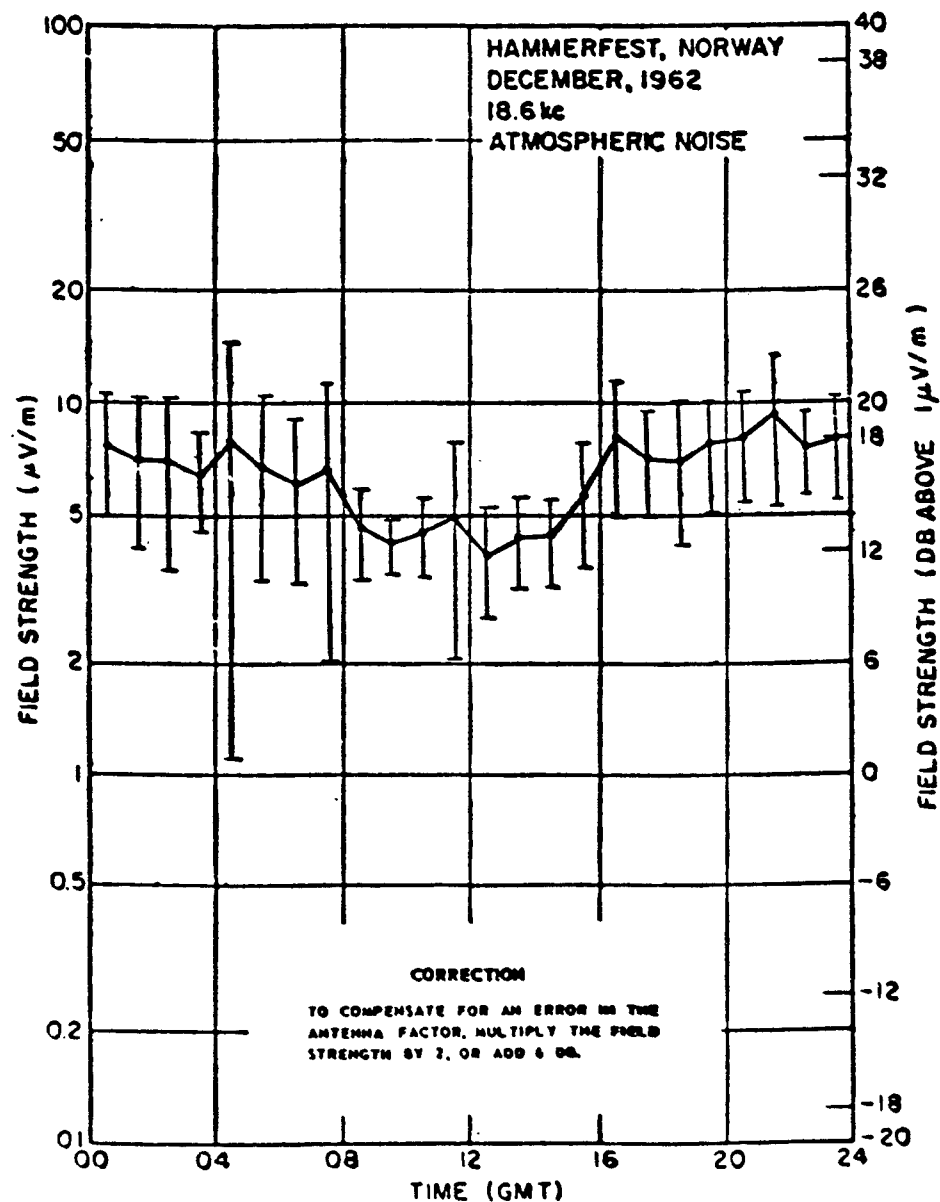


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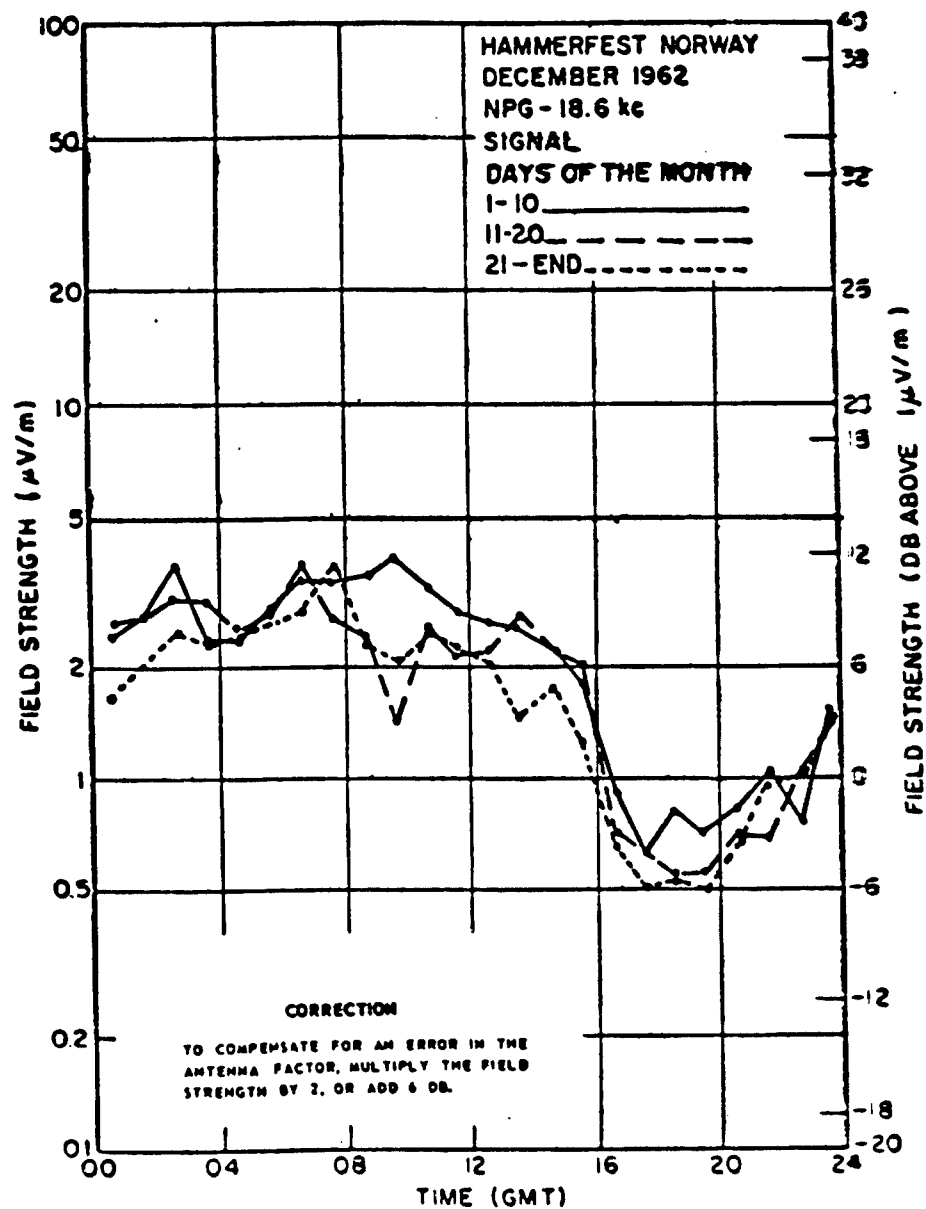


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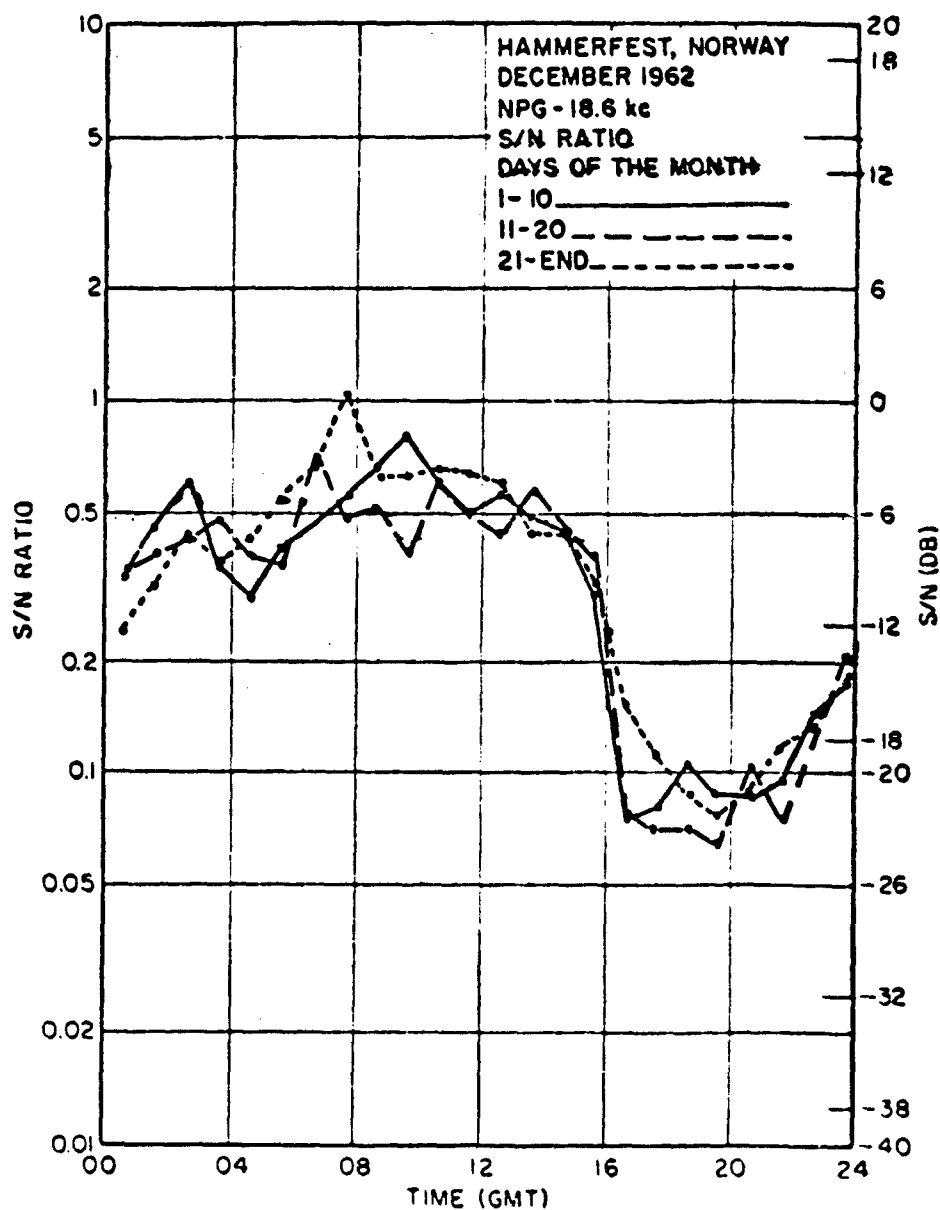


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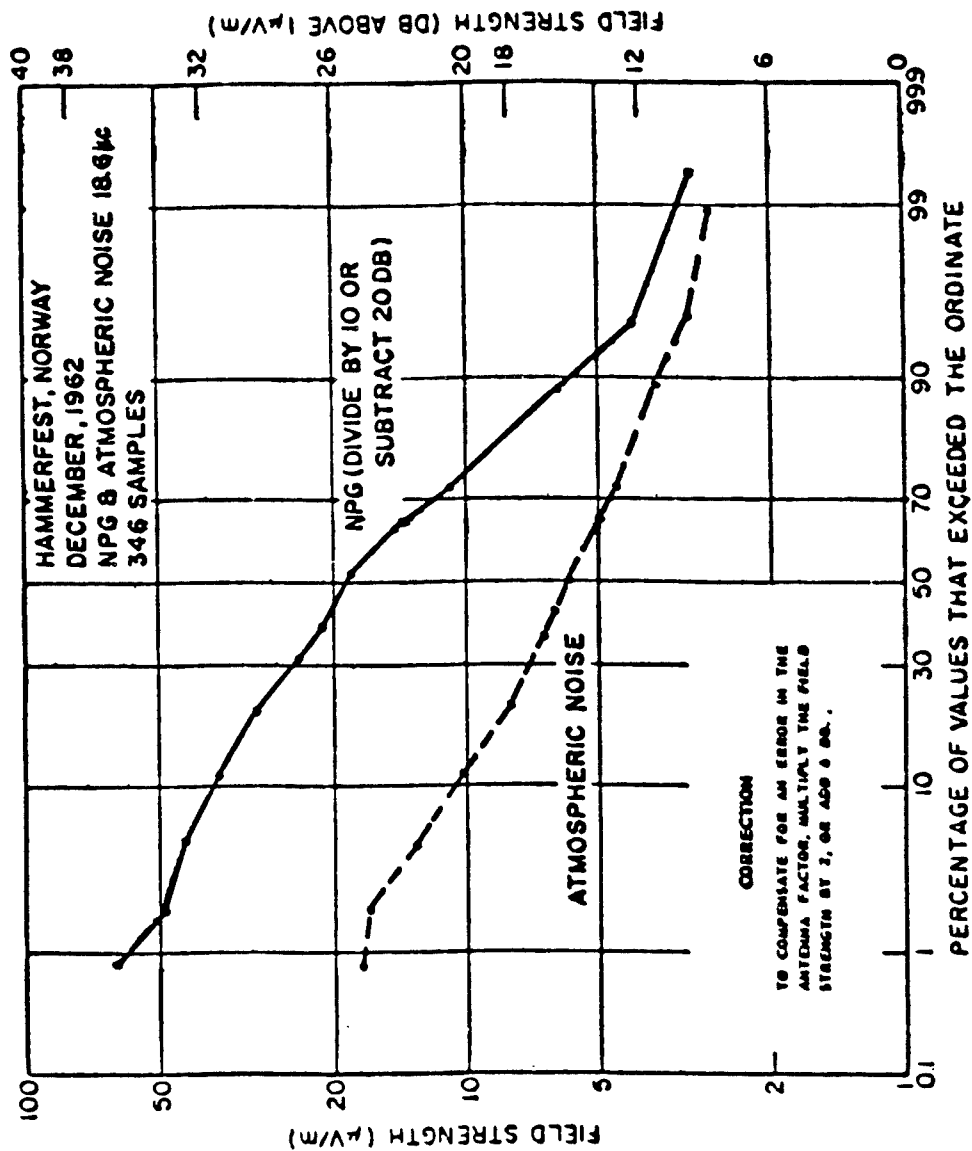


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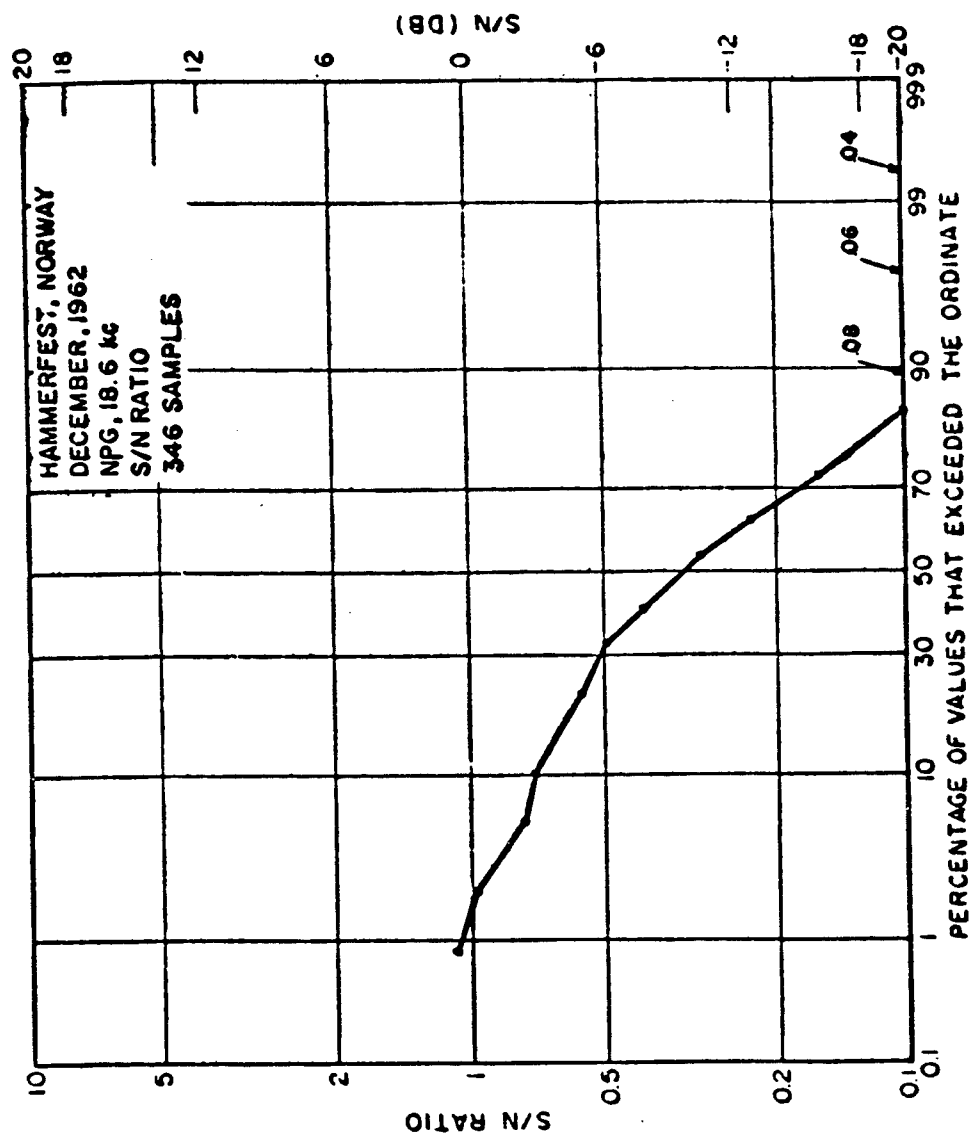


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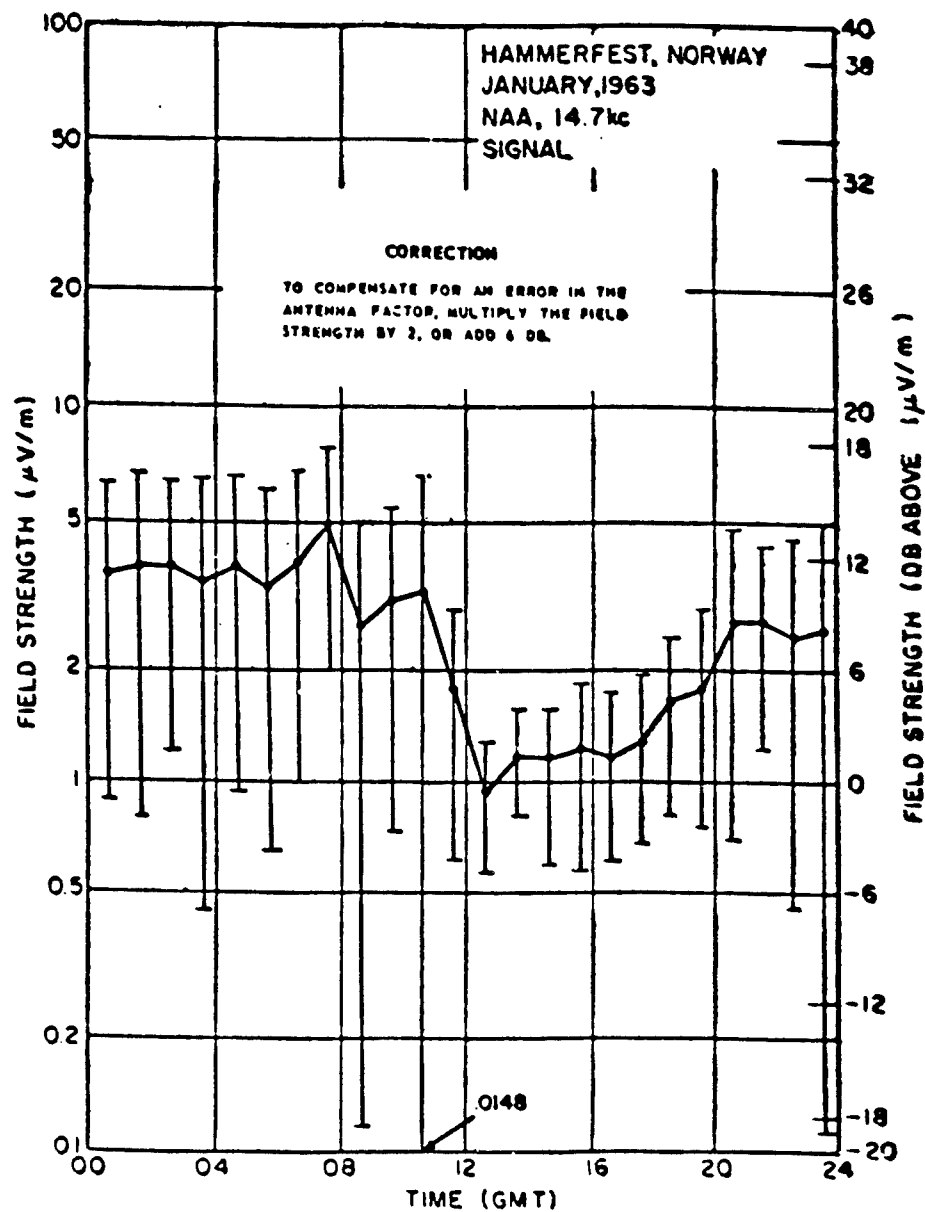


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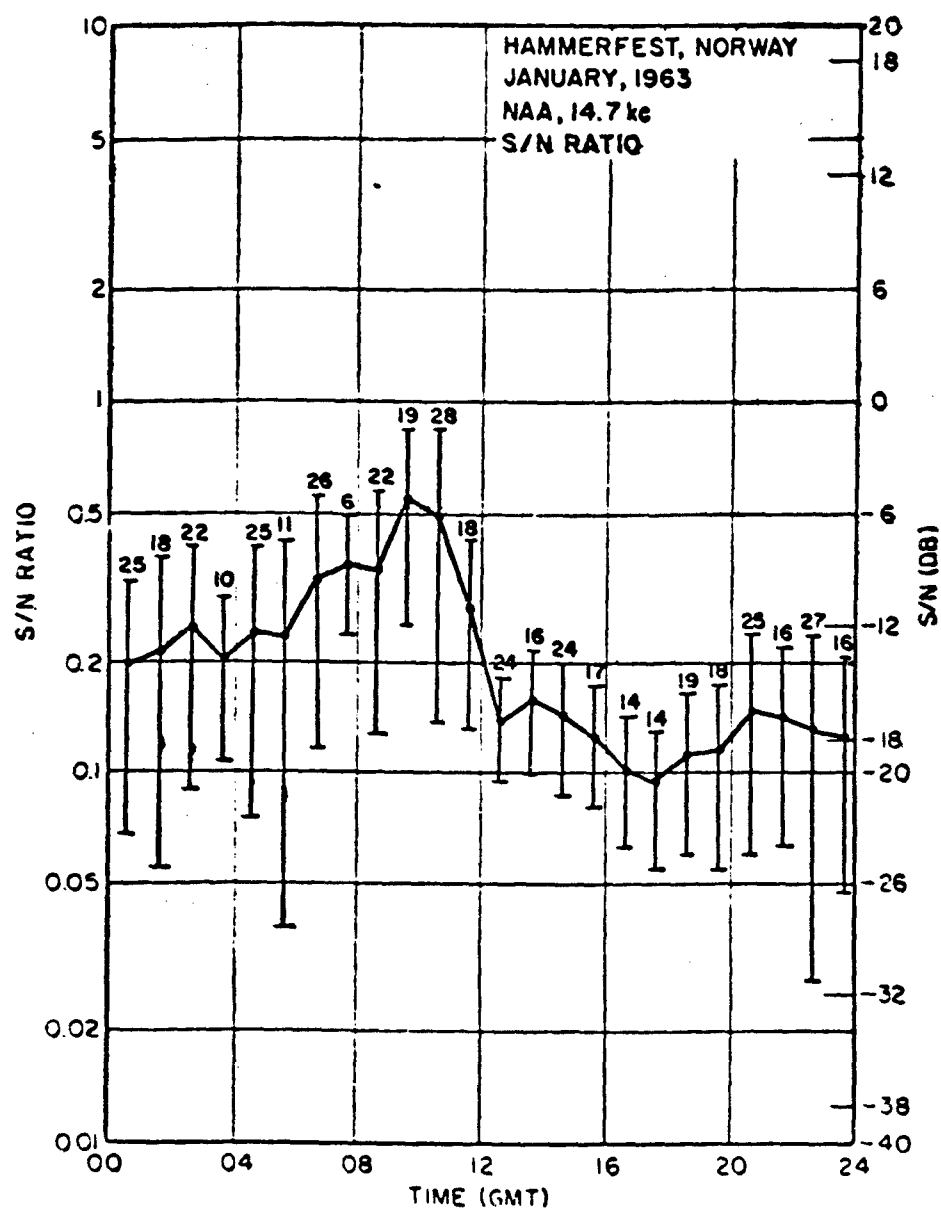


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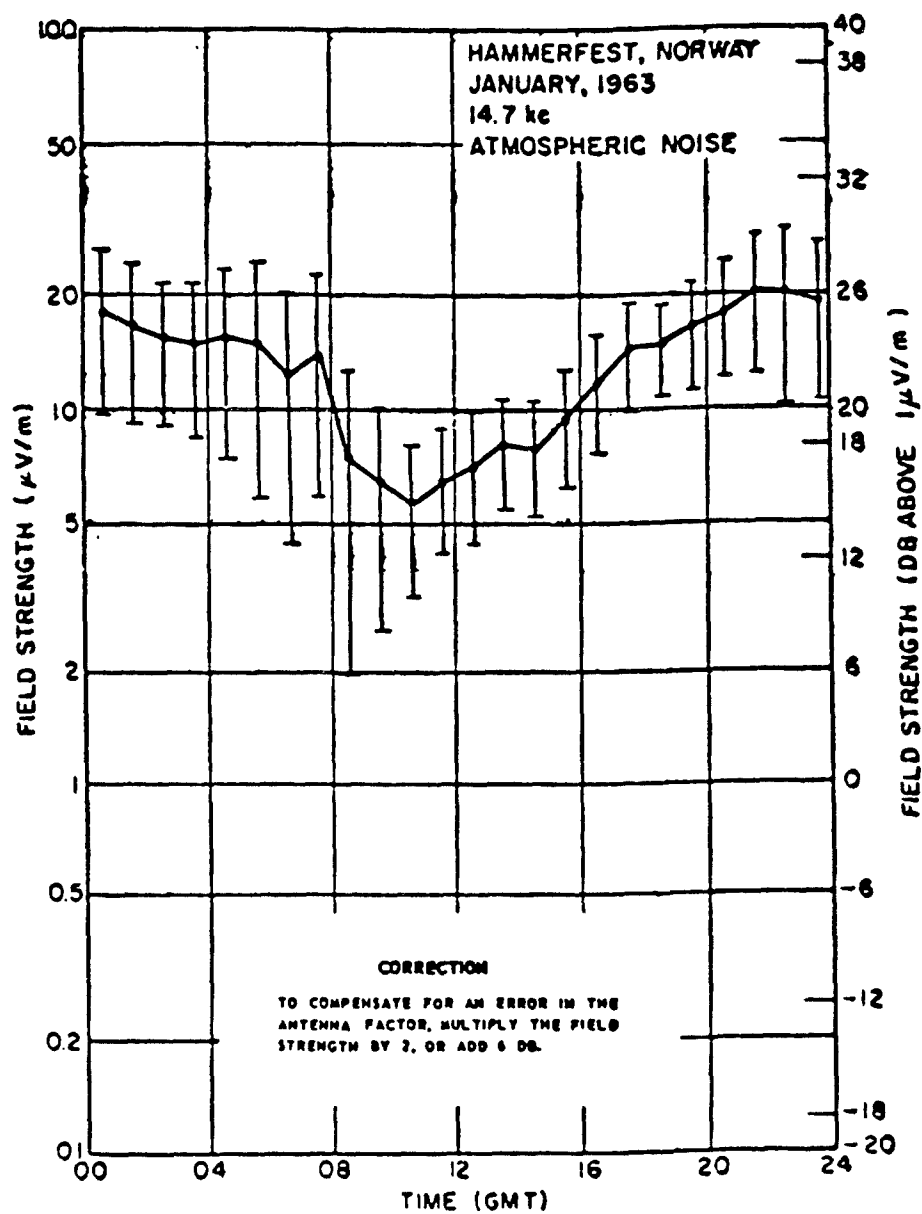


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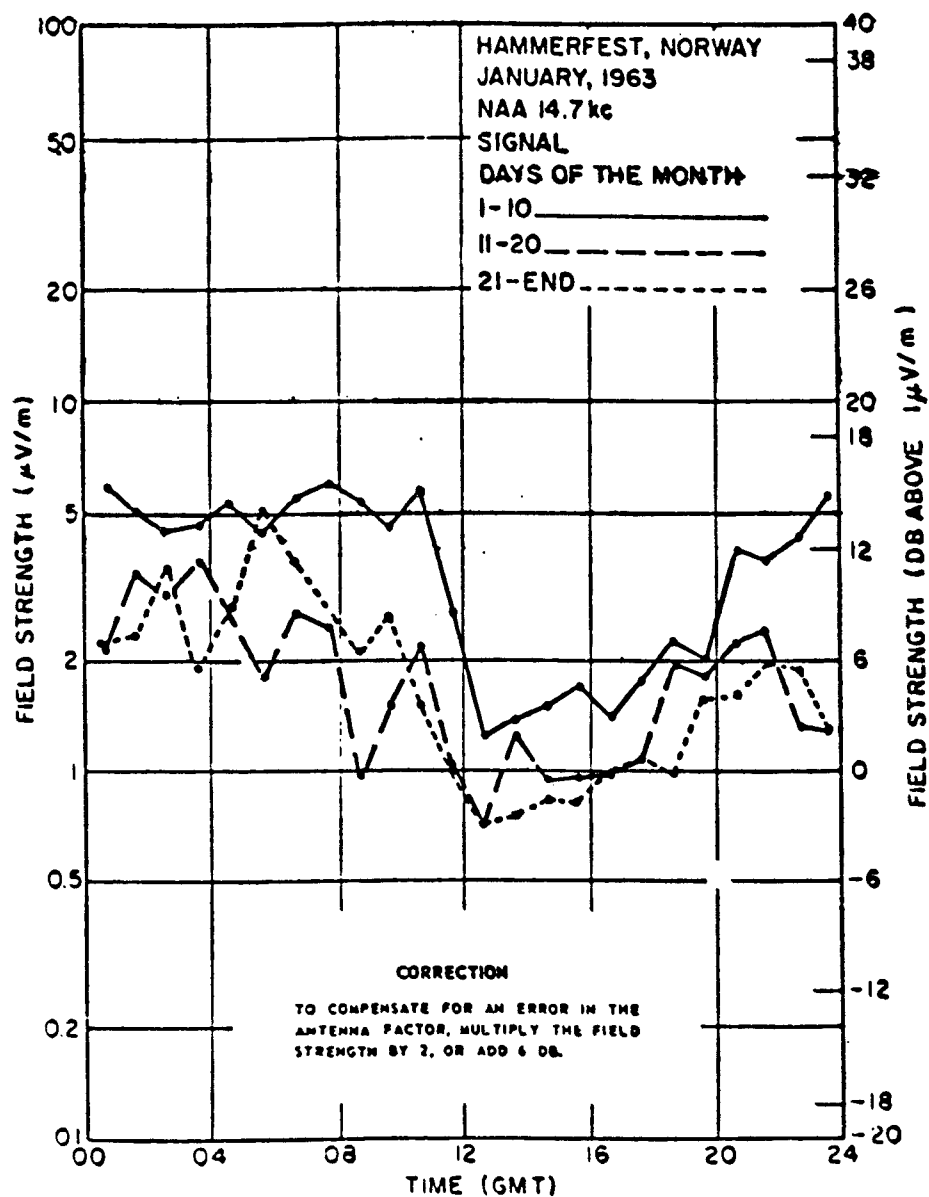


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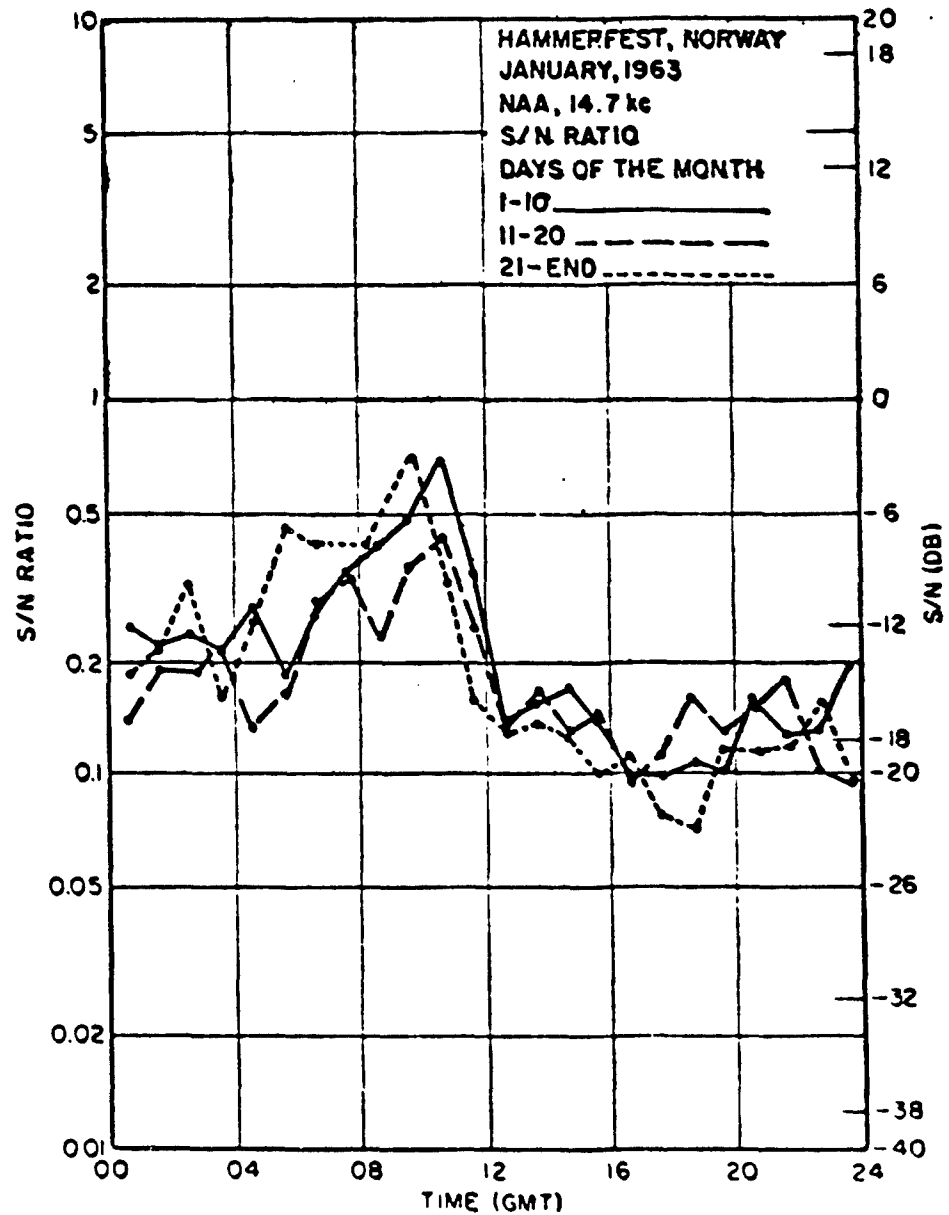


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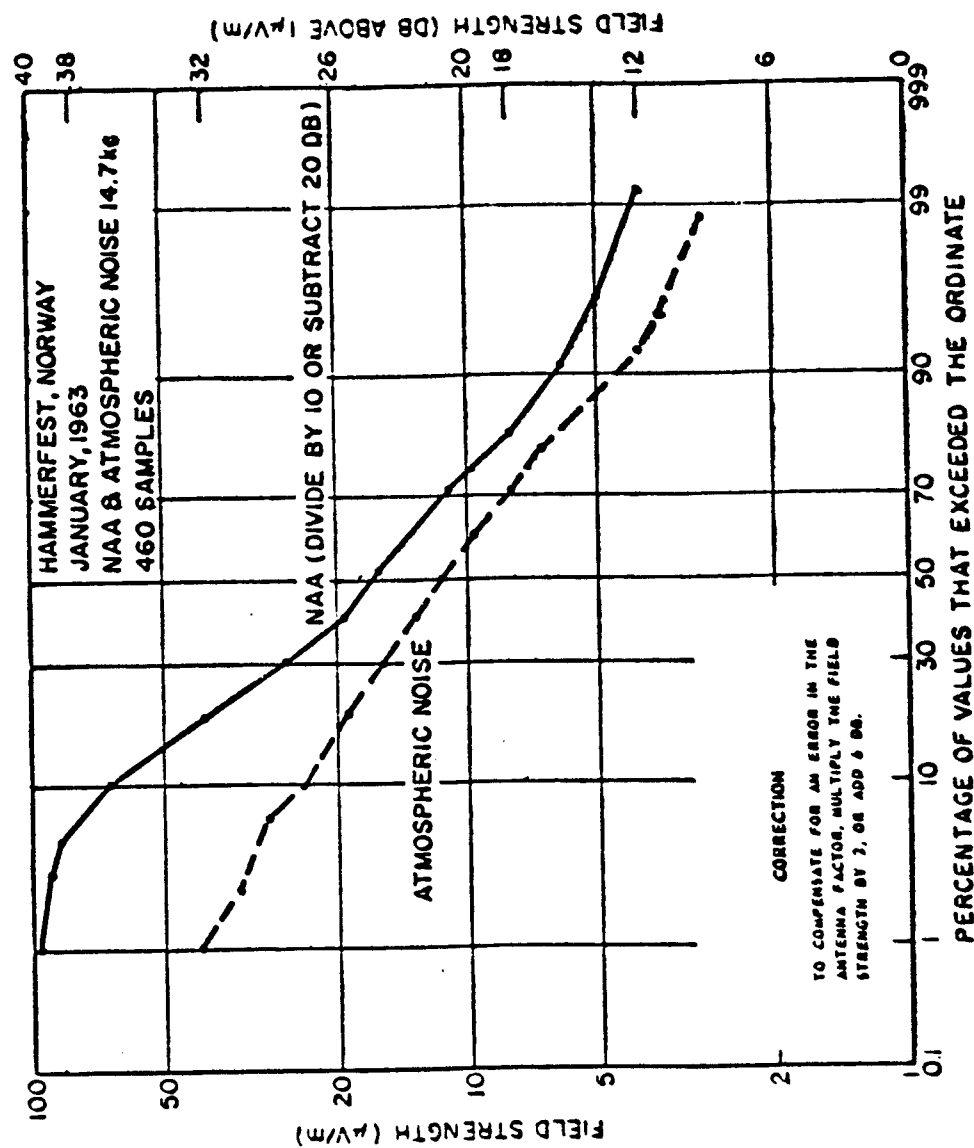


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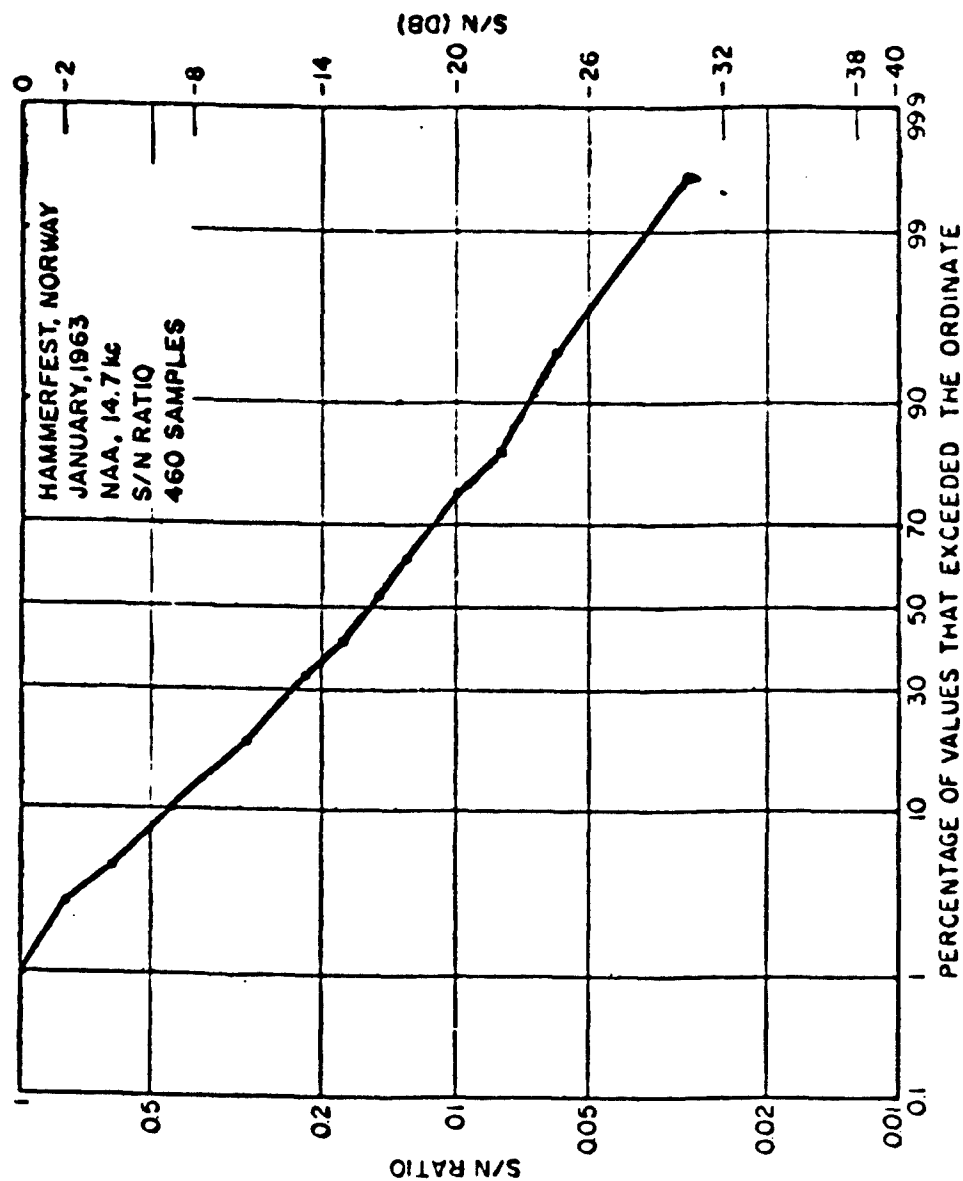


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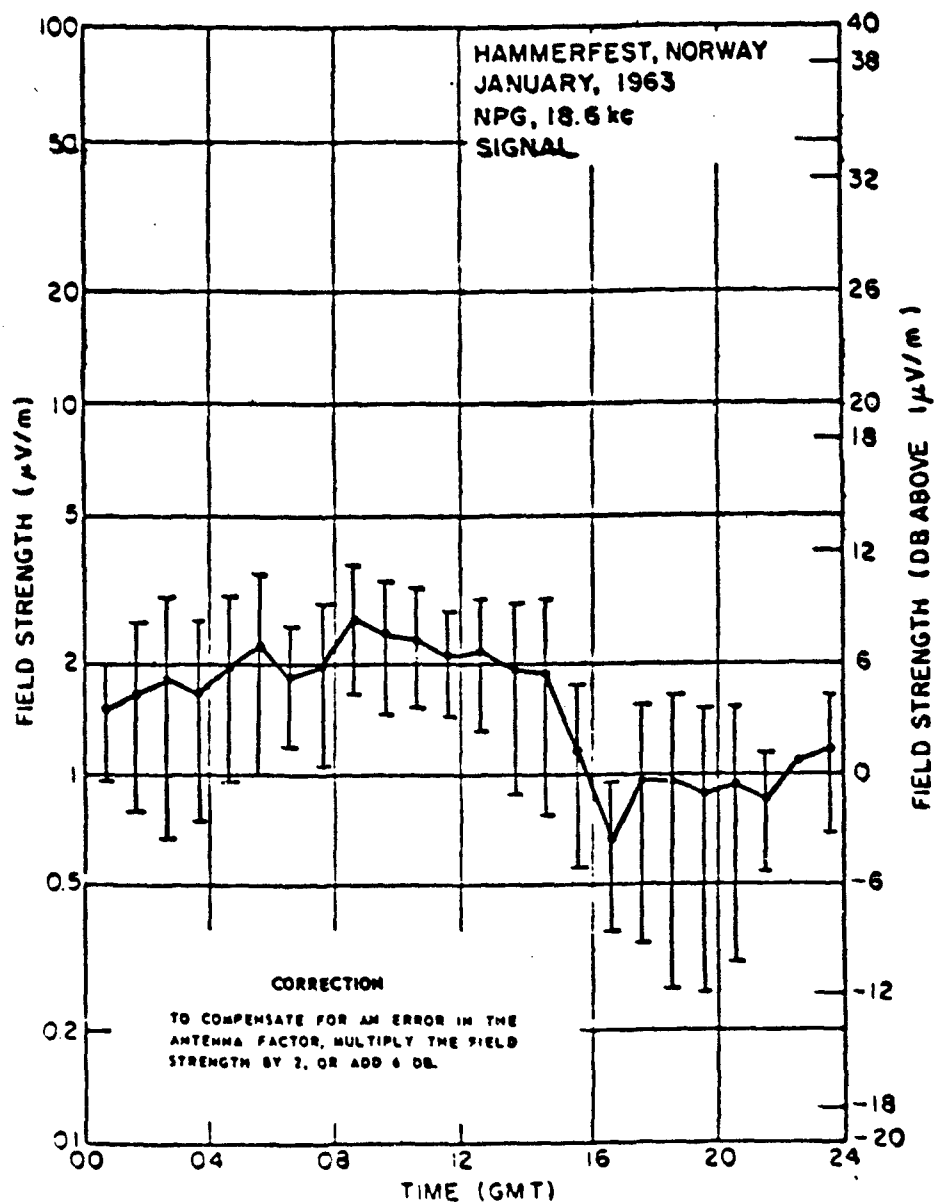


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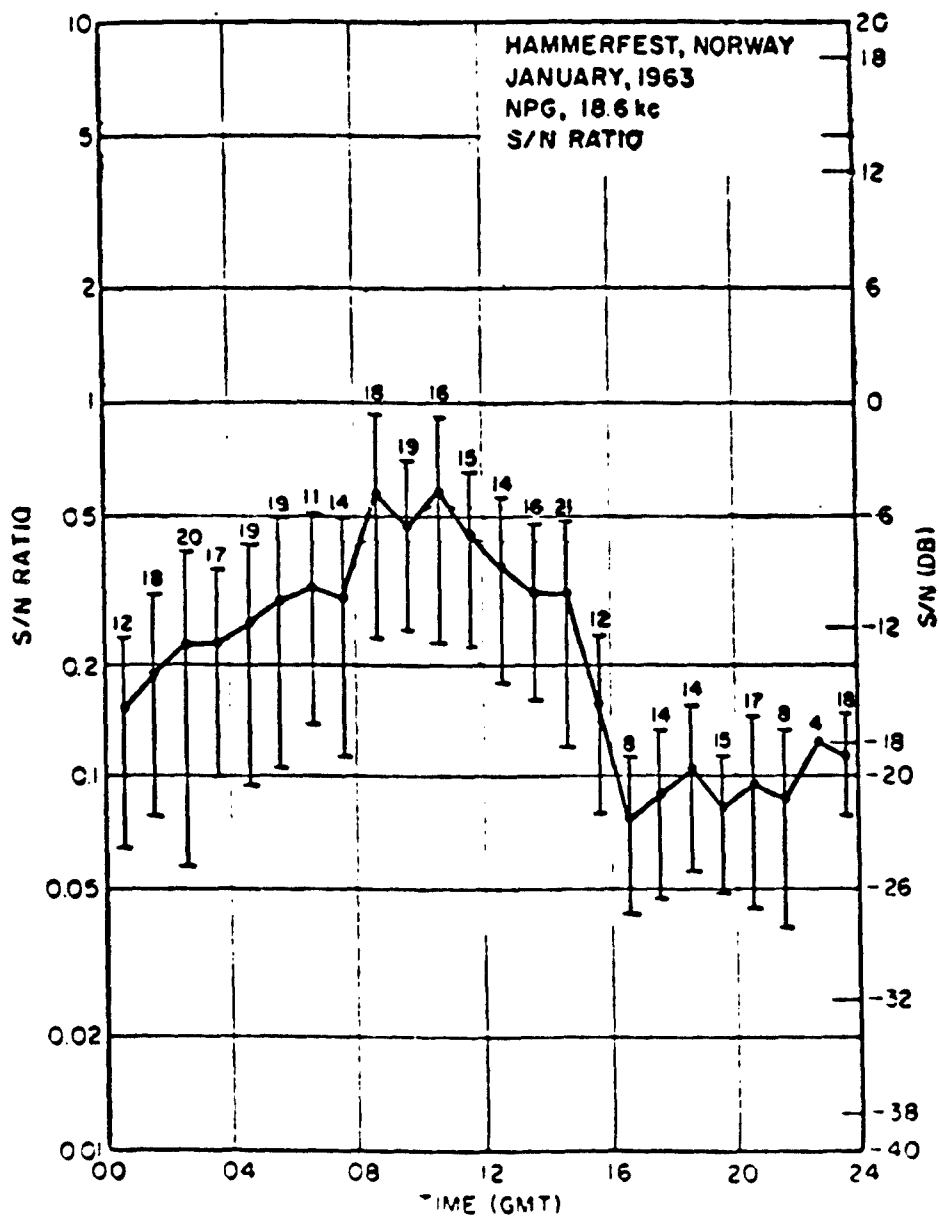


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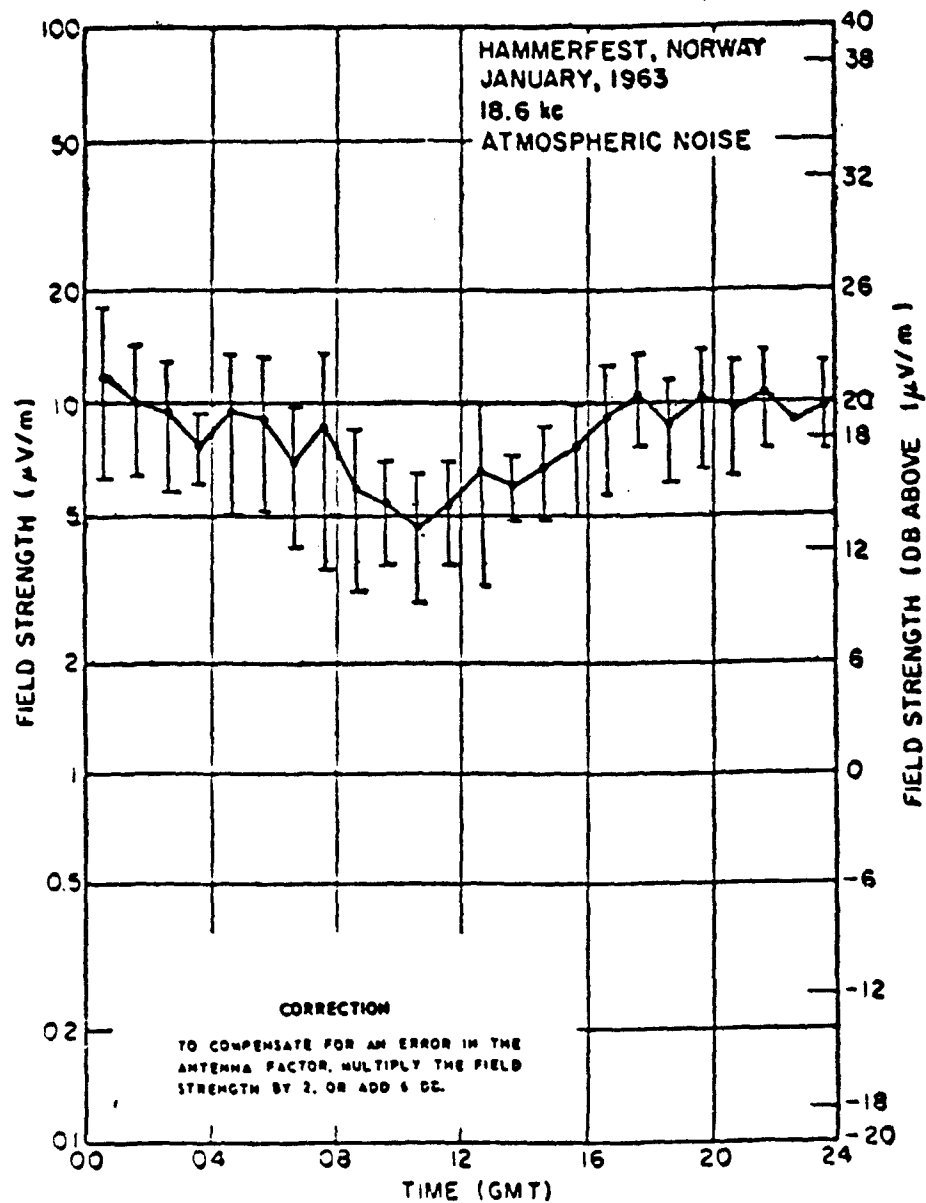


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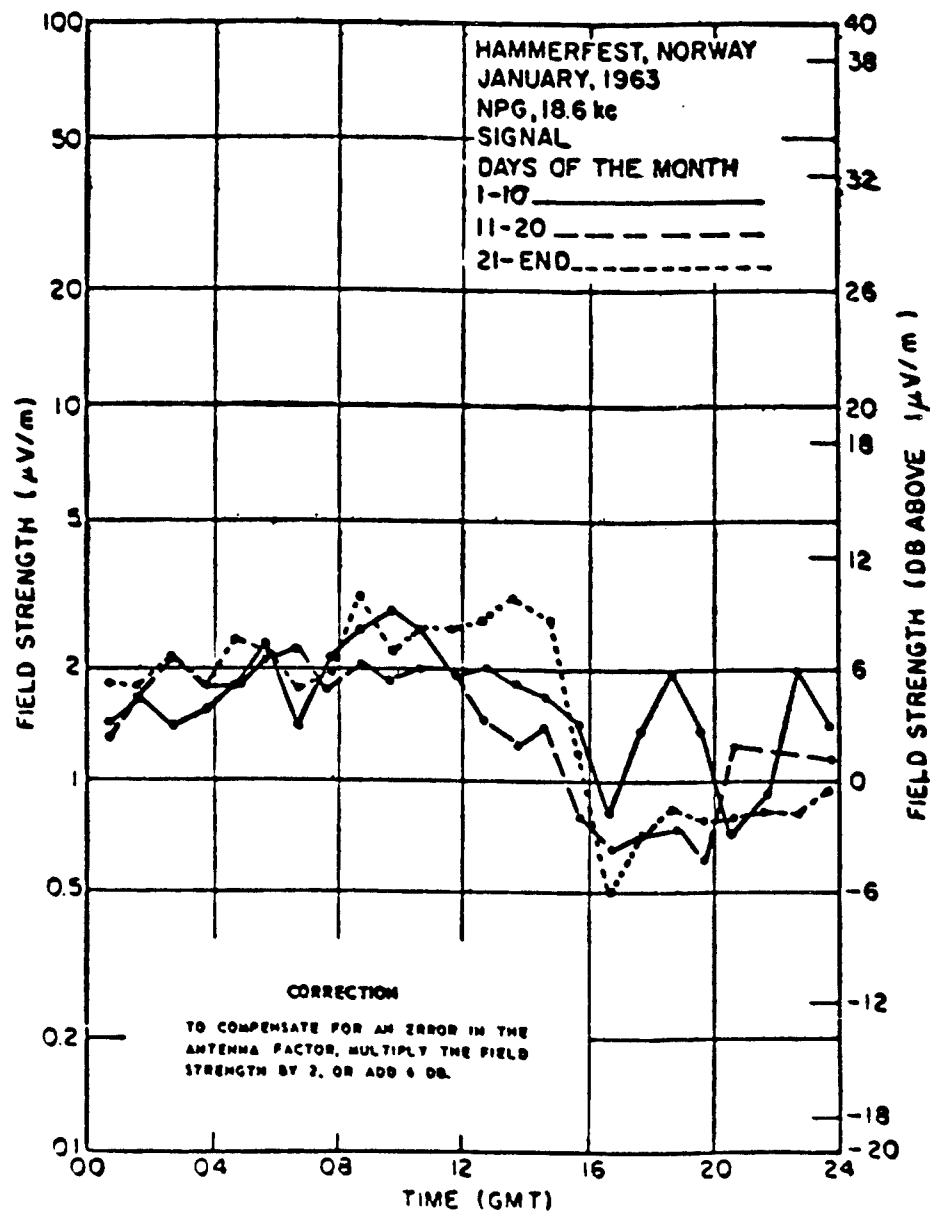


Figure 139

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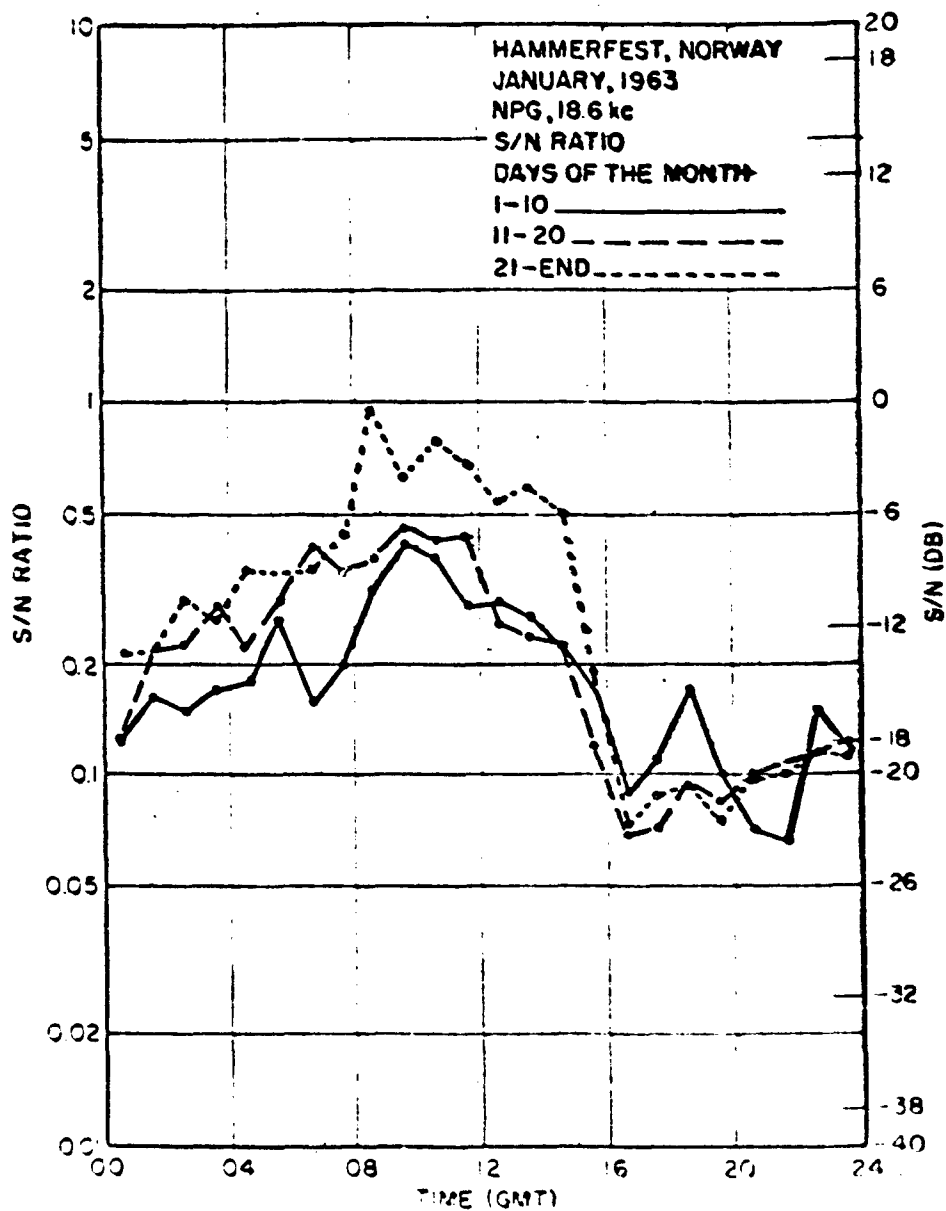


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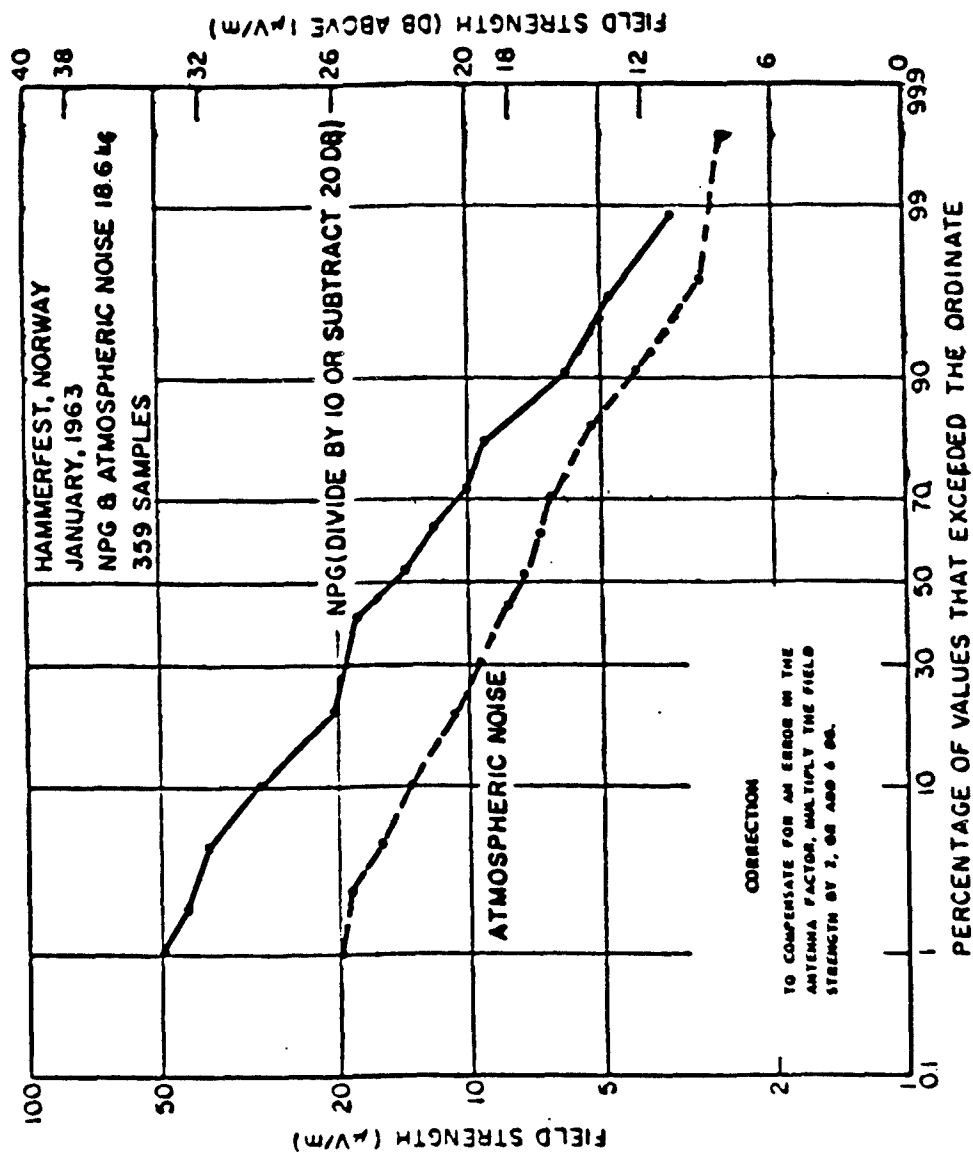


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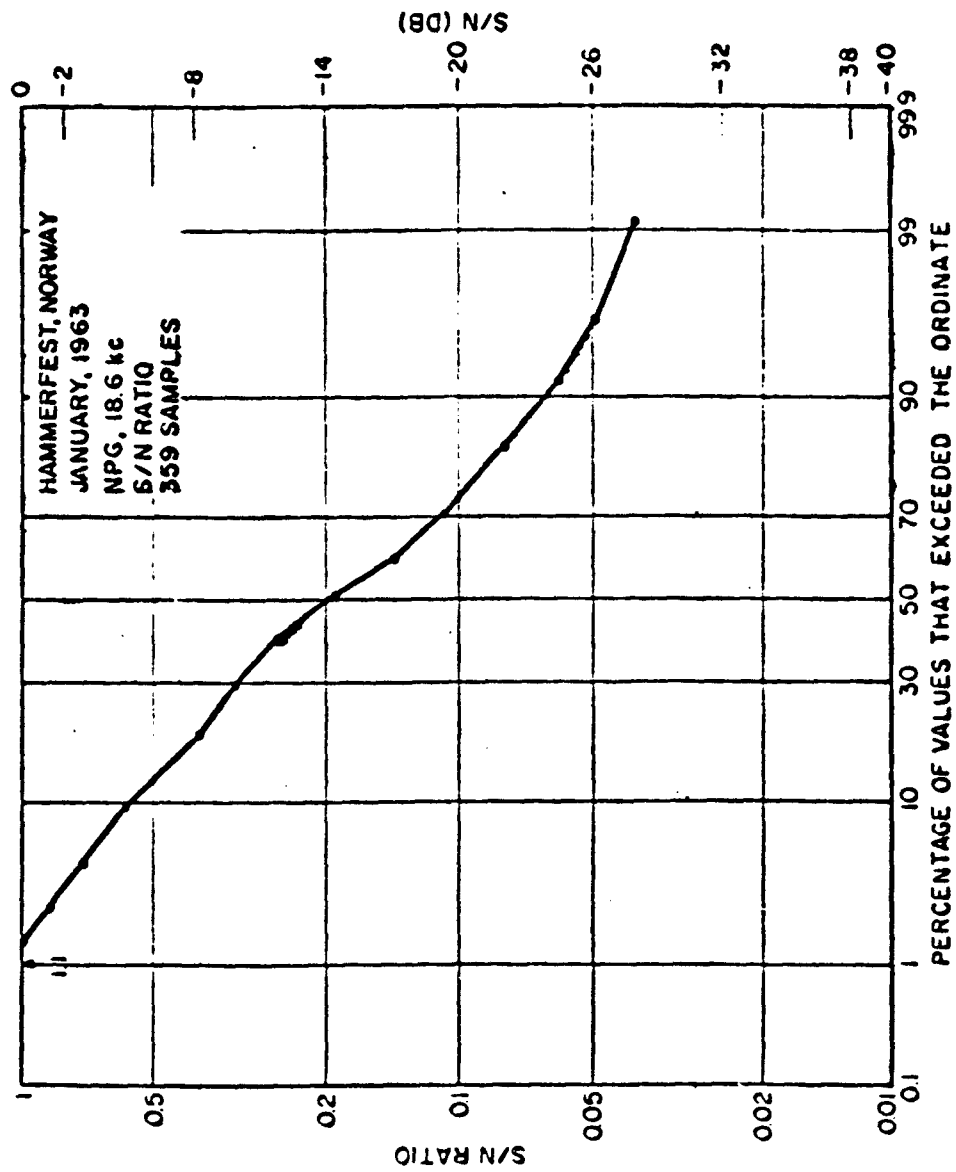


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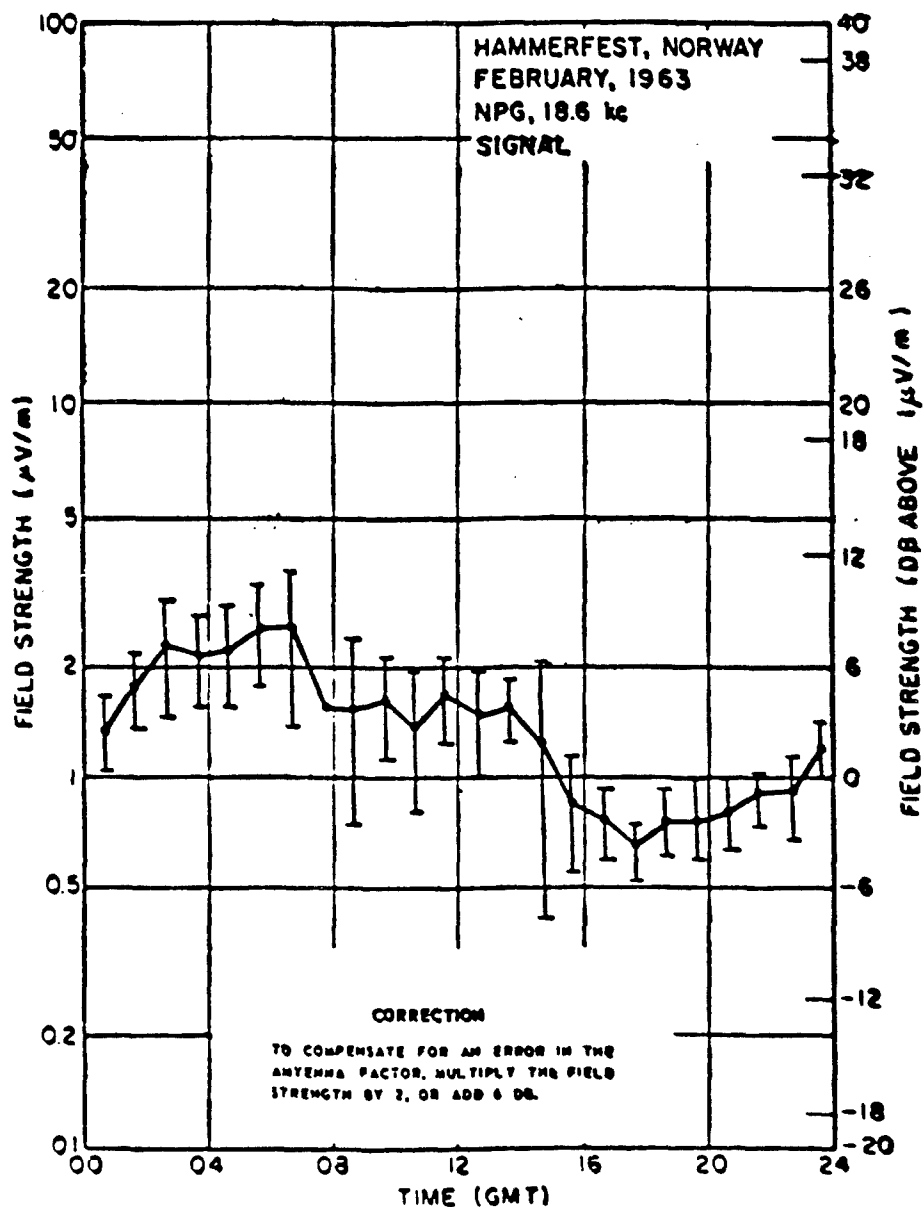


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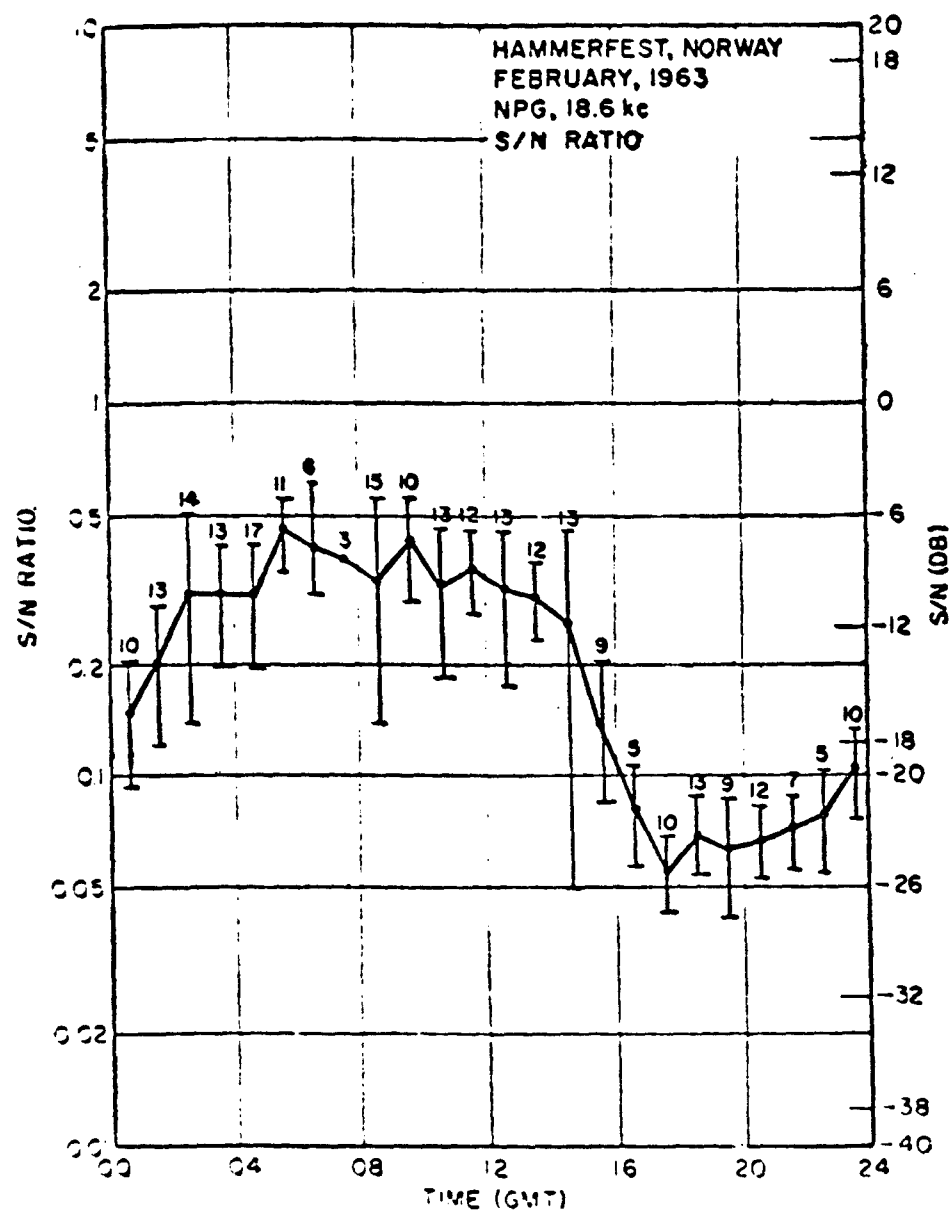


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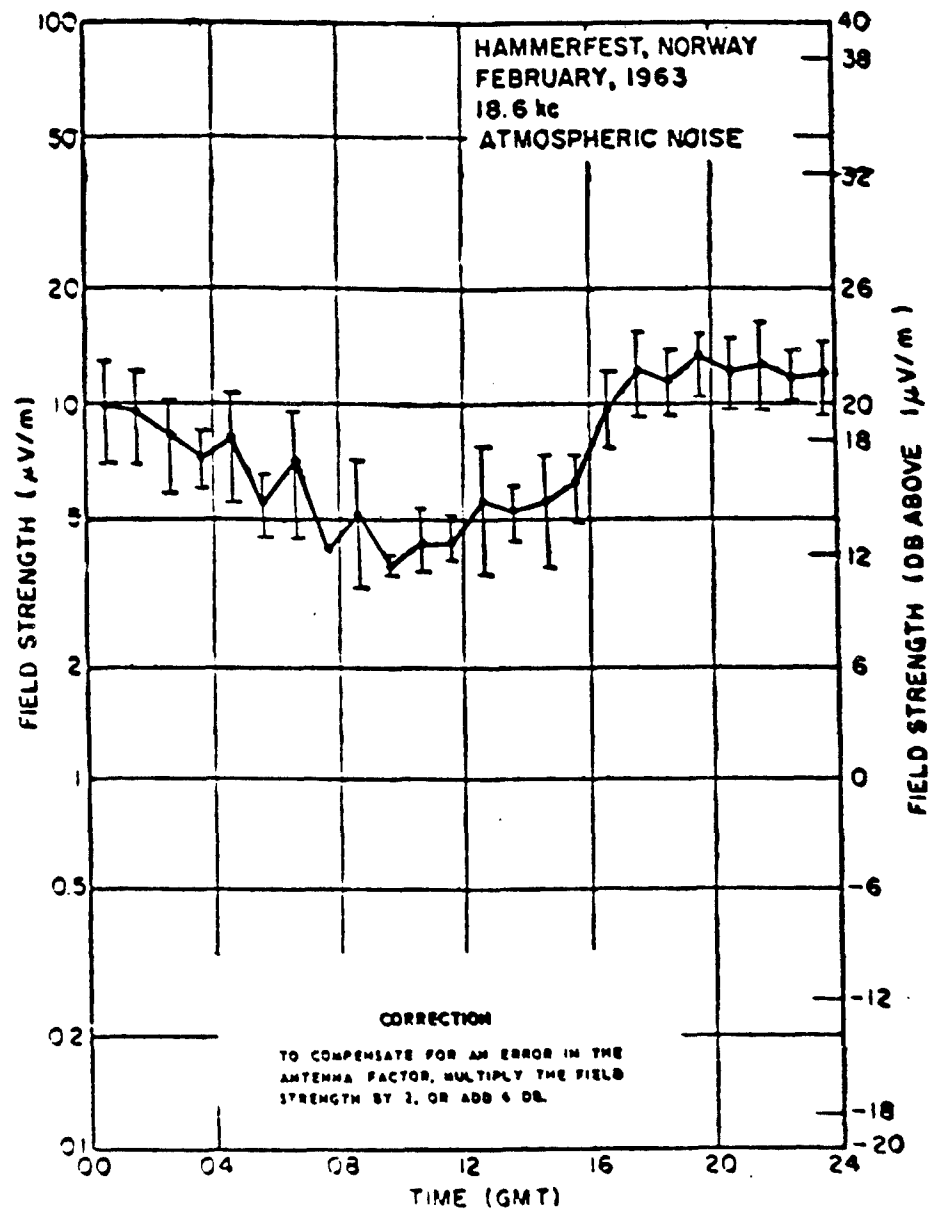


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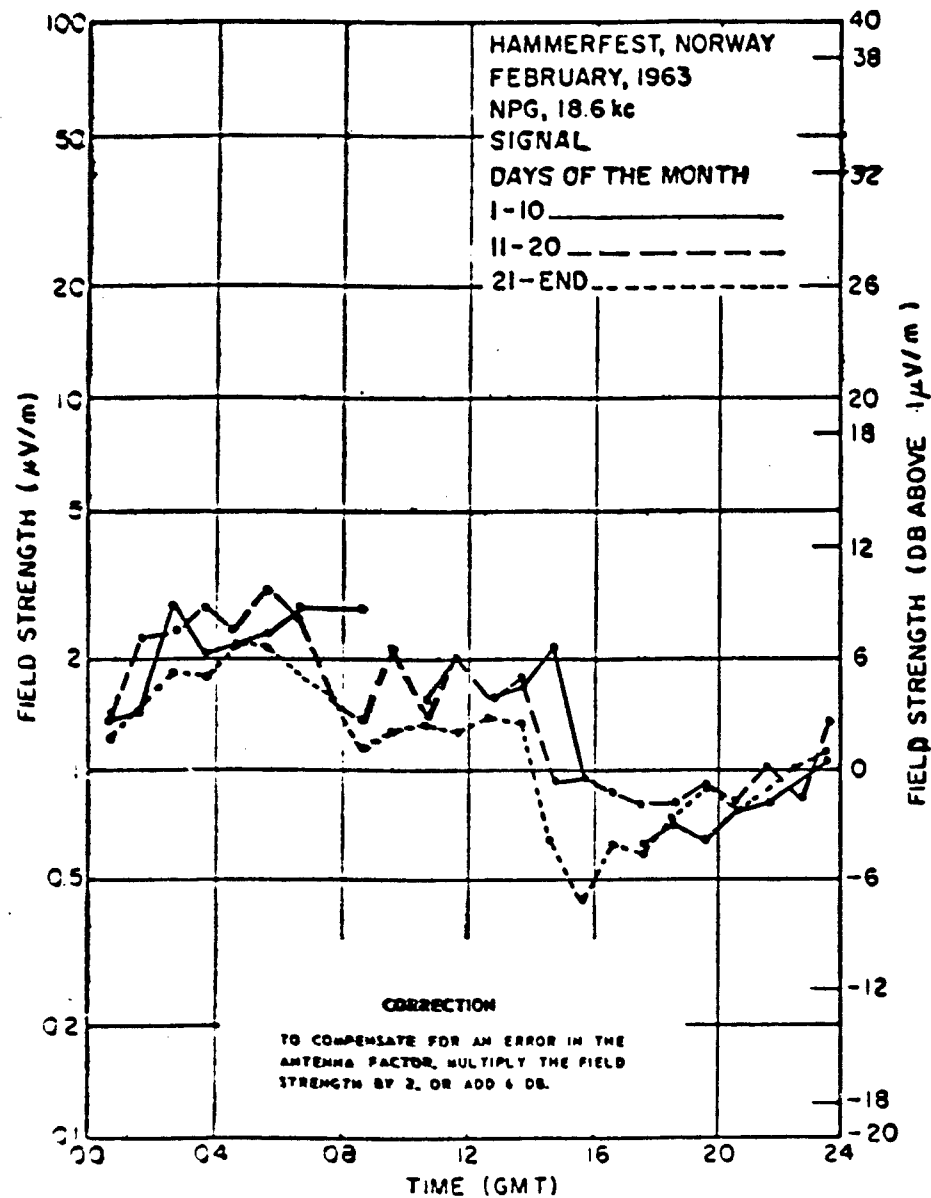


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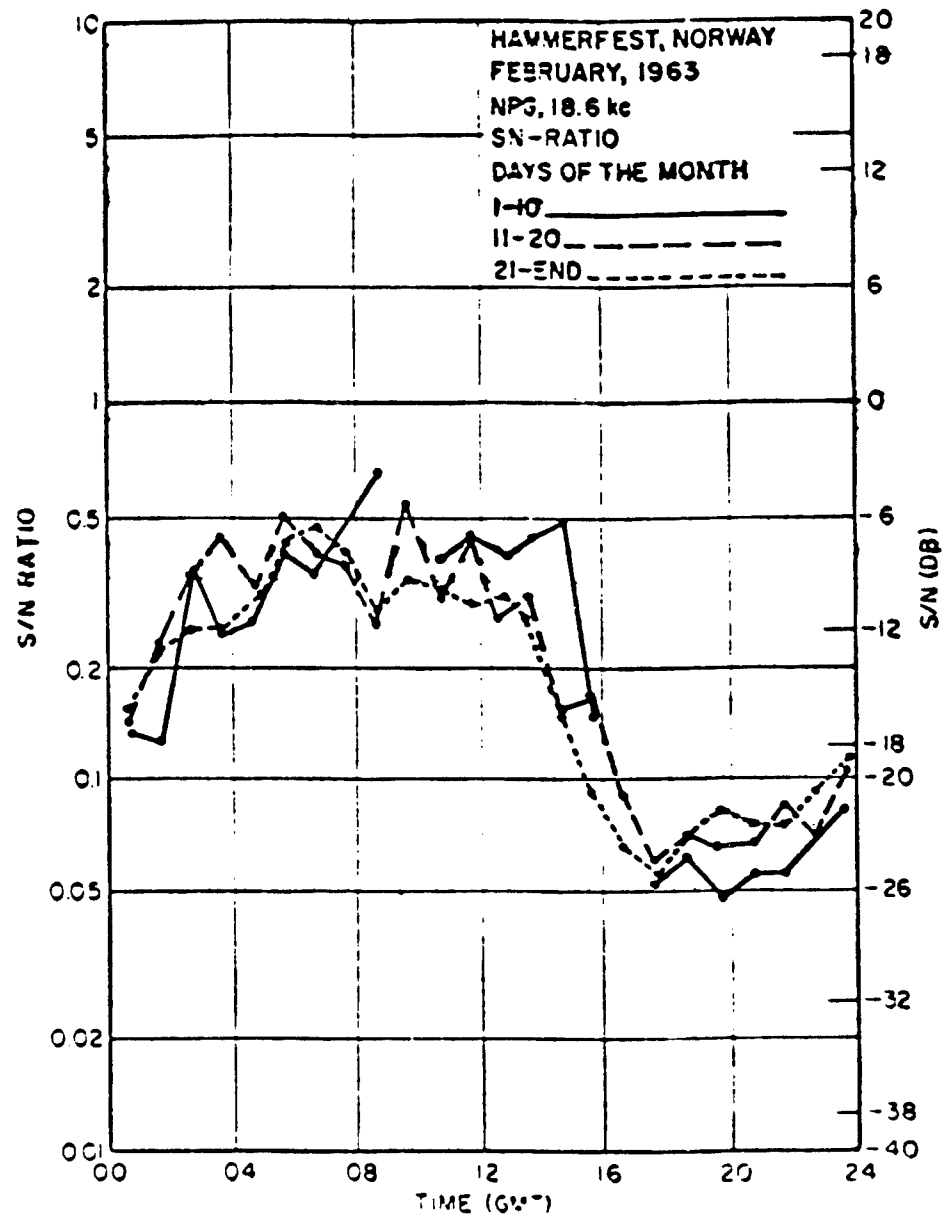


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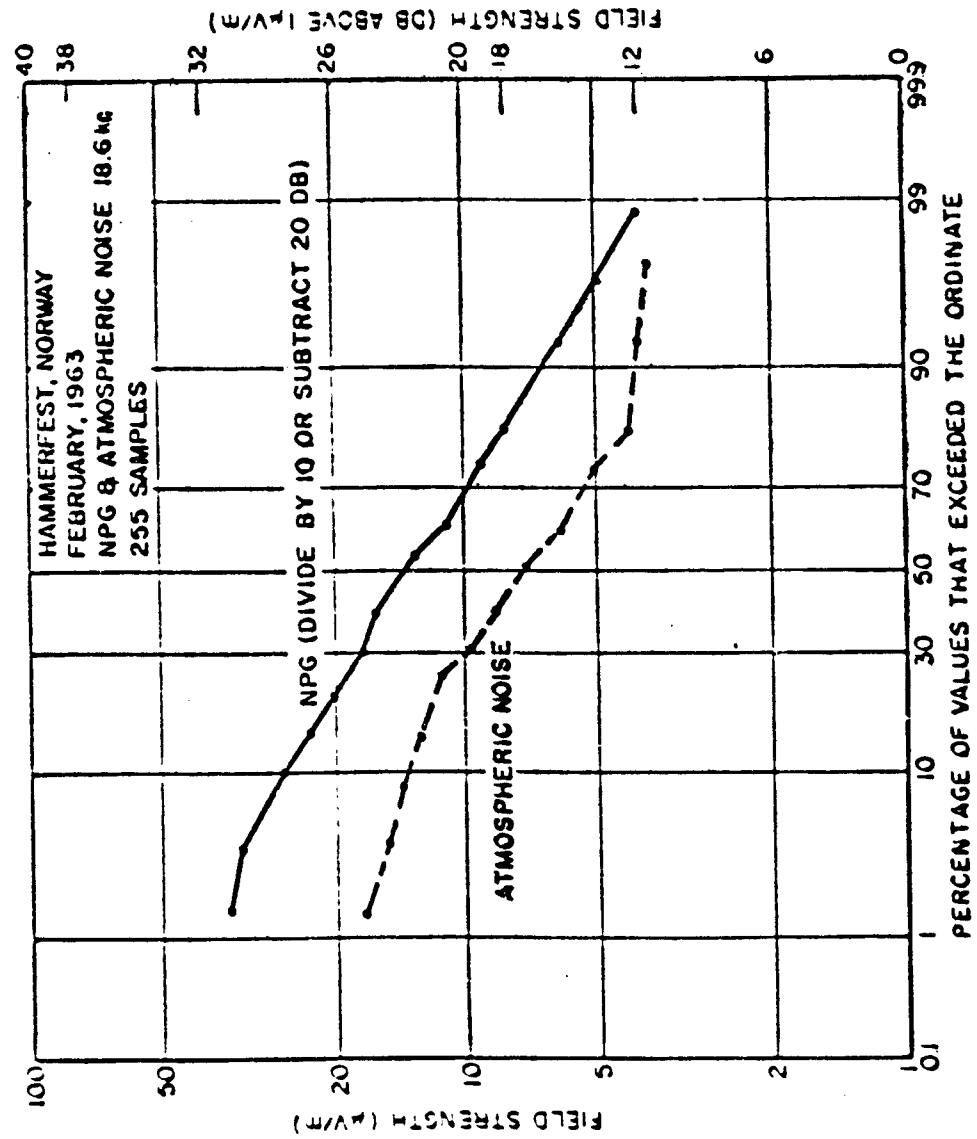


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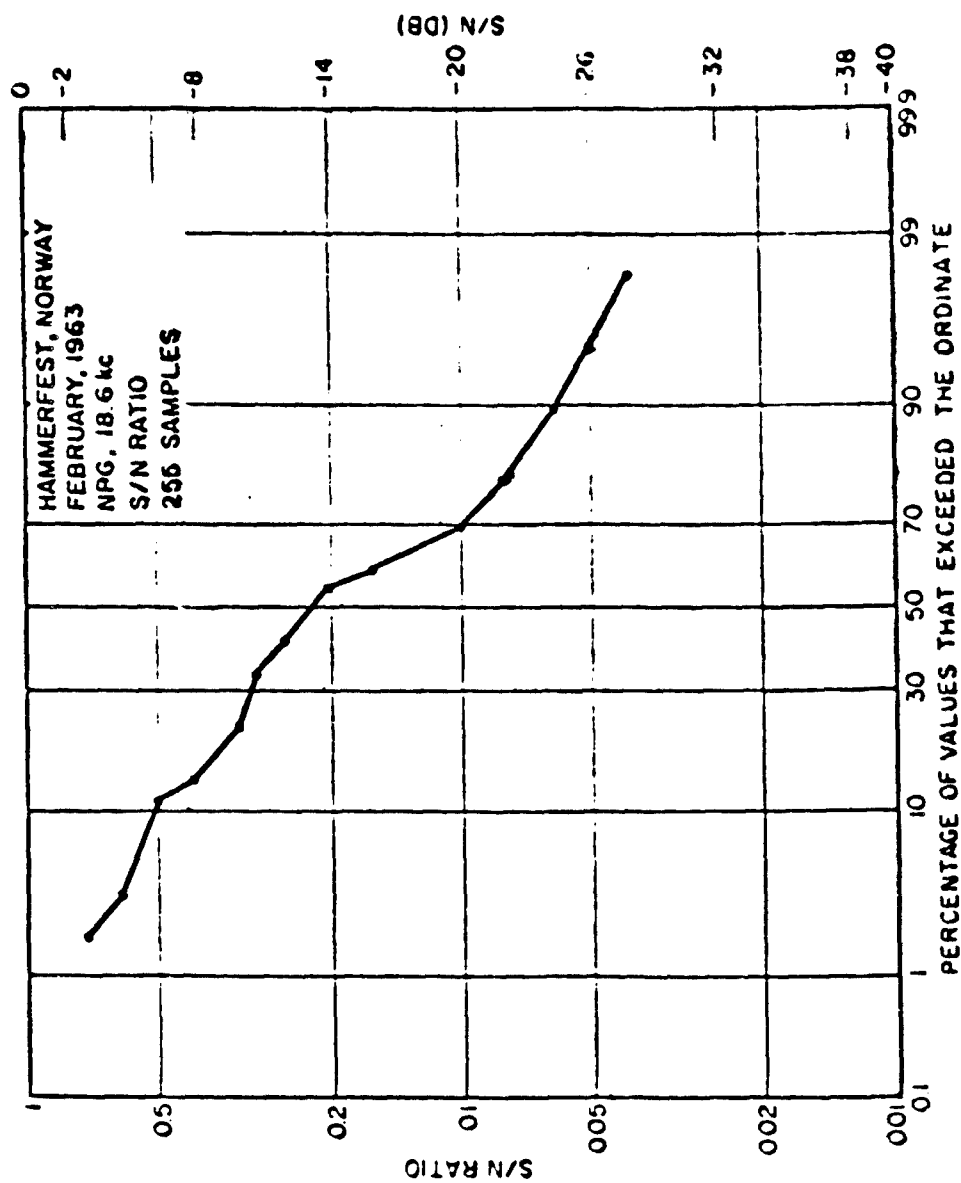


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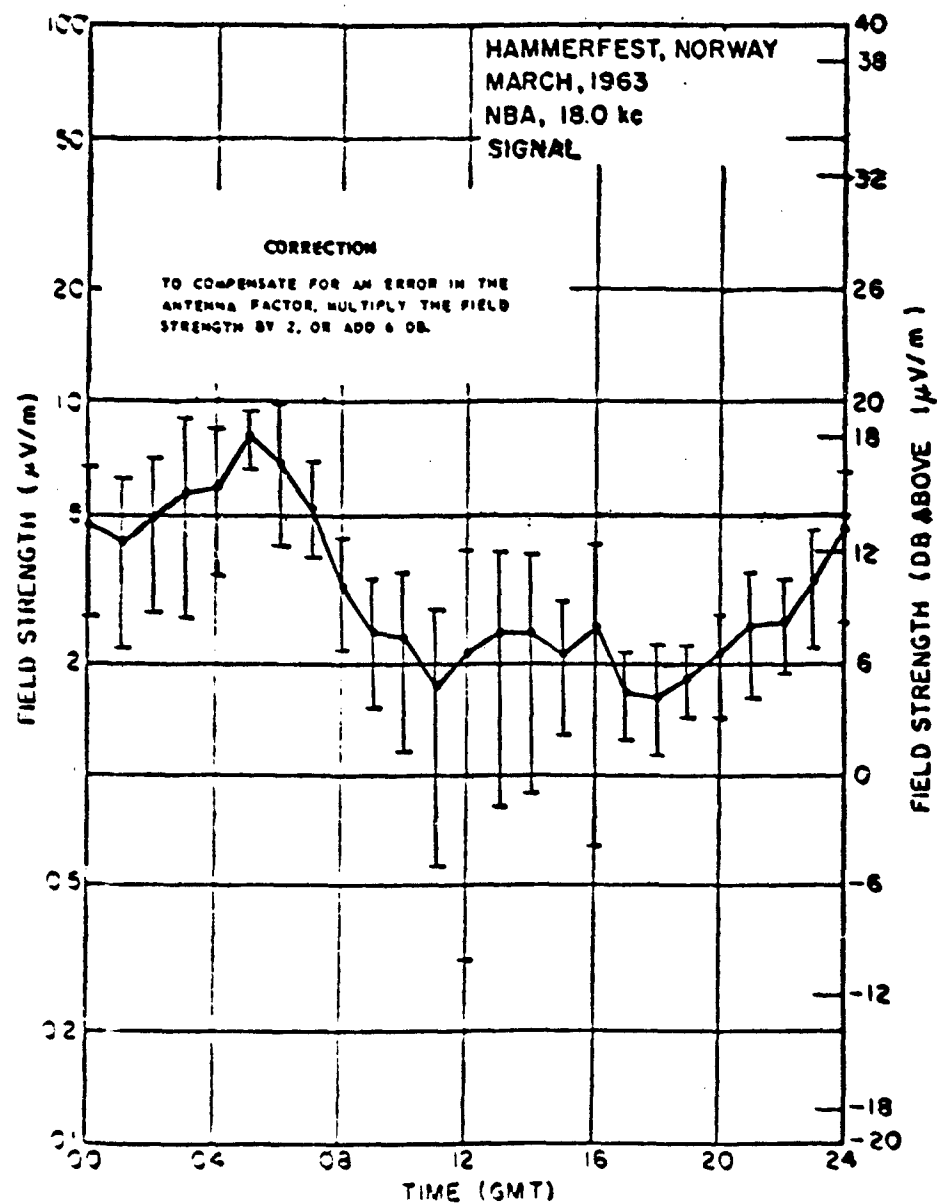


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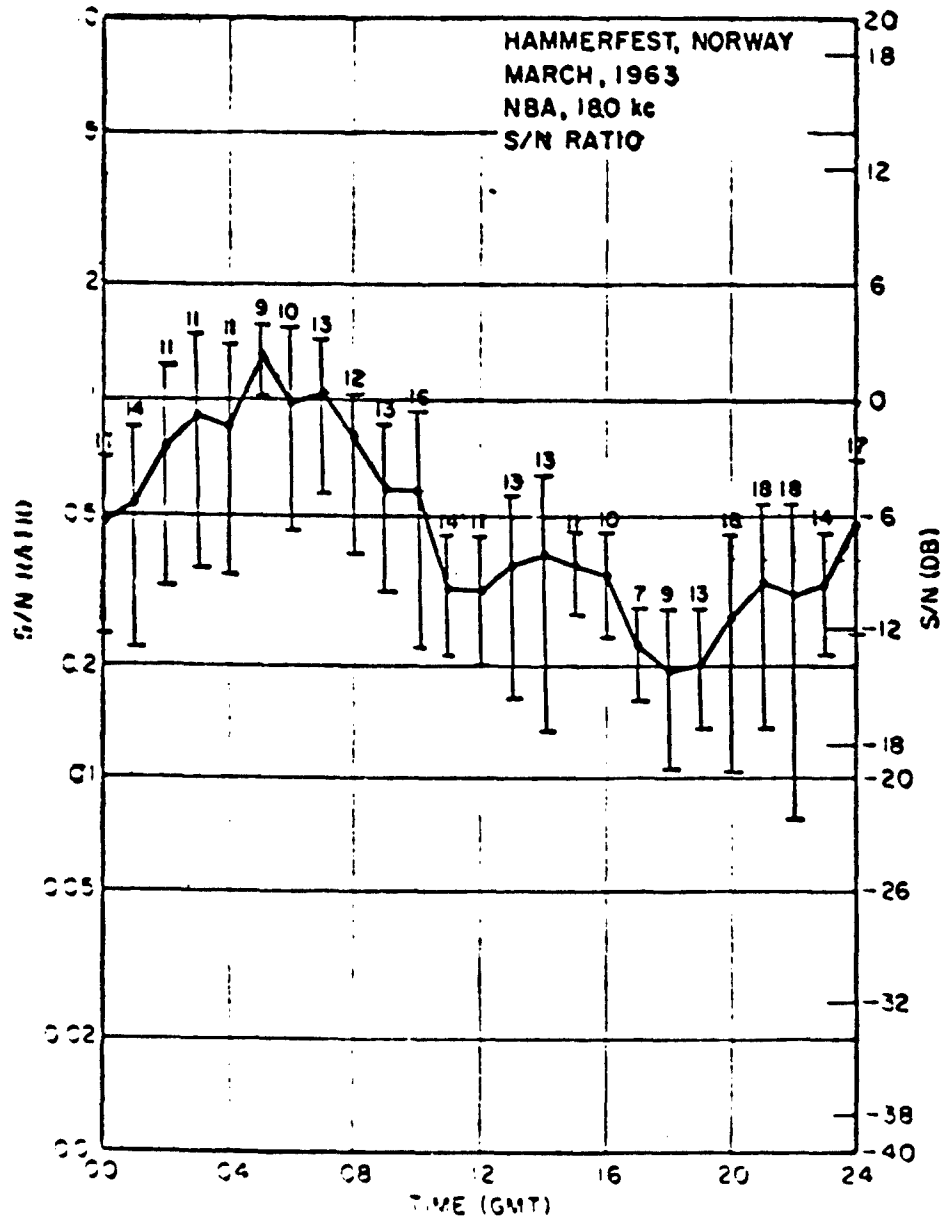


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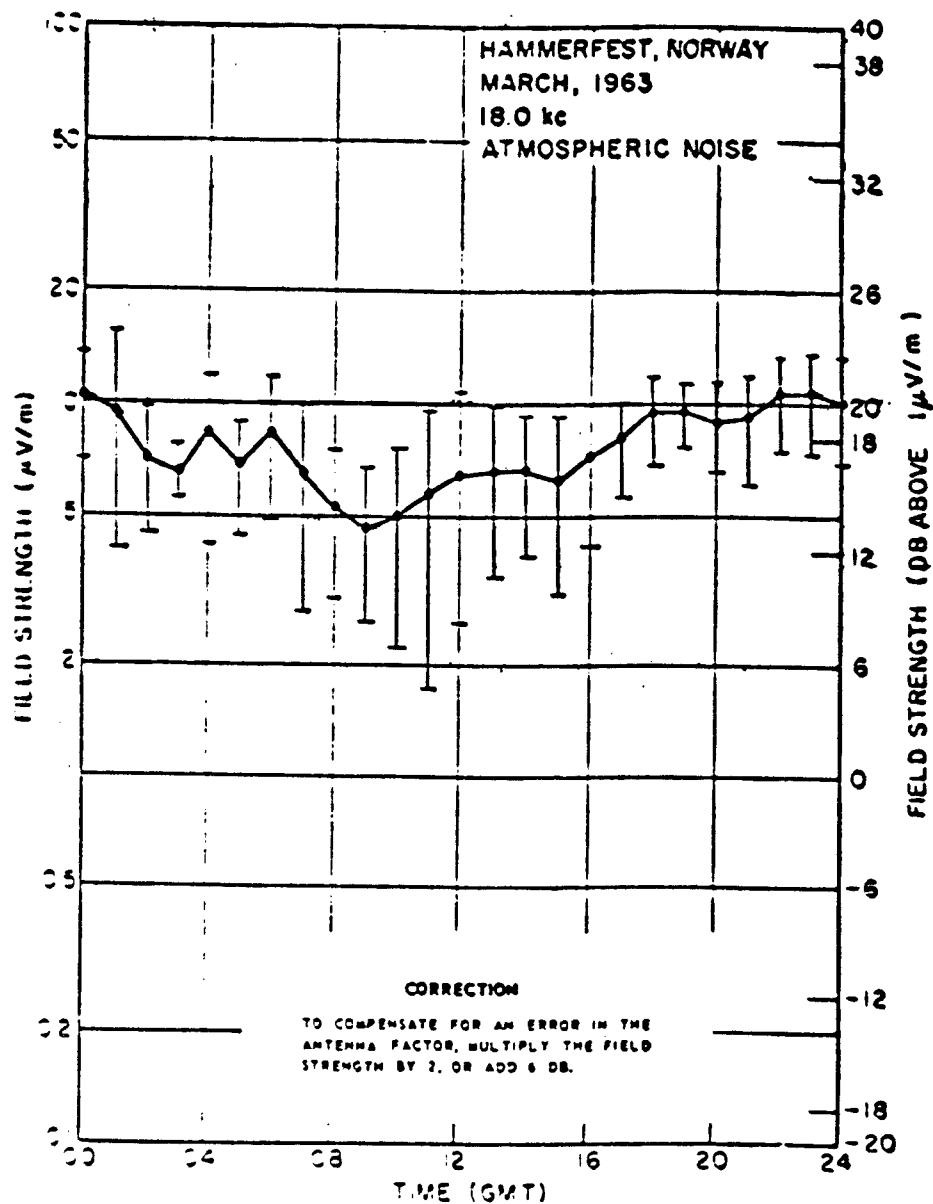


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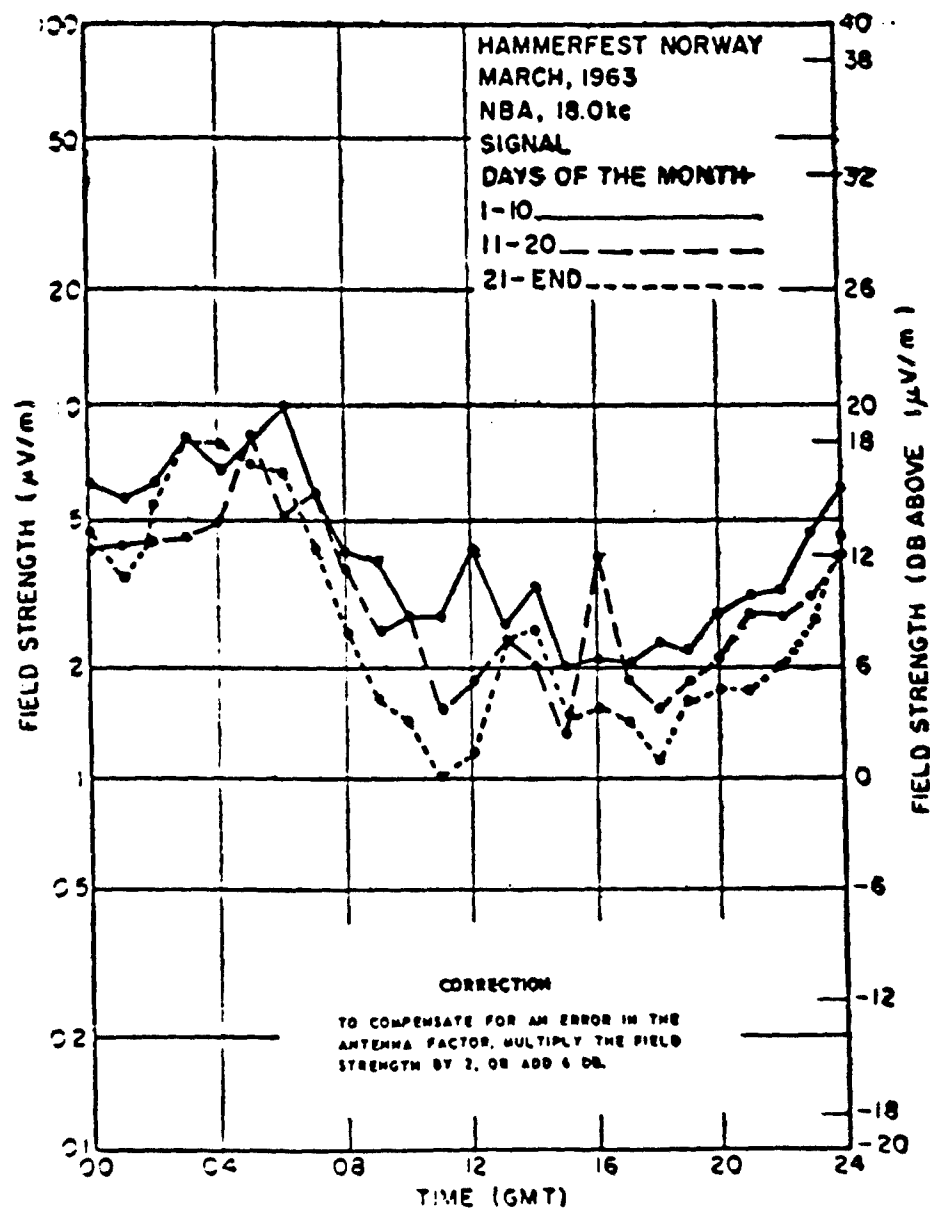


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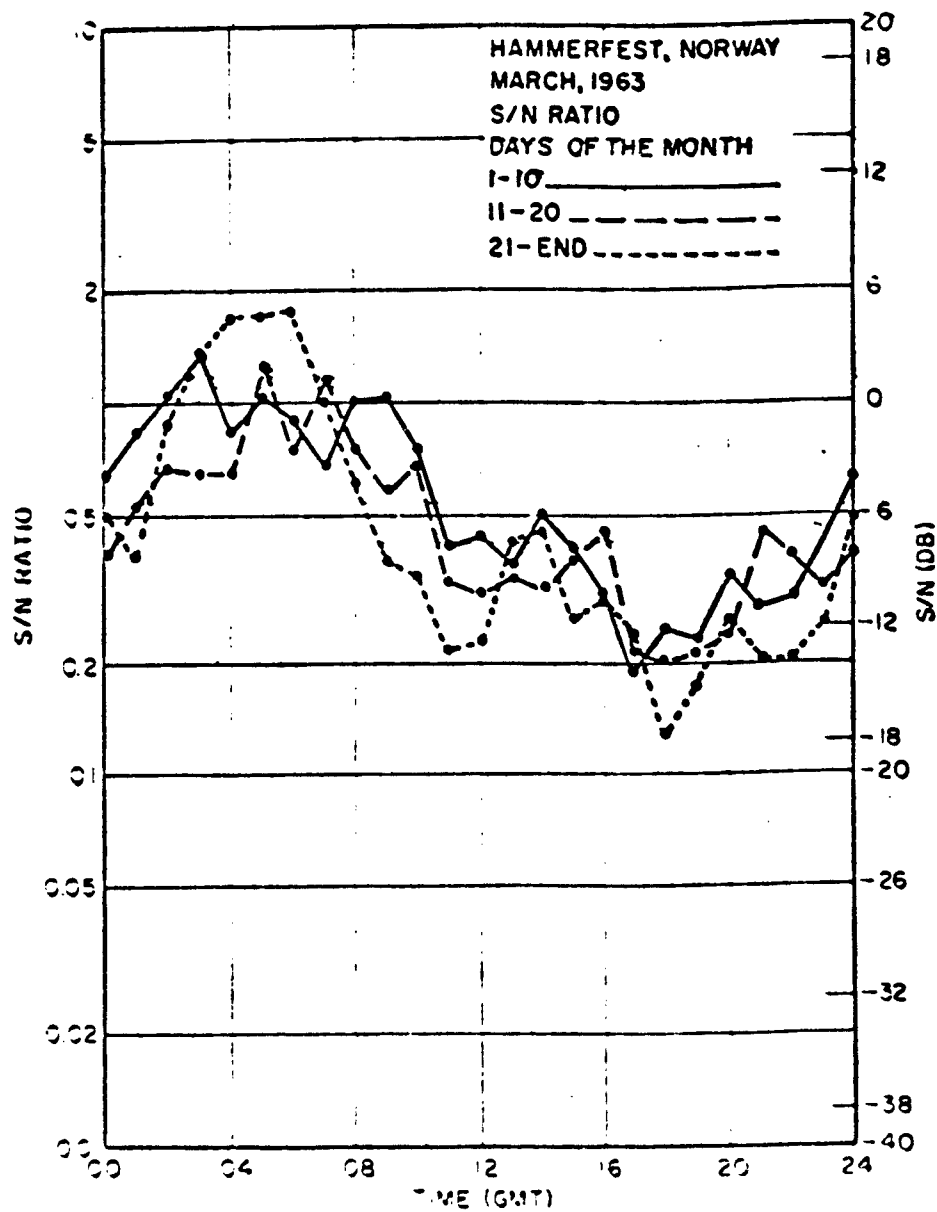


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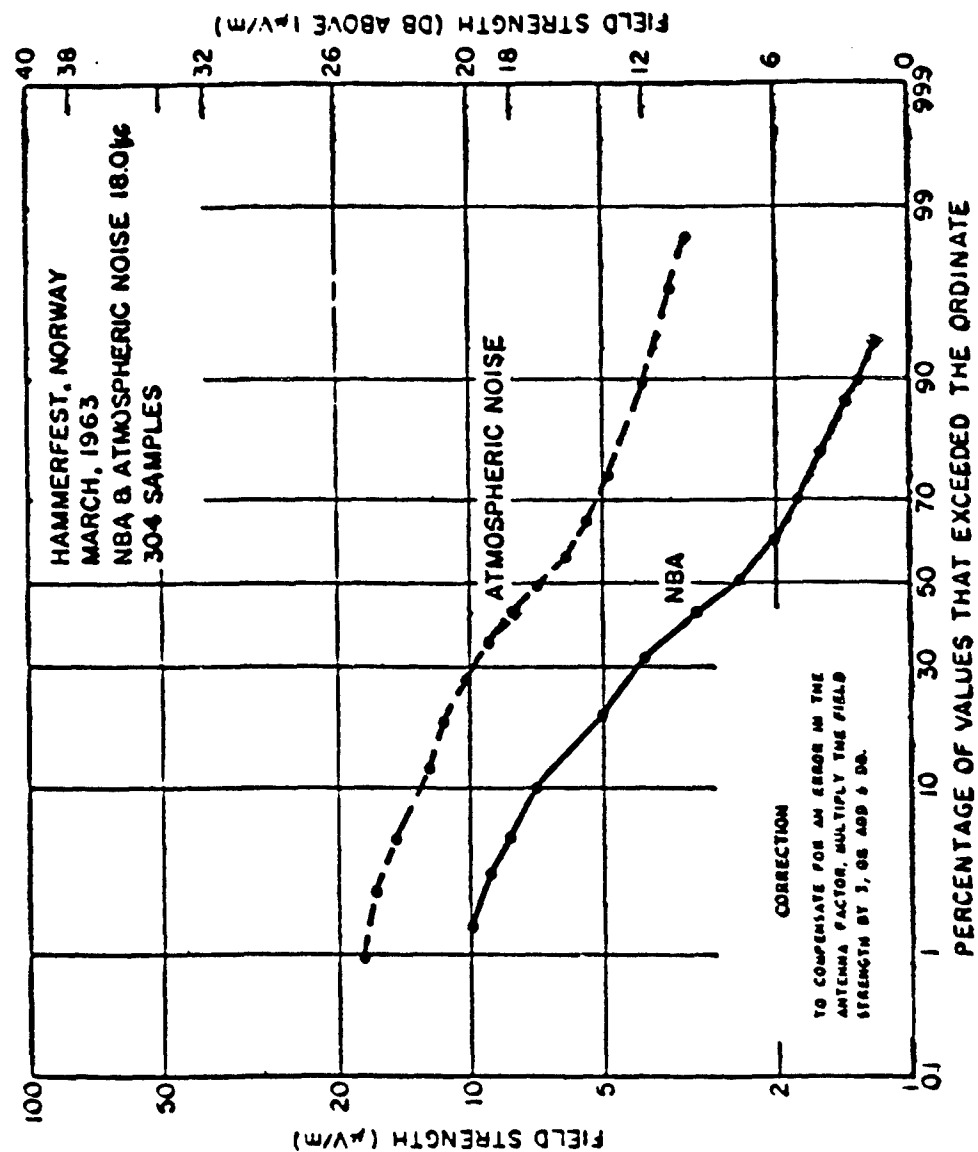


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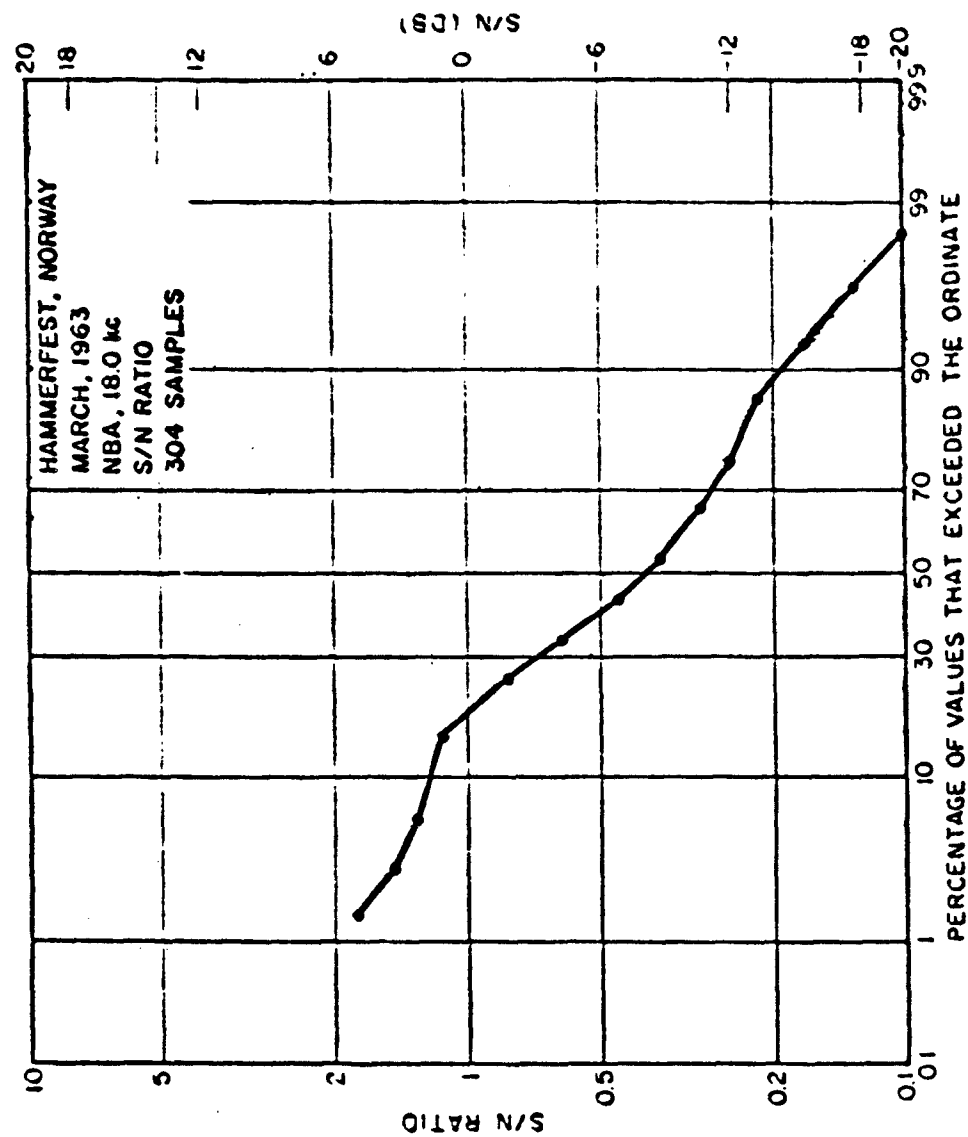


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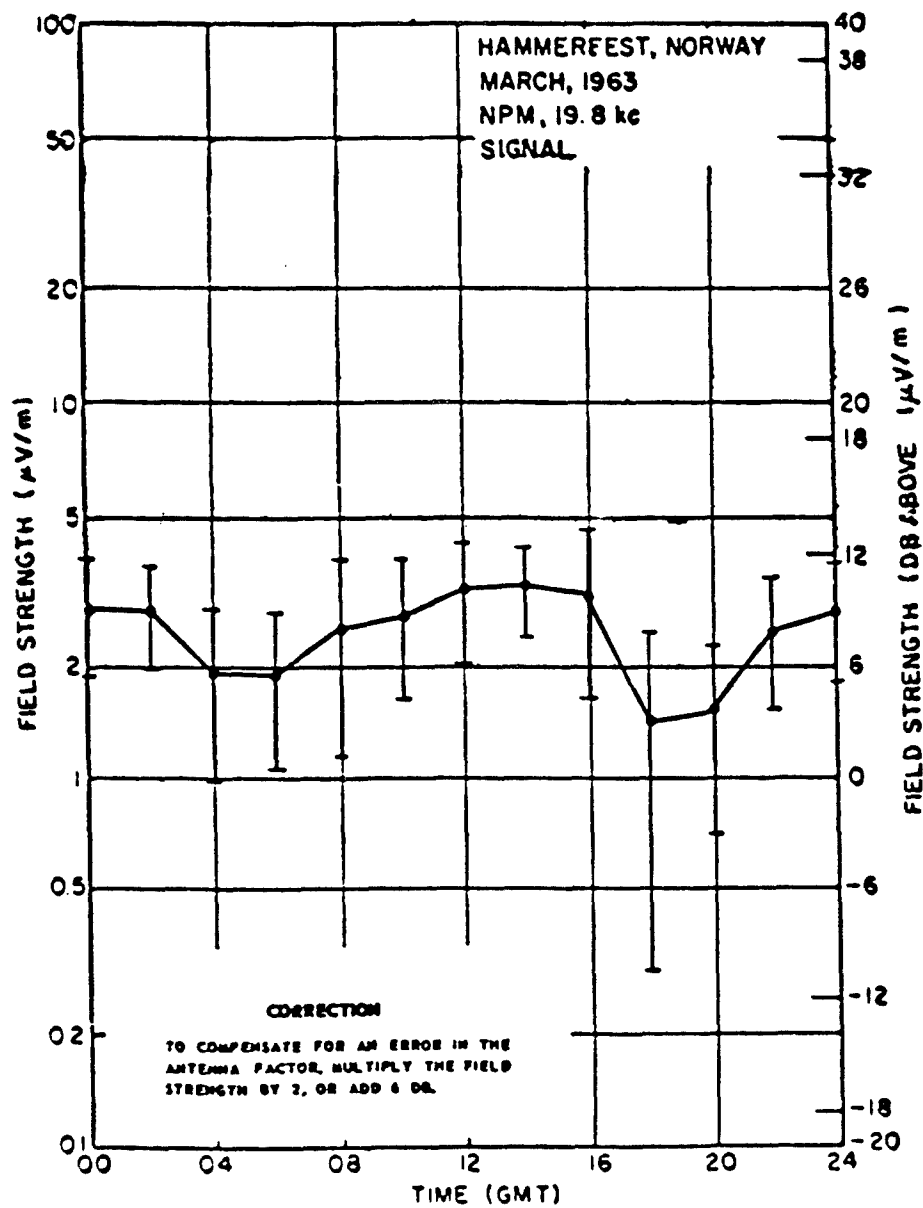


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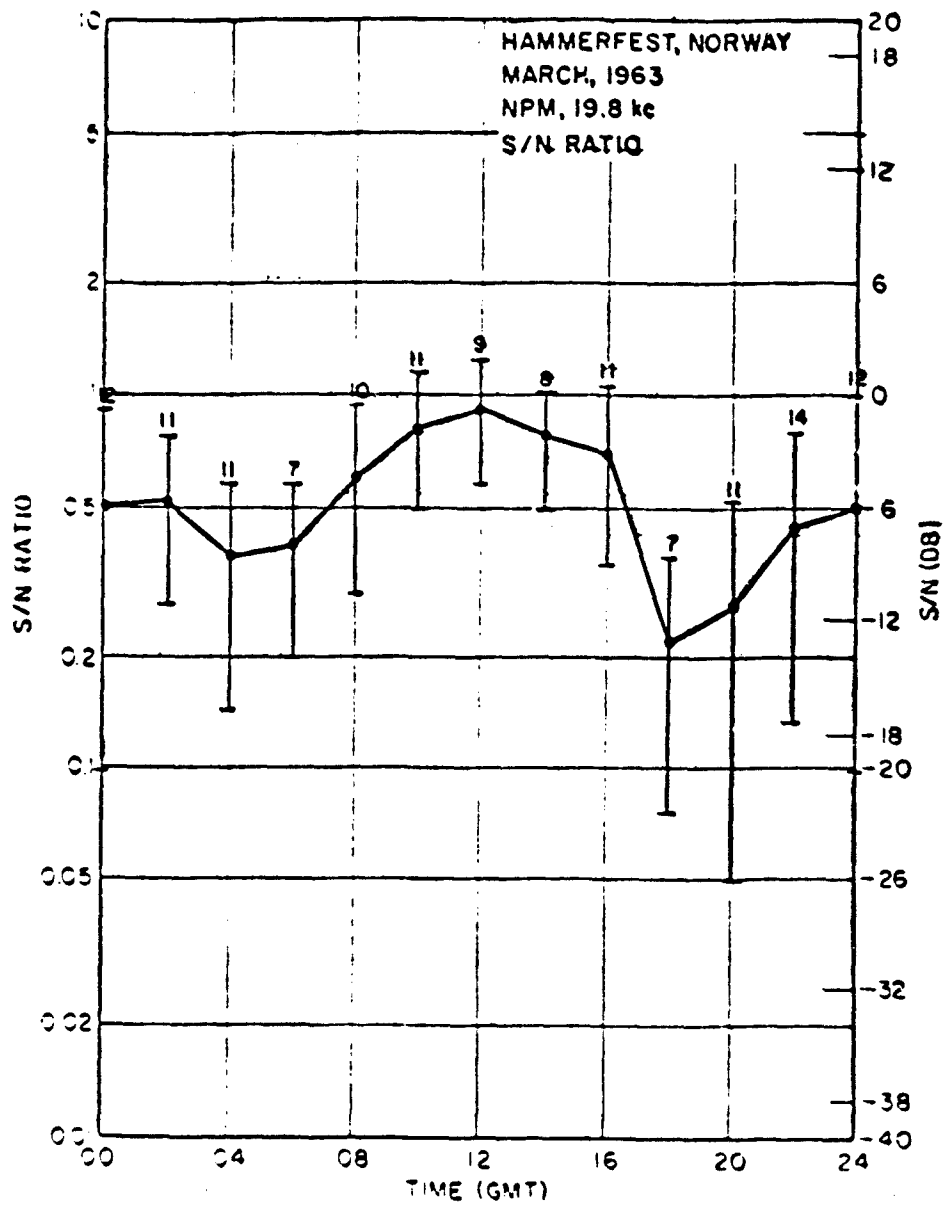


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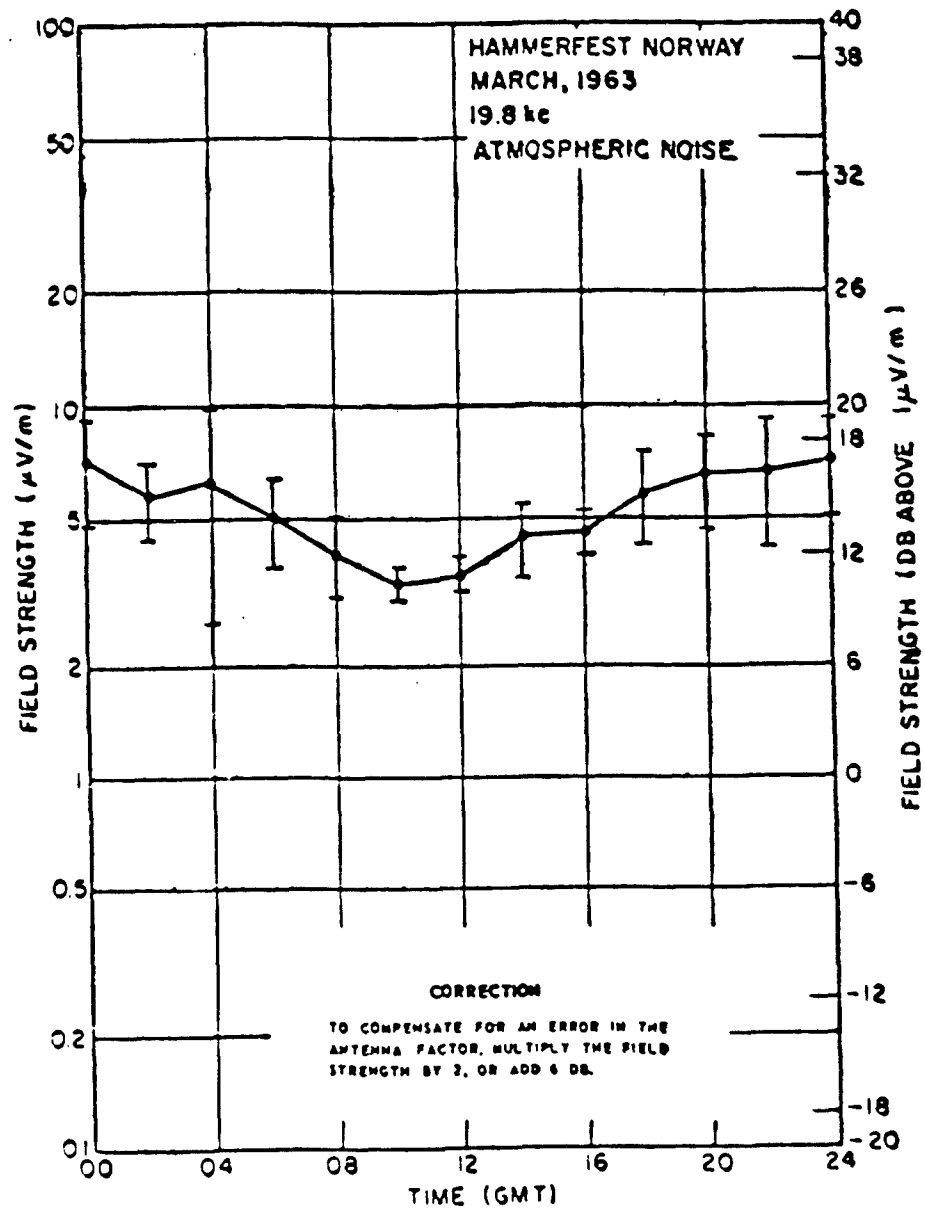


Figure 159

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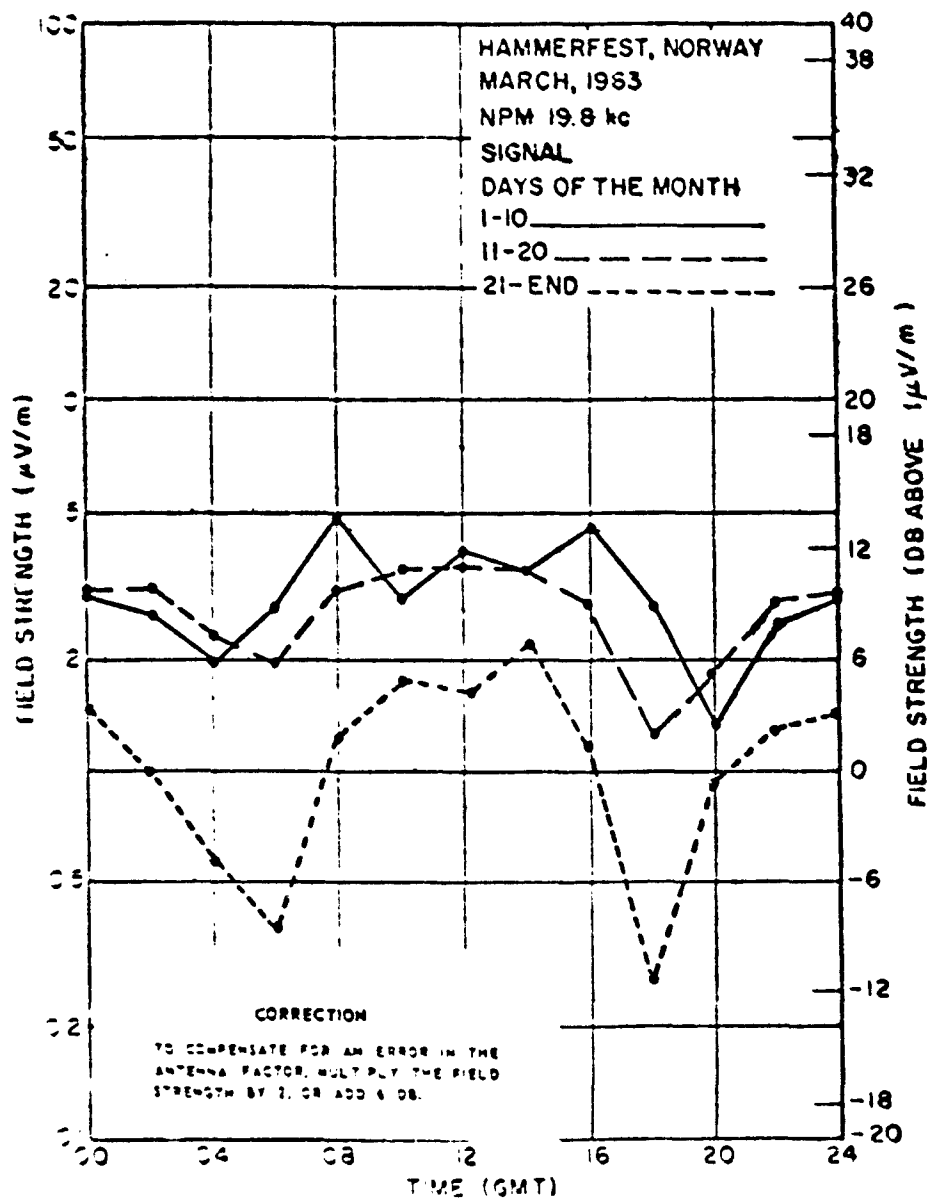


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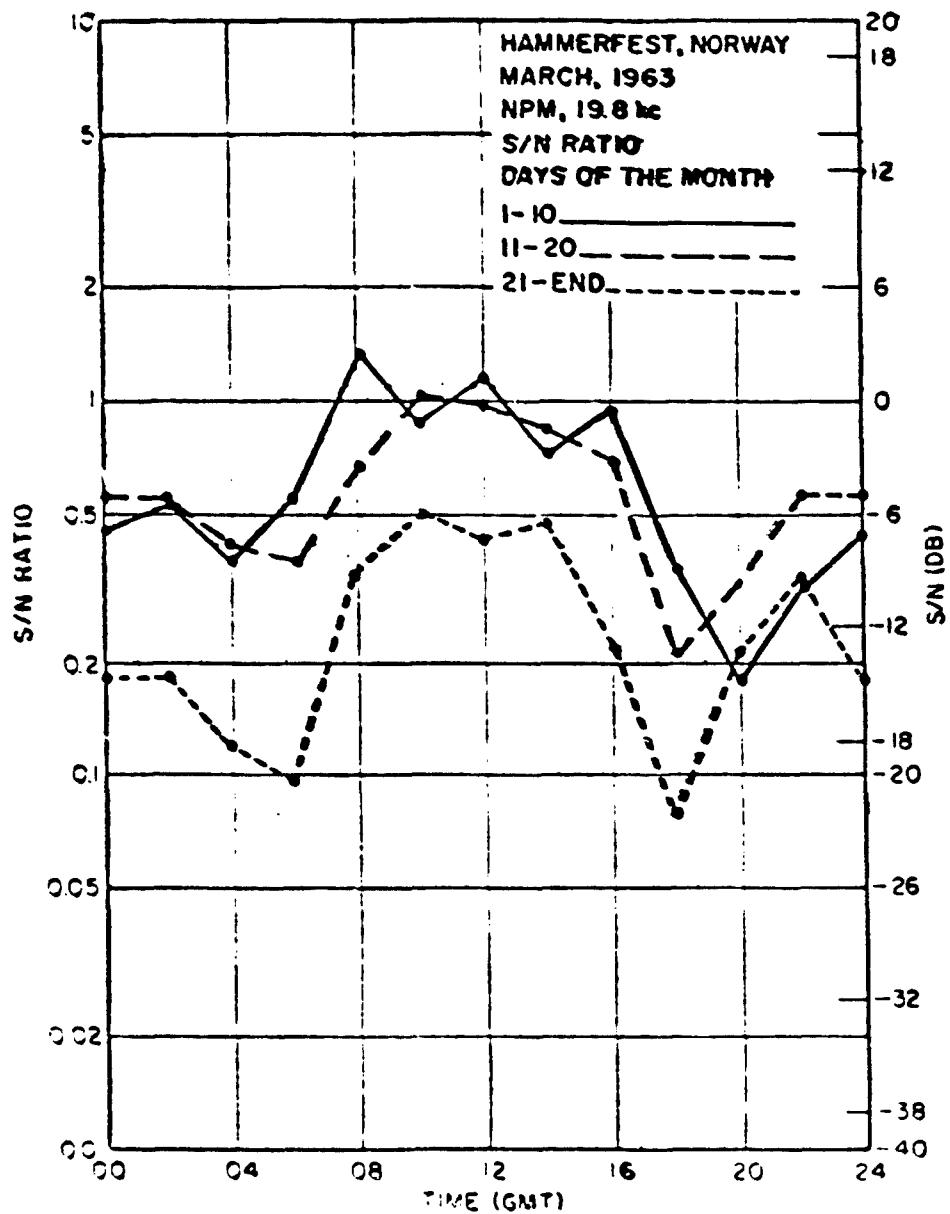


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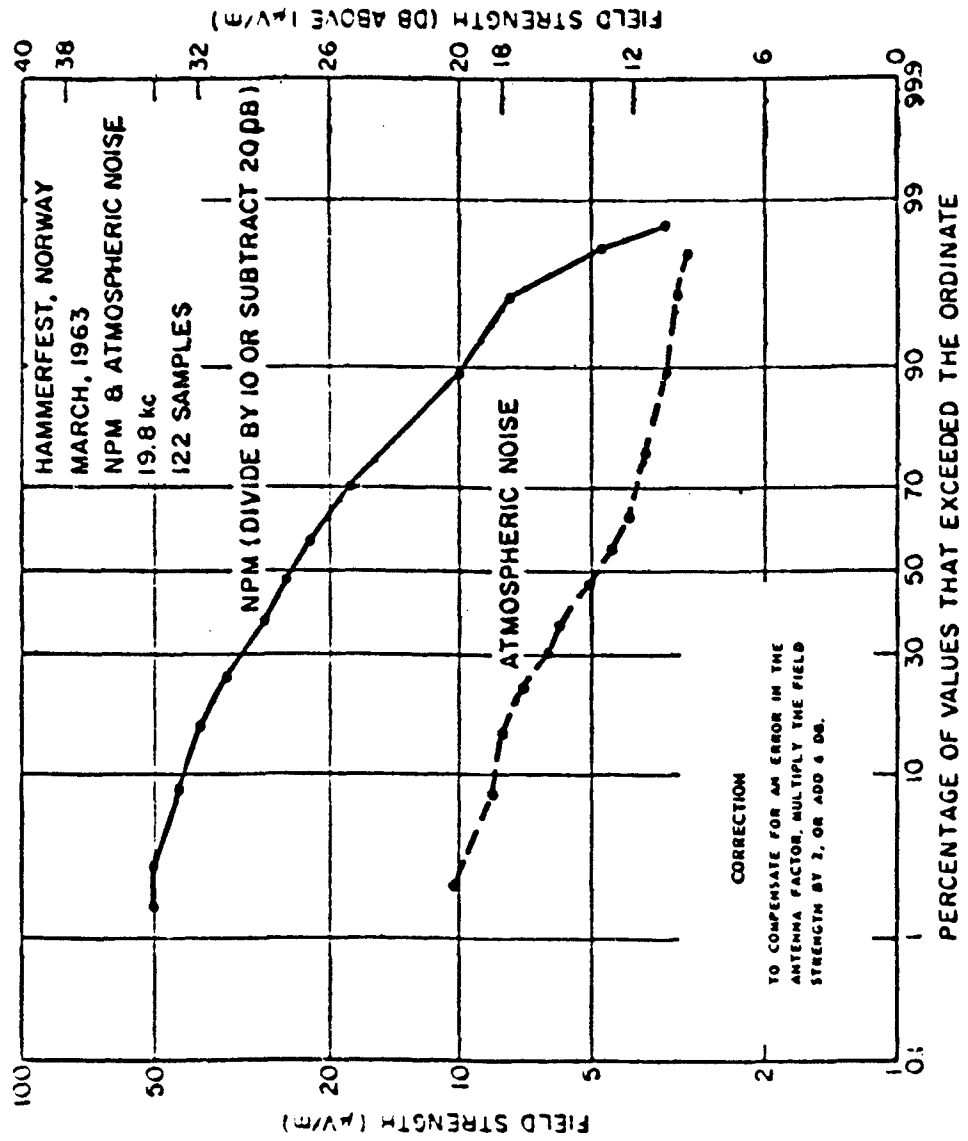


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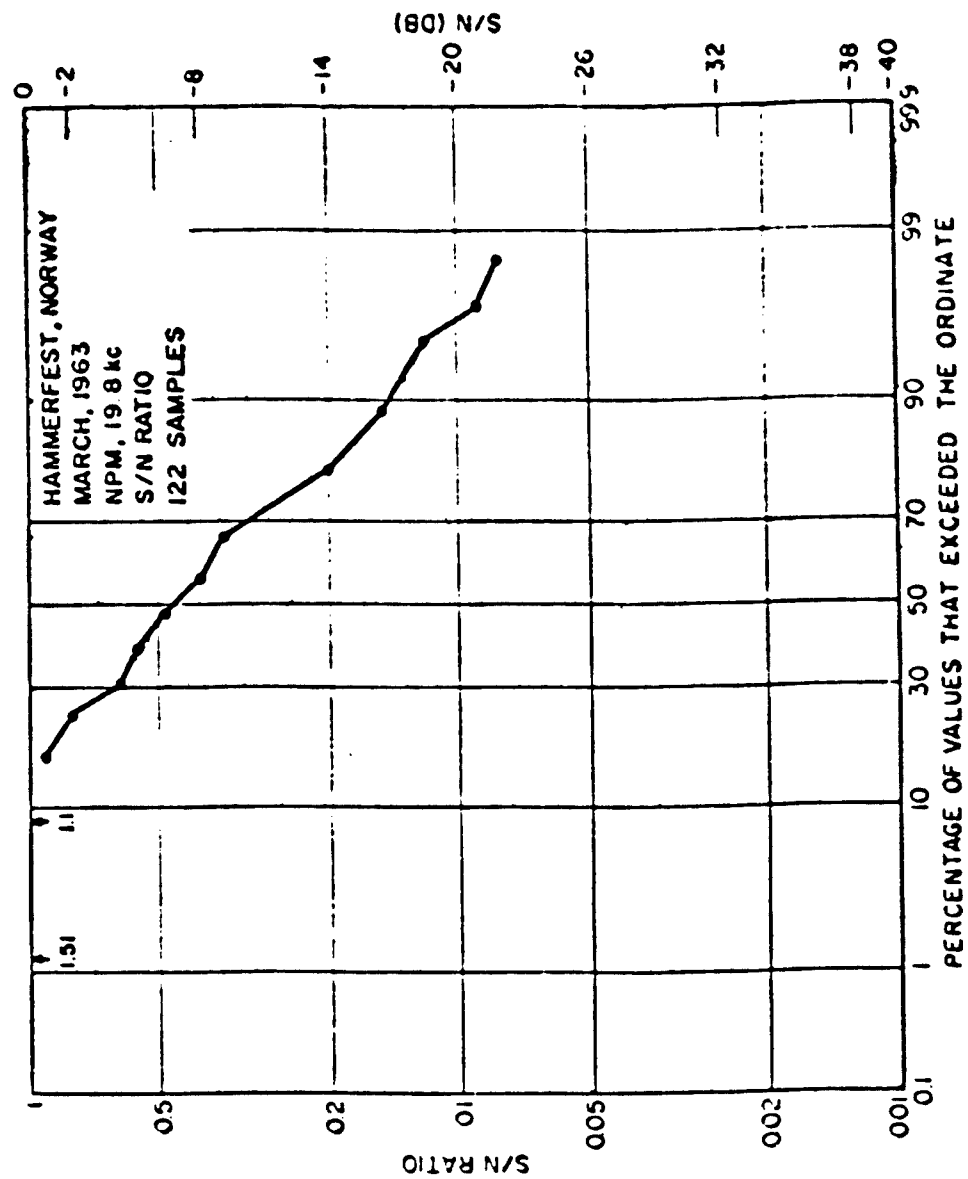


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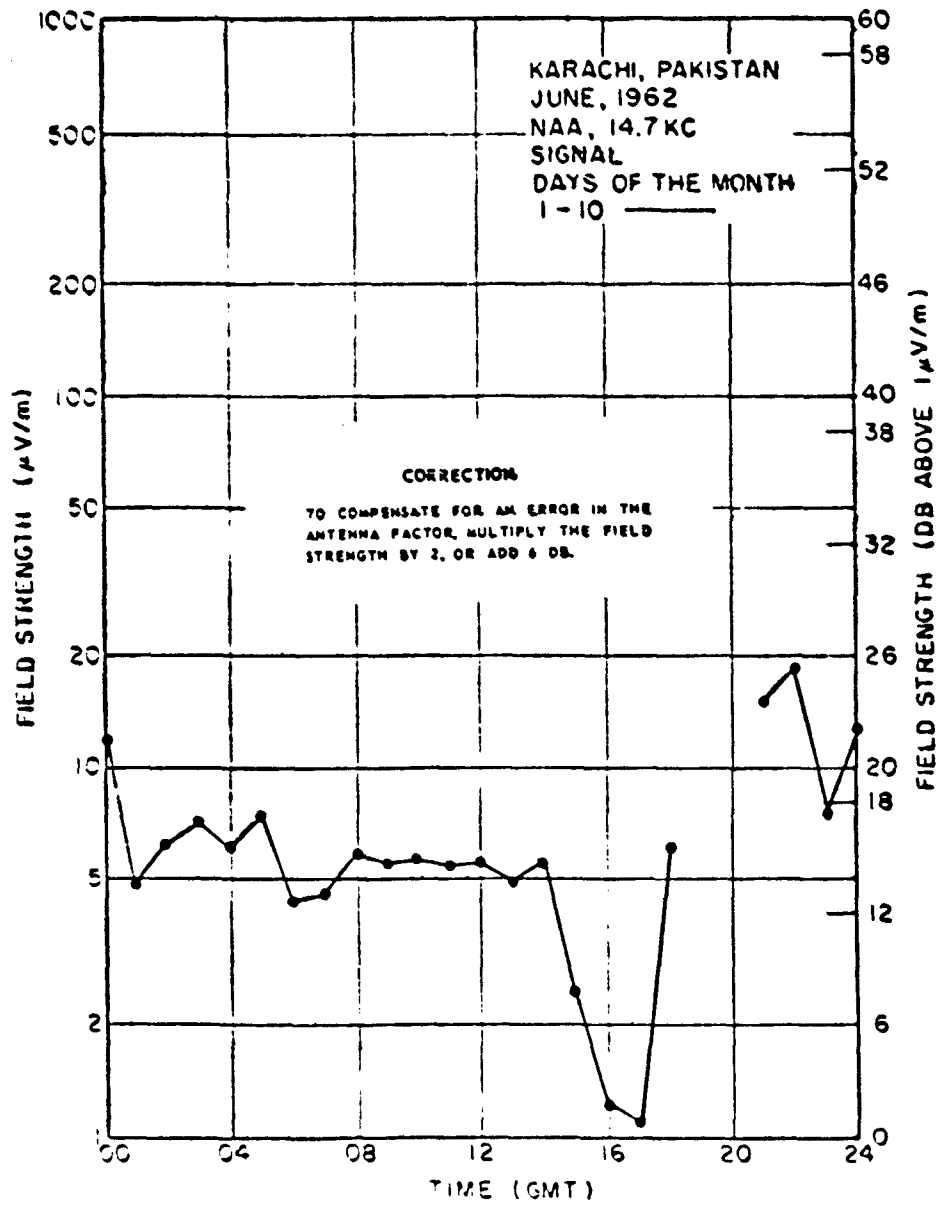


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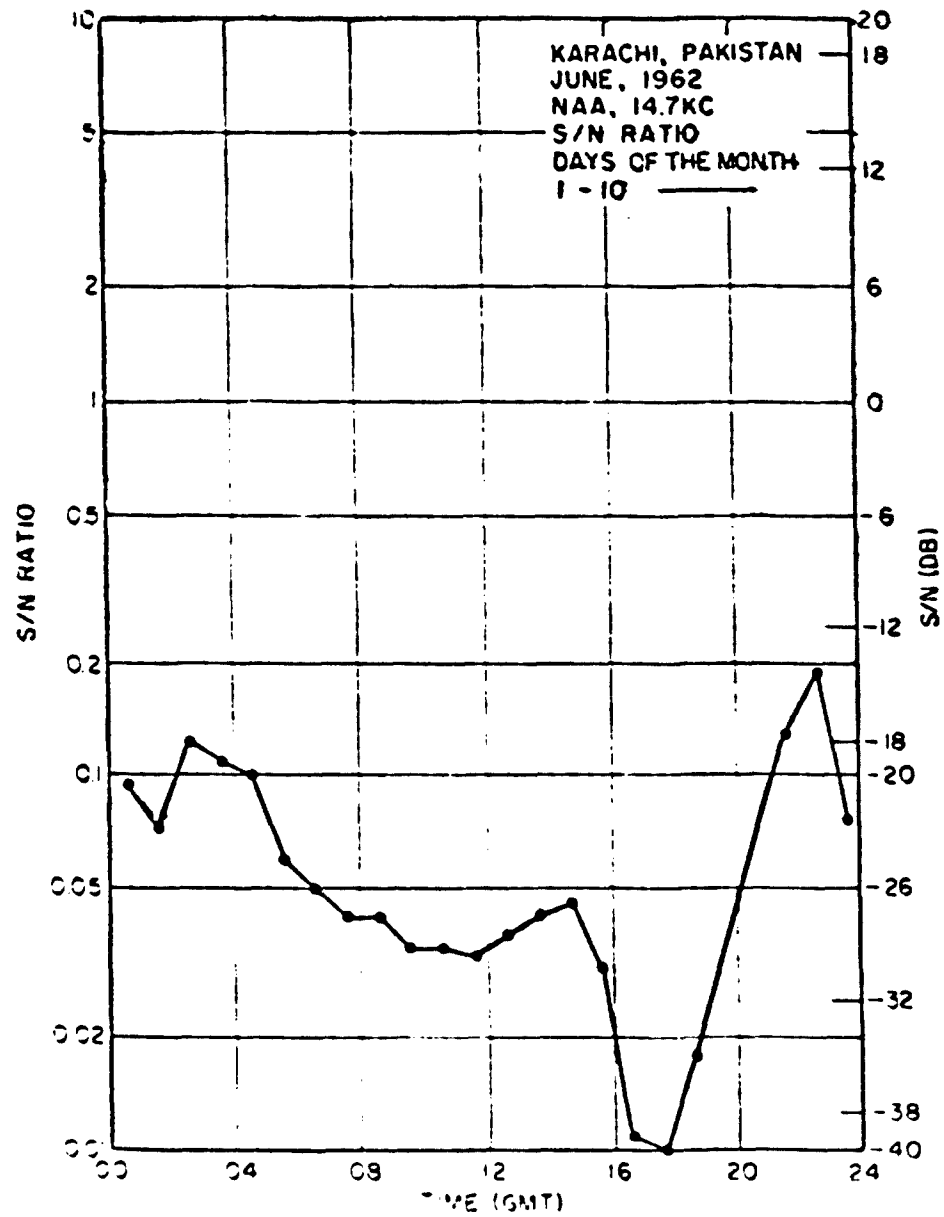


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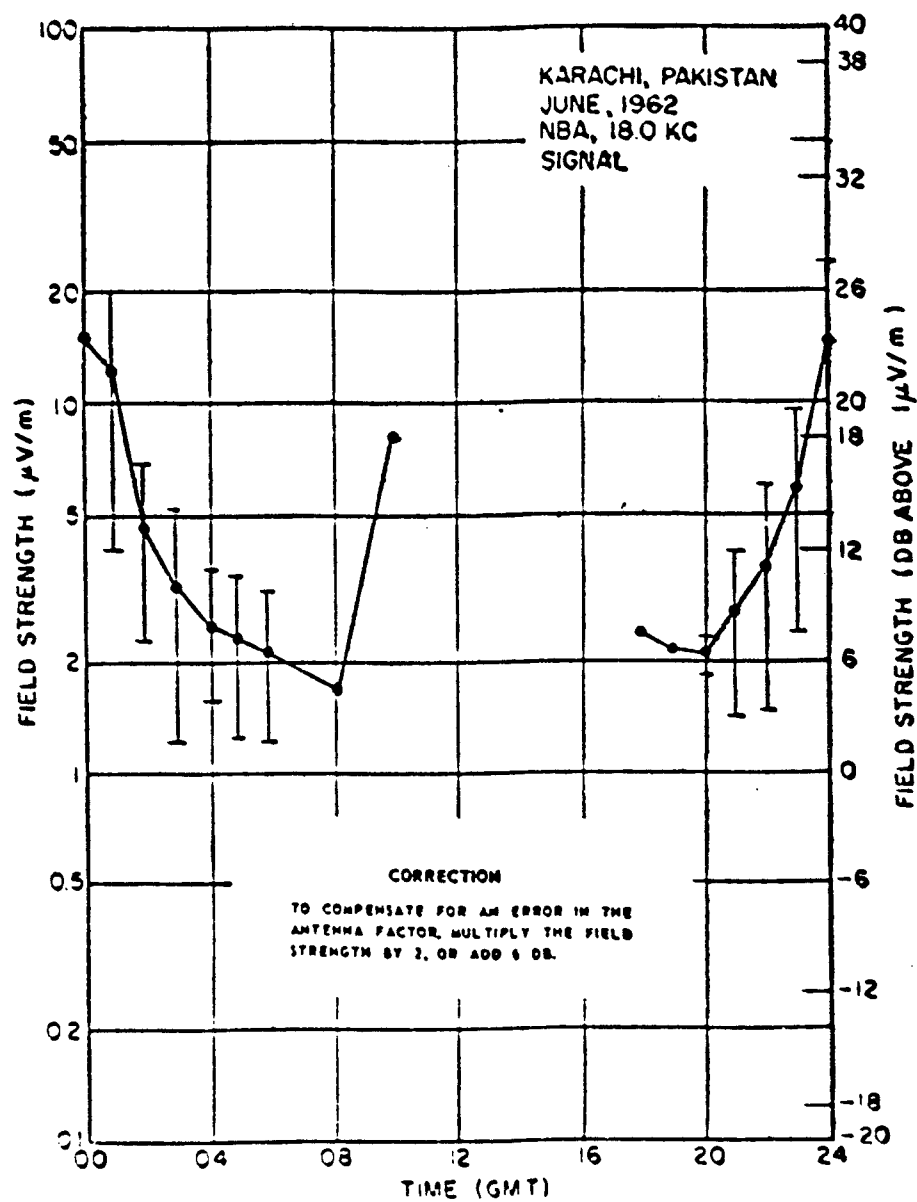


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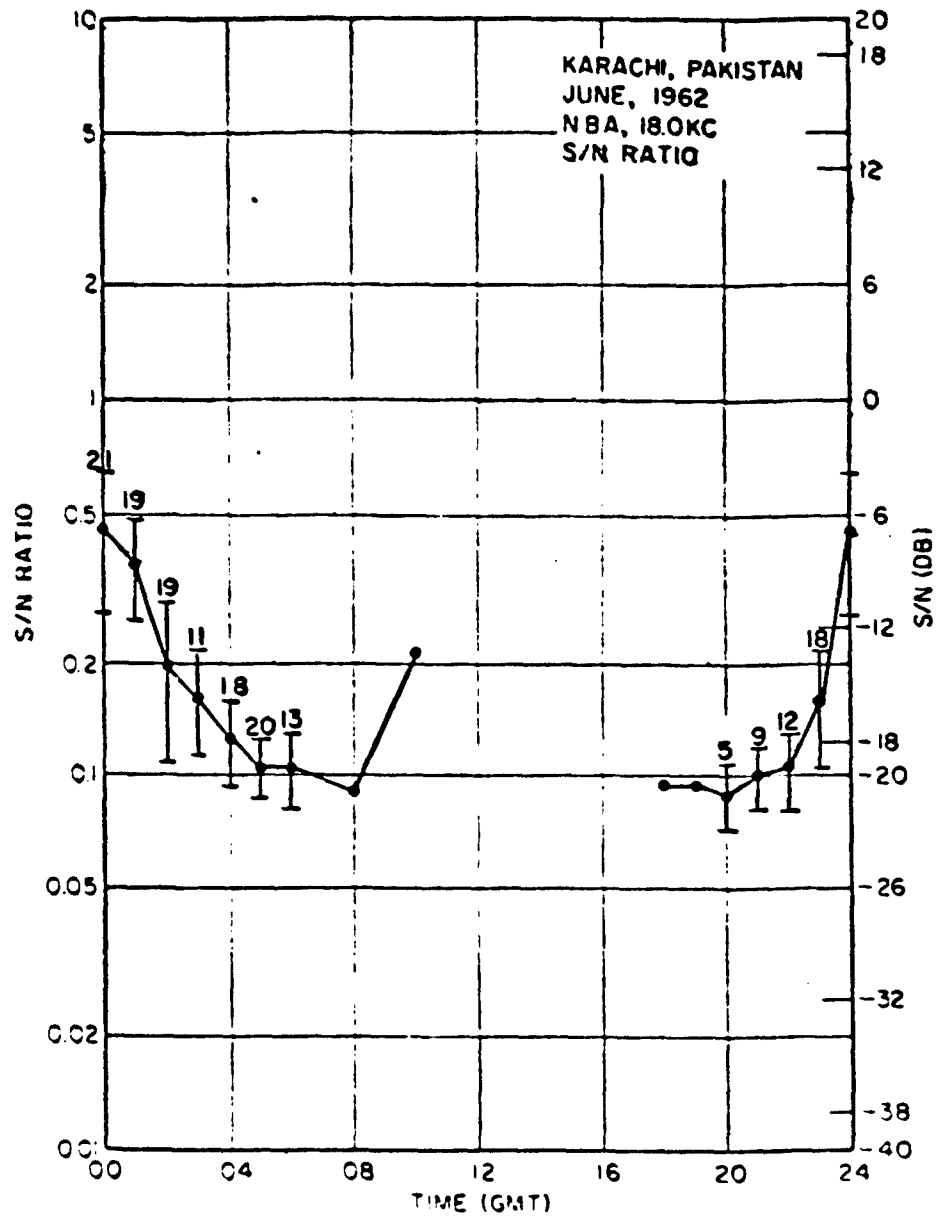


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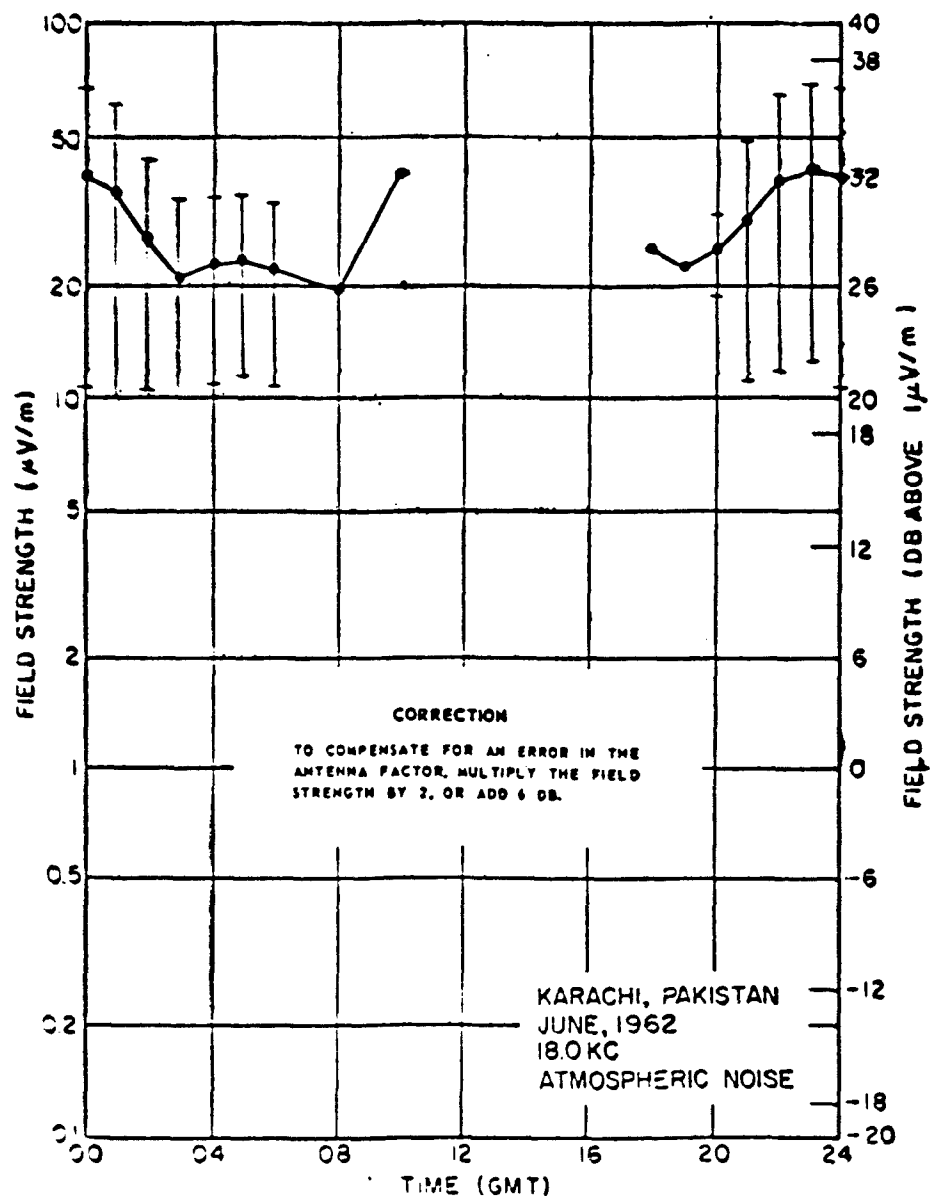


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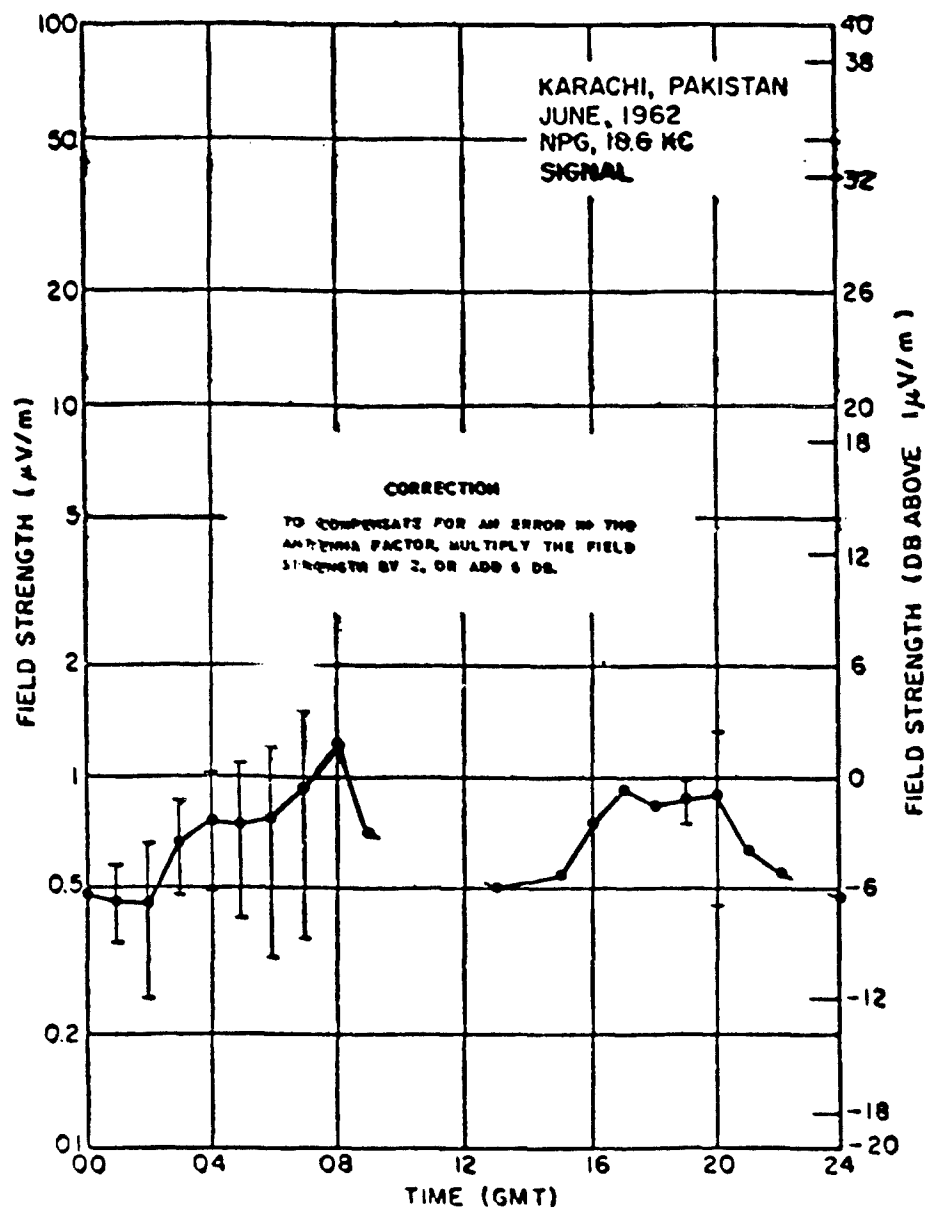


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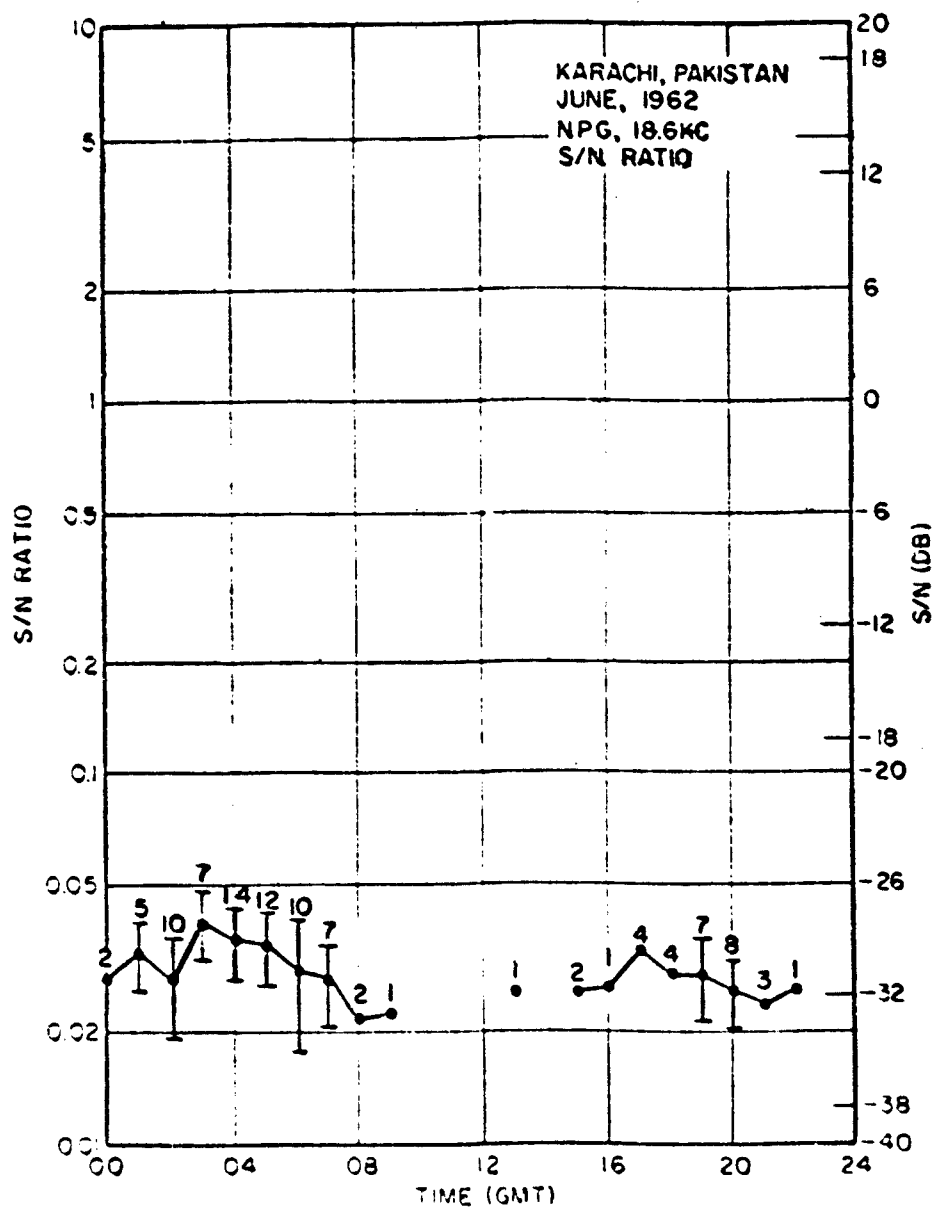


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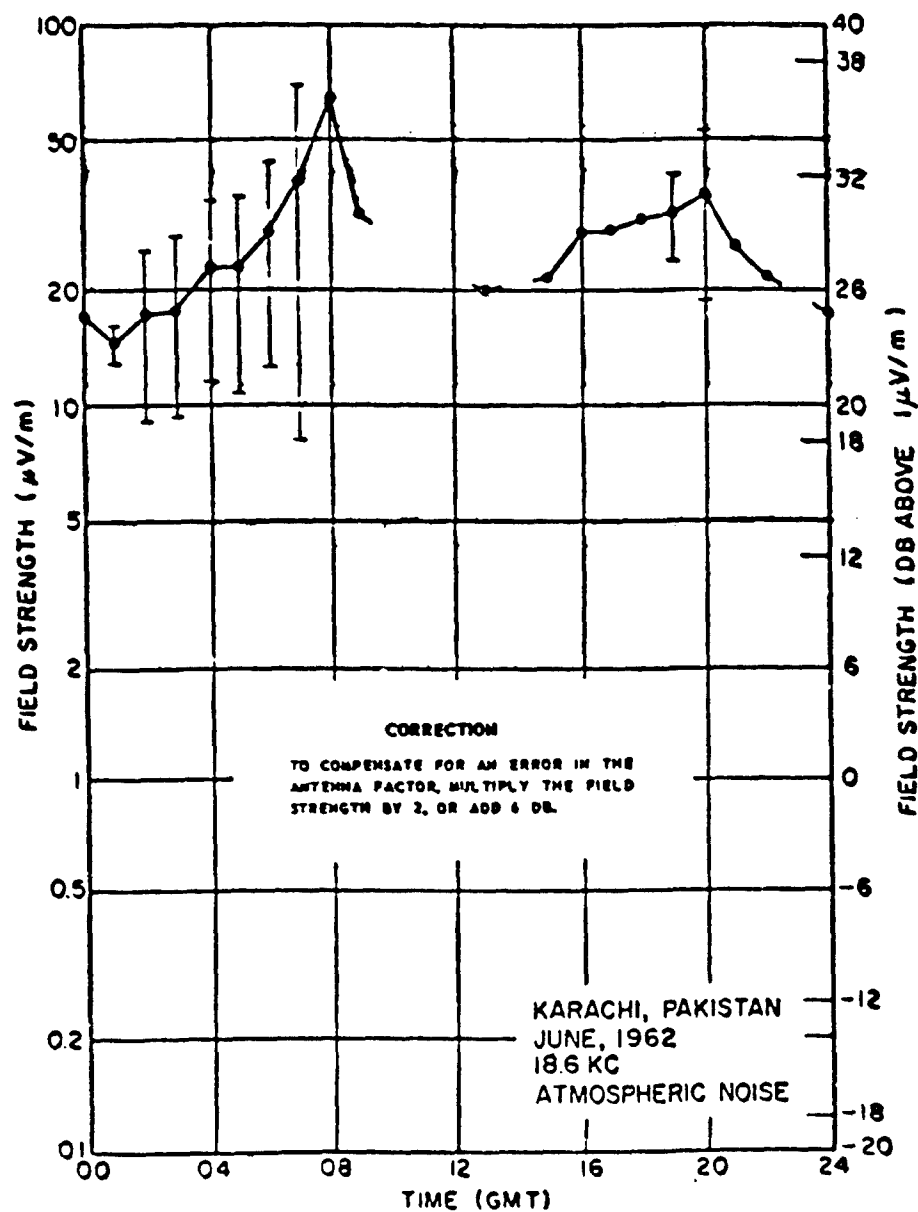


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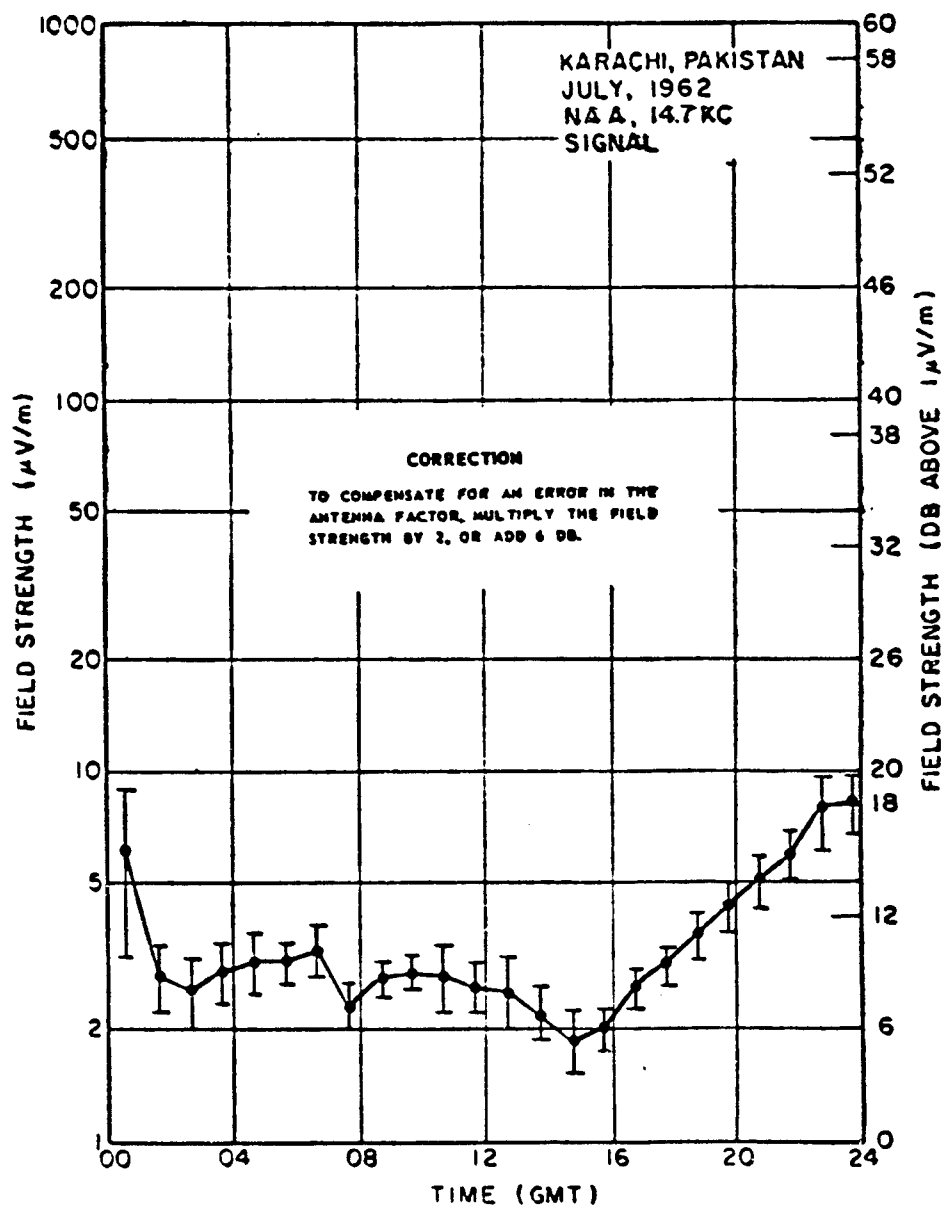


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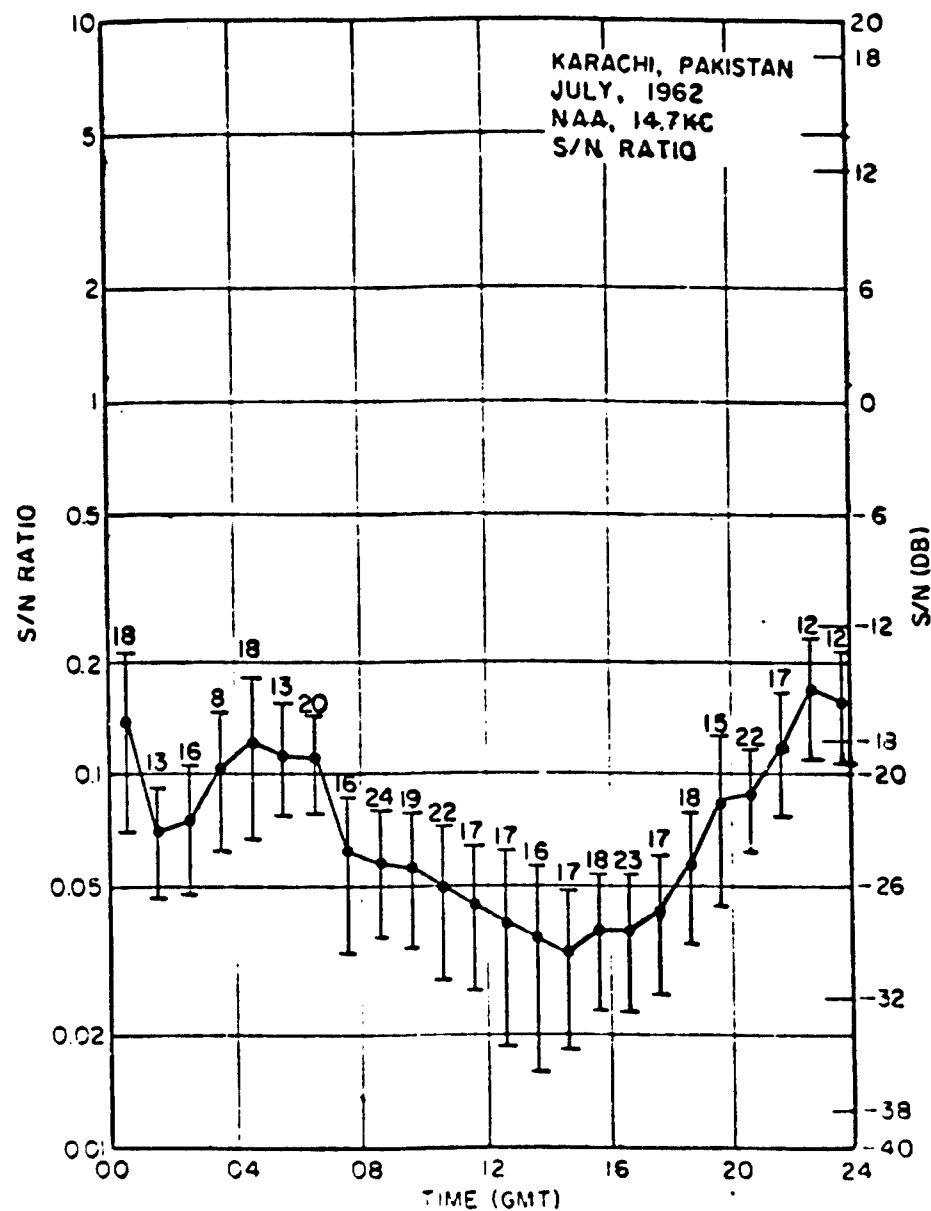


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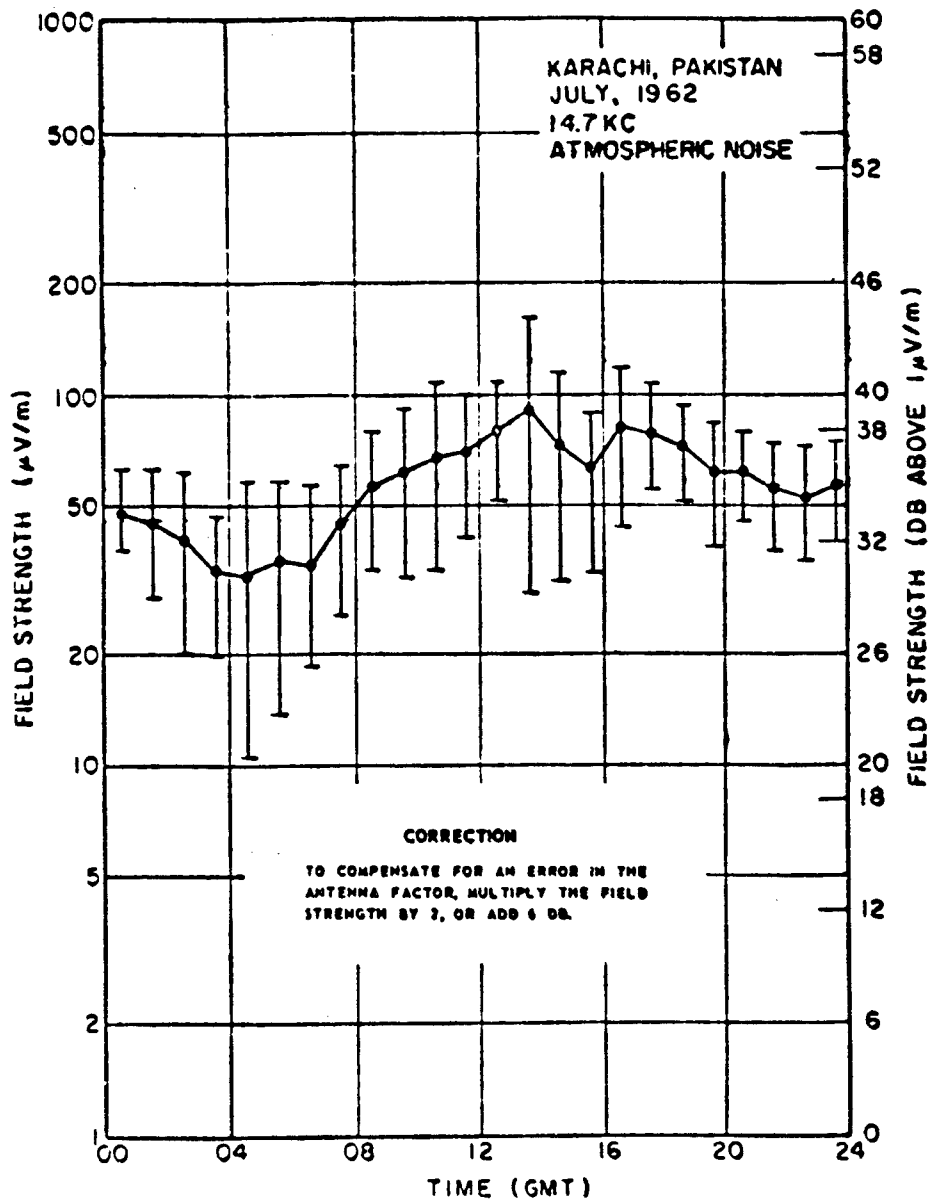


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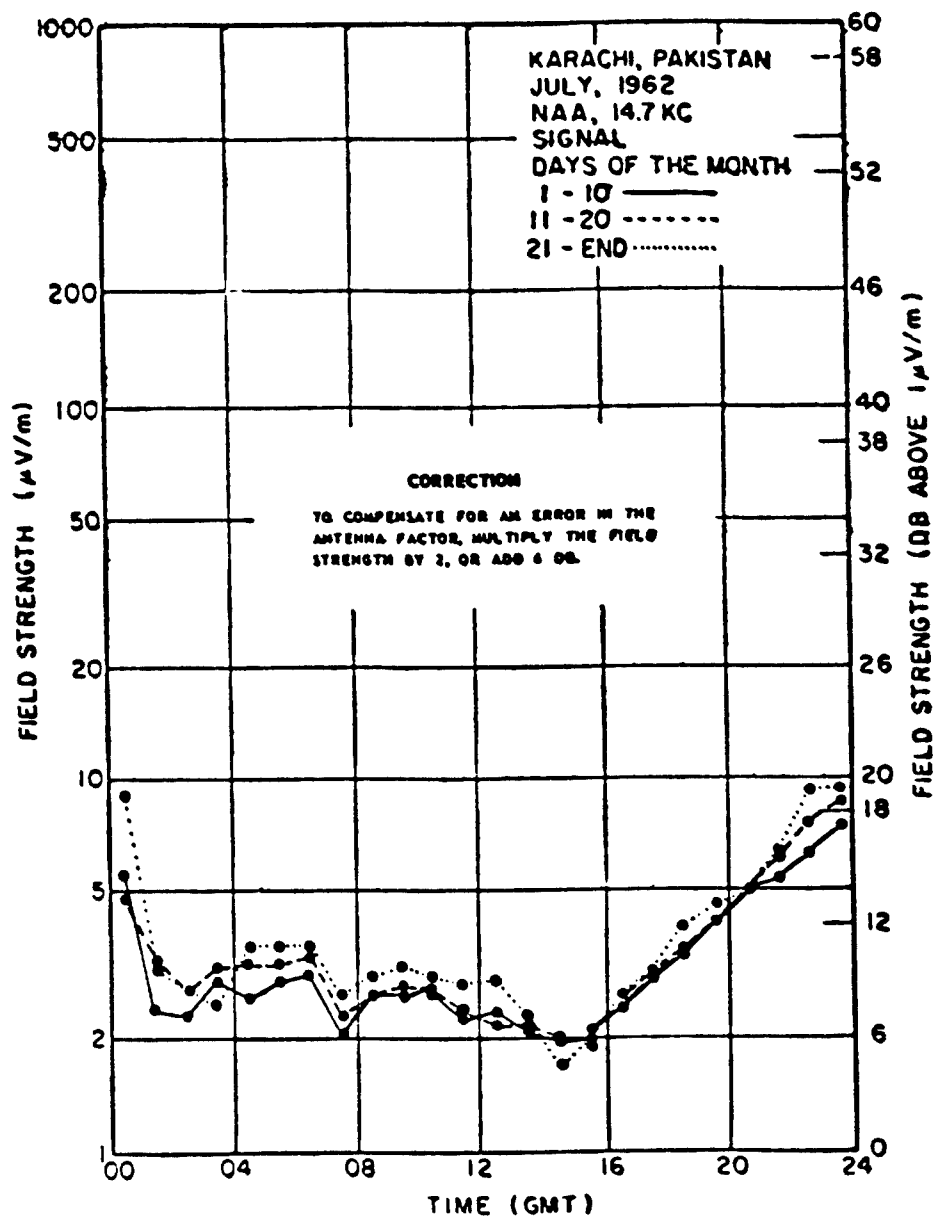


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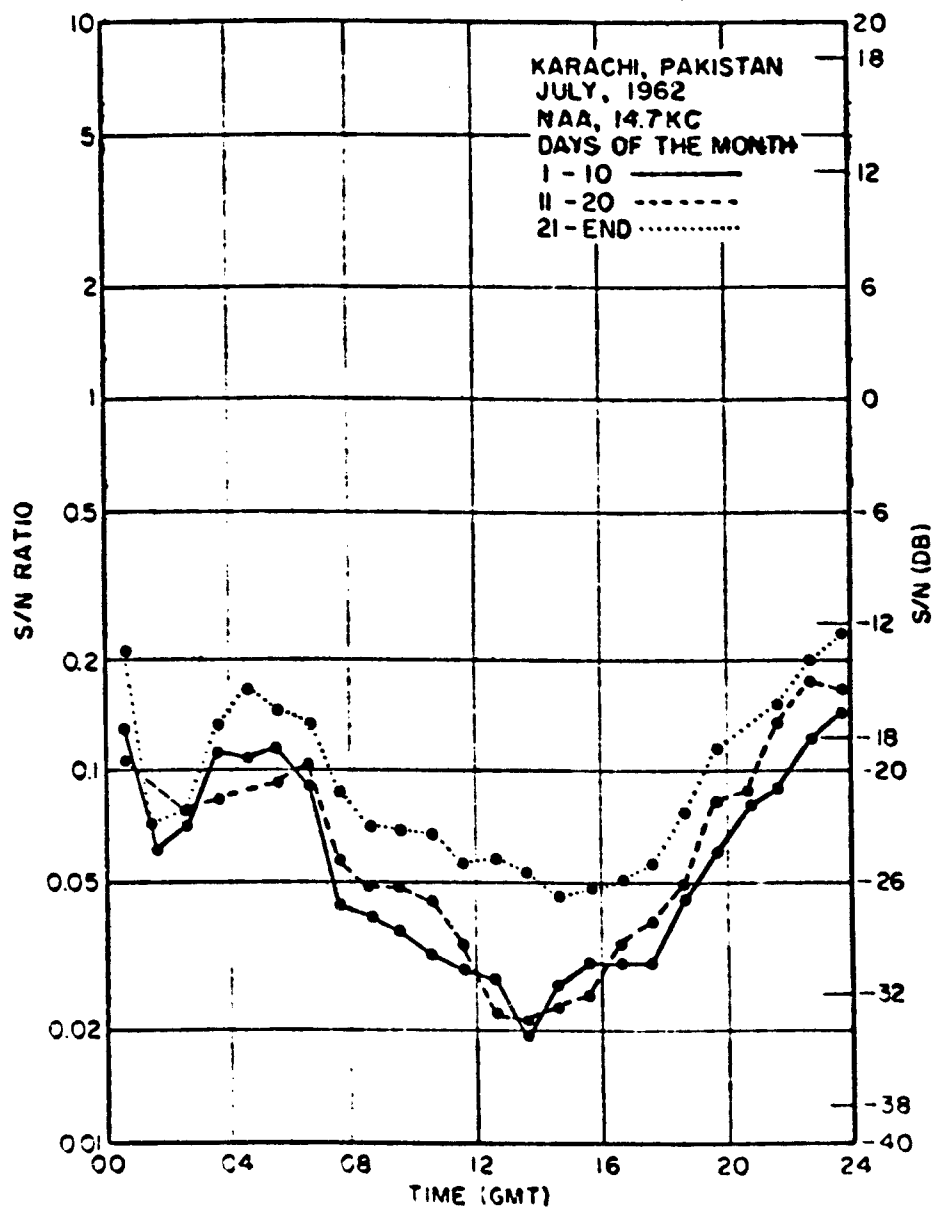


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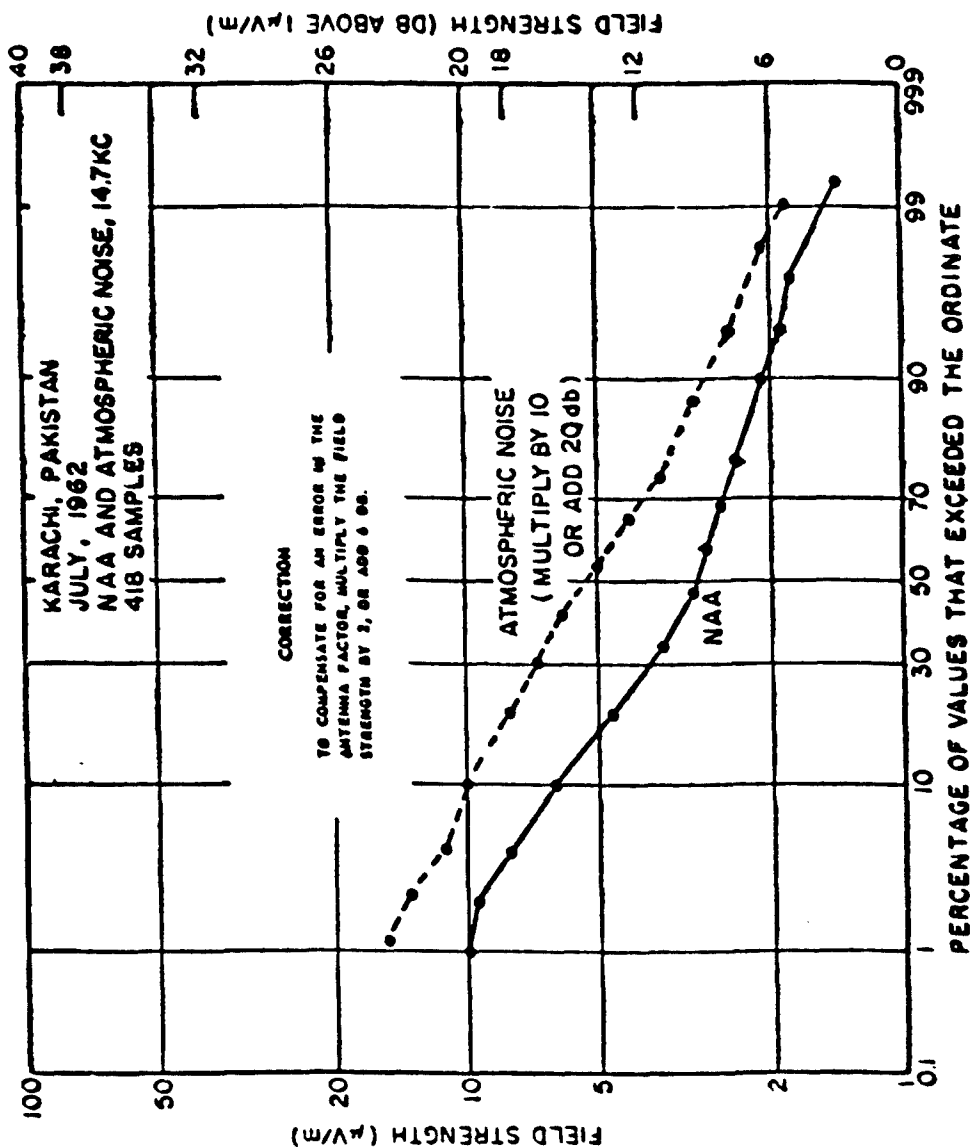


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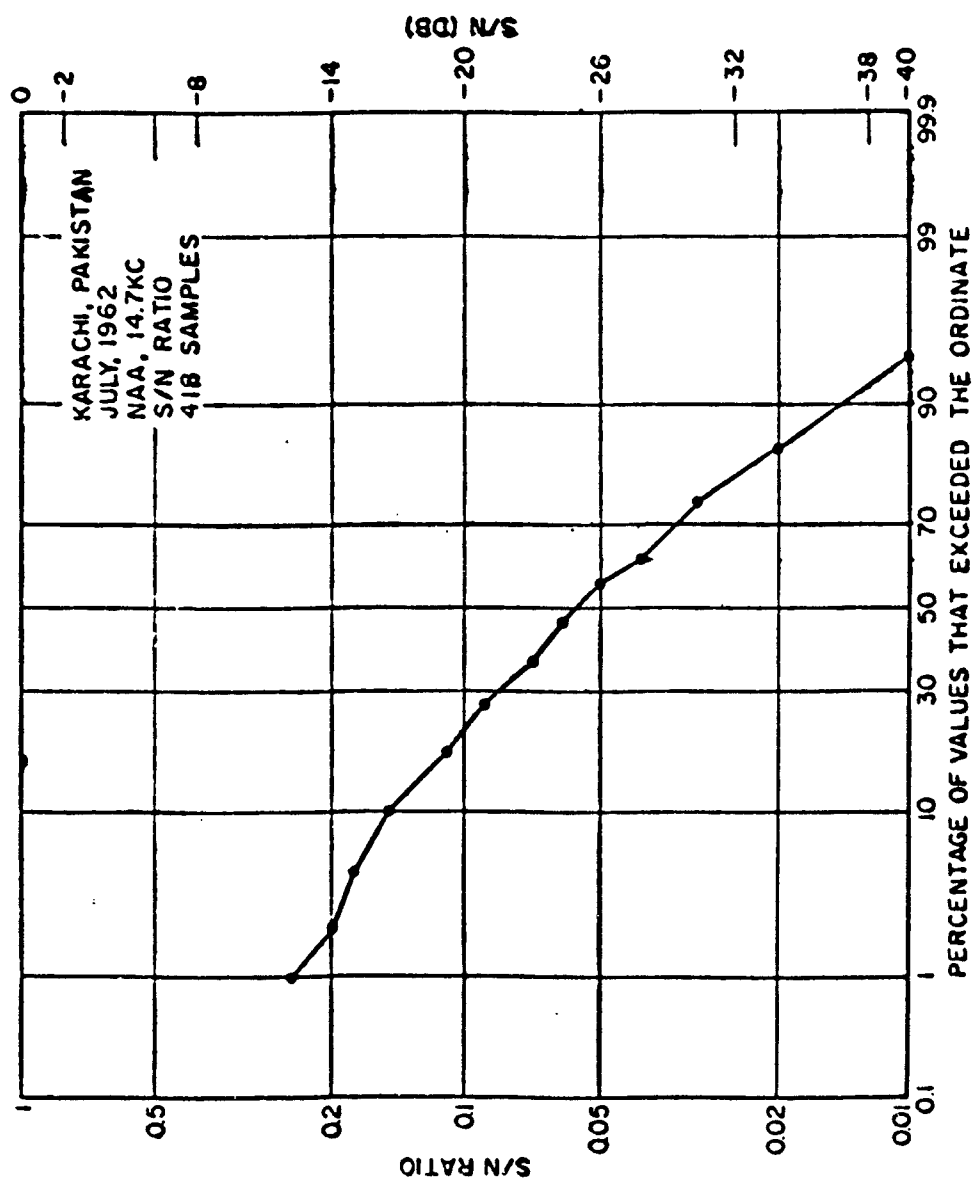


Figure 178

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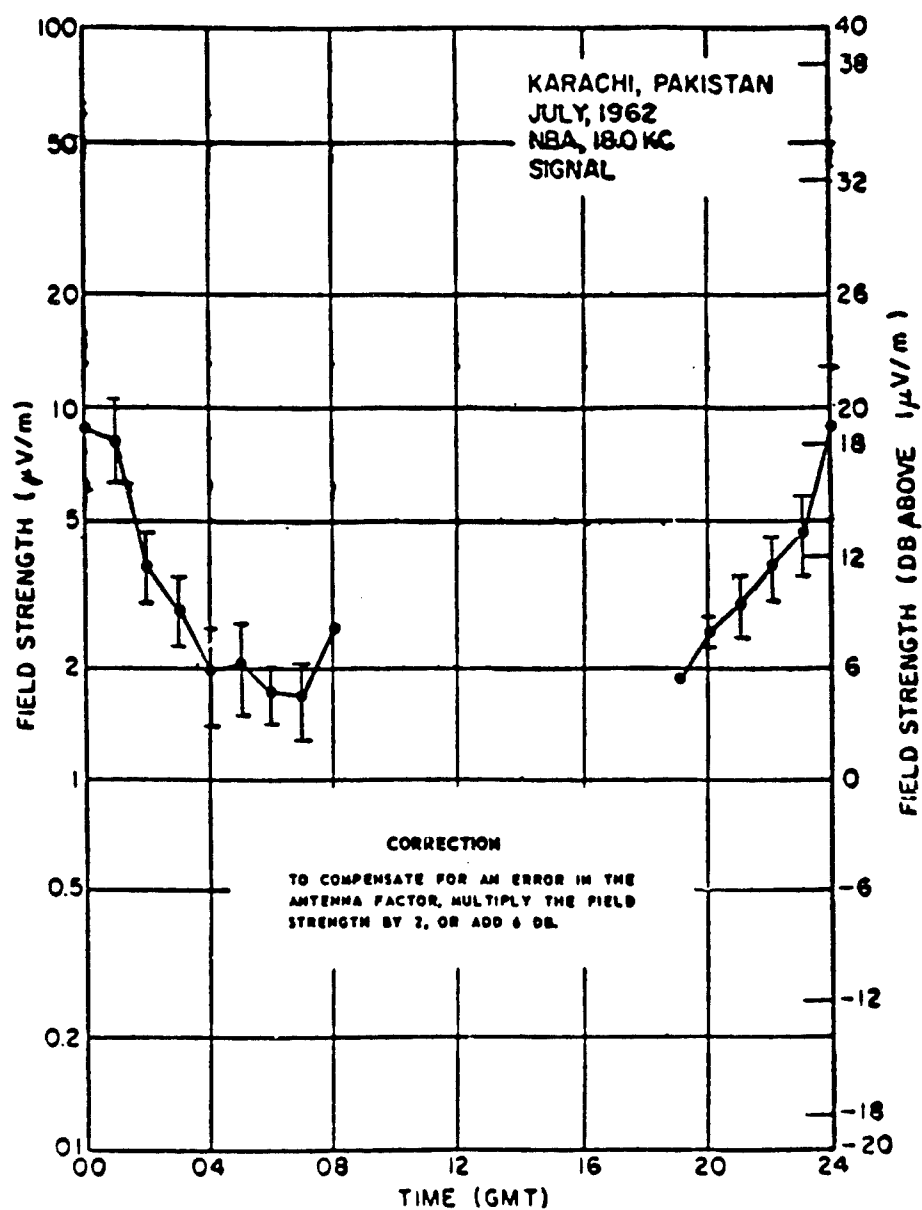


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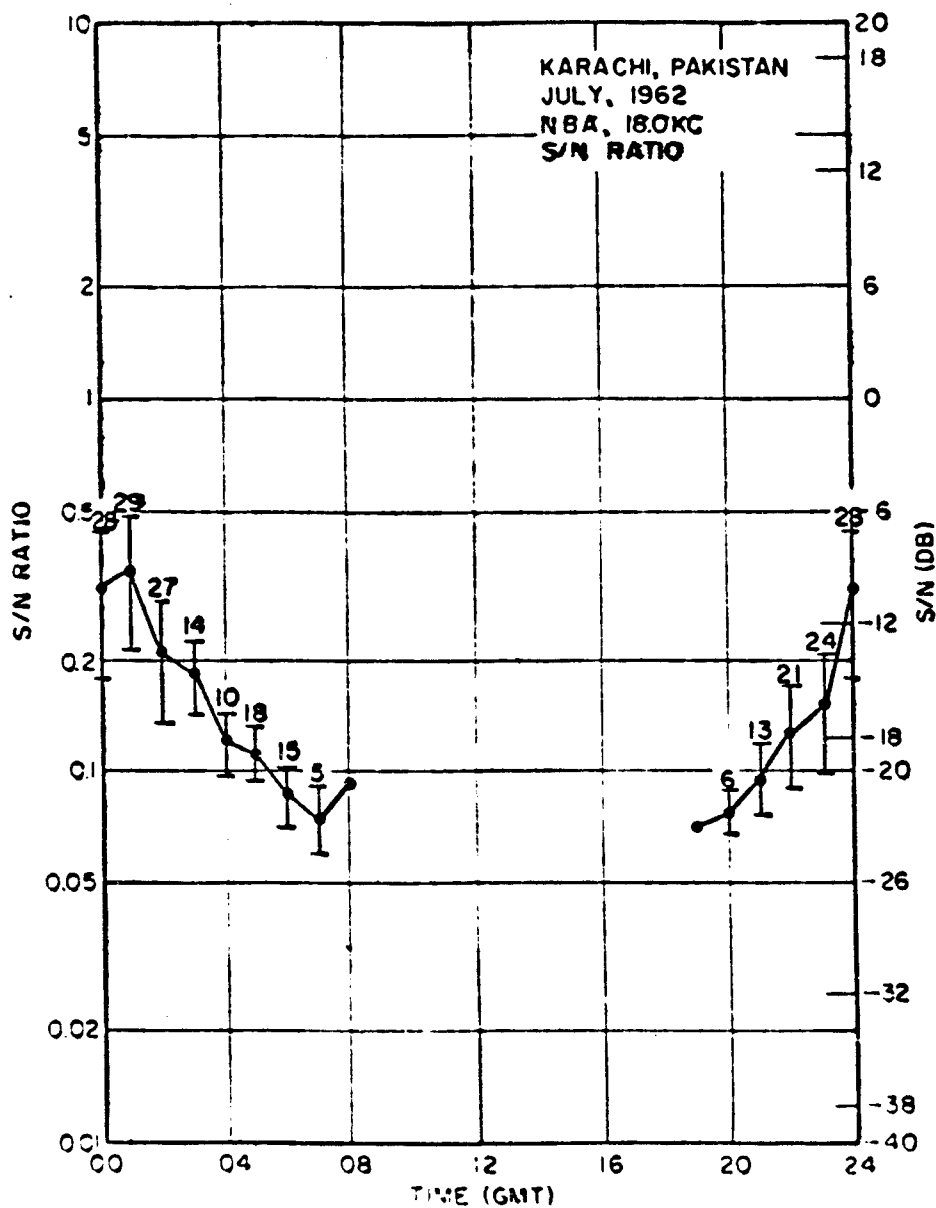


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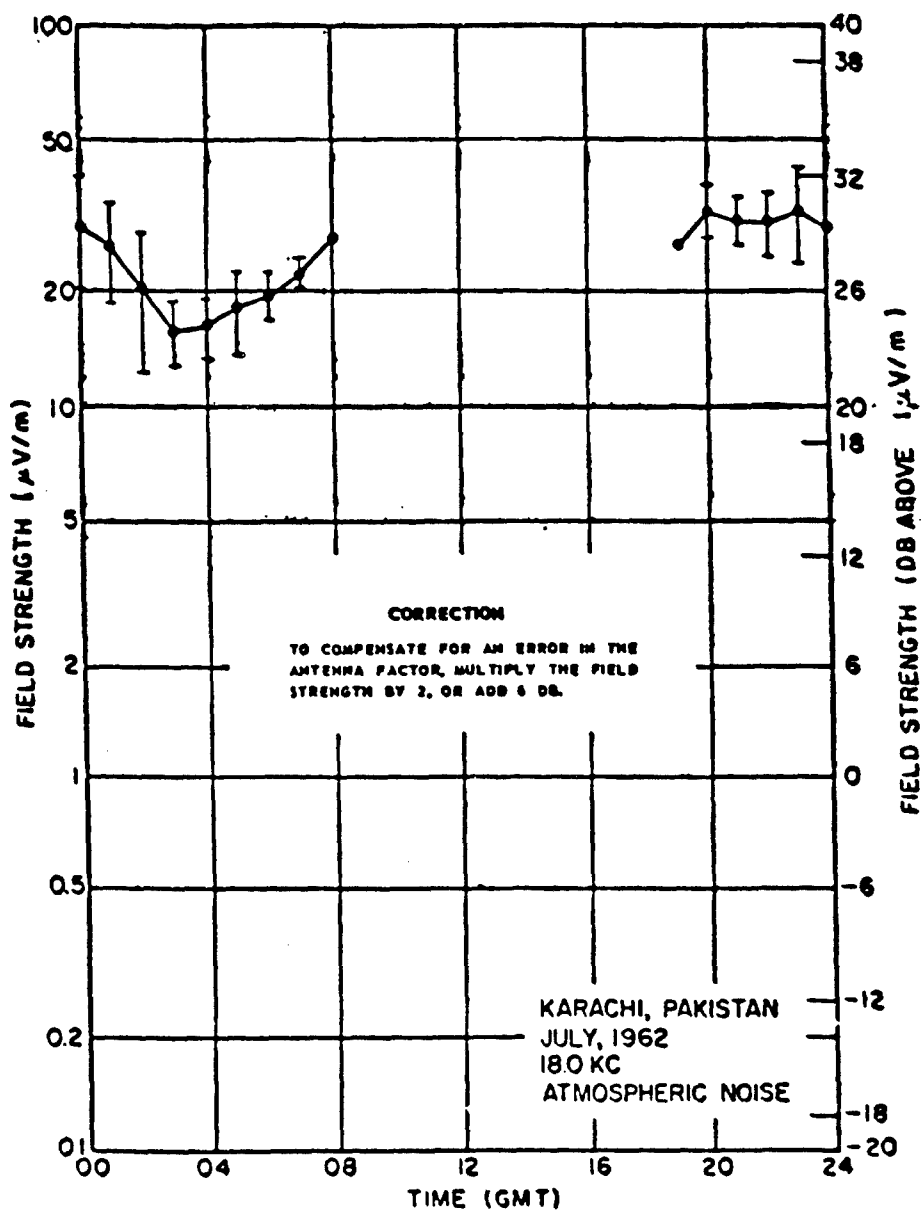


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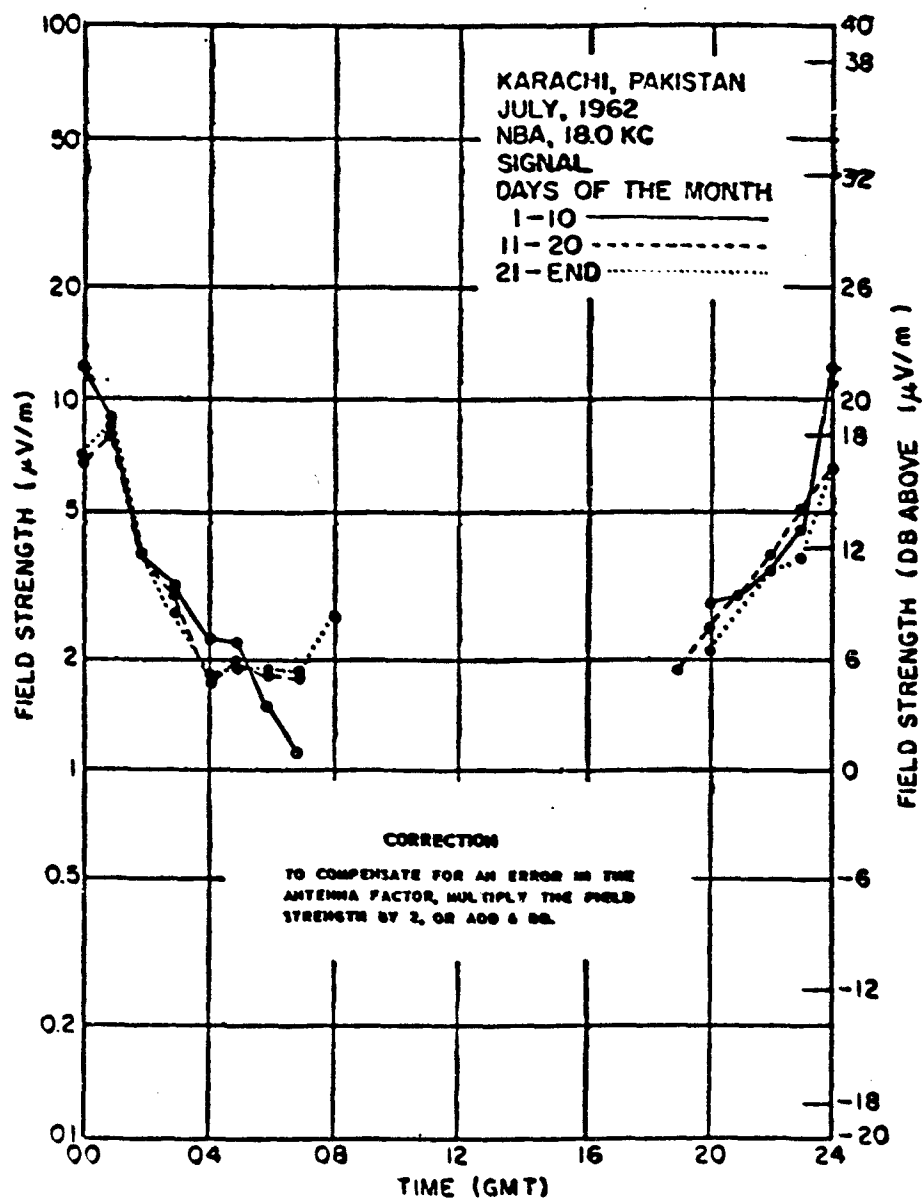


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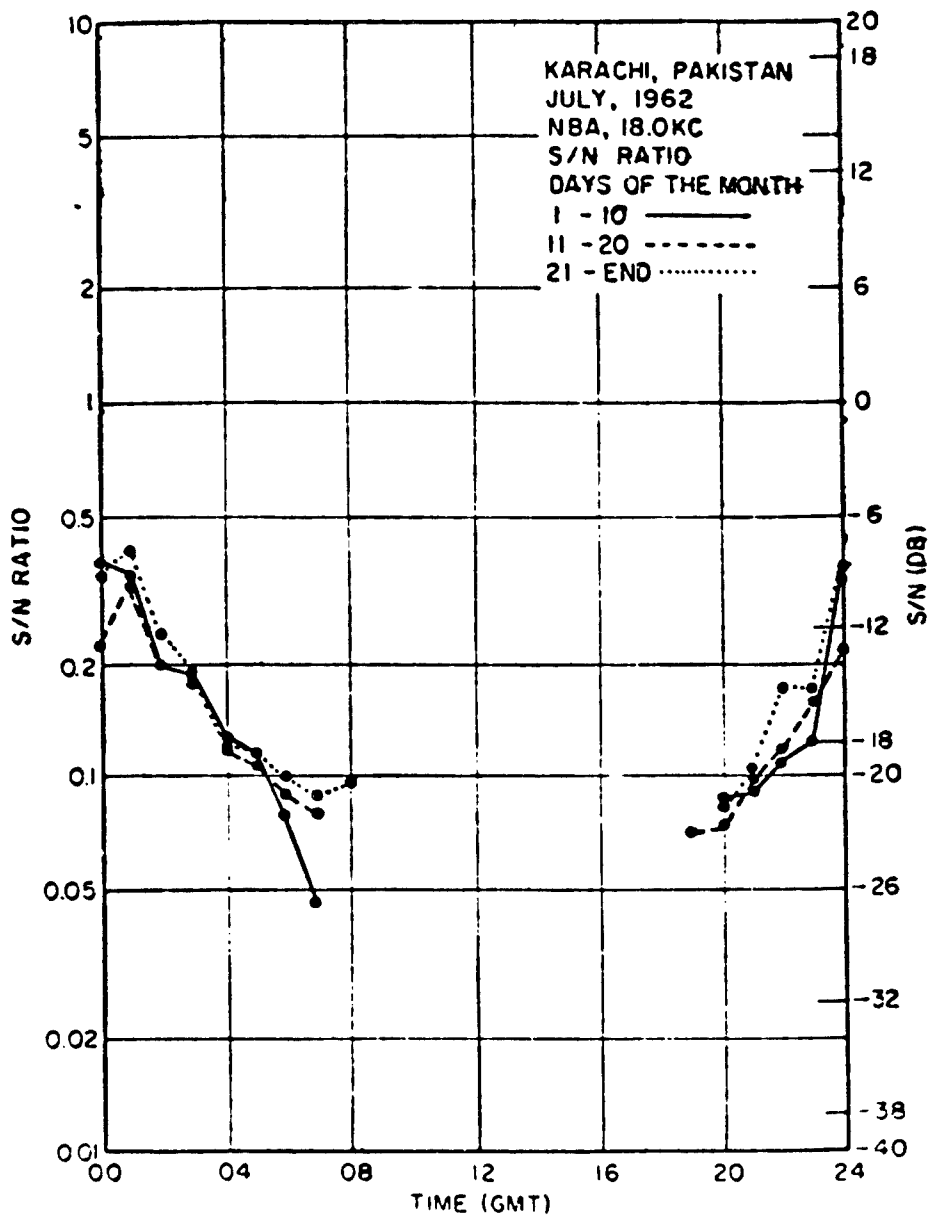


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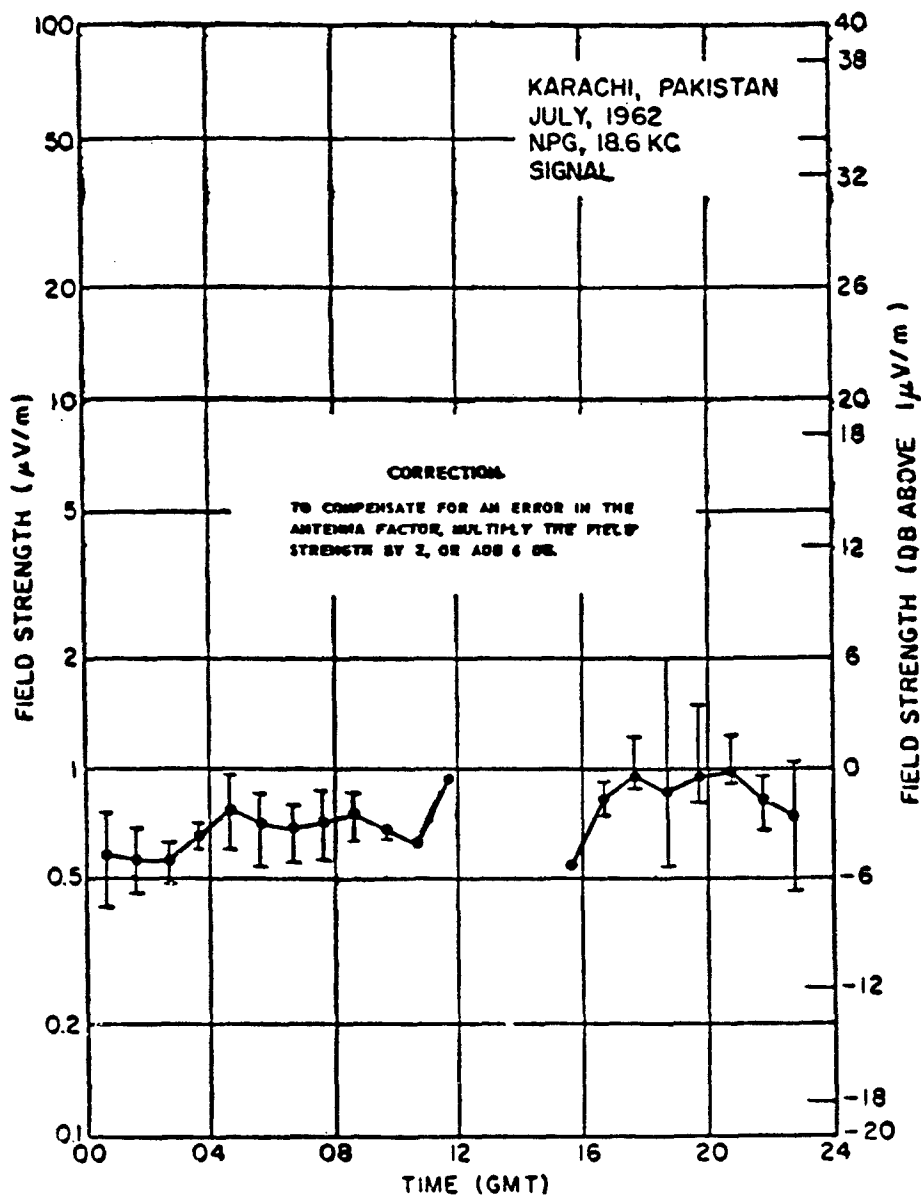


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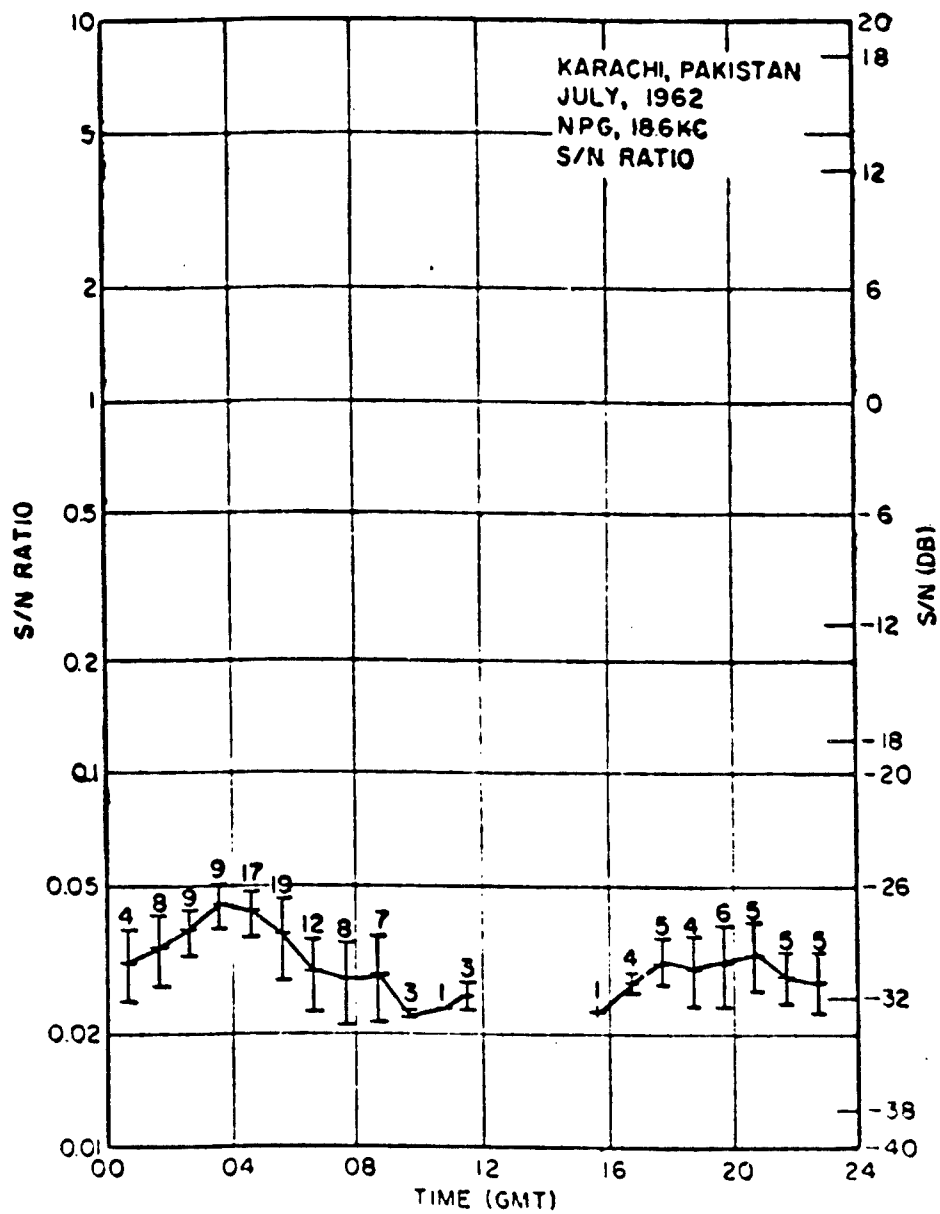


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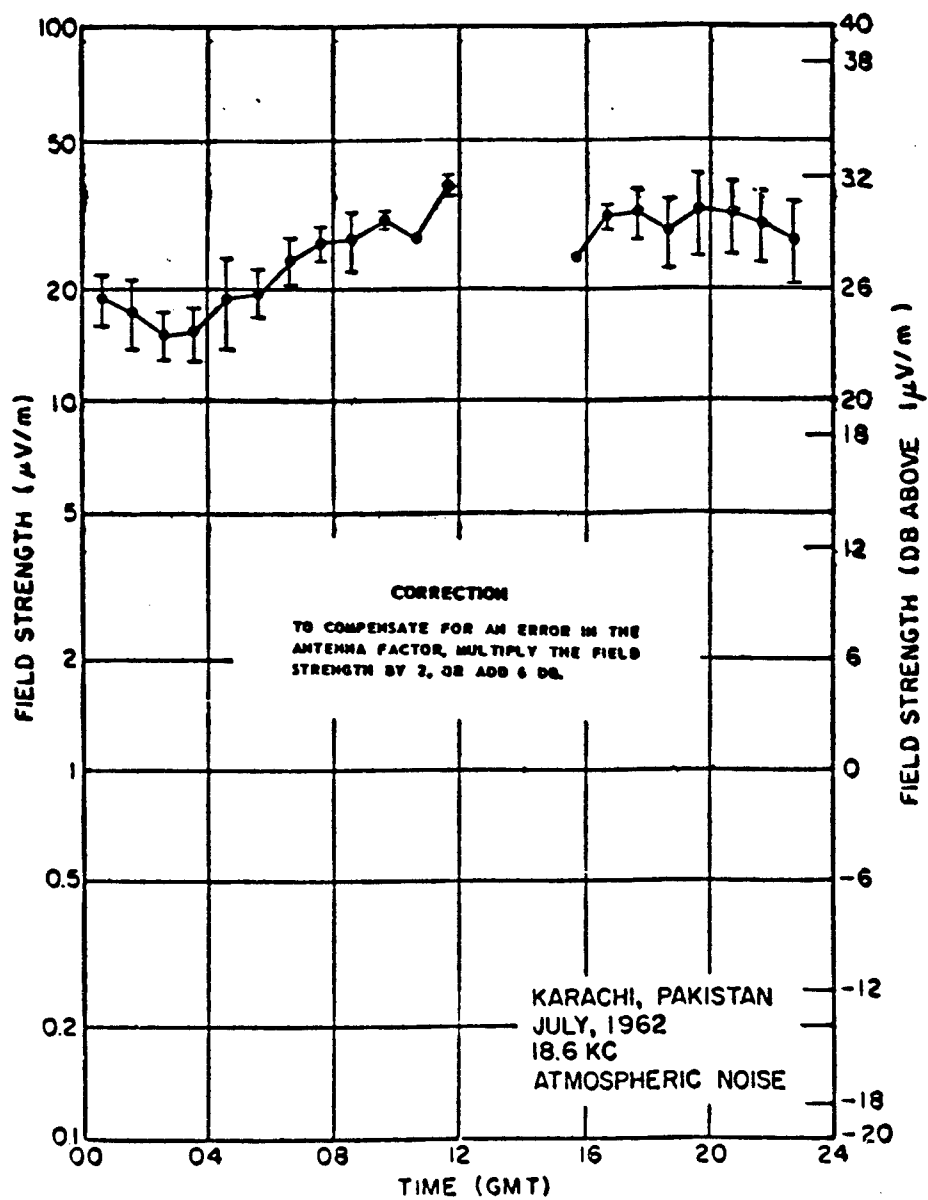


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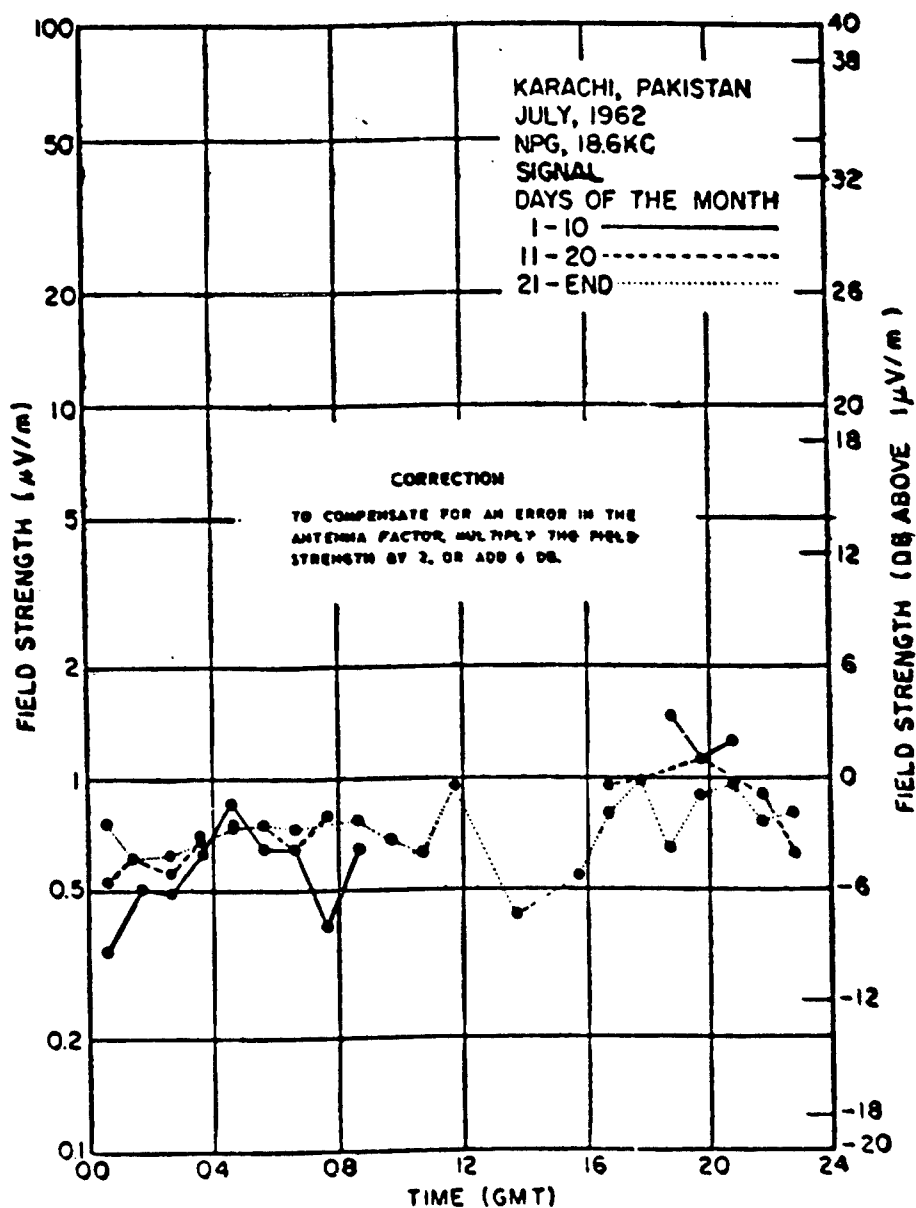


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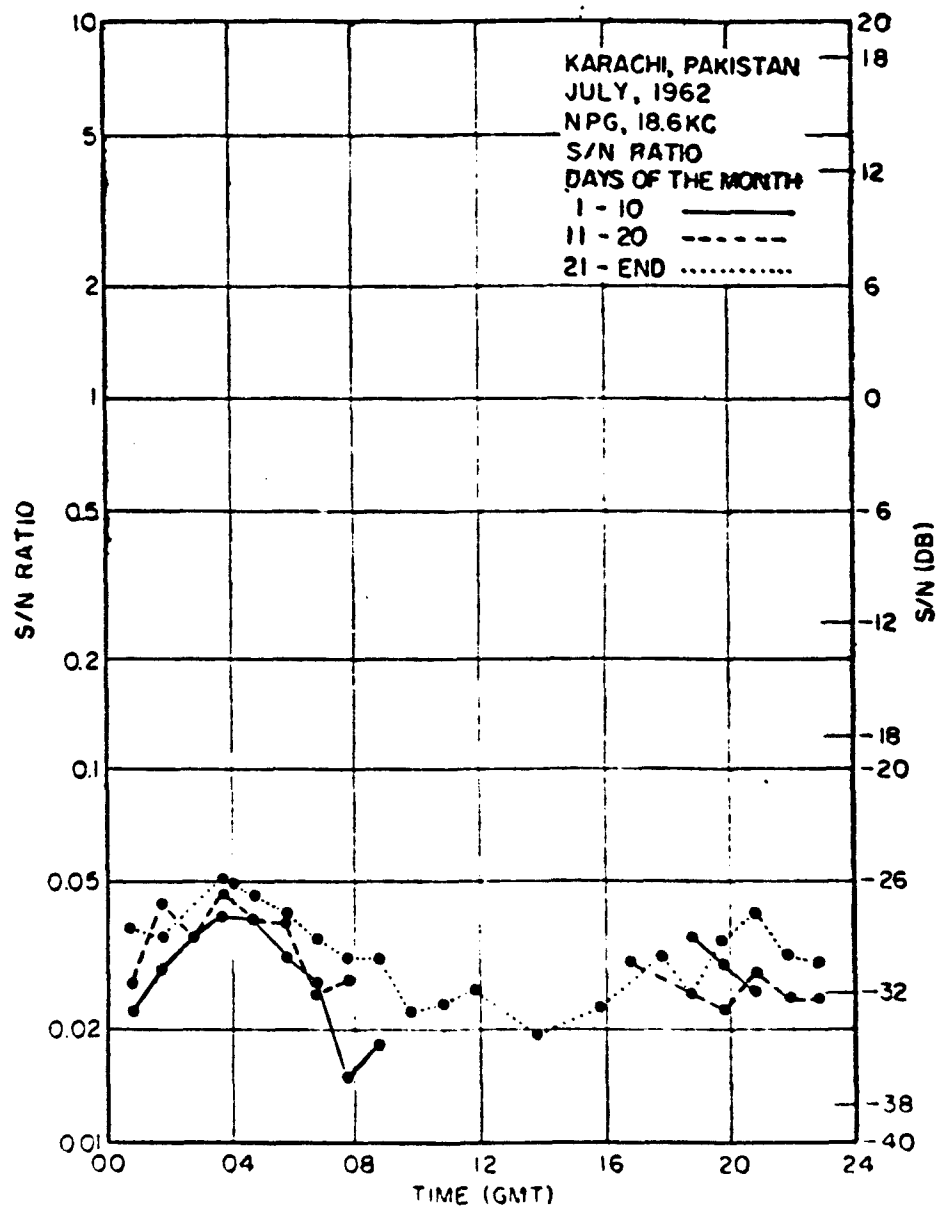


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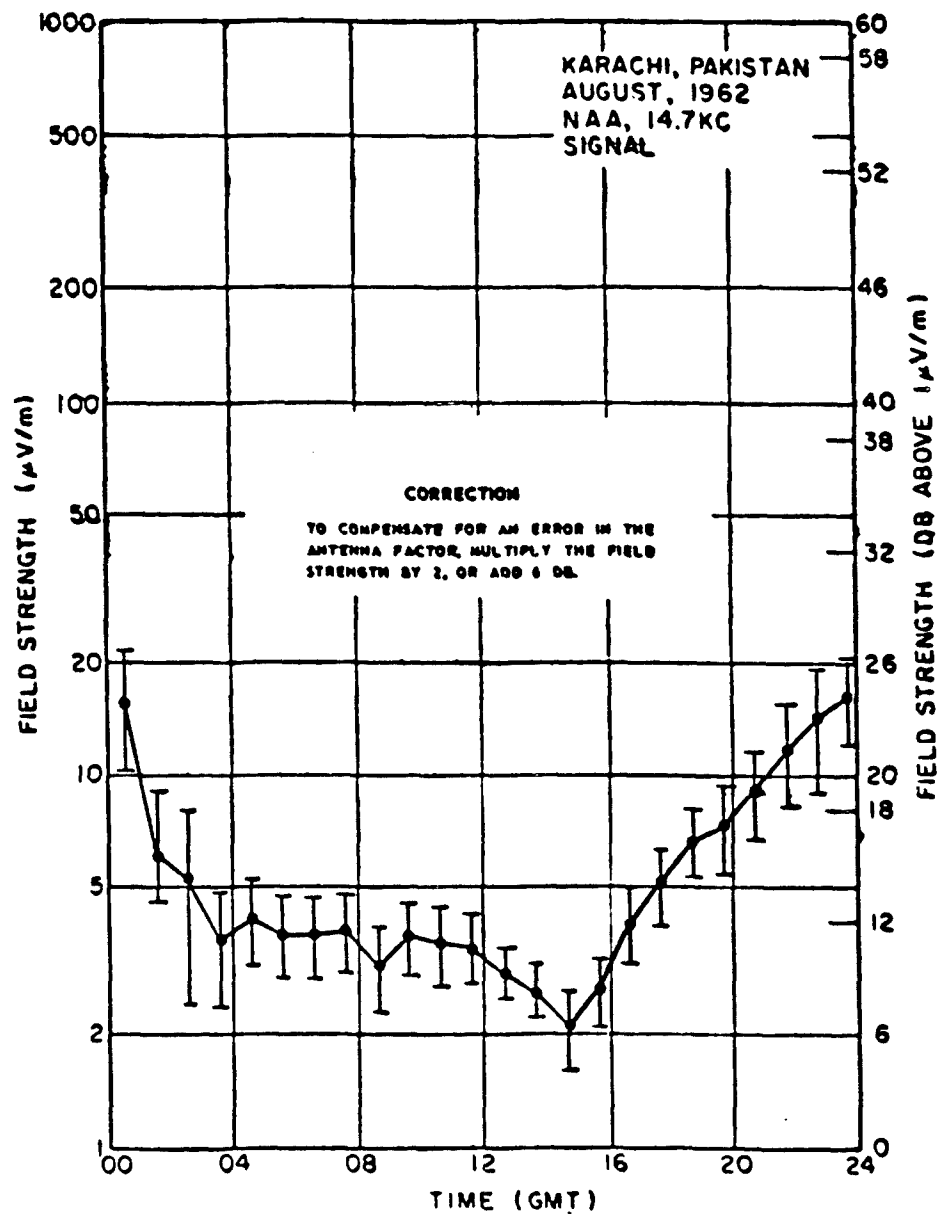


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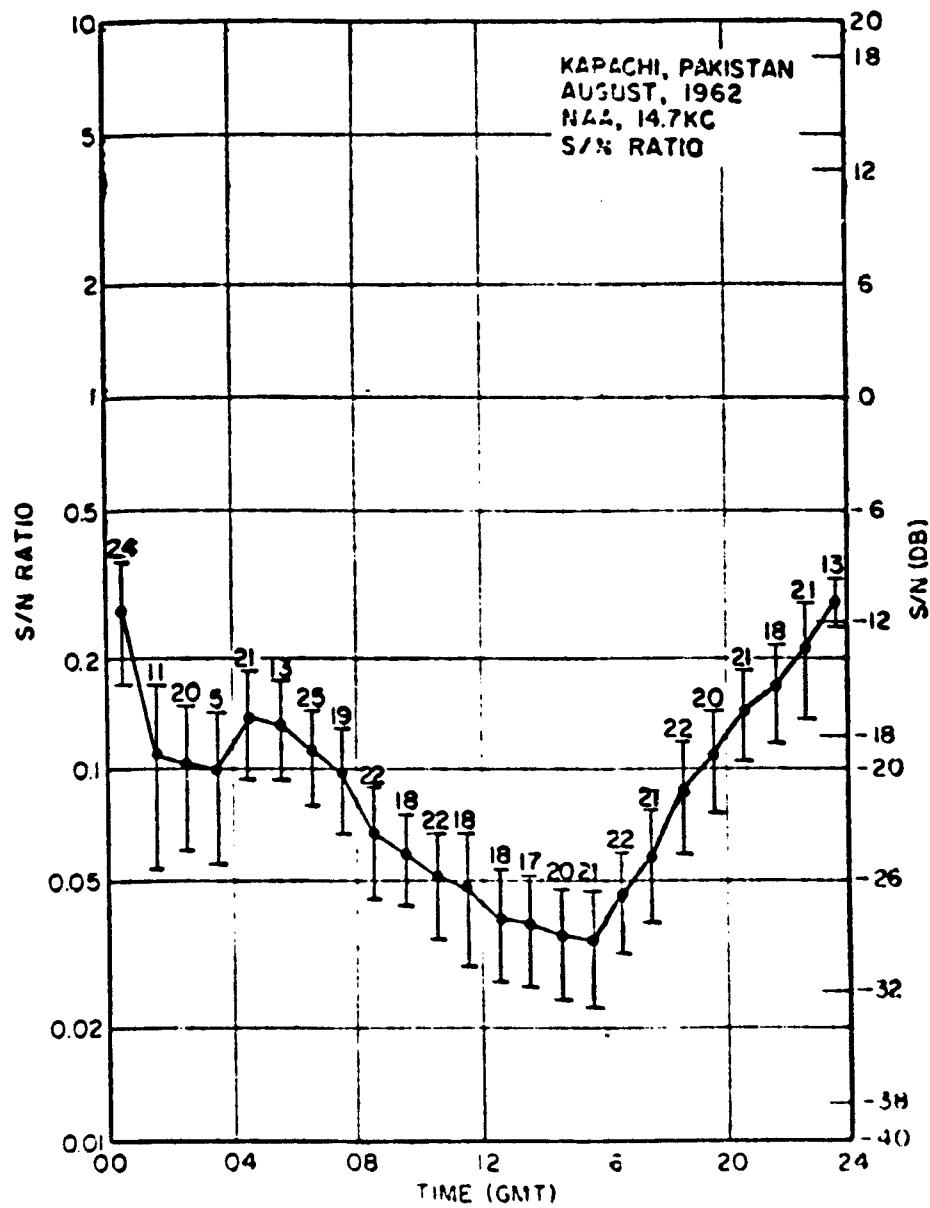


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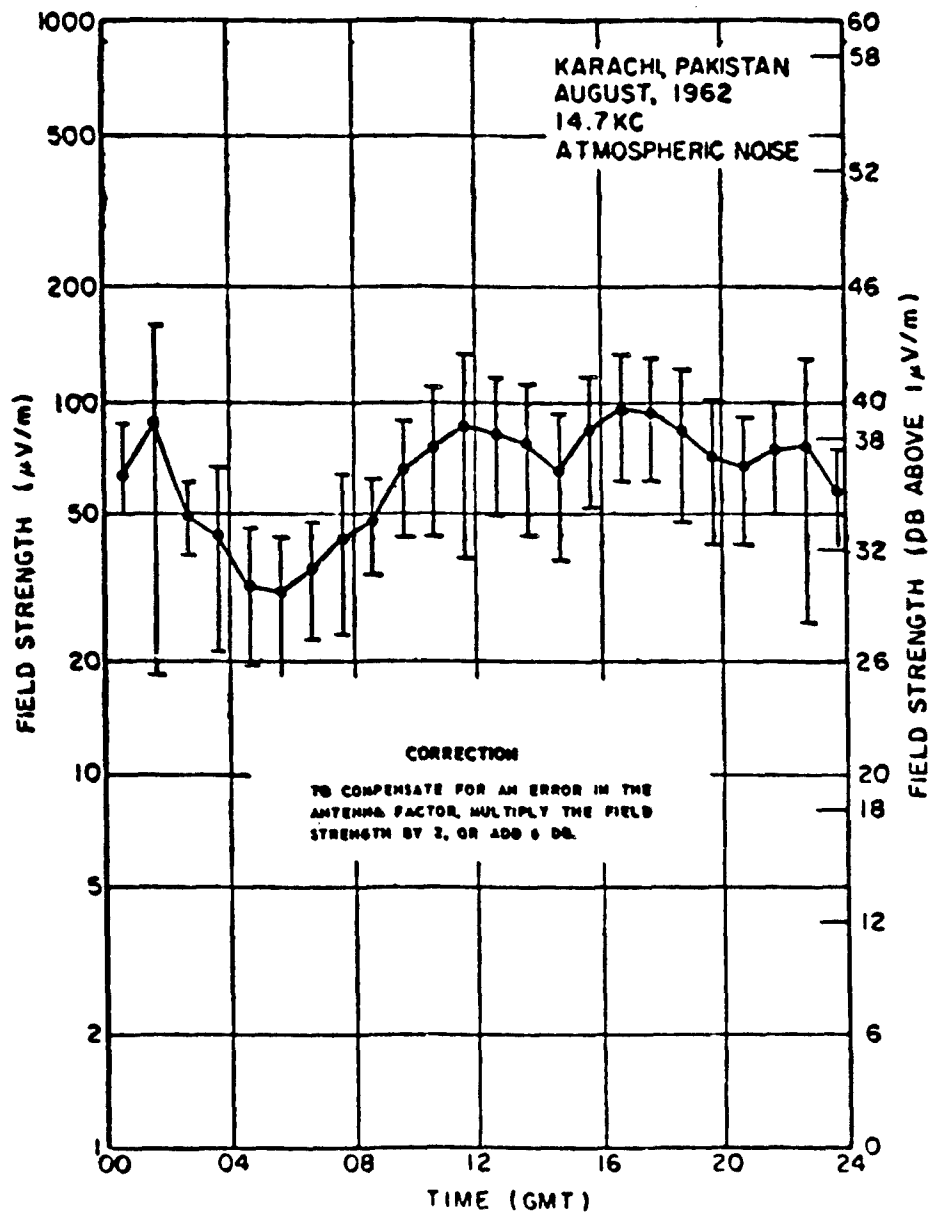


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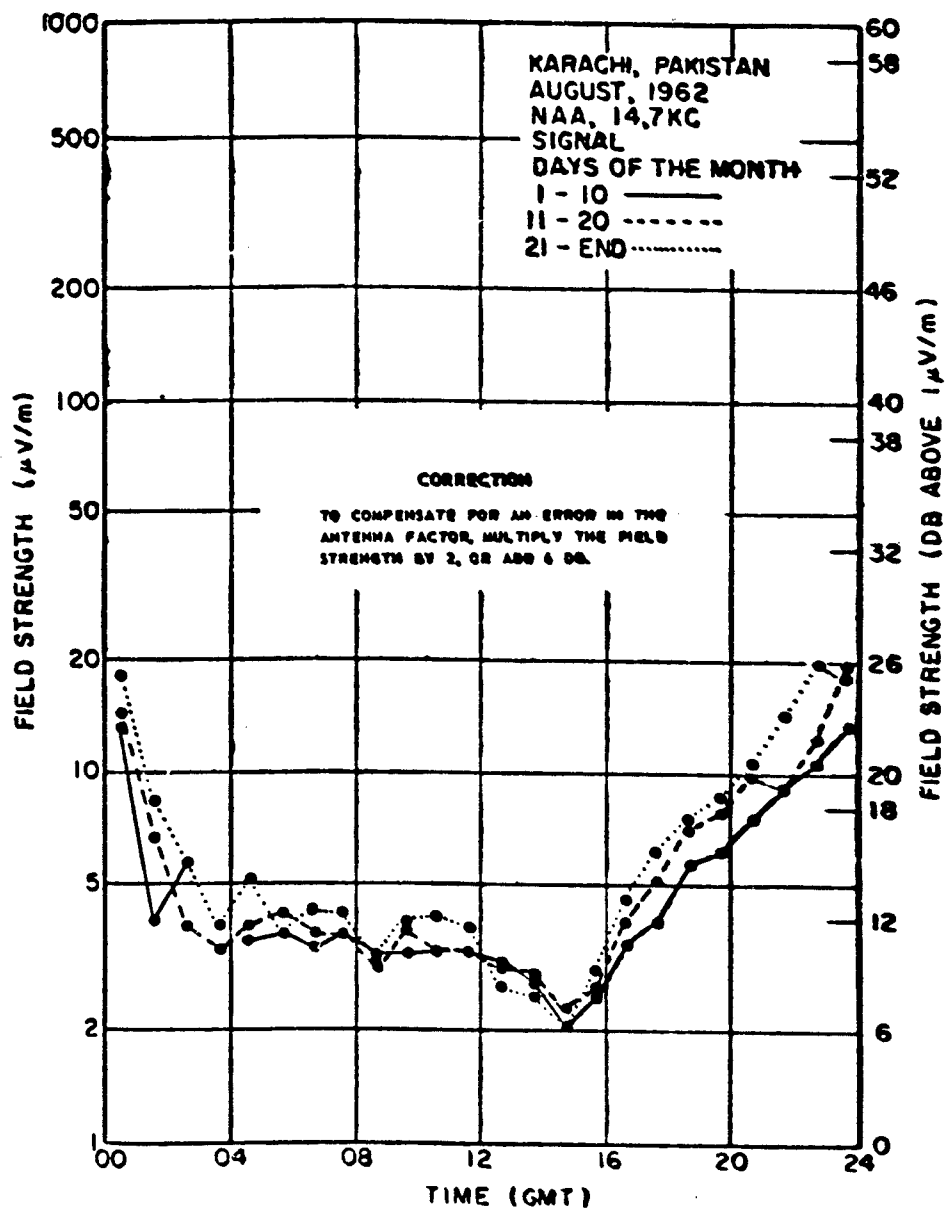


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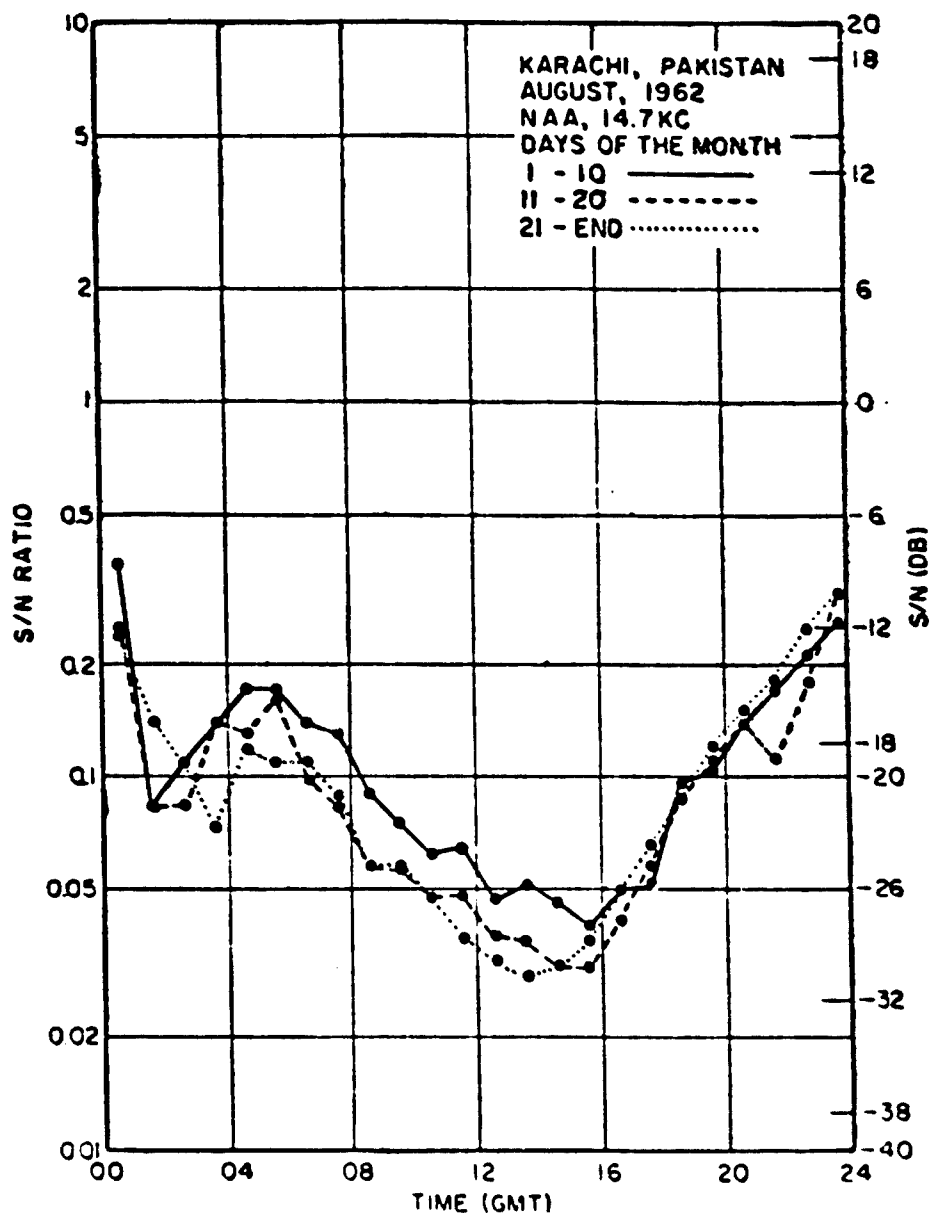


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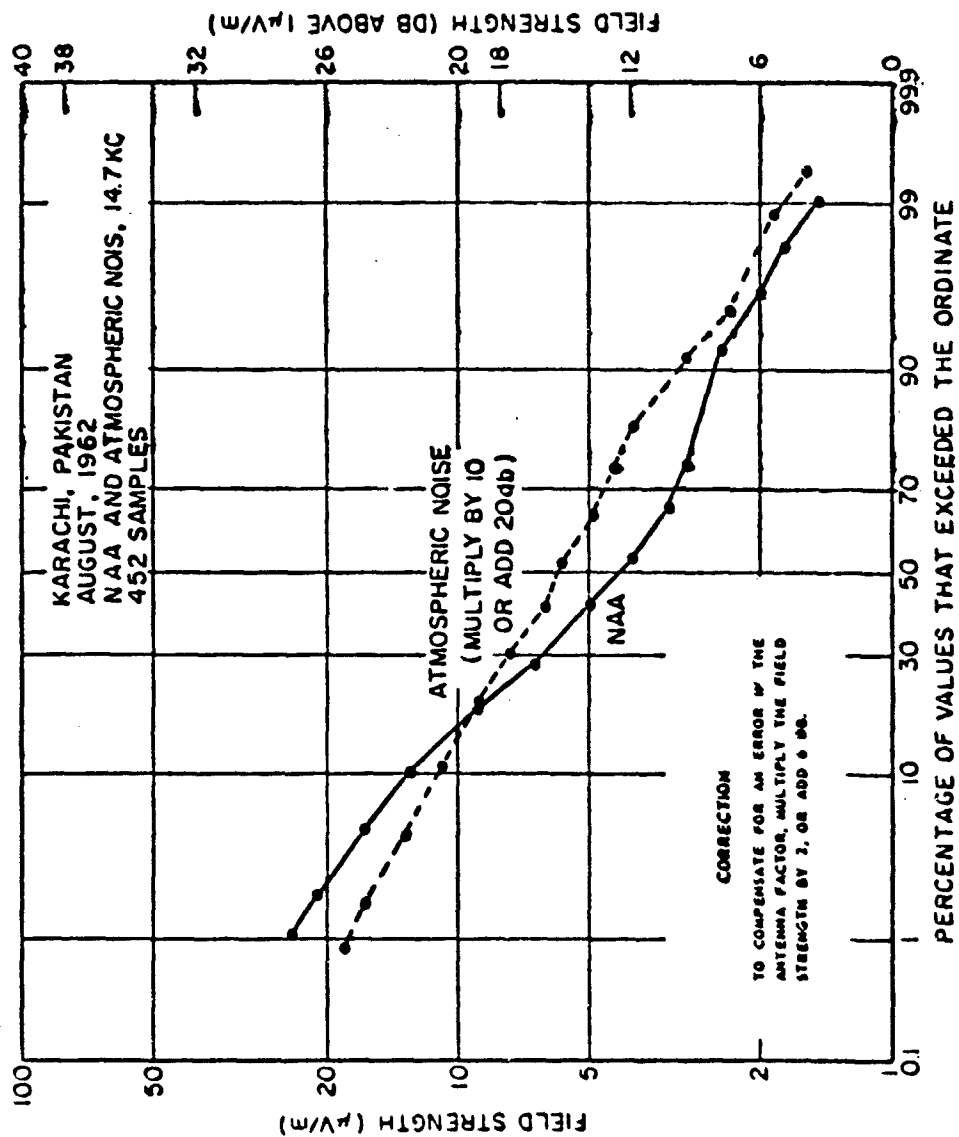


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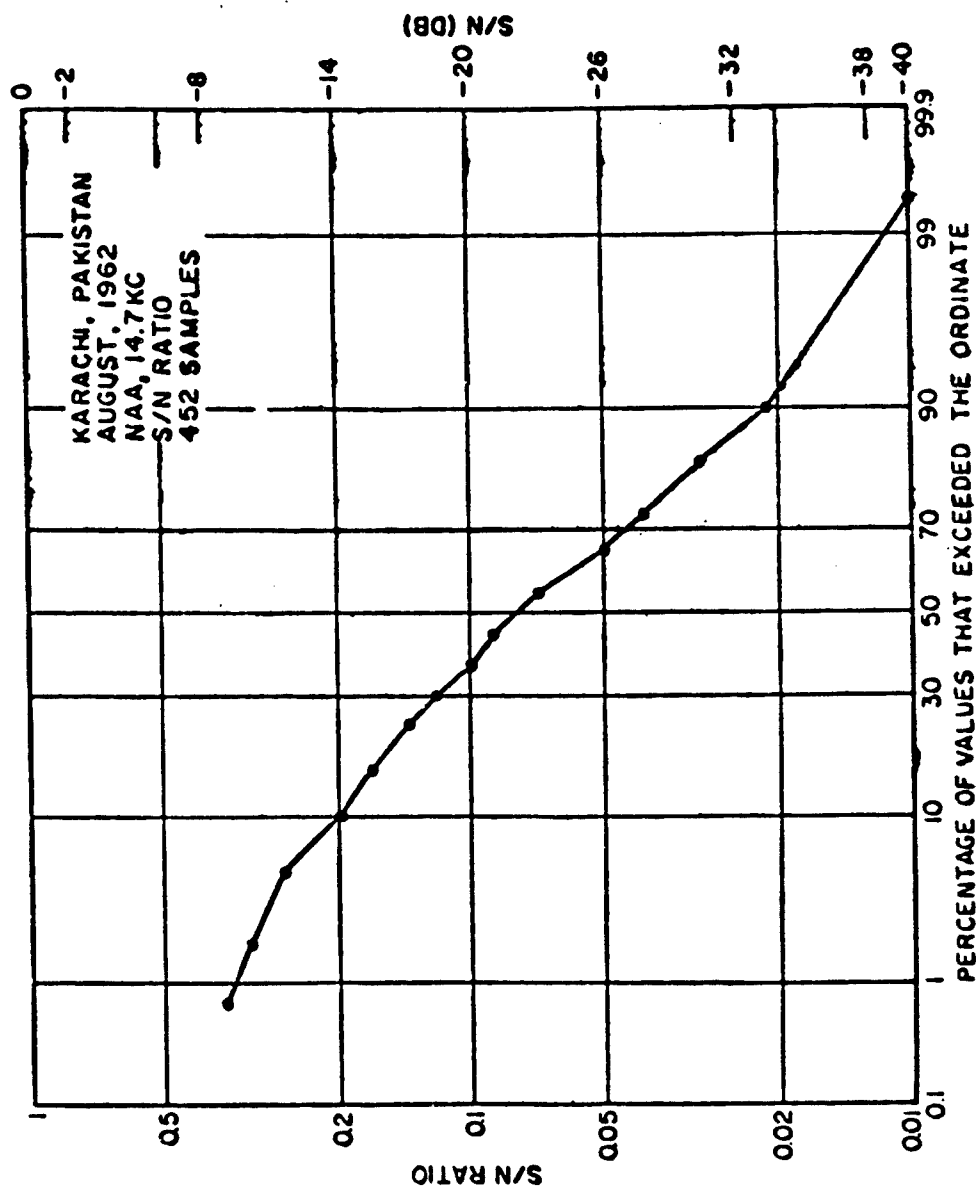


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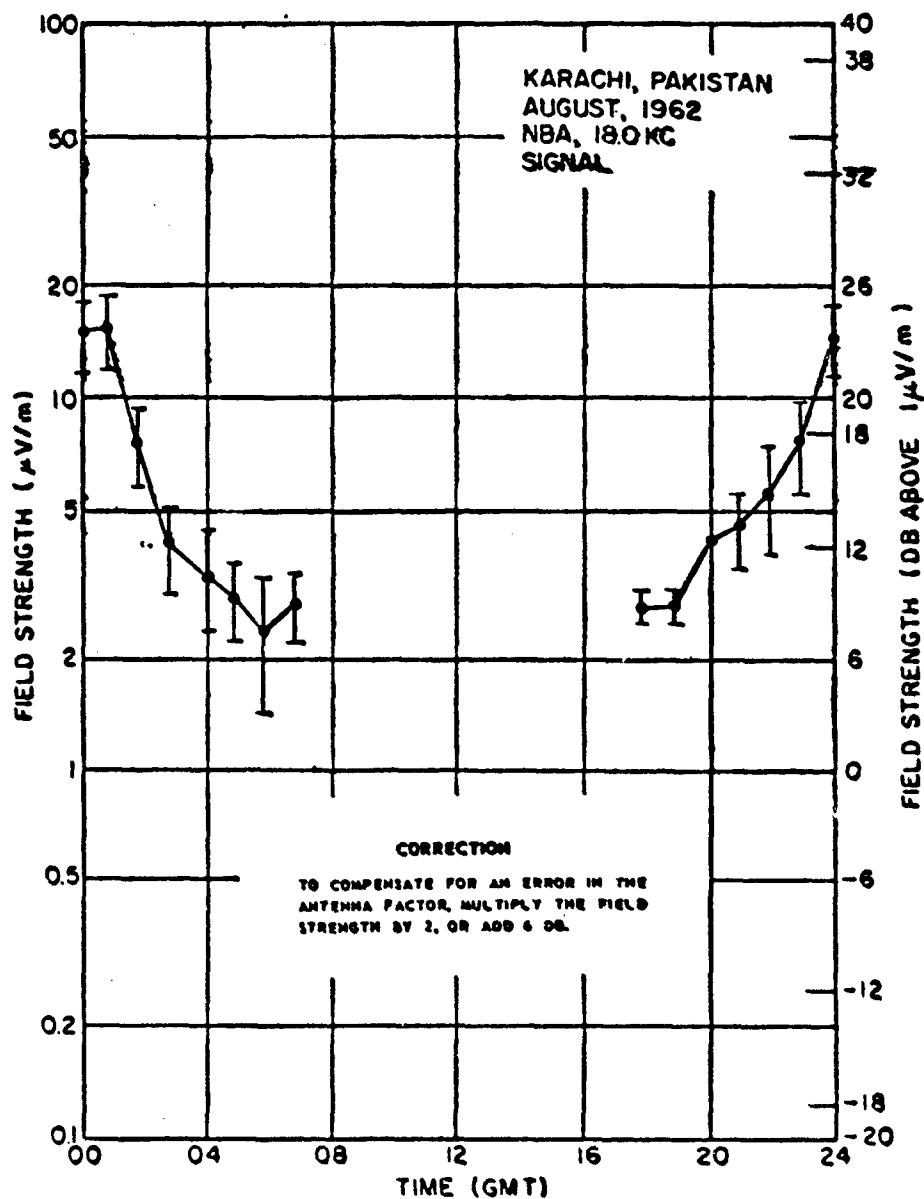


Figure 196

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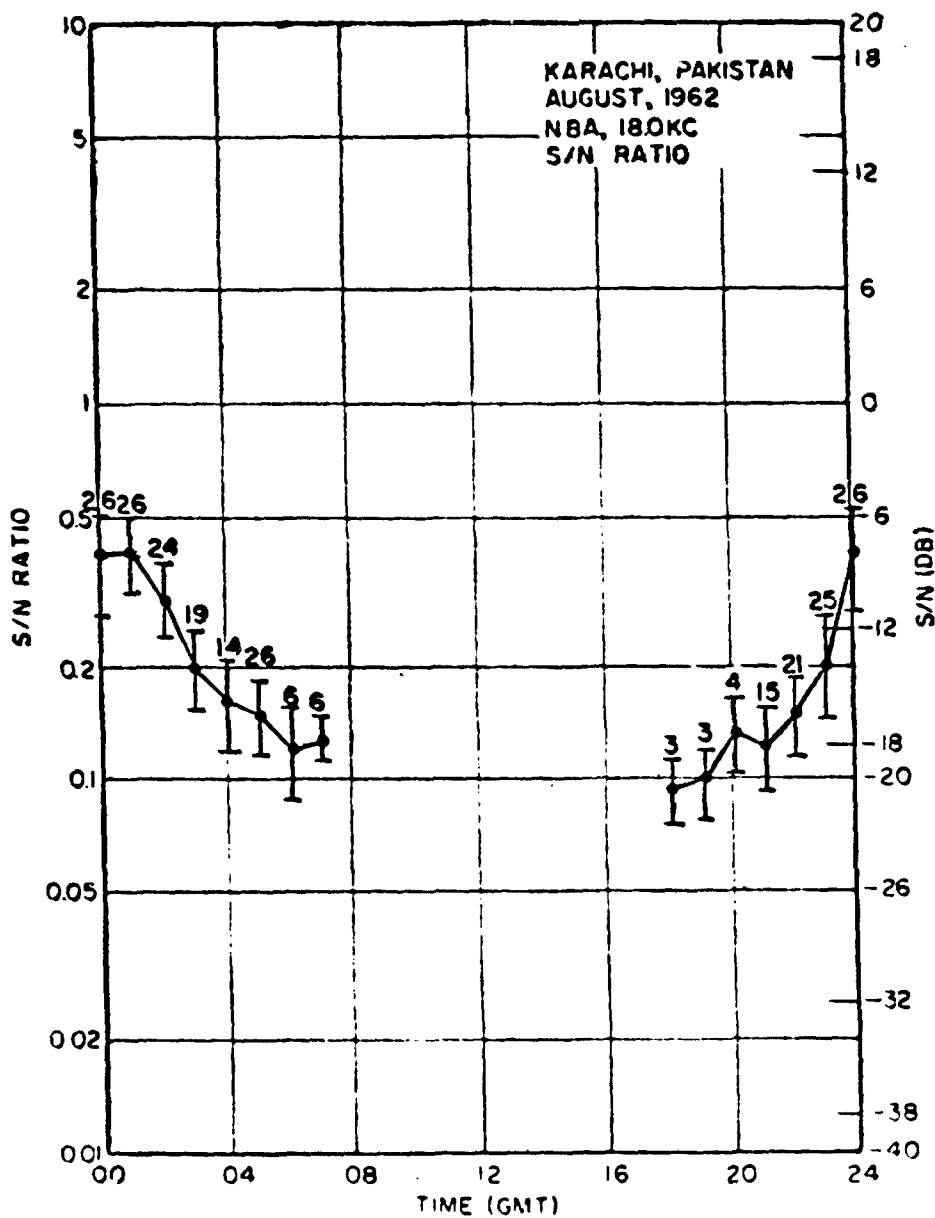


Figure 197

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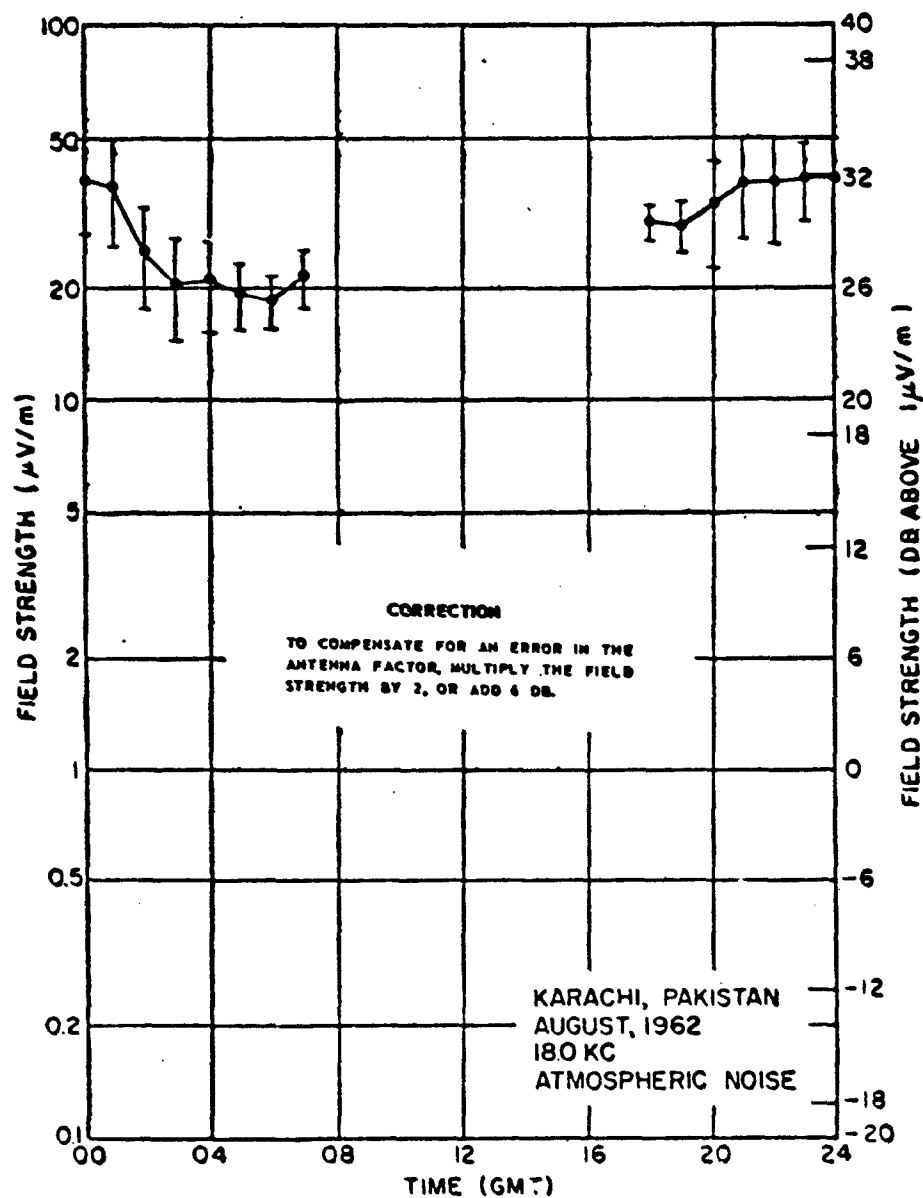


Figure 198

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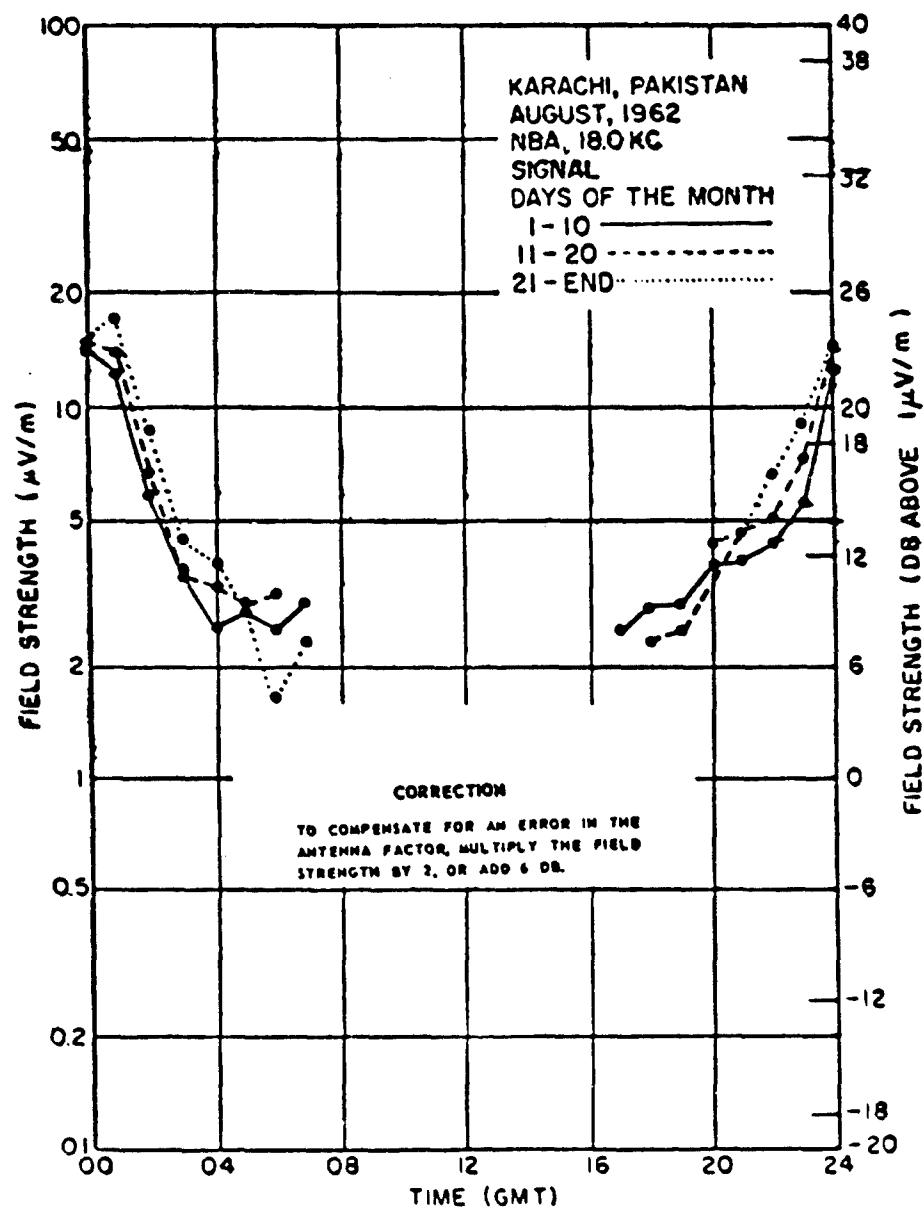


Figure 199

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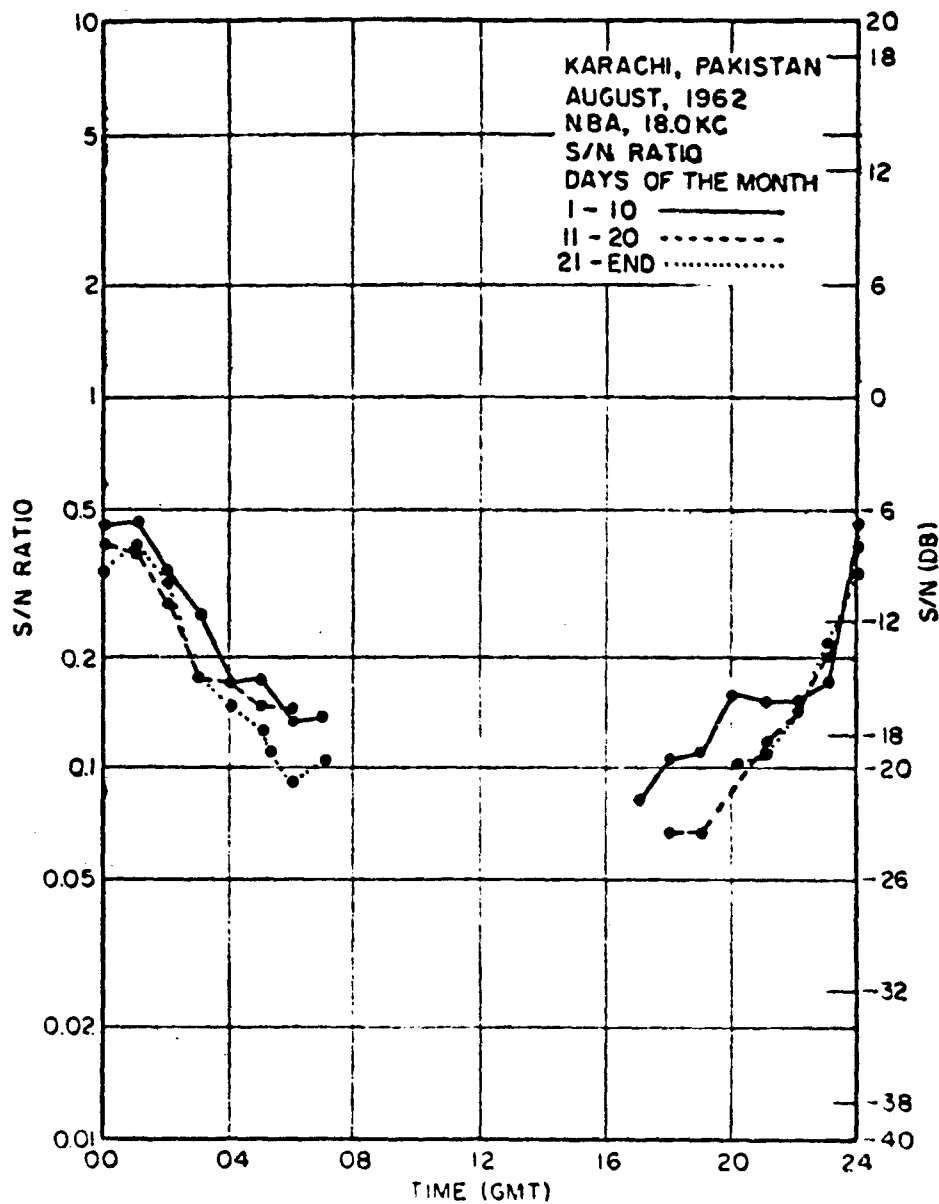


Figure 200

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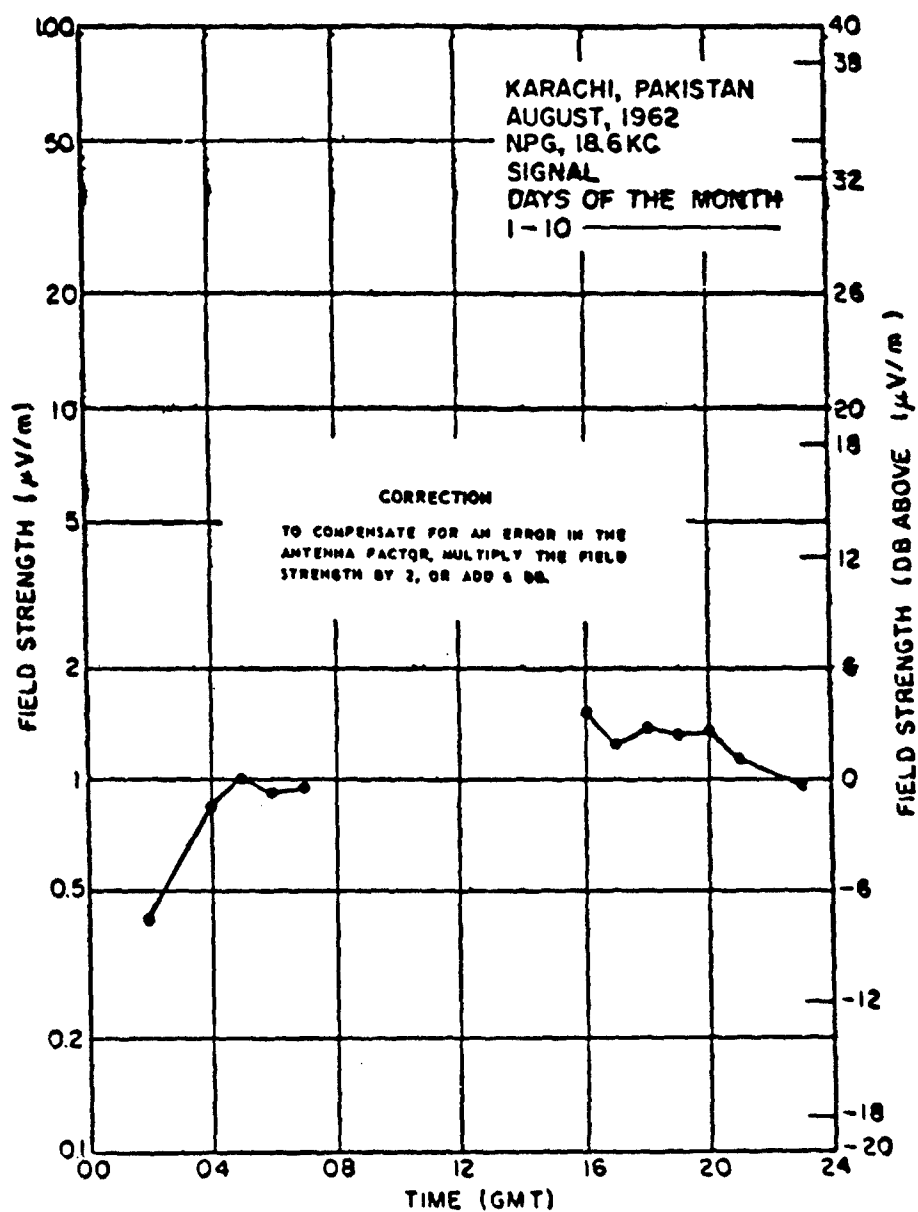


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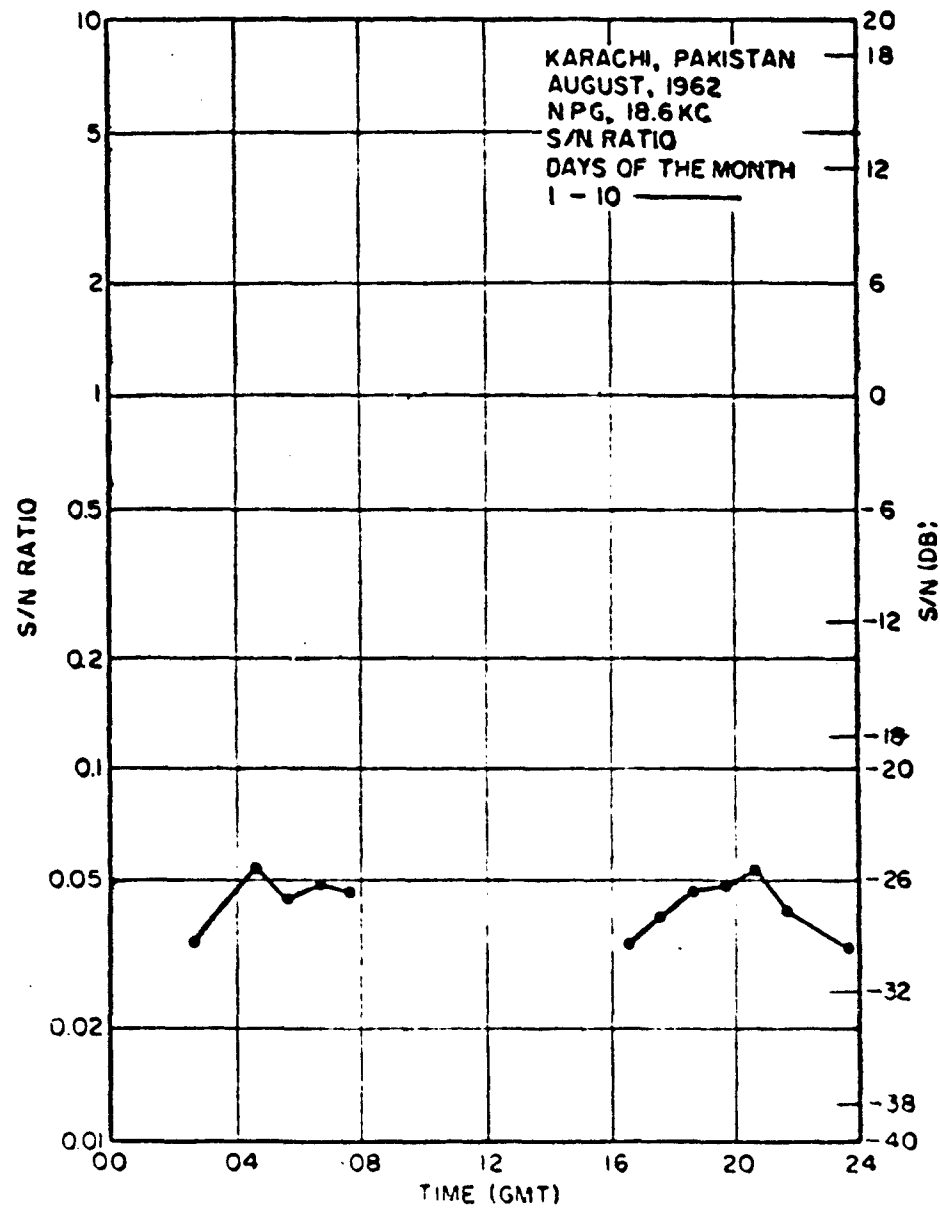


Figure 202

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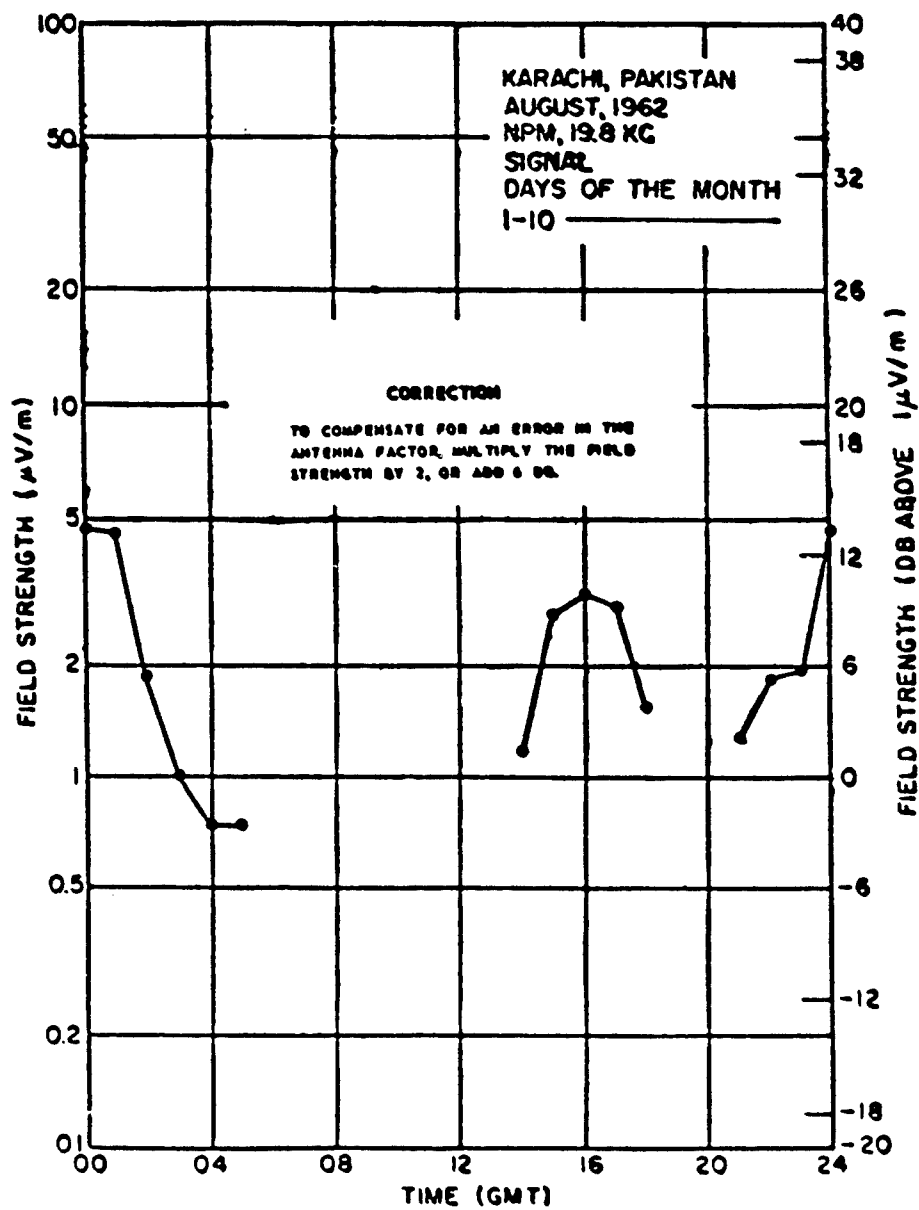


Figure 203

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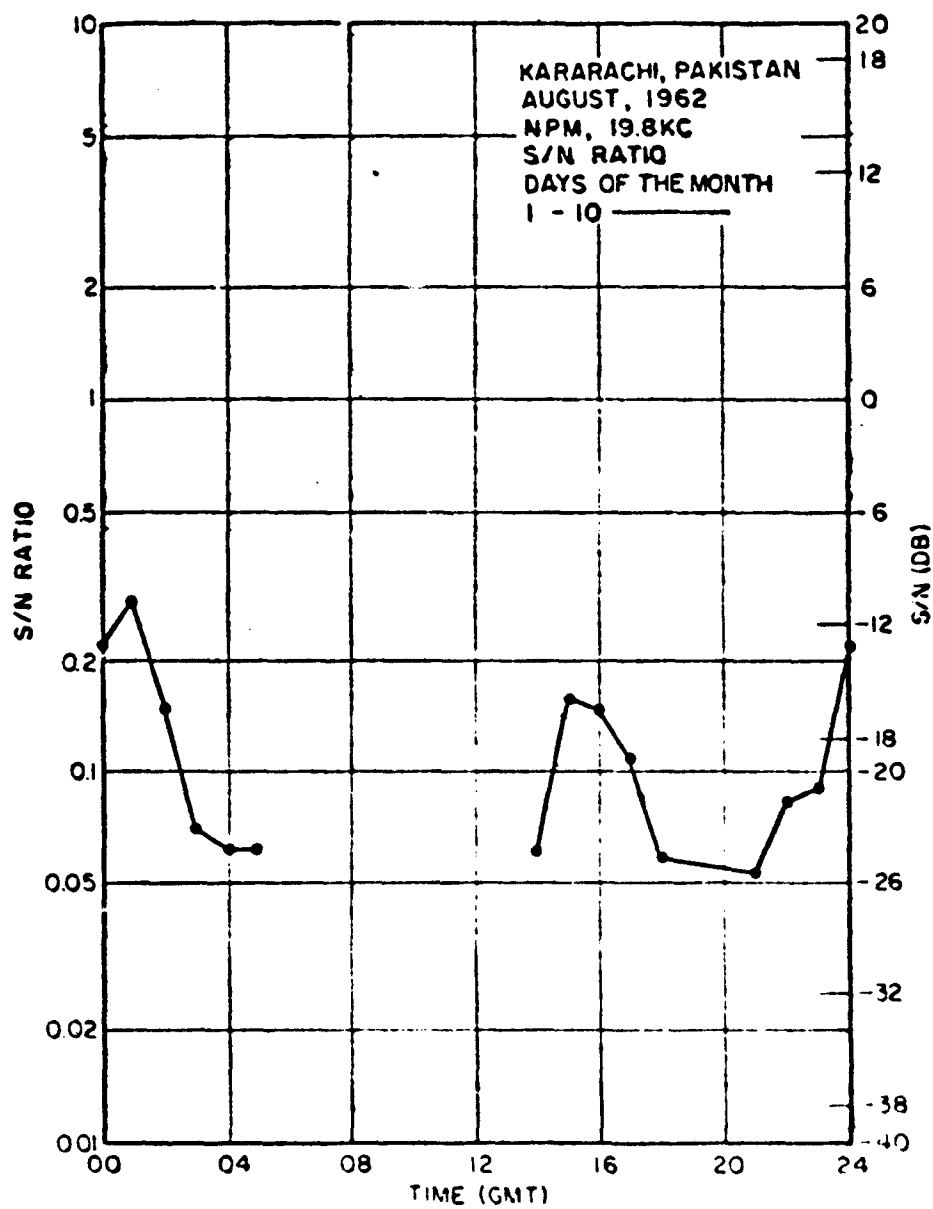


Figure 204

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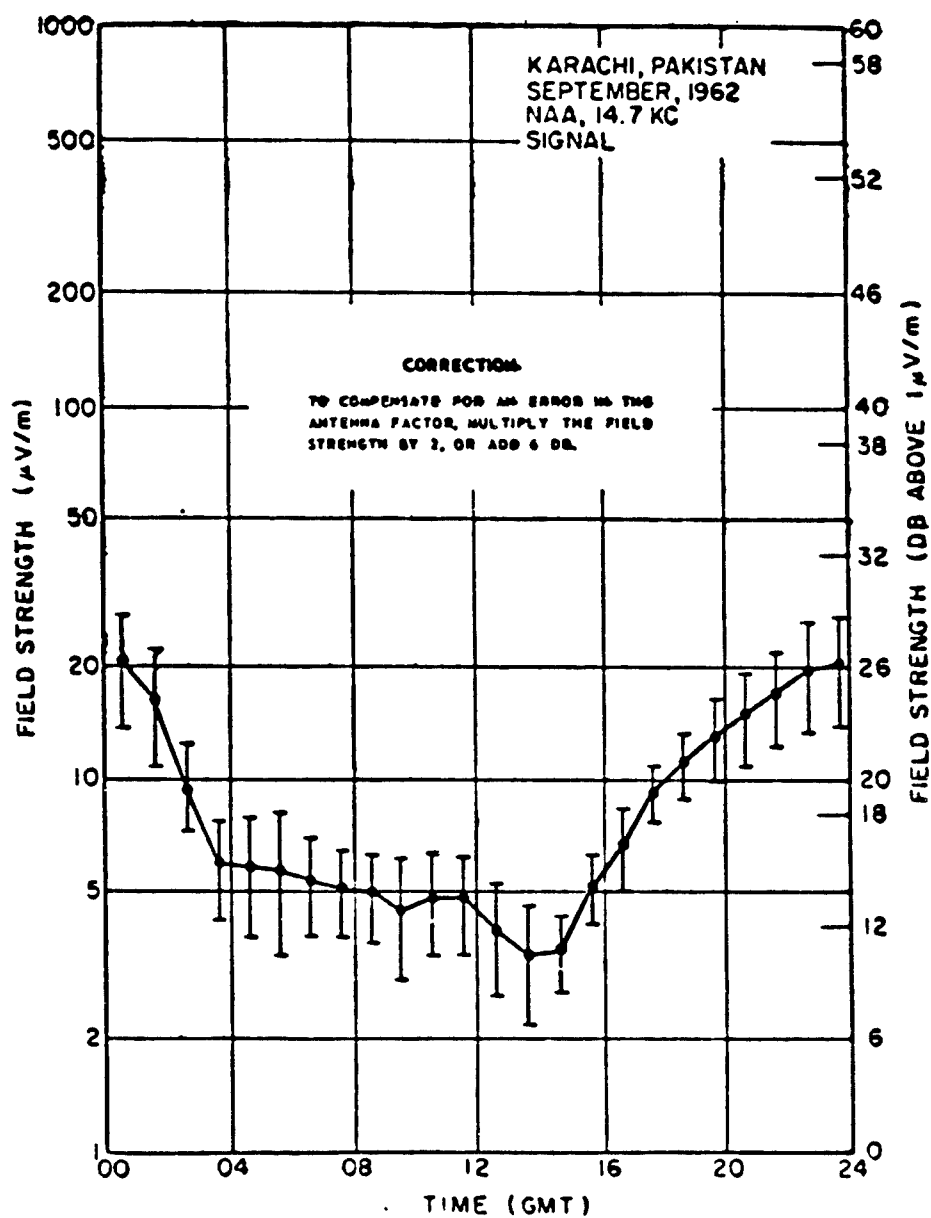


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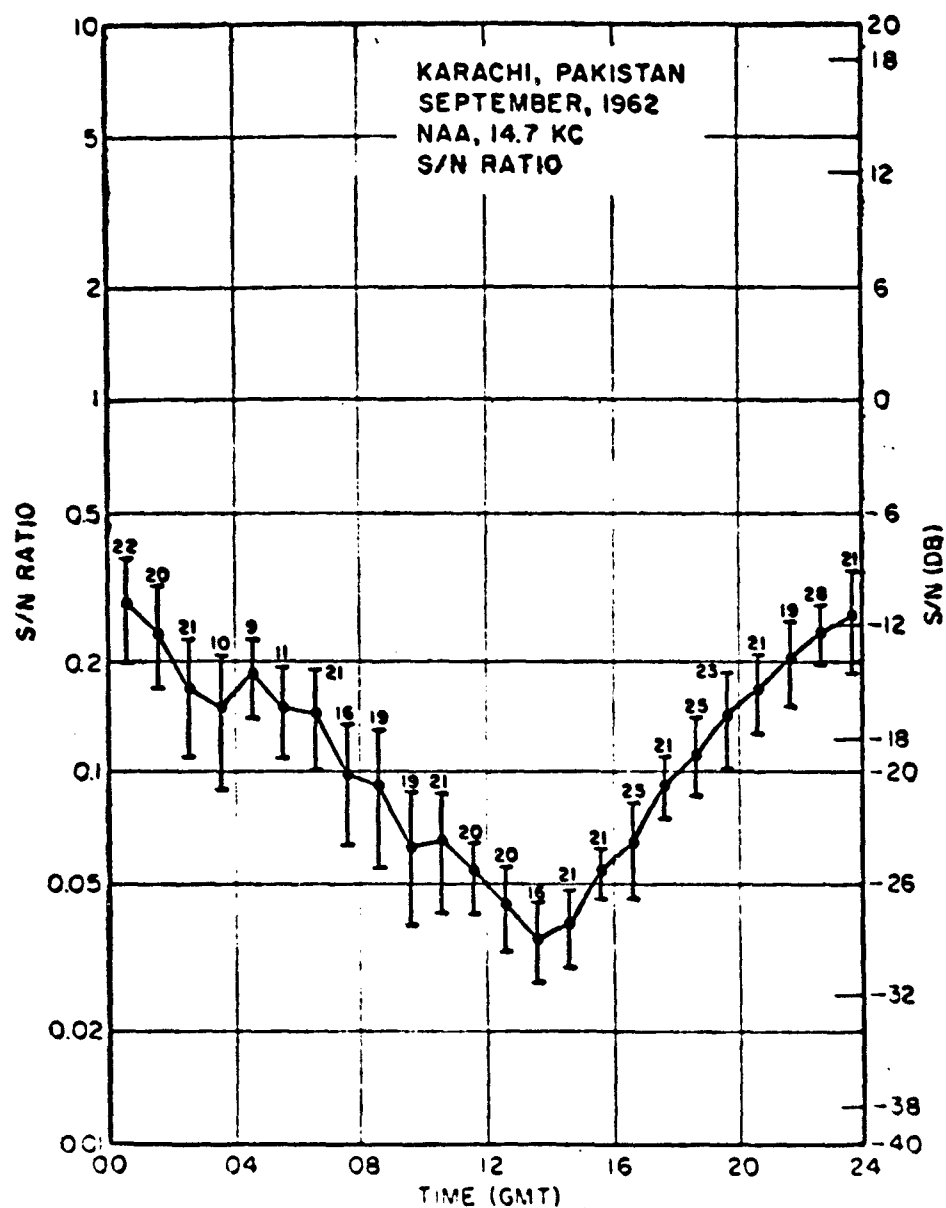


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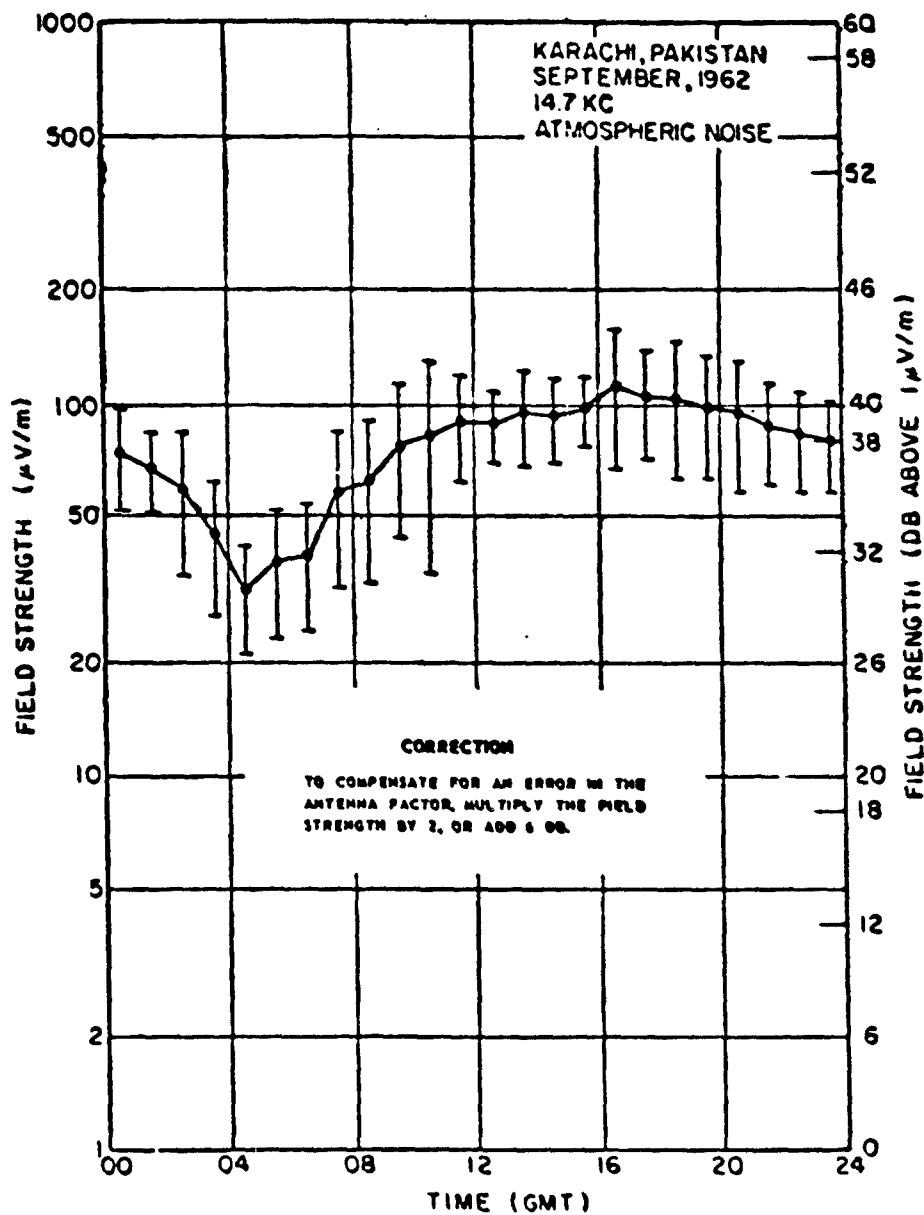


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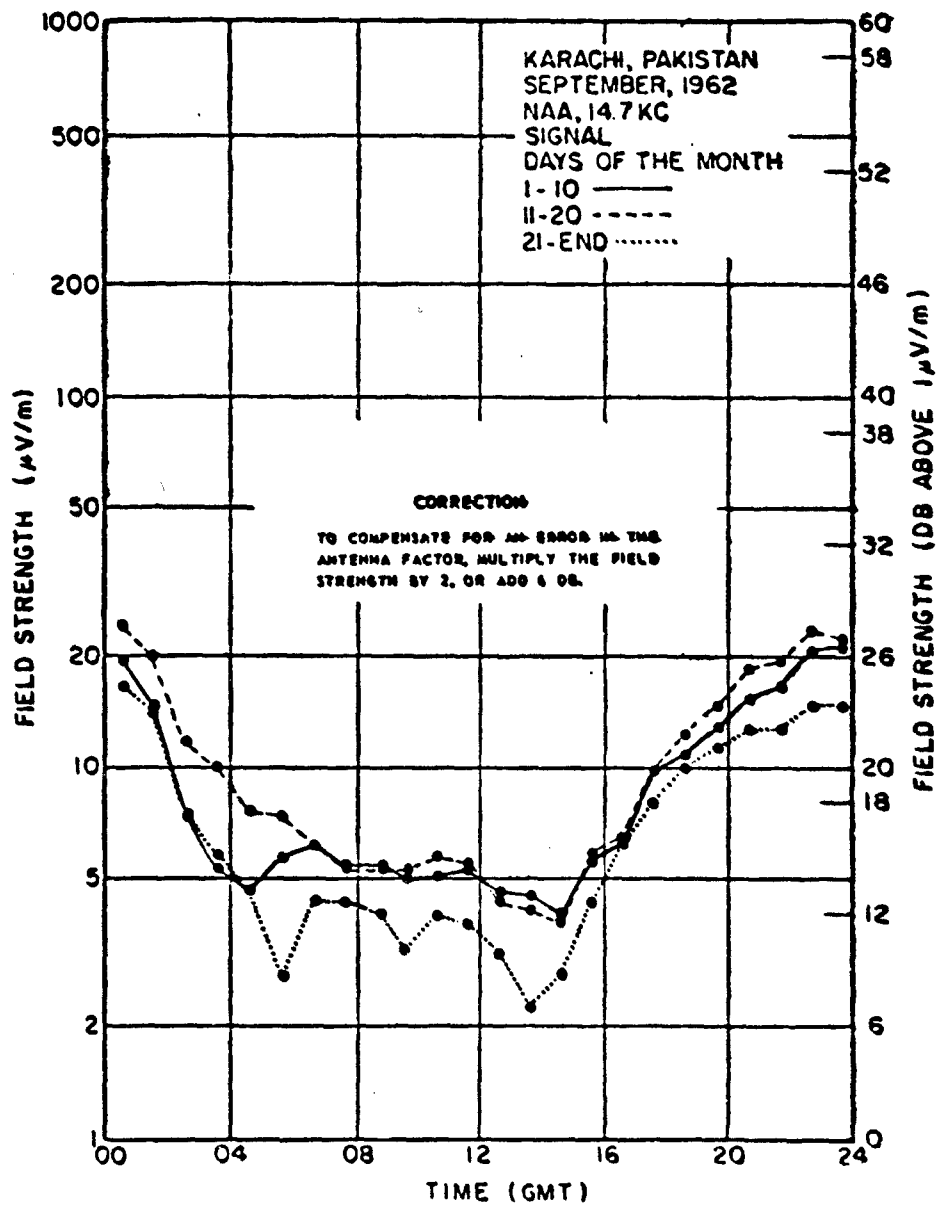


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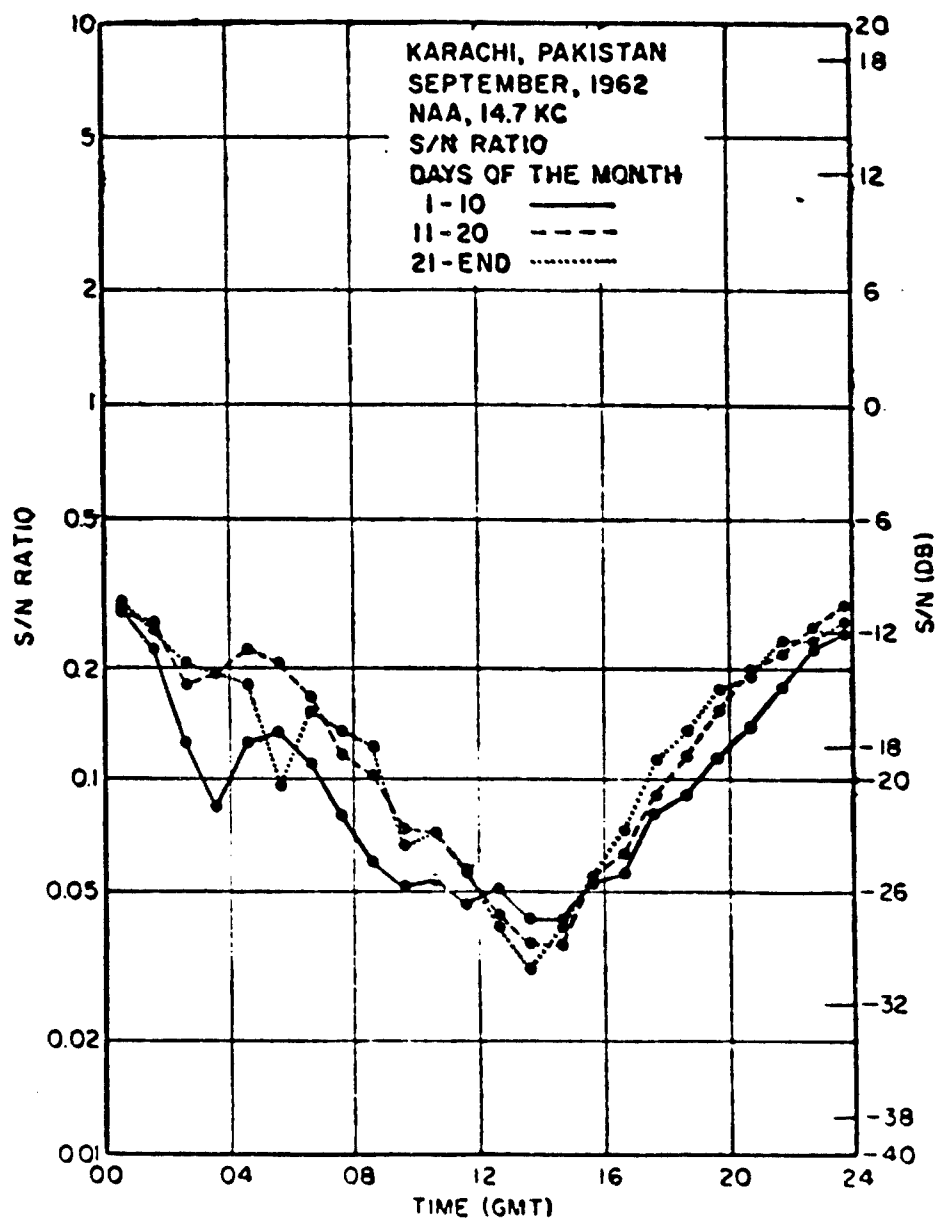


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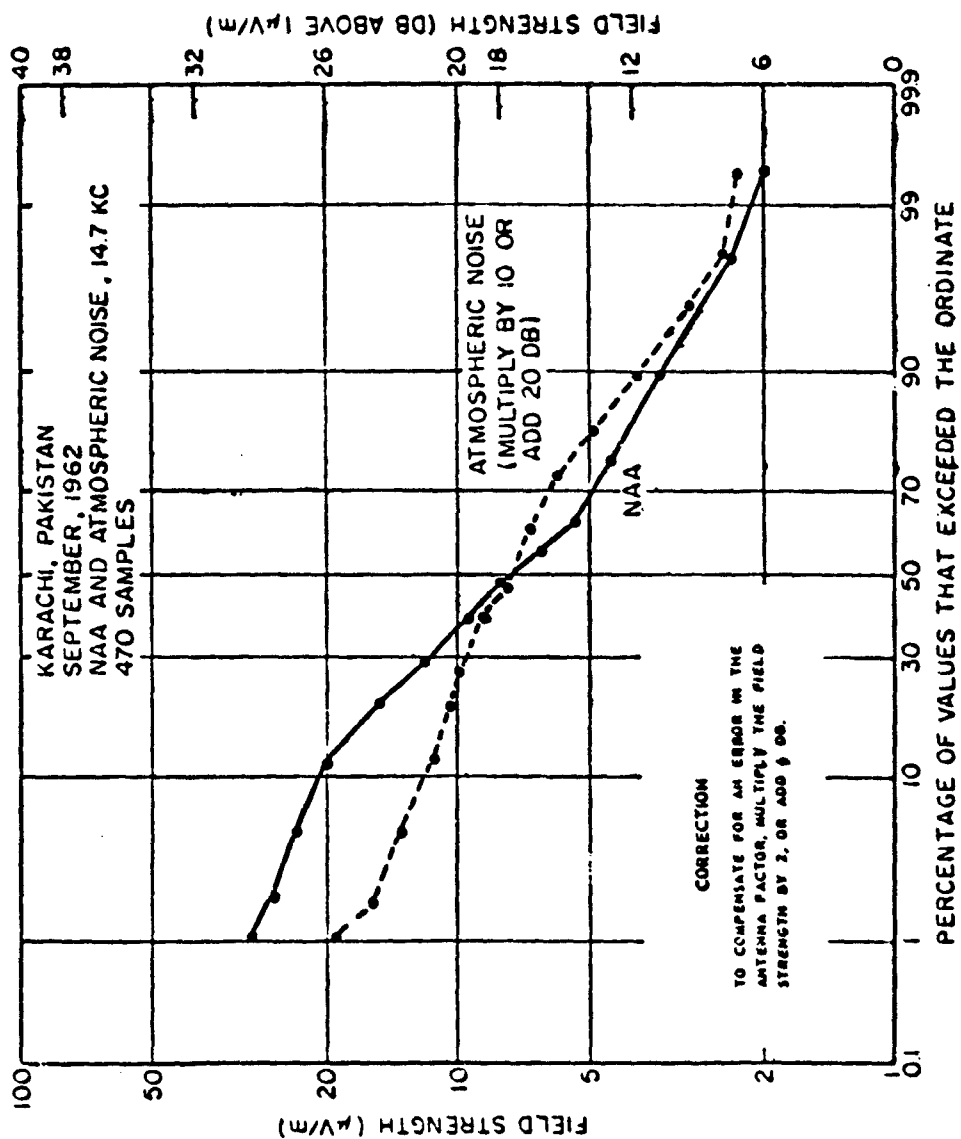


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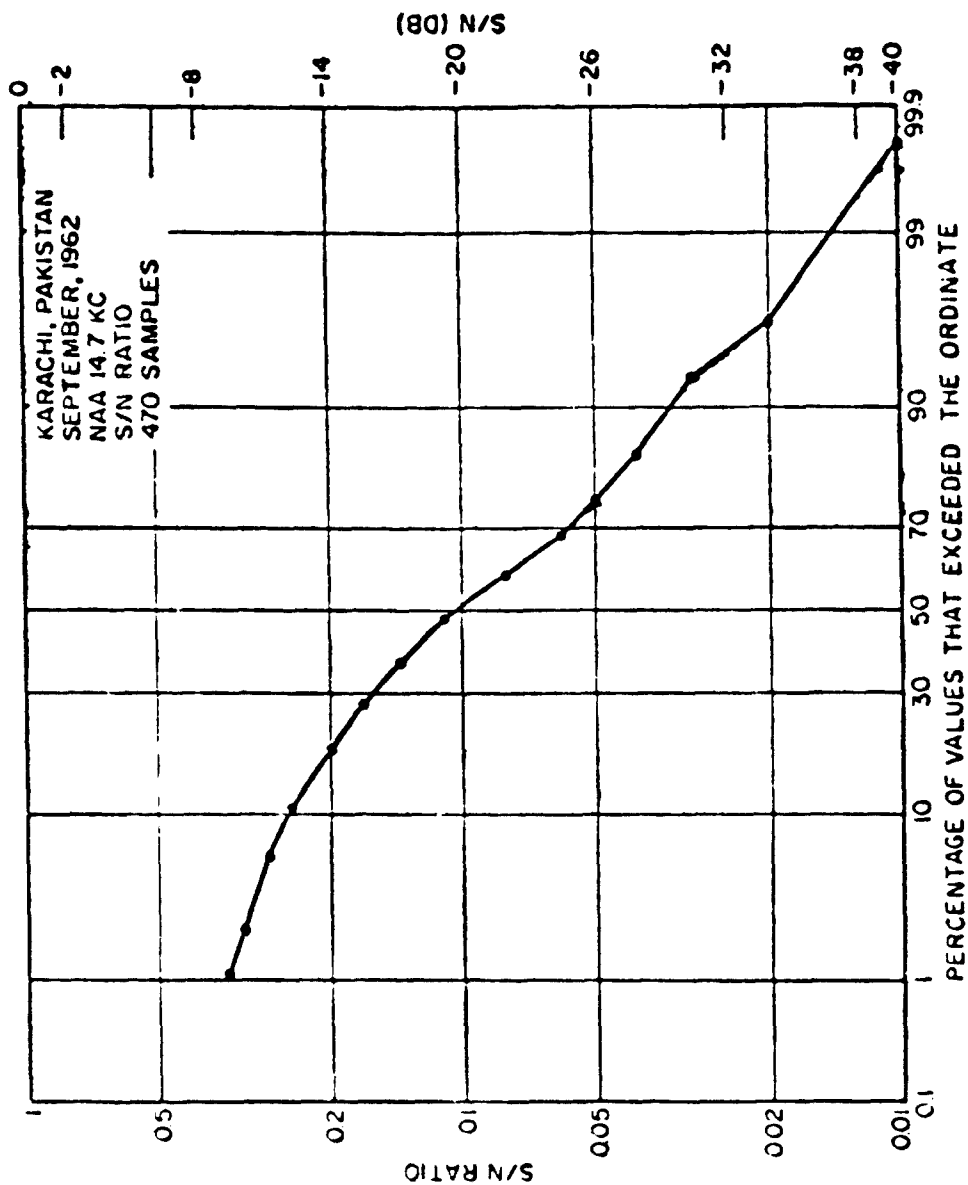


Figure 211

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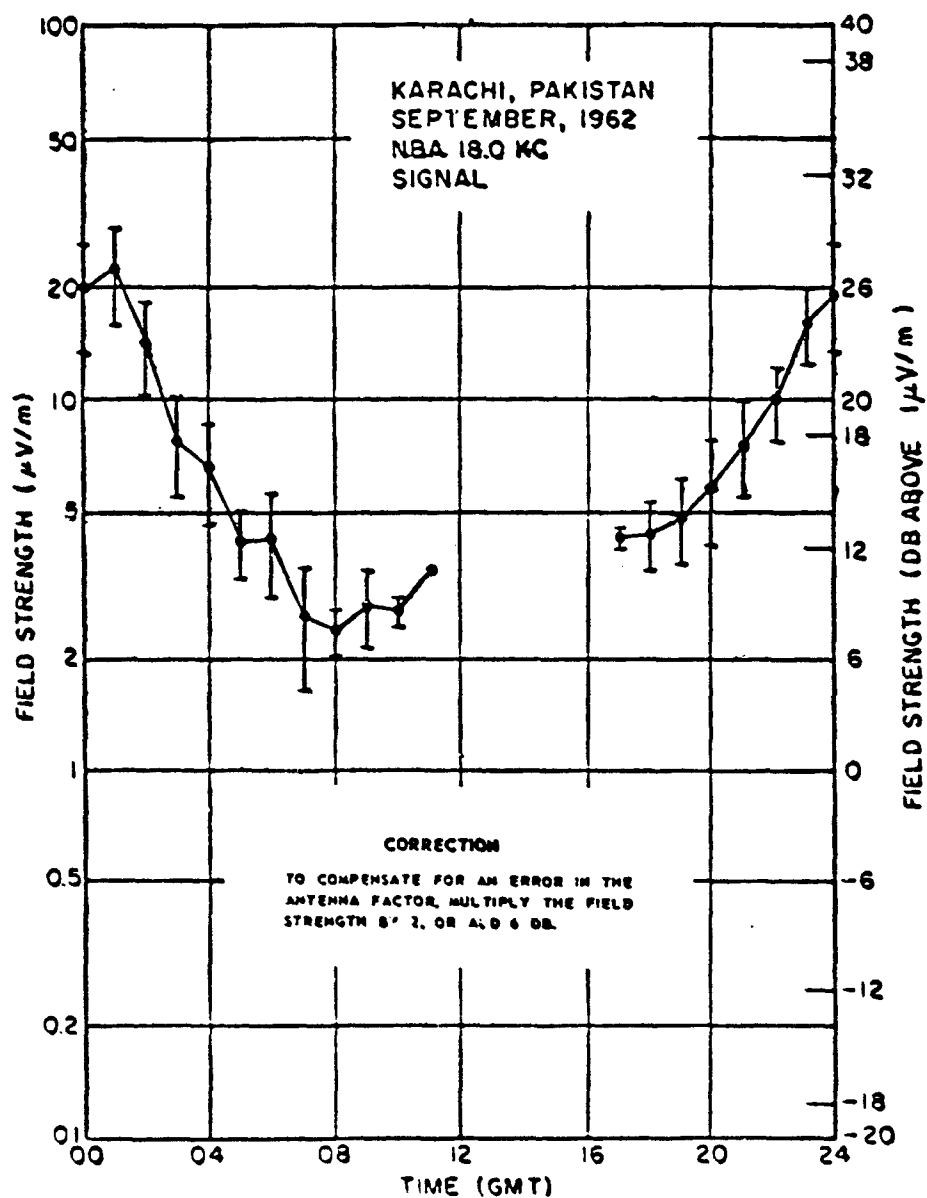


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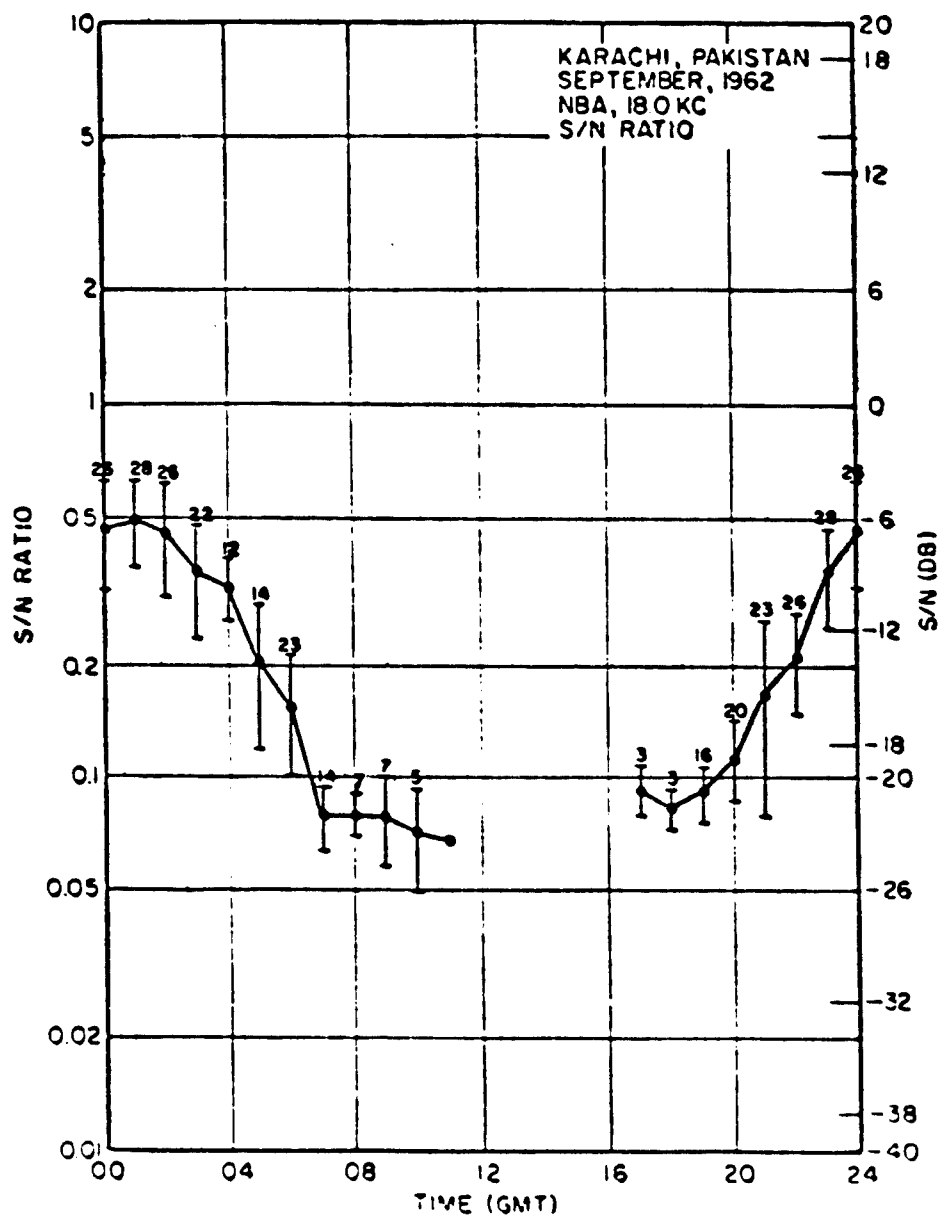


Figure 213

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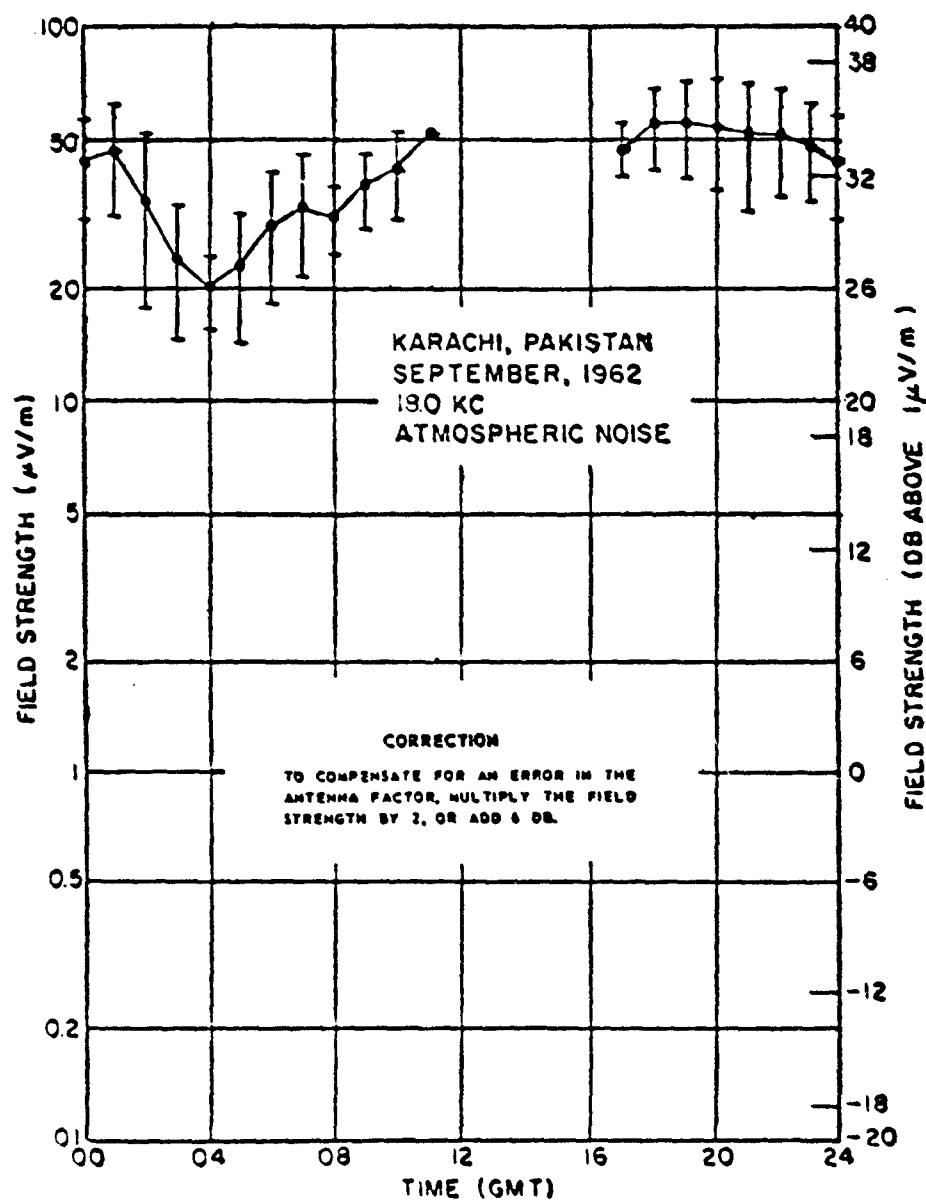


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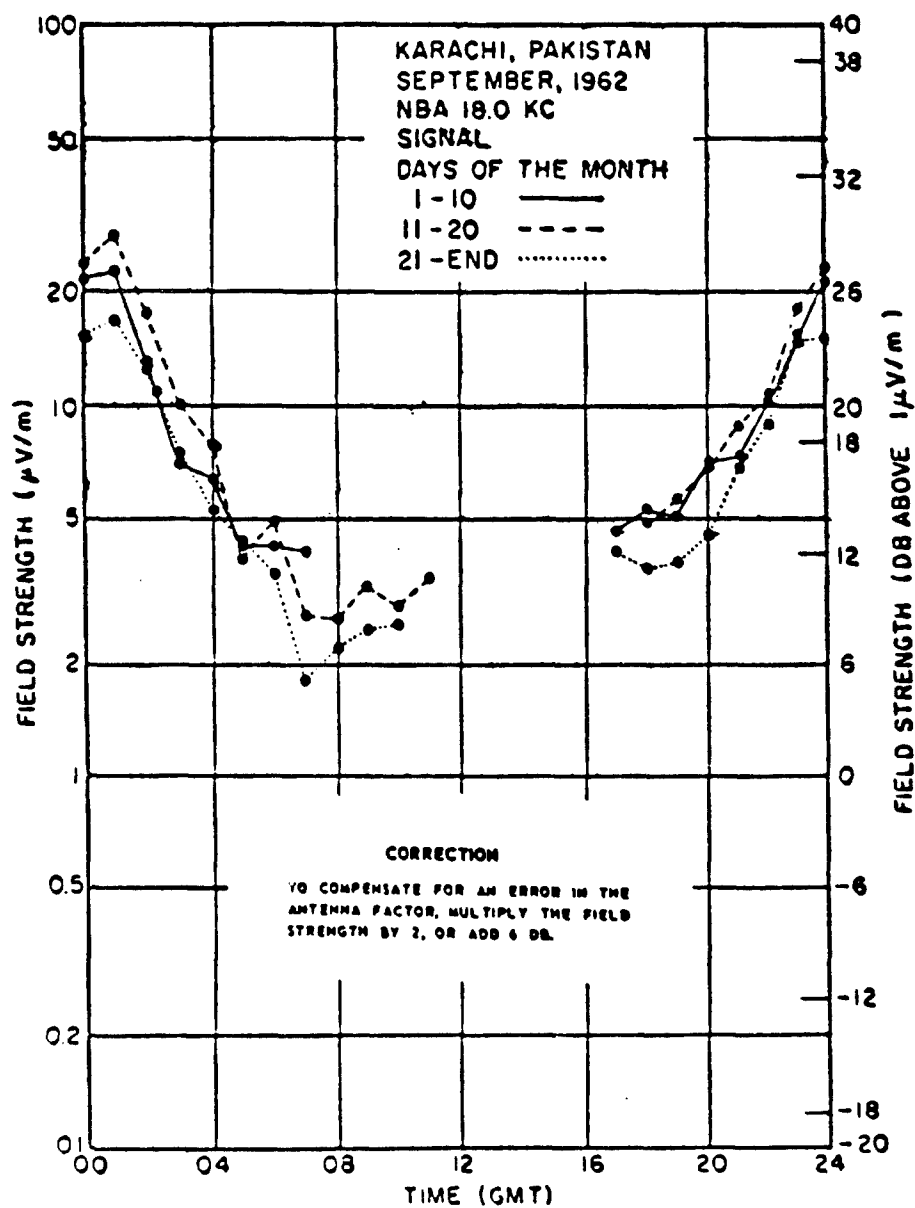


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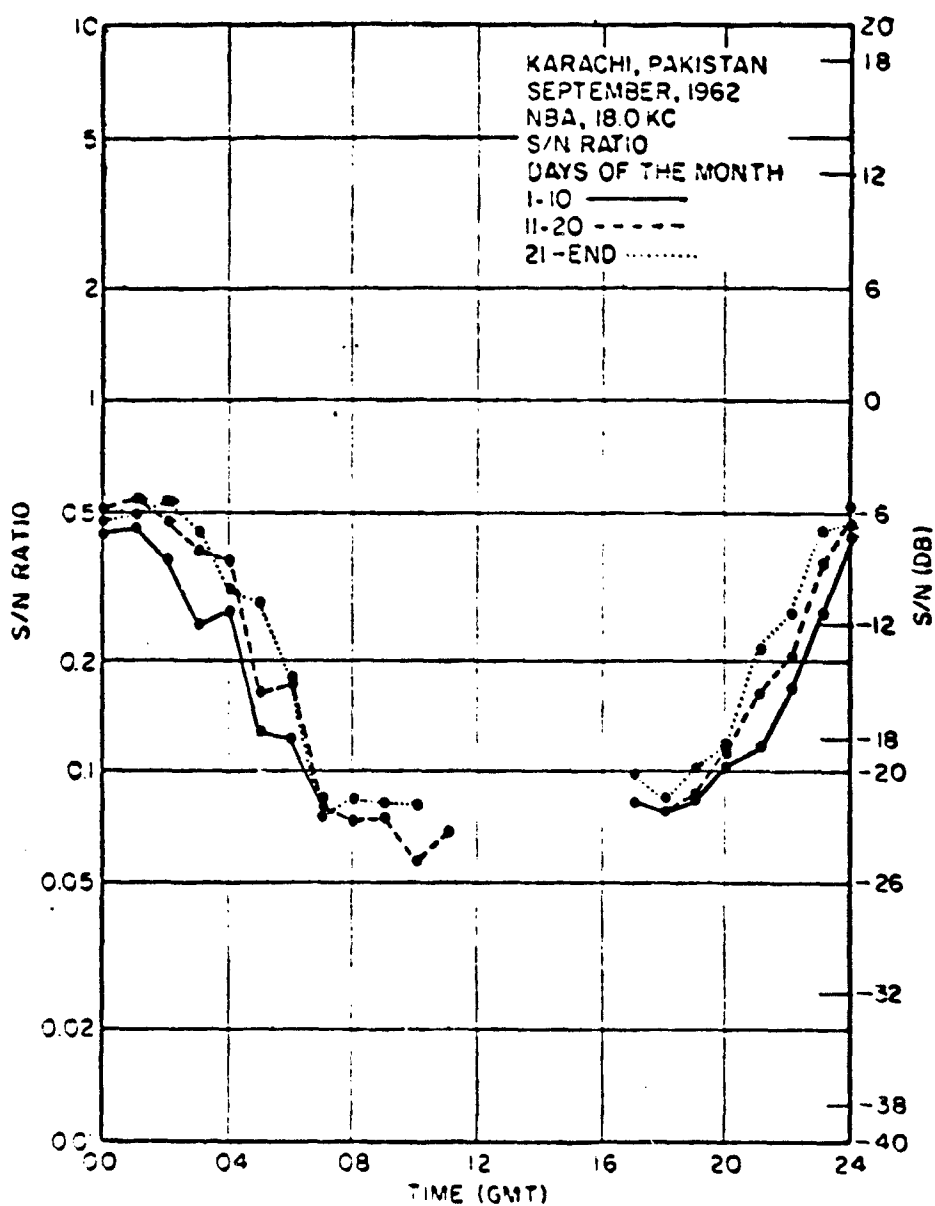


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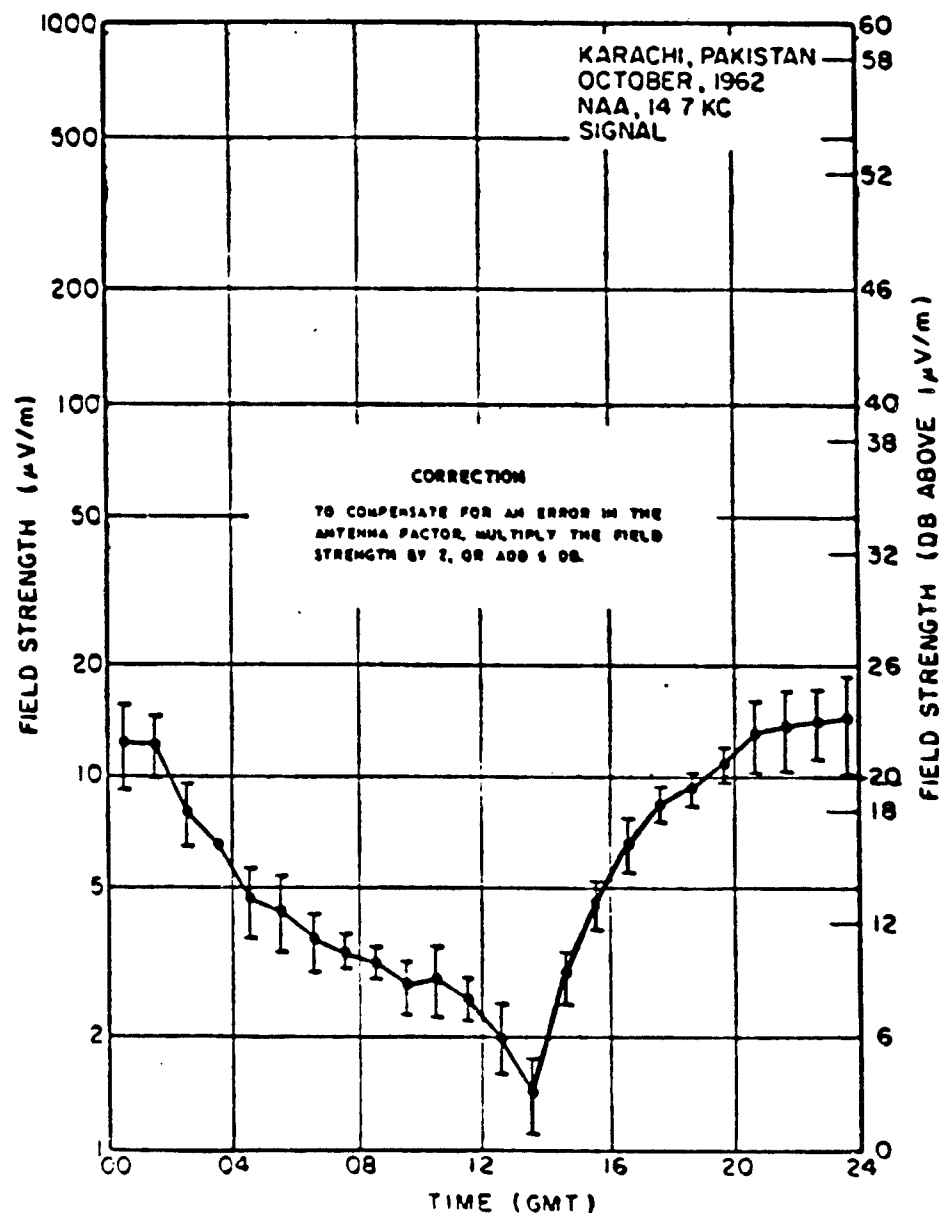


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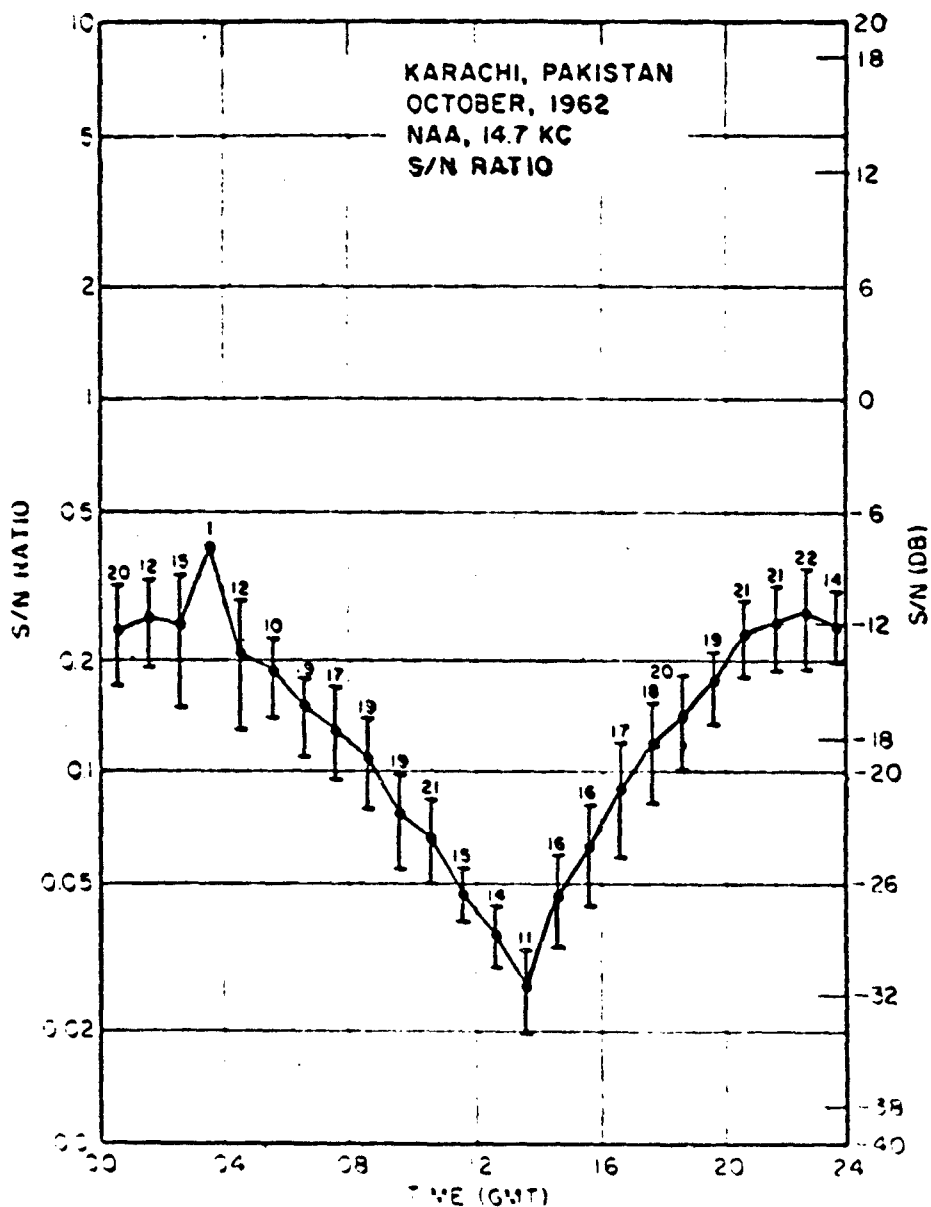


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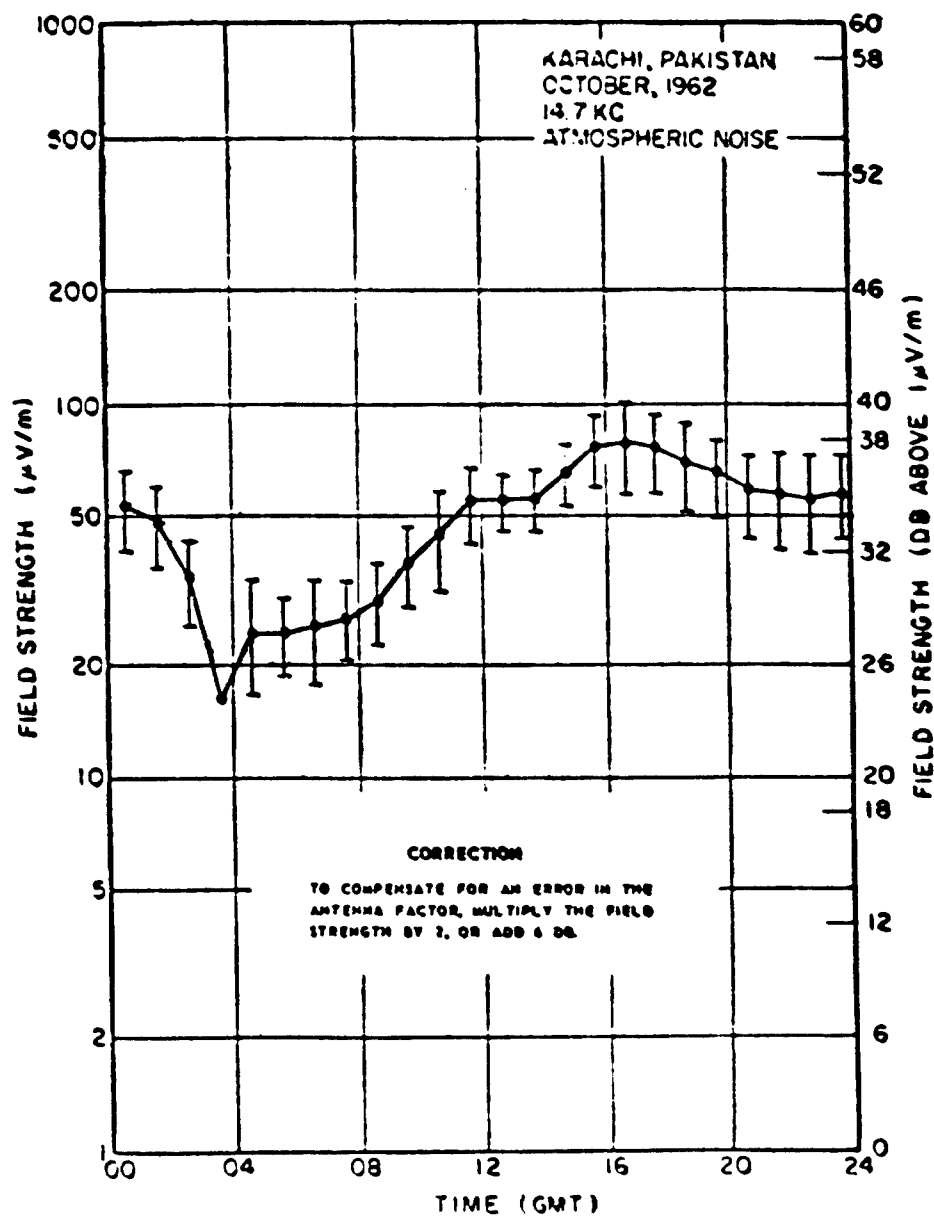


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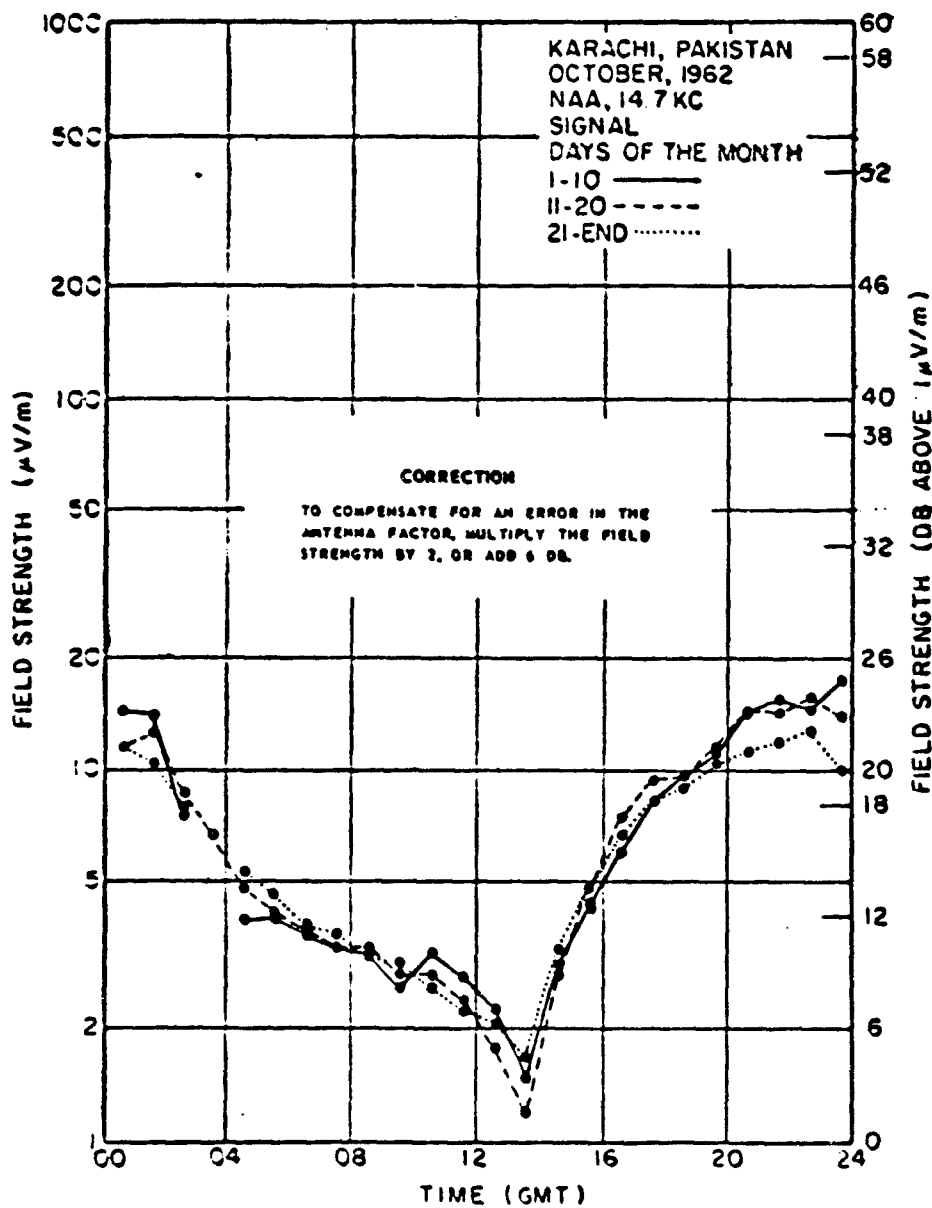


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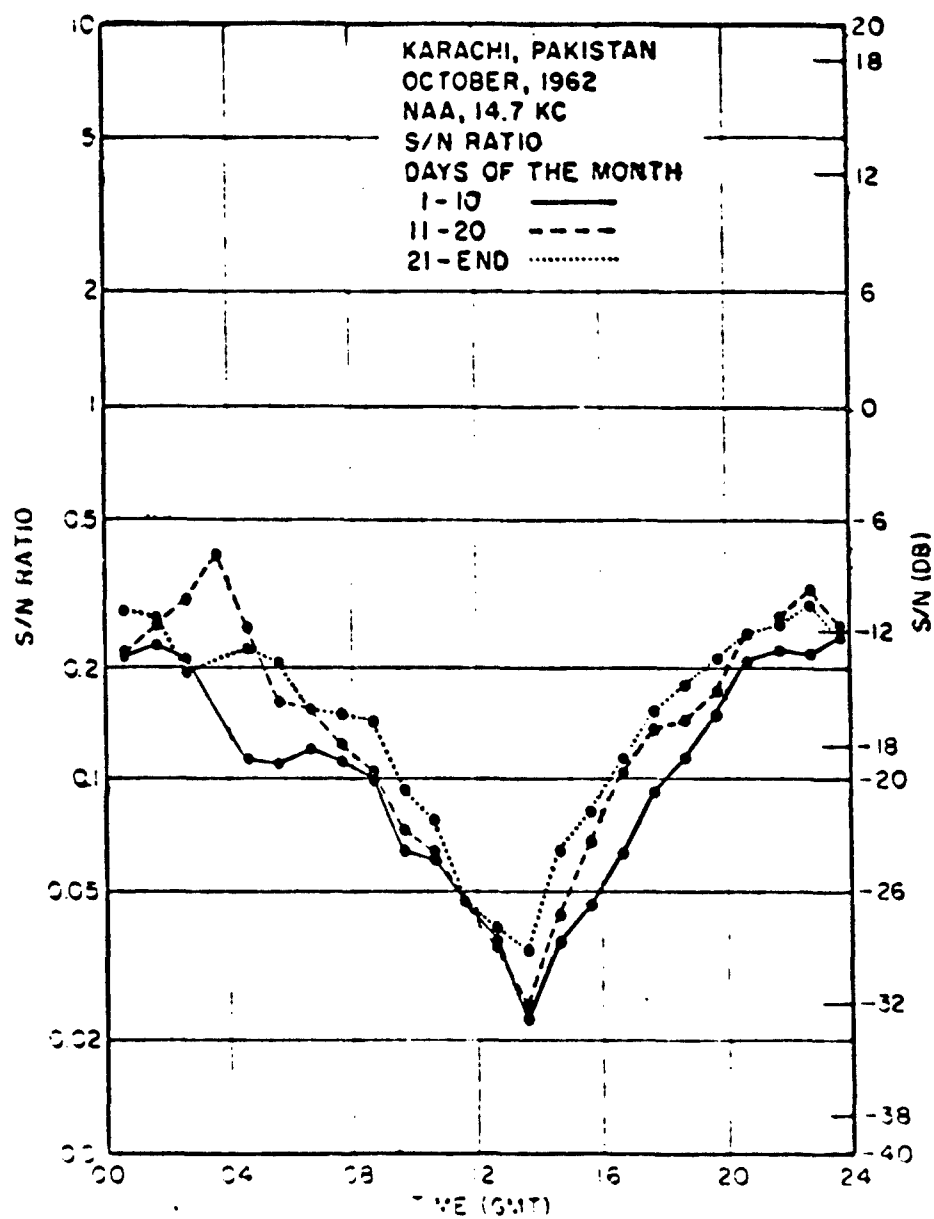


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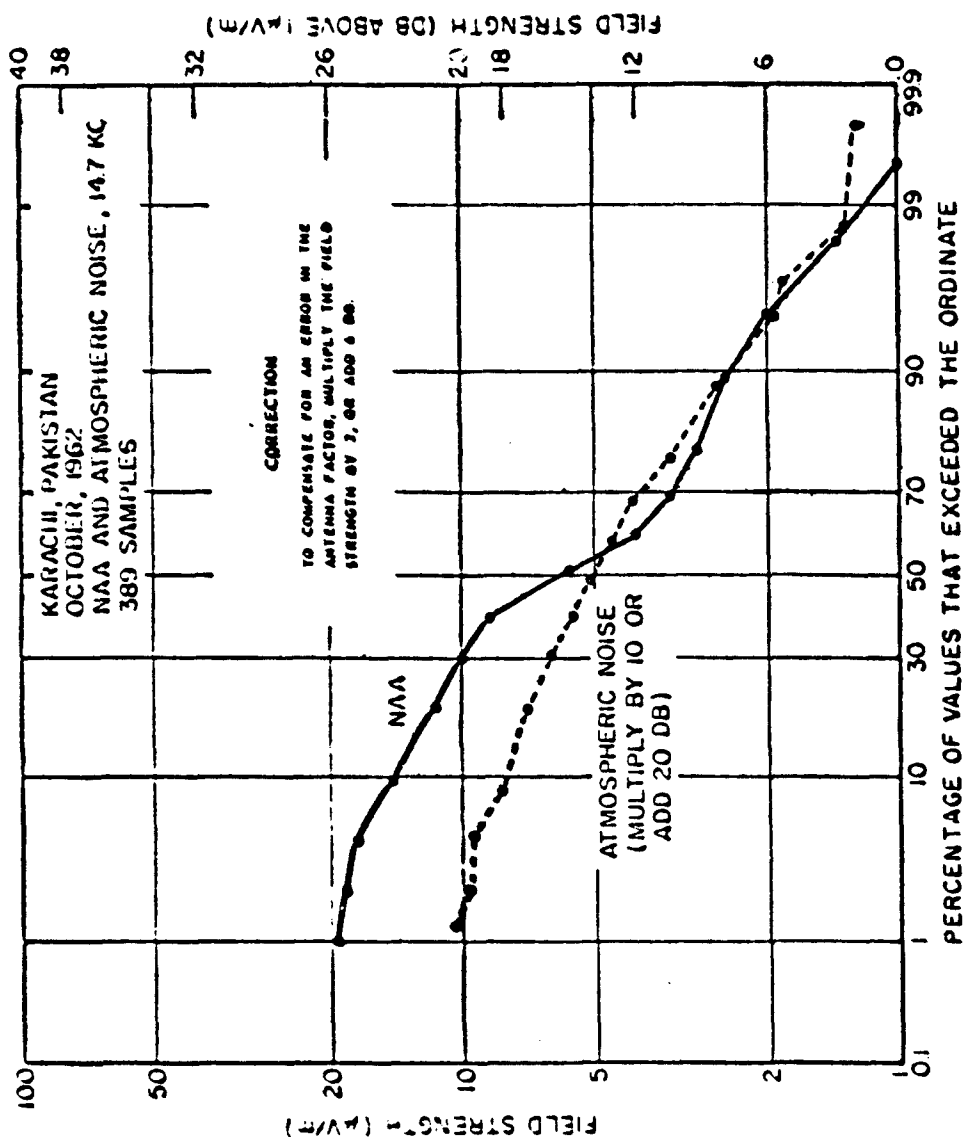


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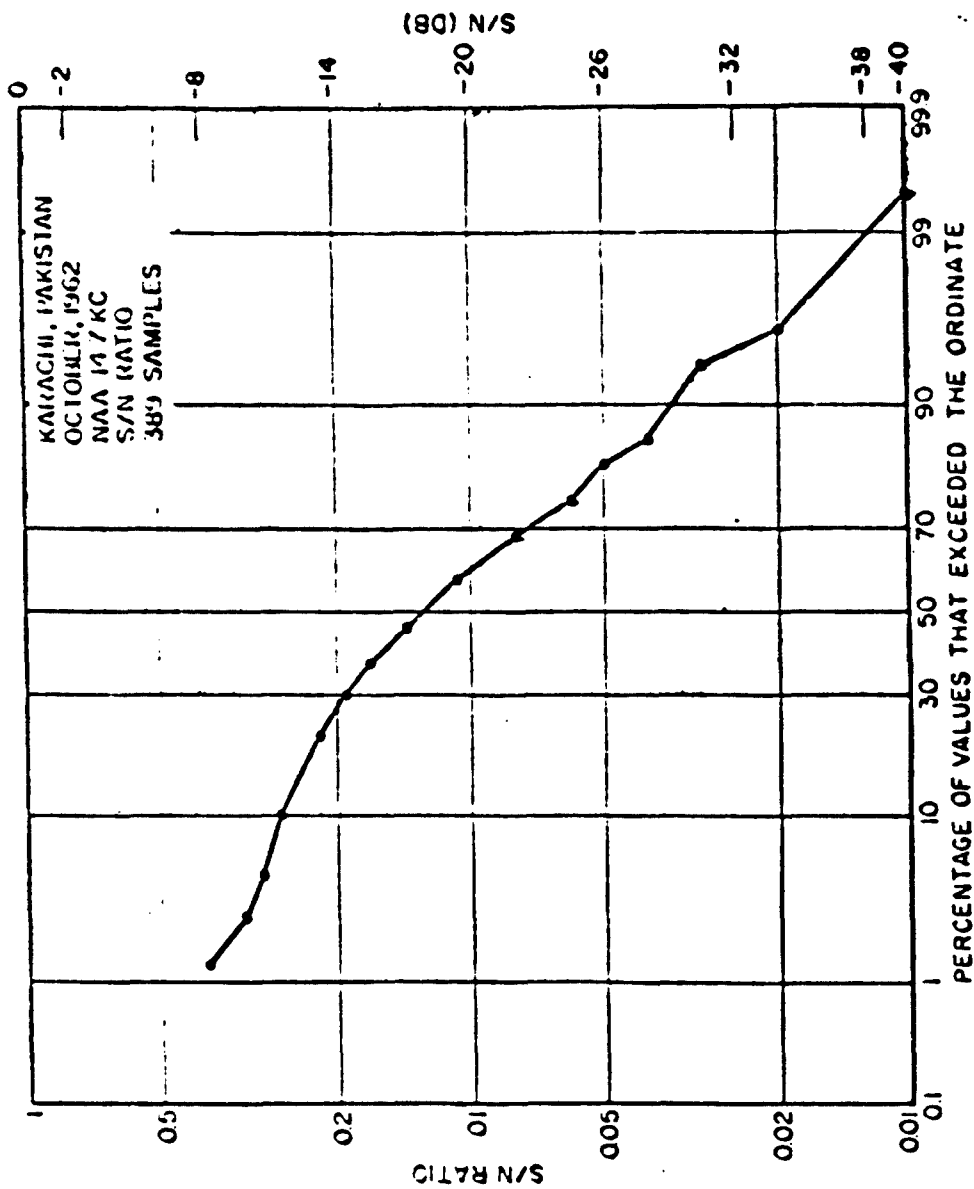


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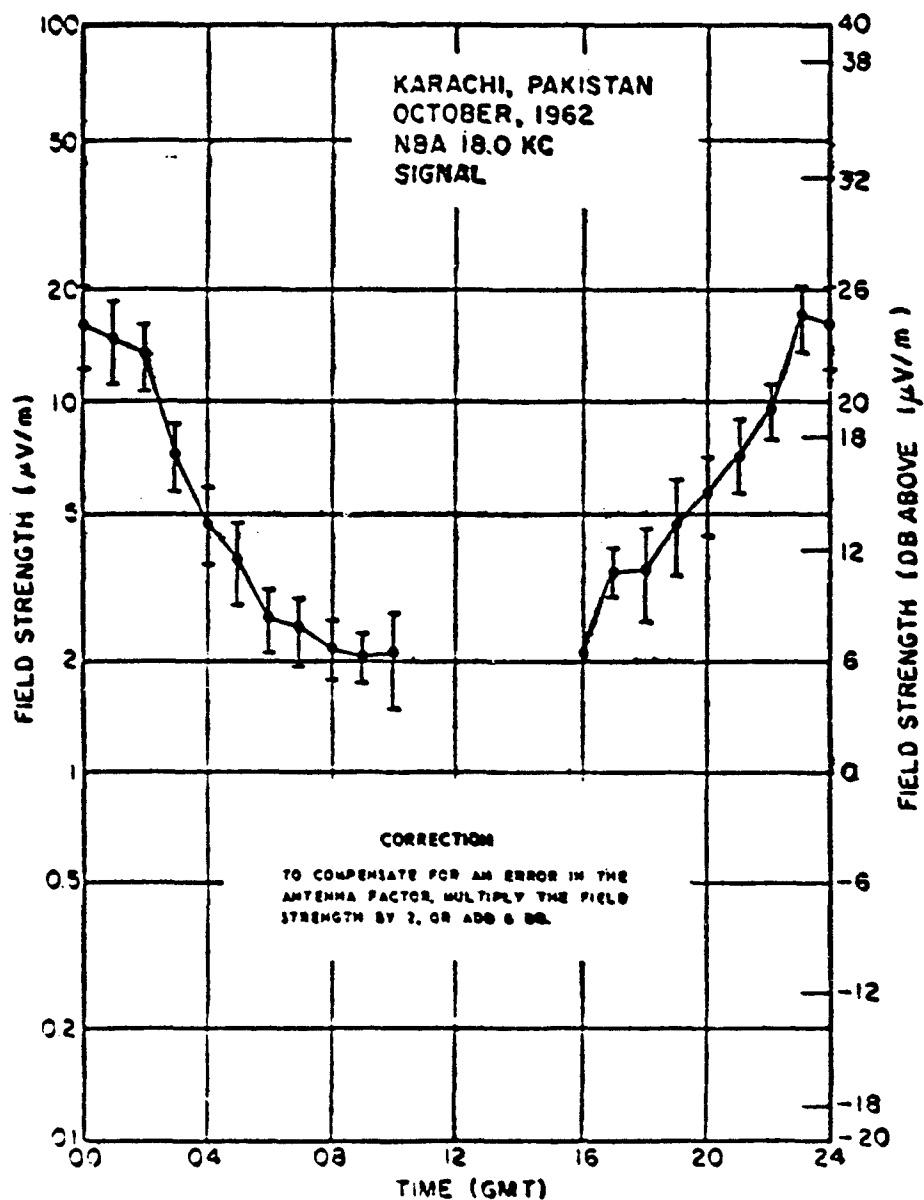


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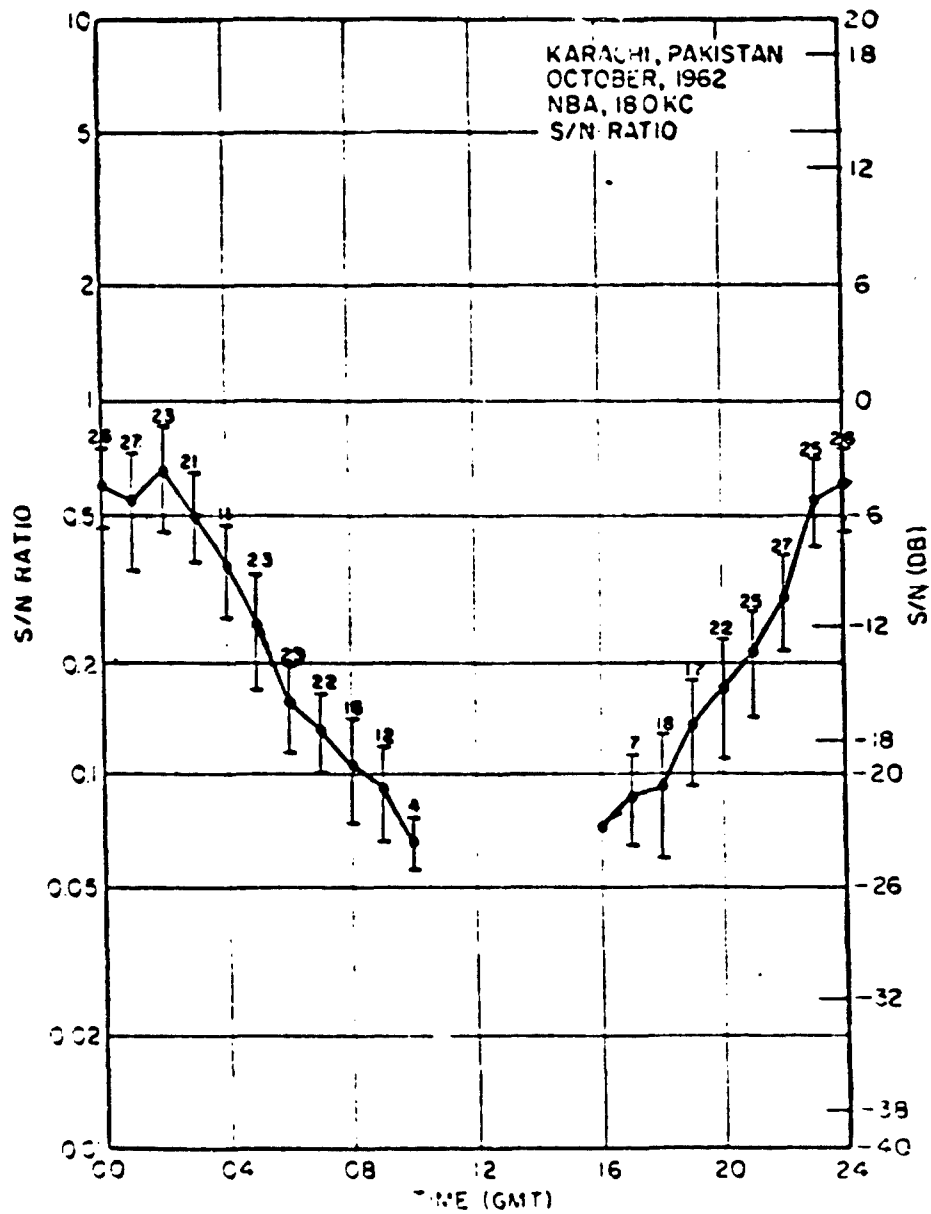


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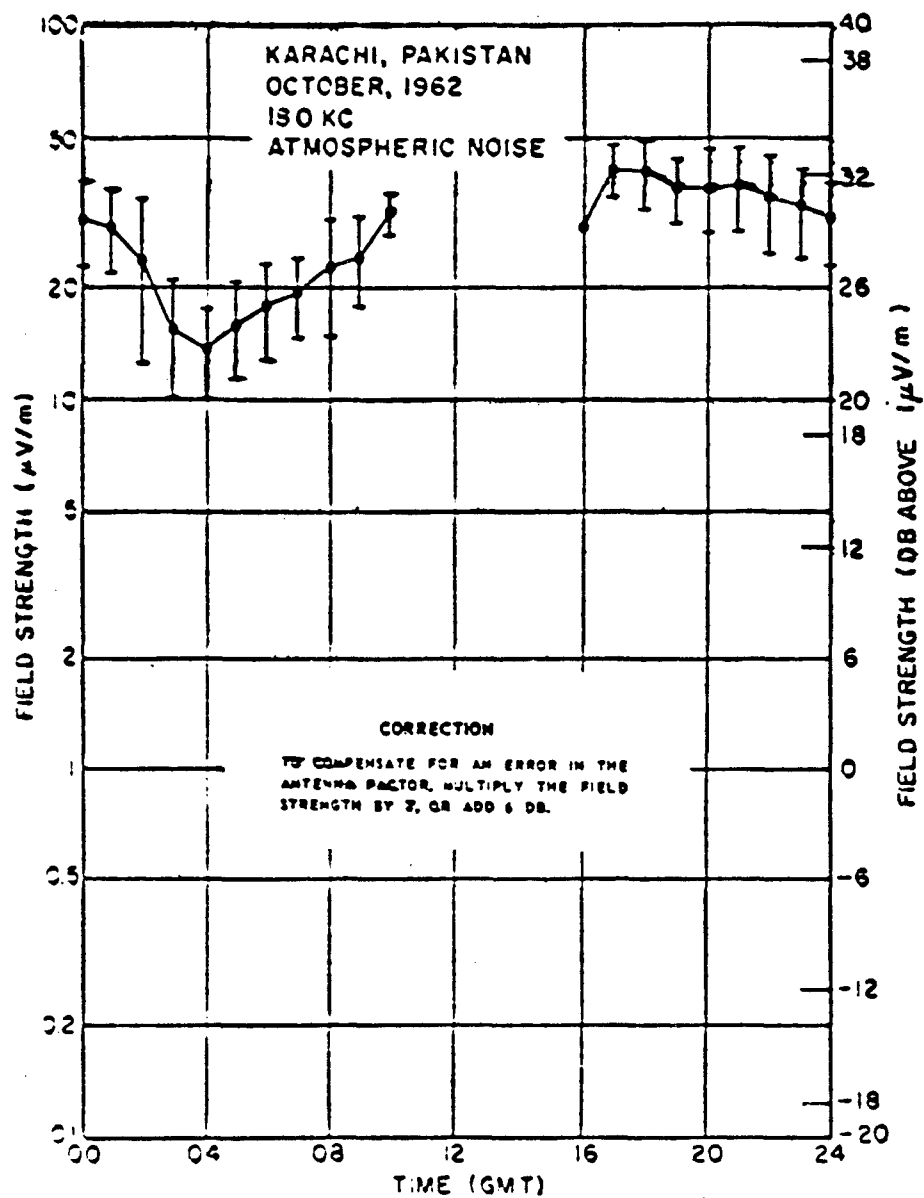


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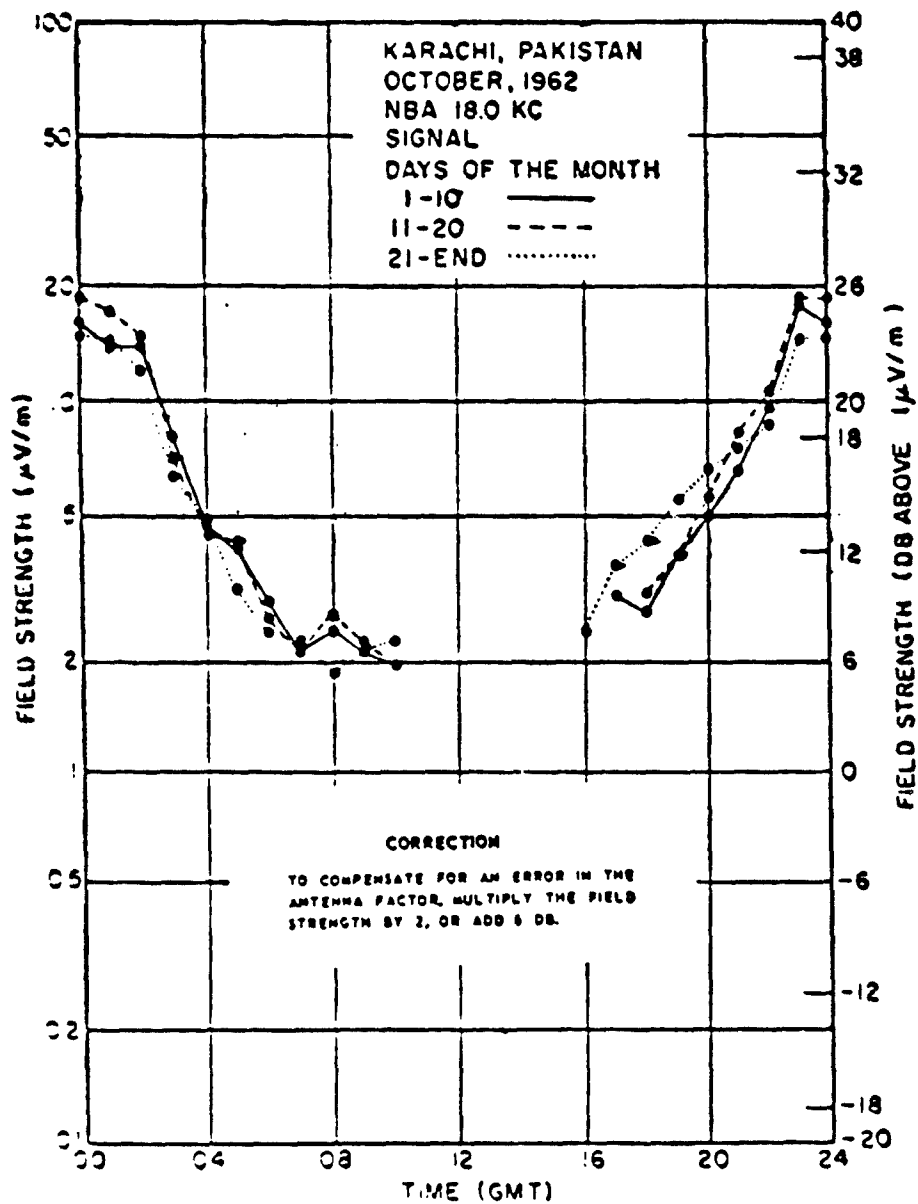


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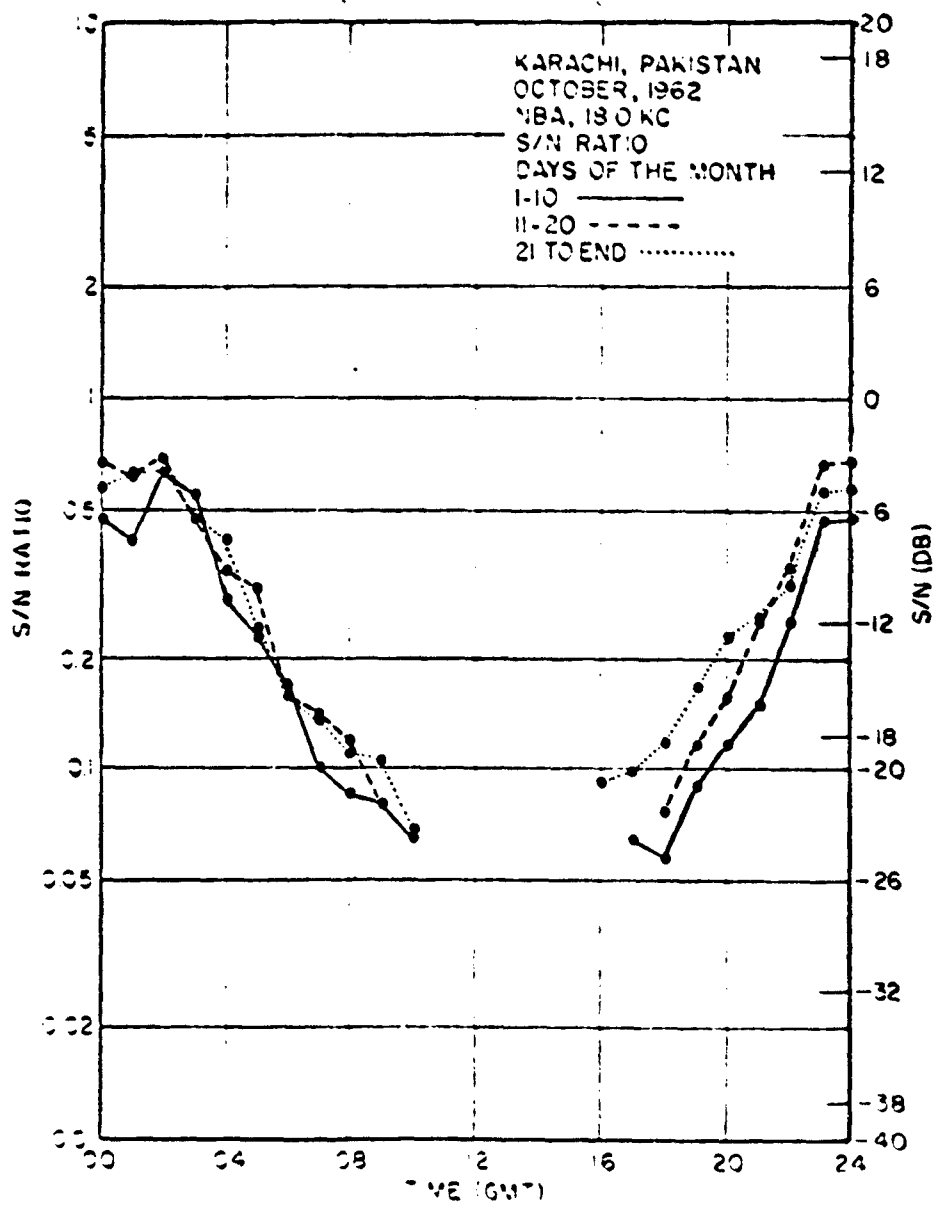


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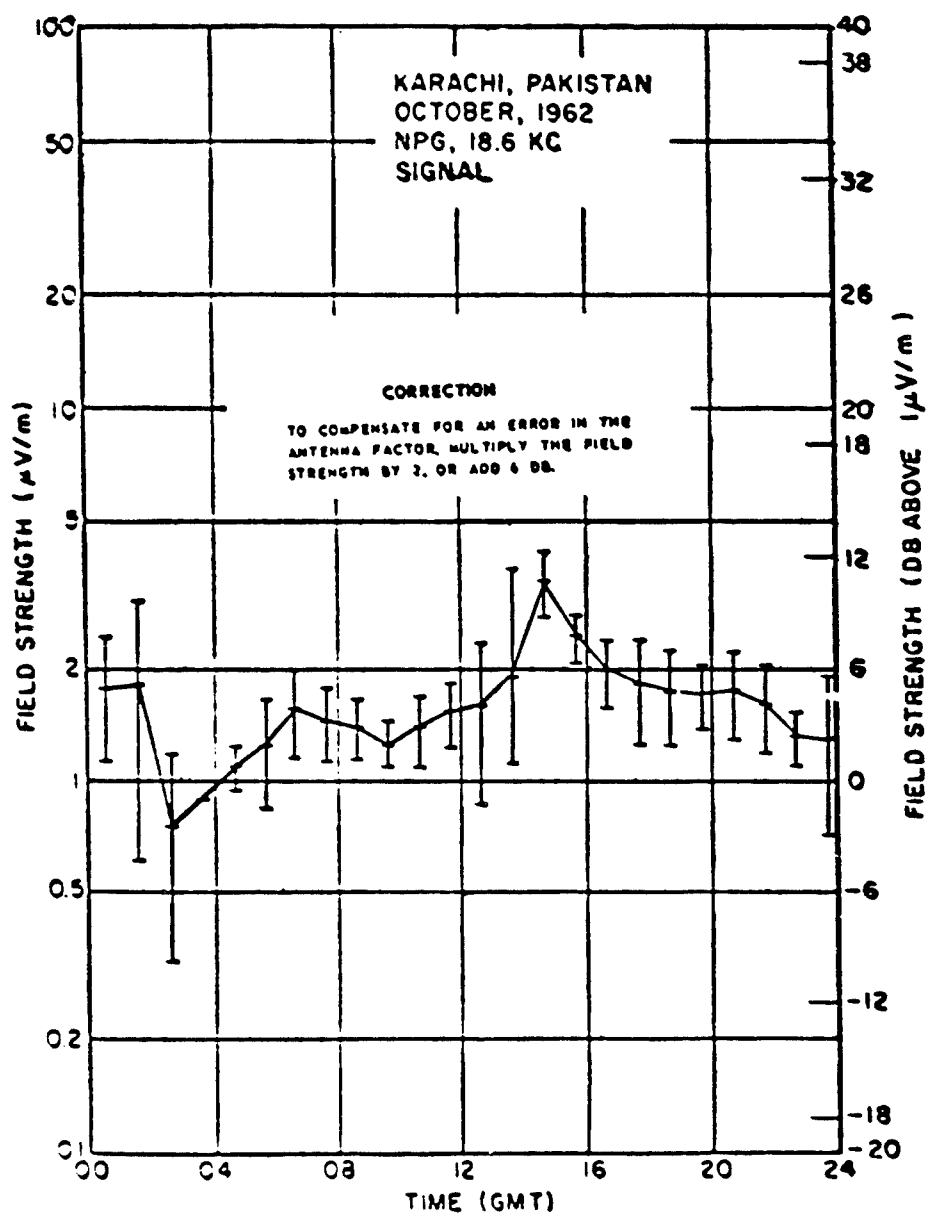


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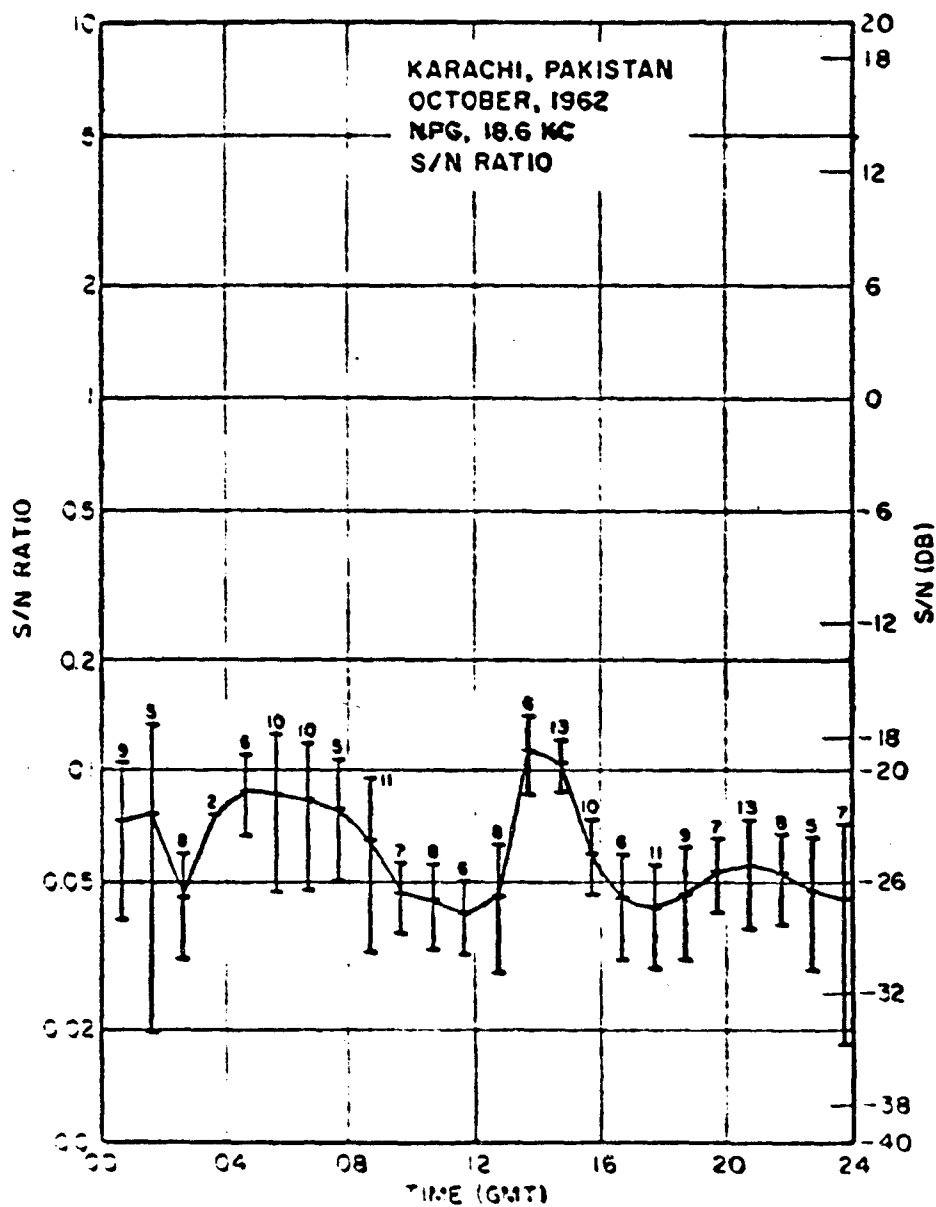


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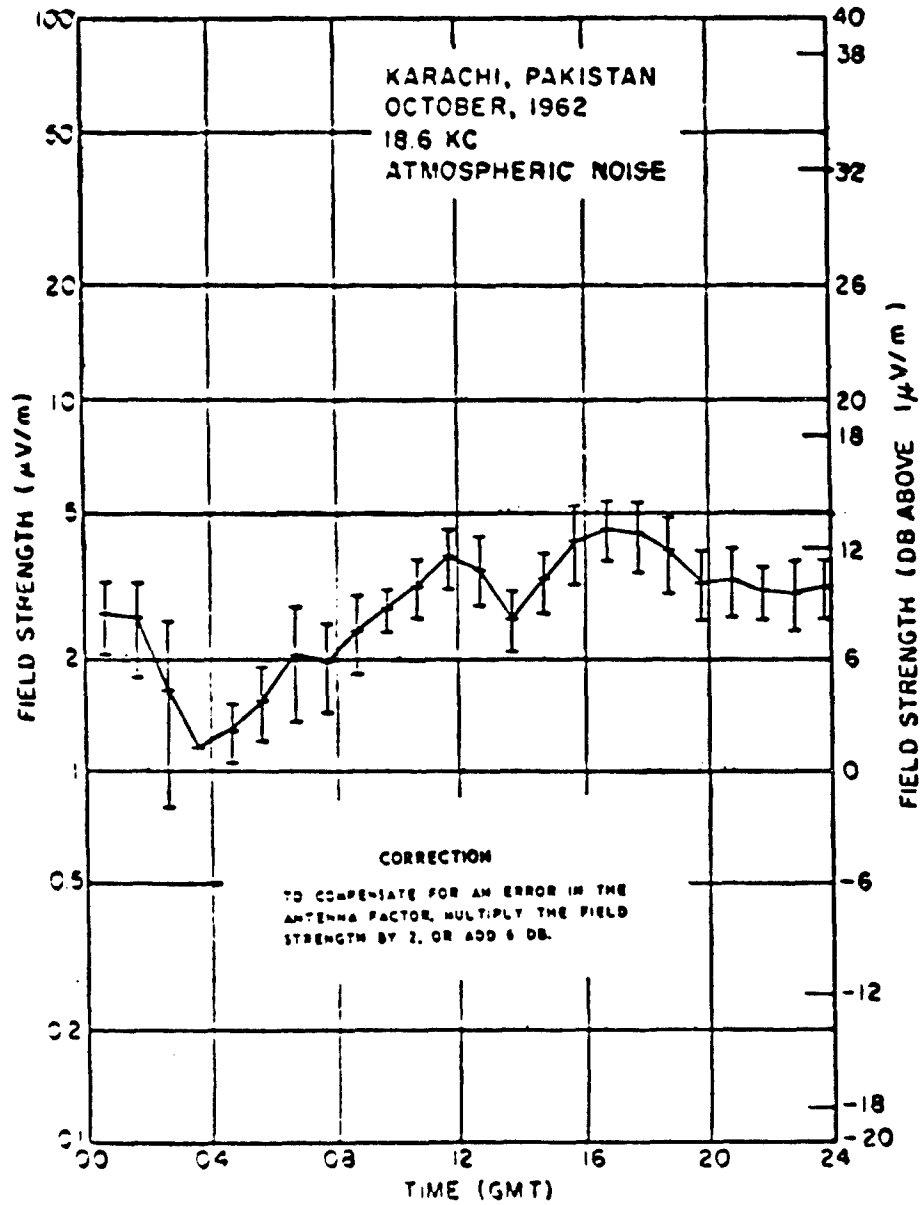


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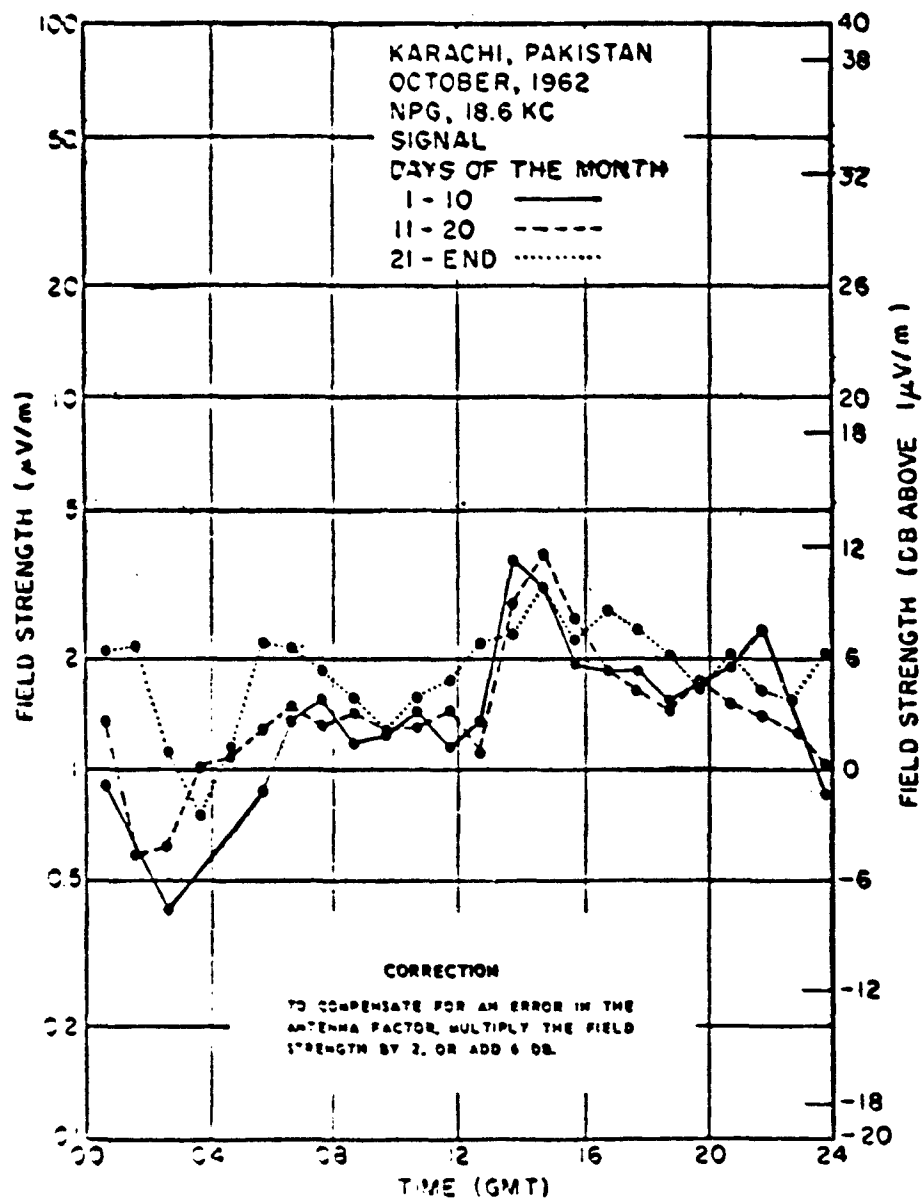


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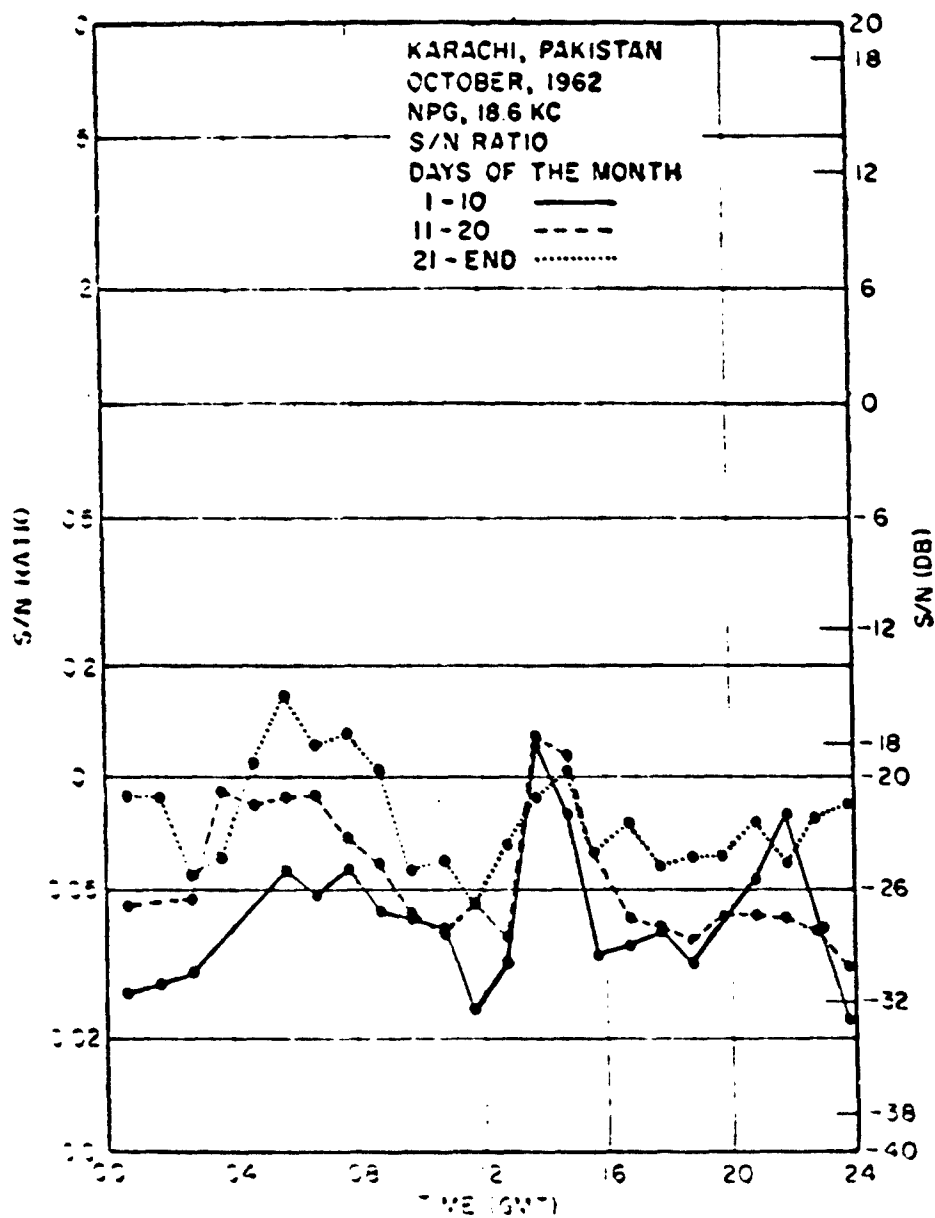


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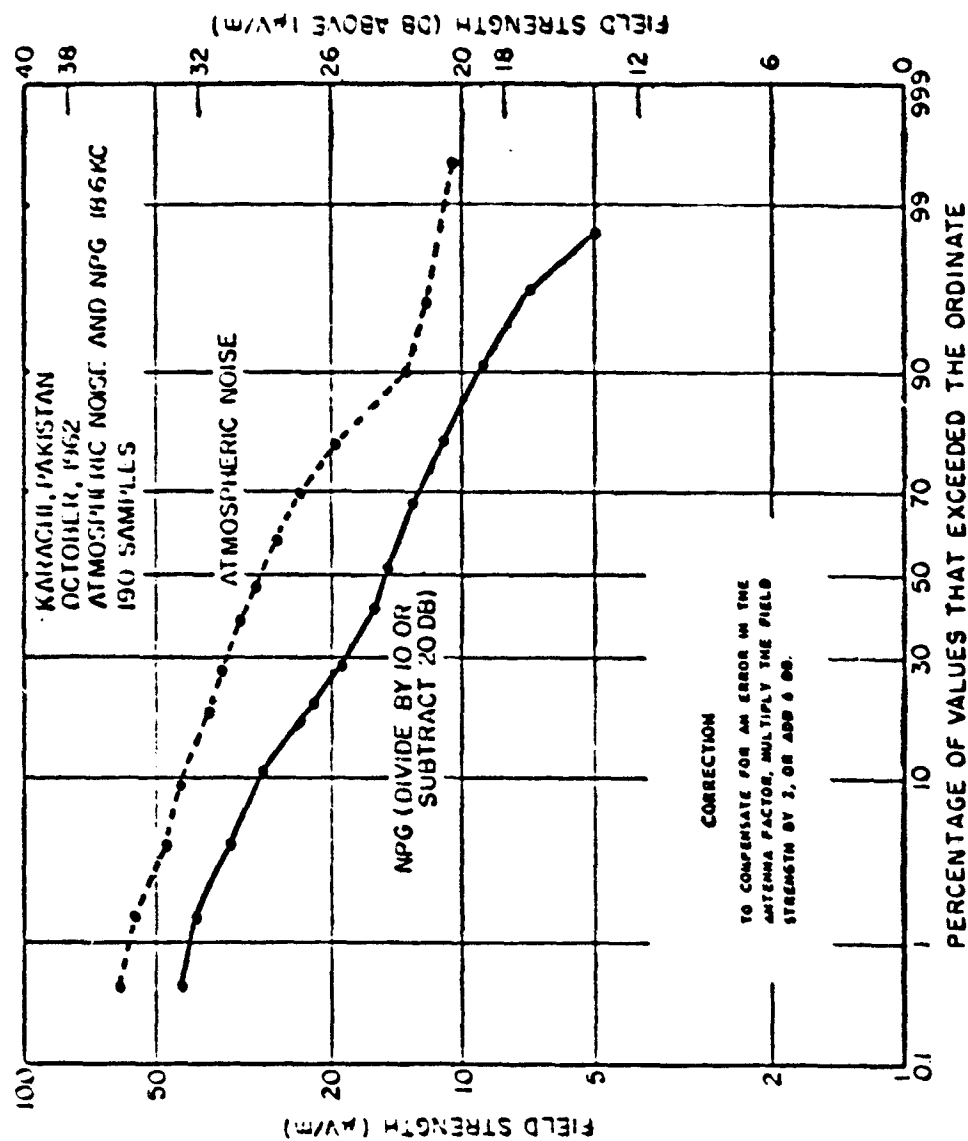


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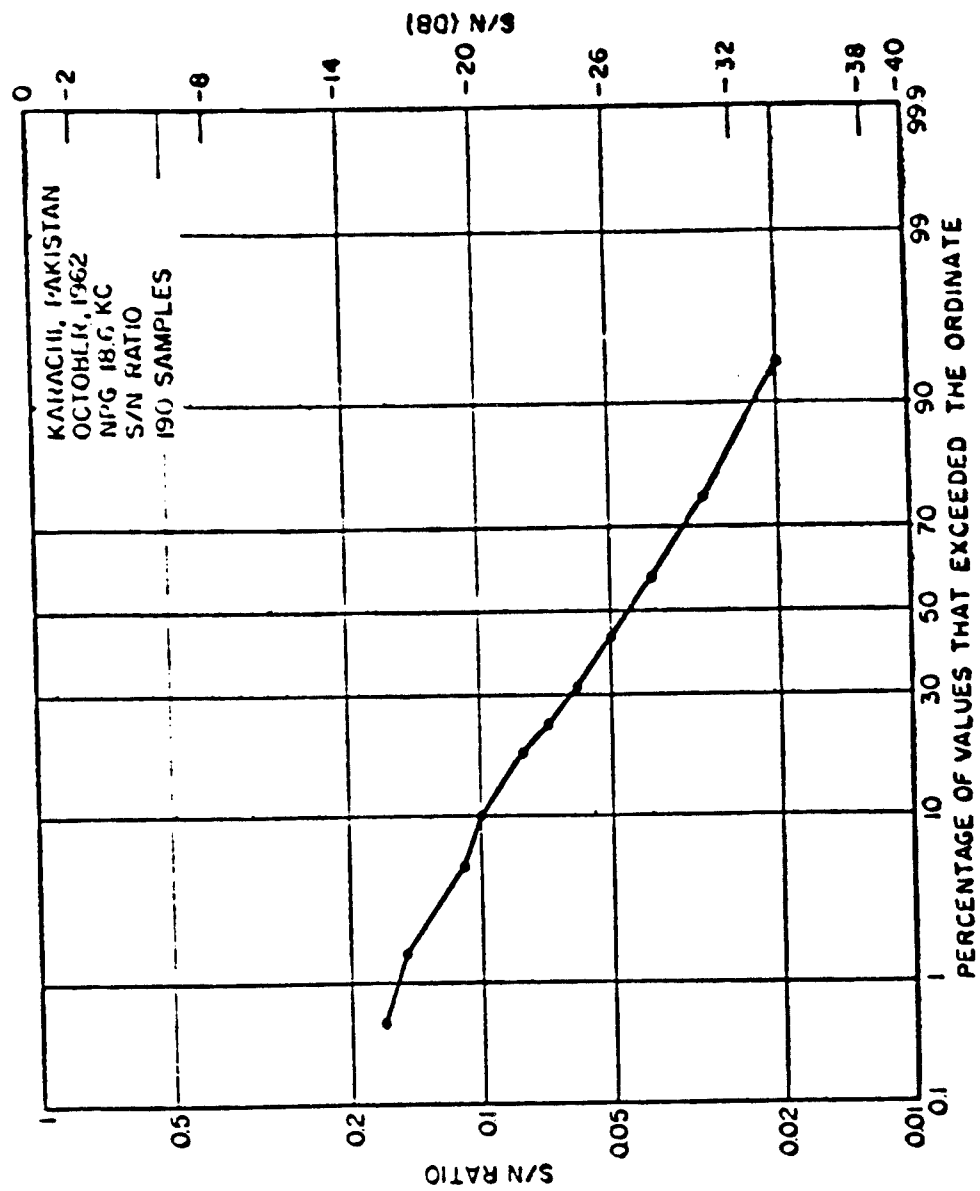


Figure 235

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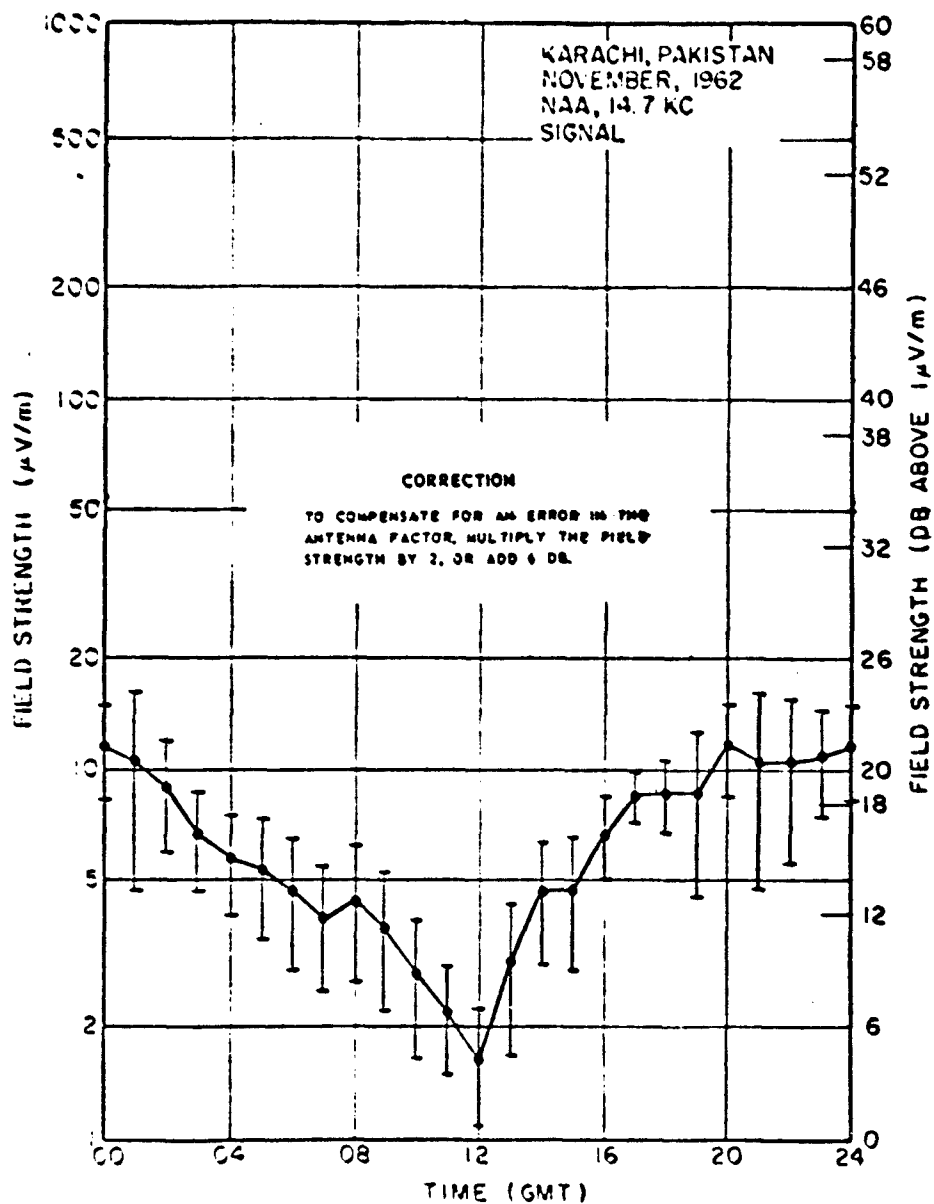


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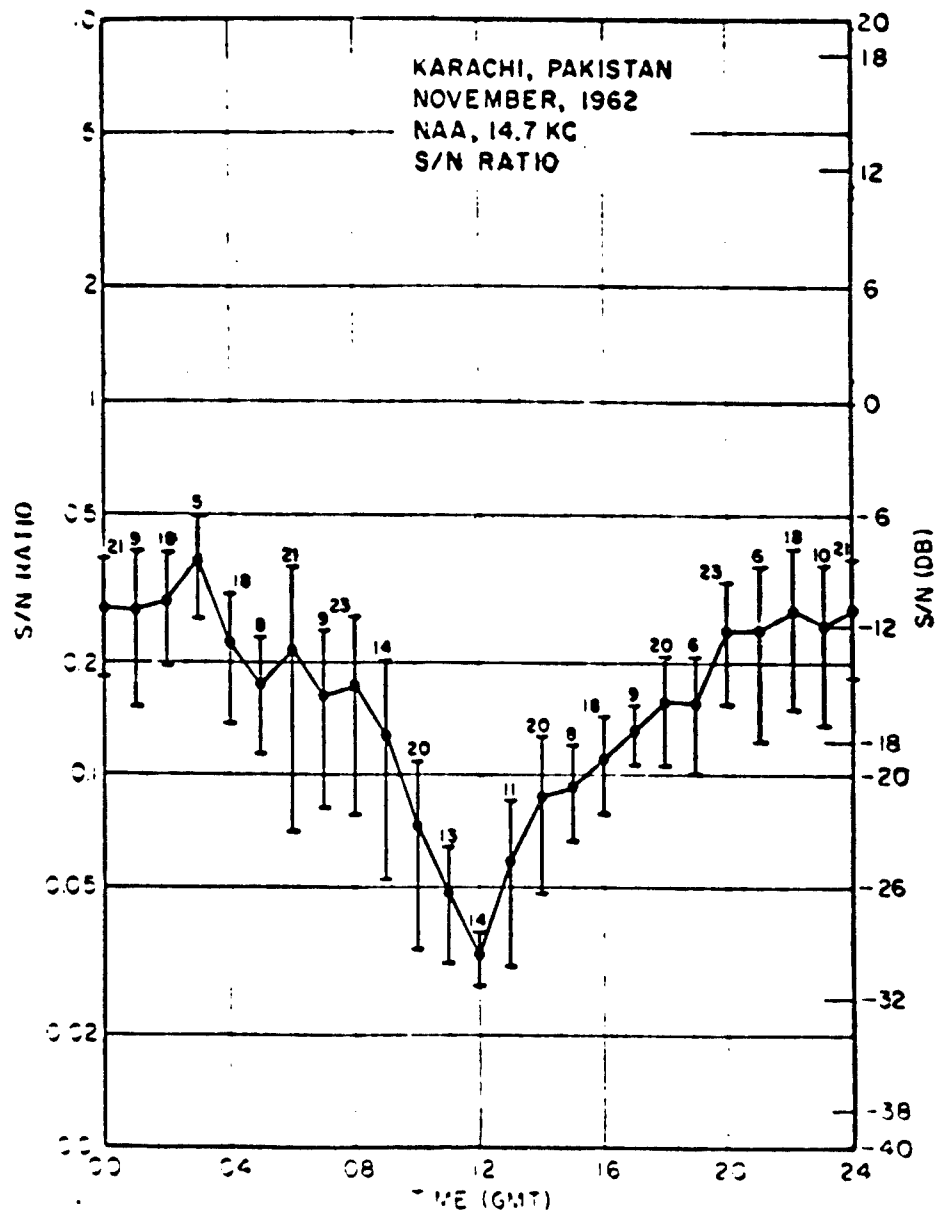


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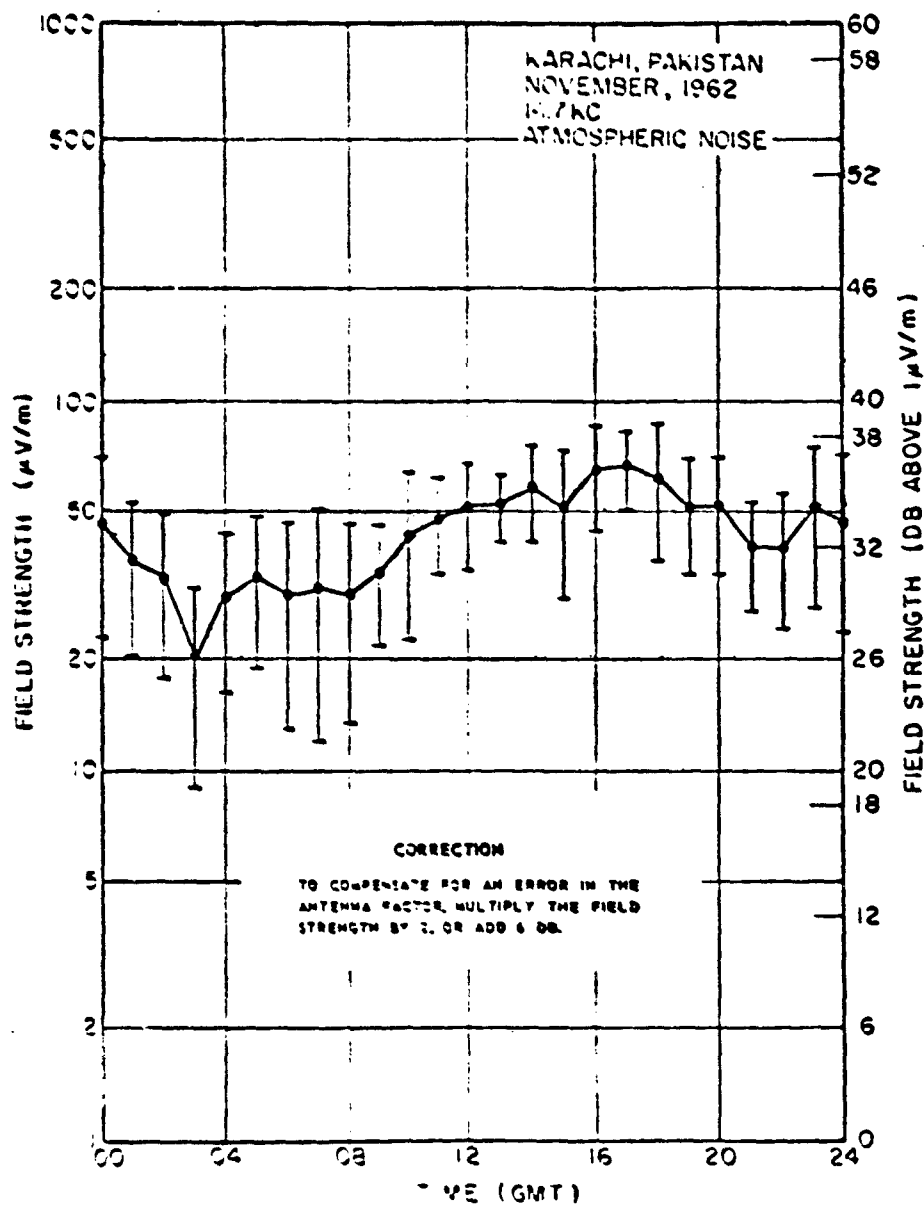


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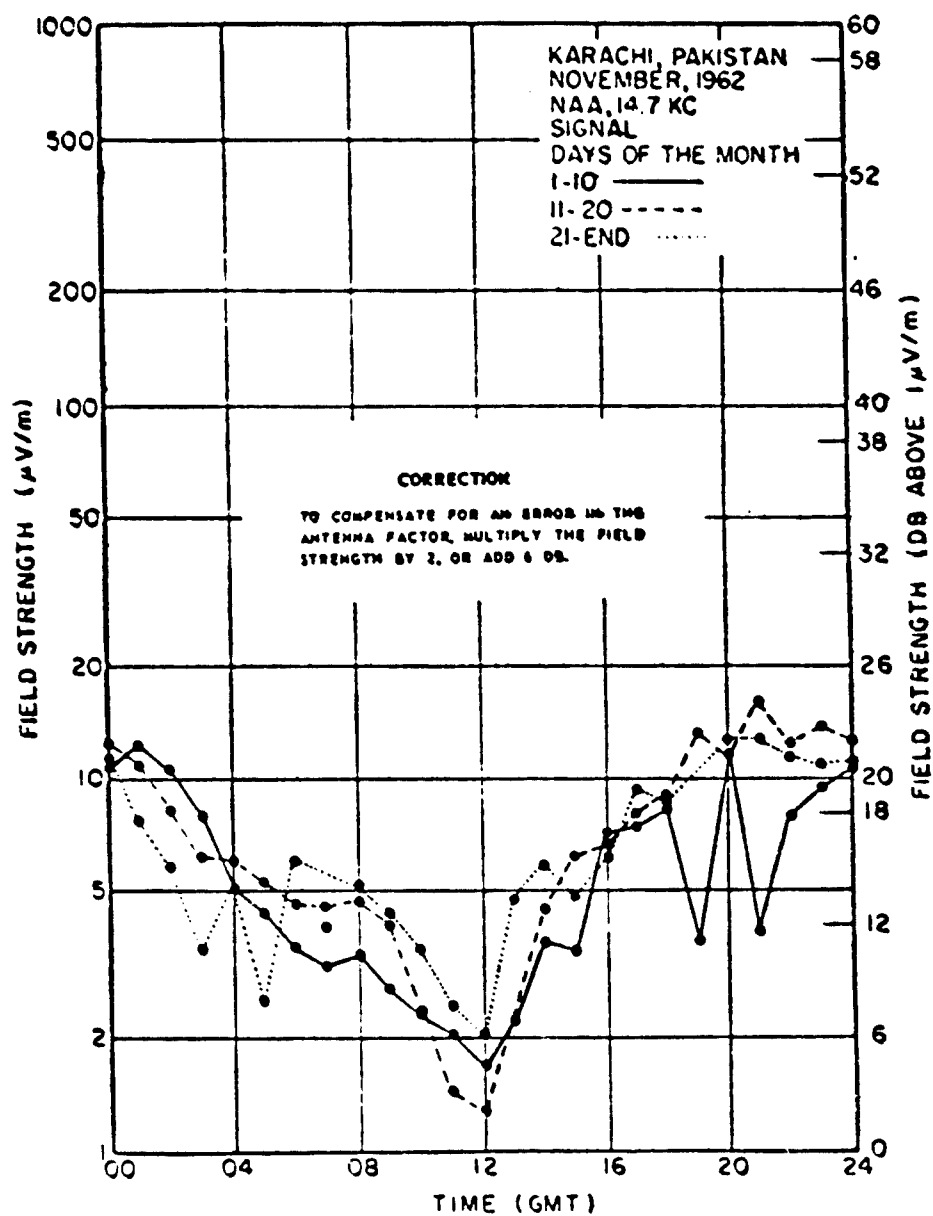


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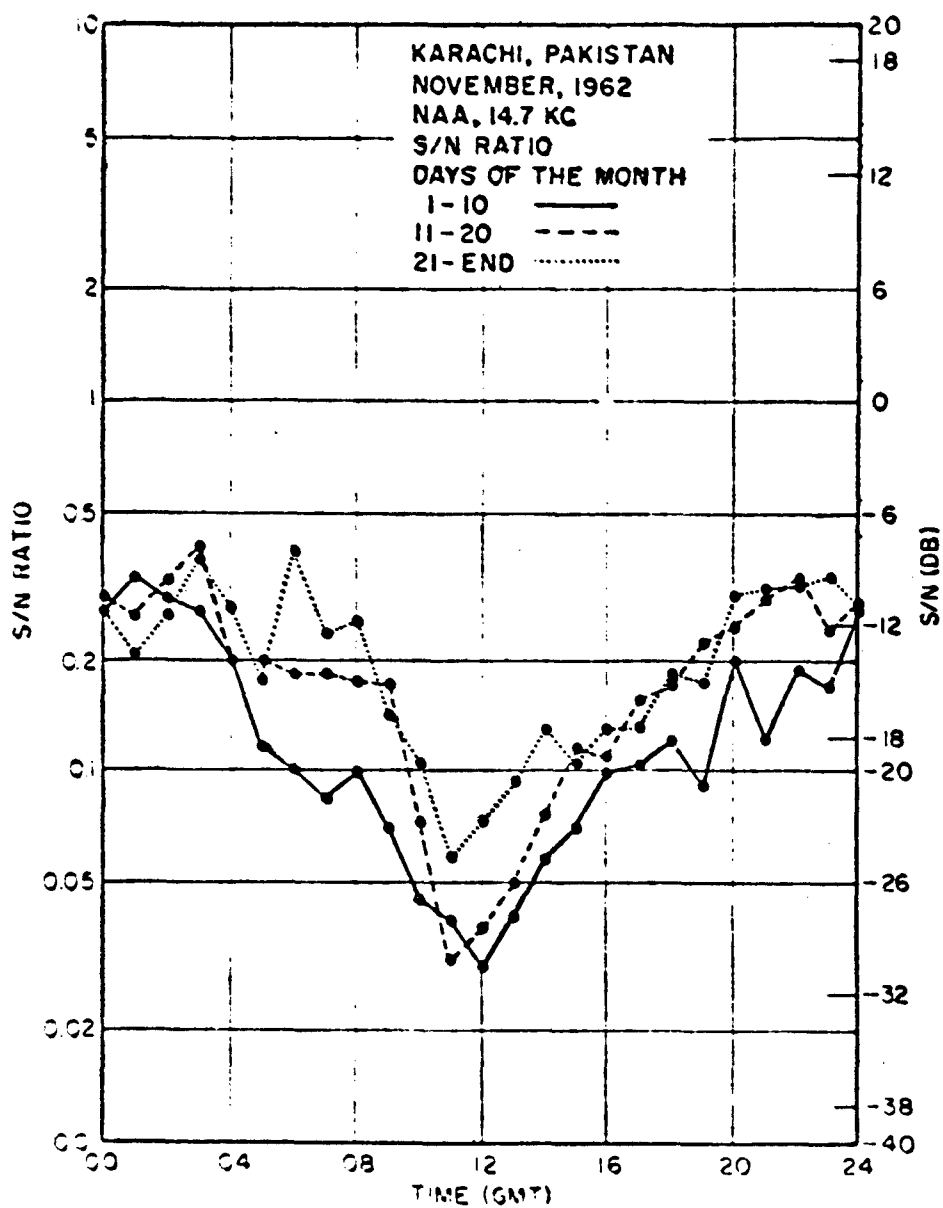


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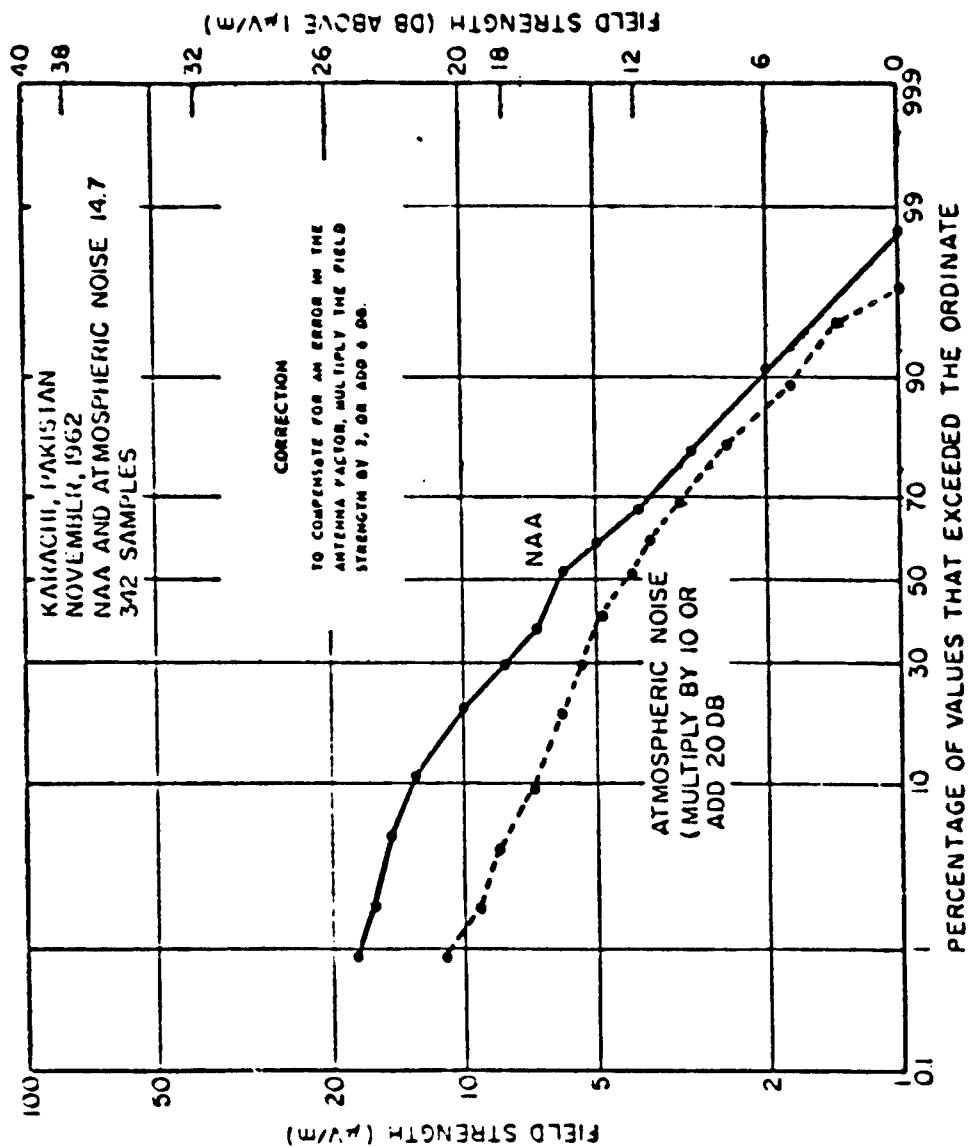


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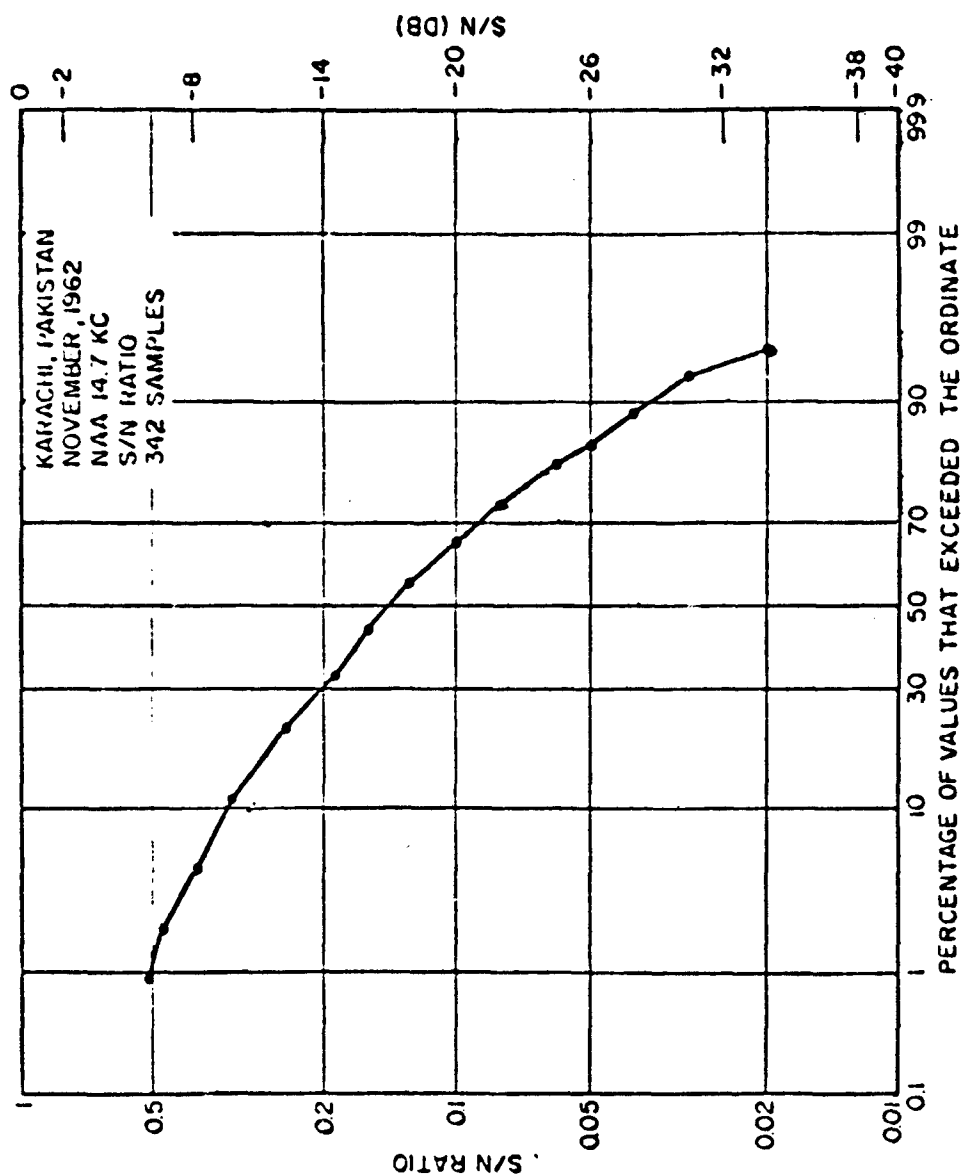


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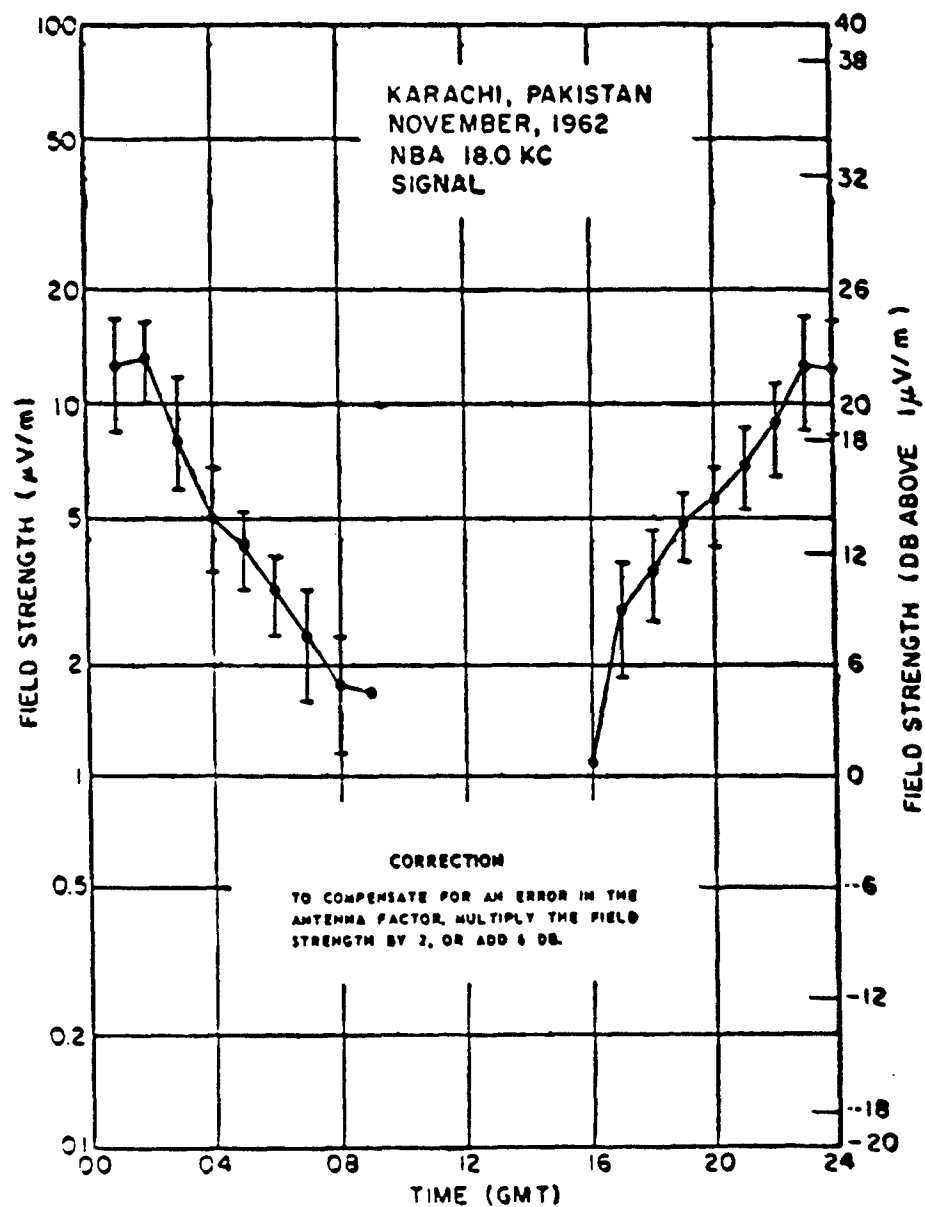


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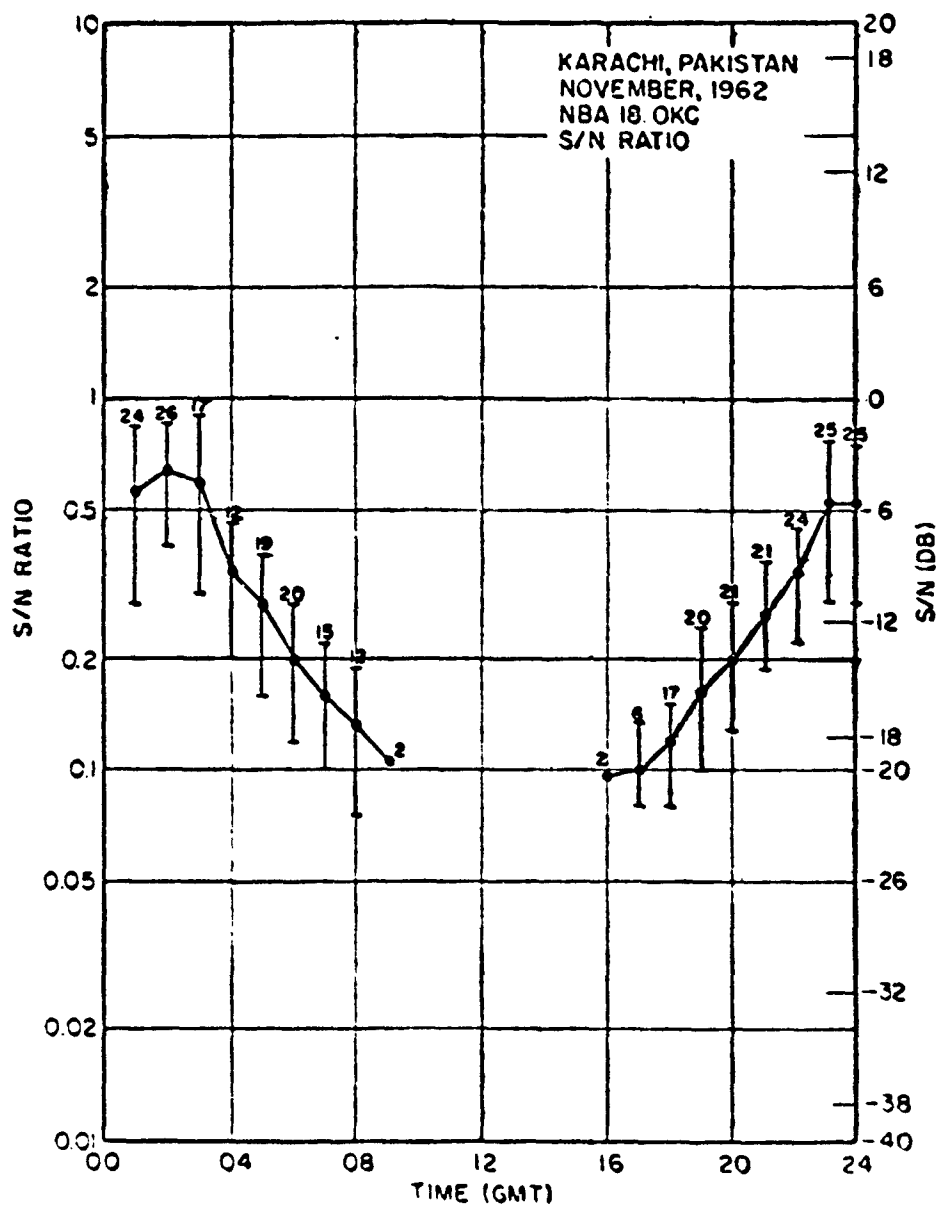


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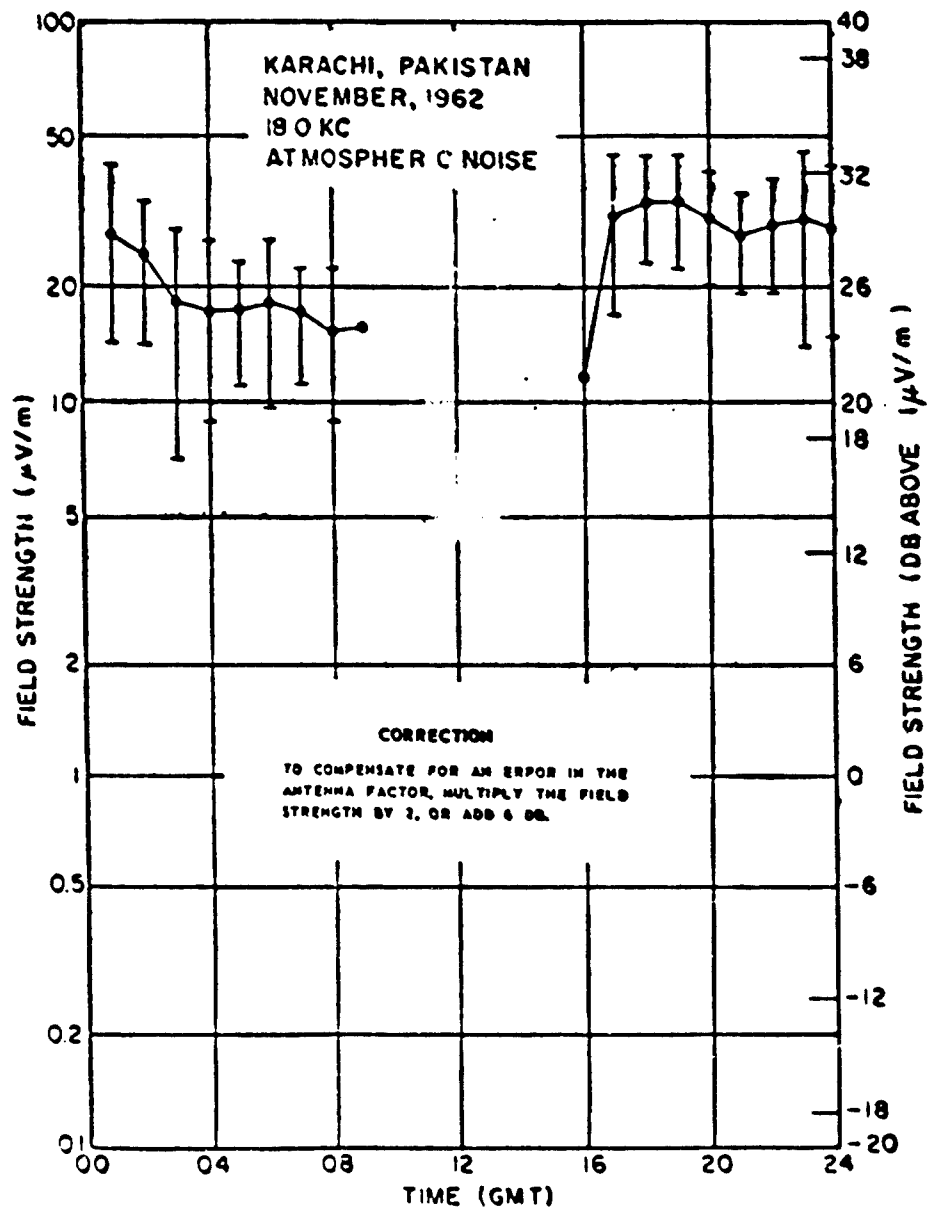


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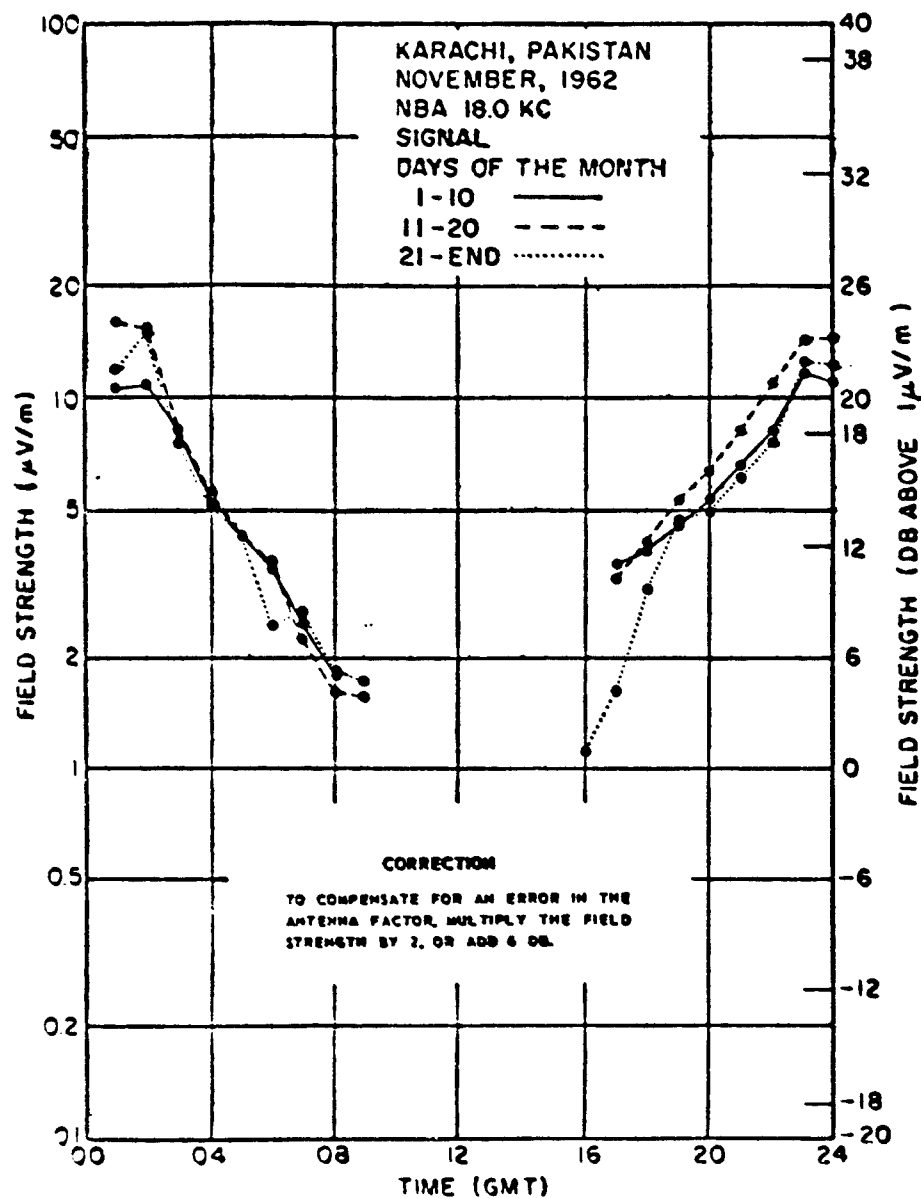


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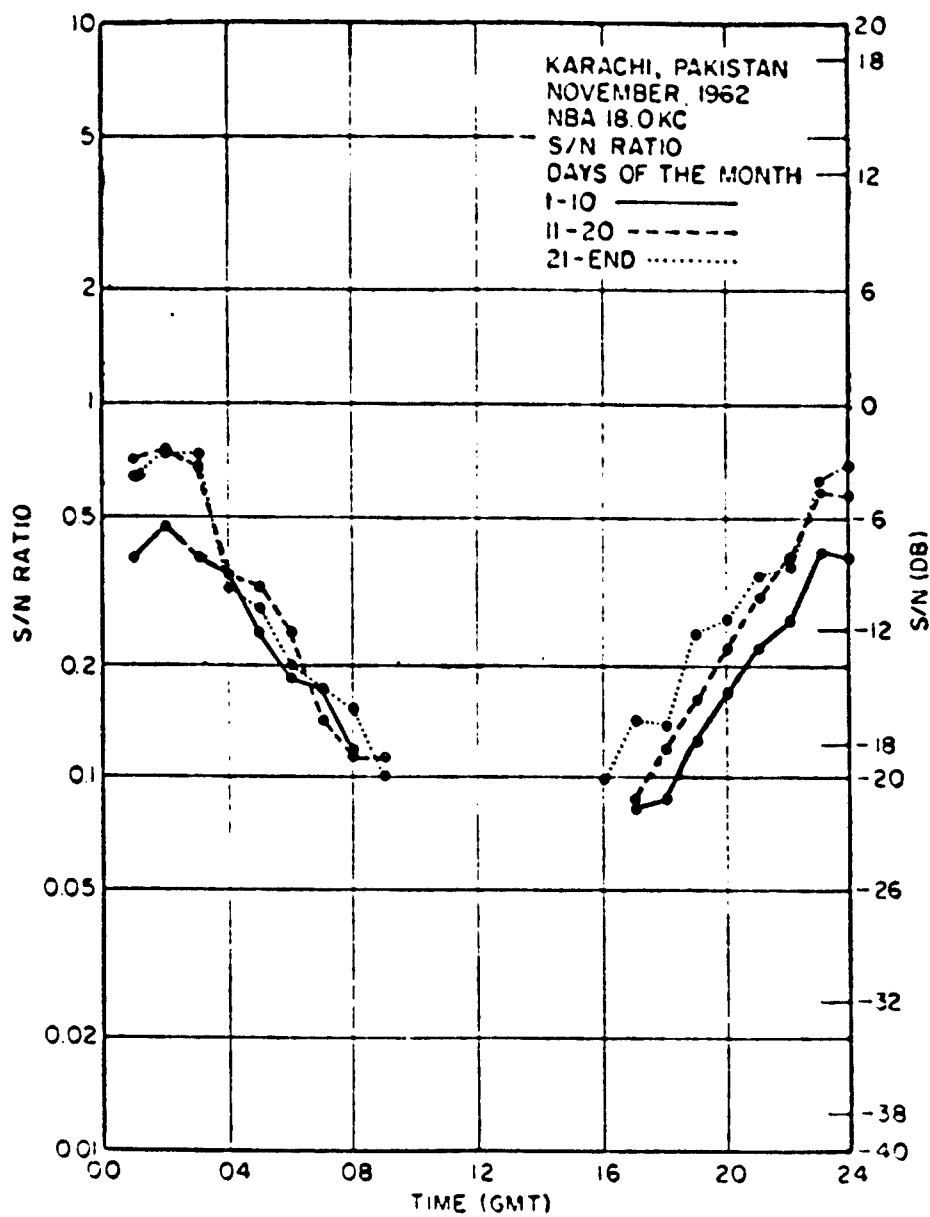


Figure 247

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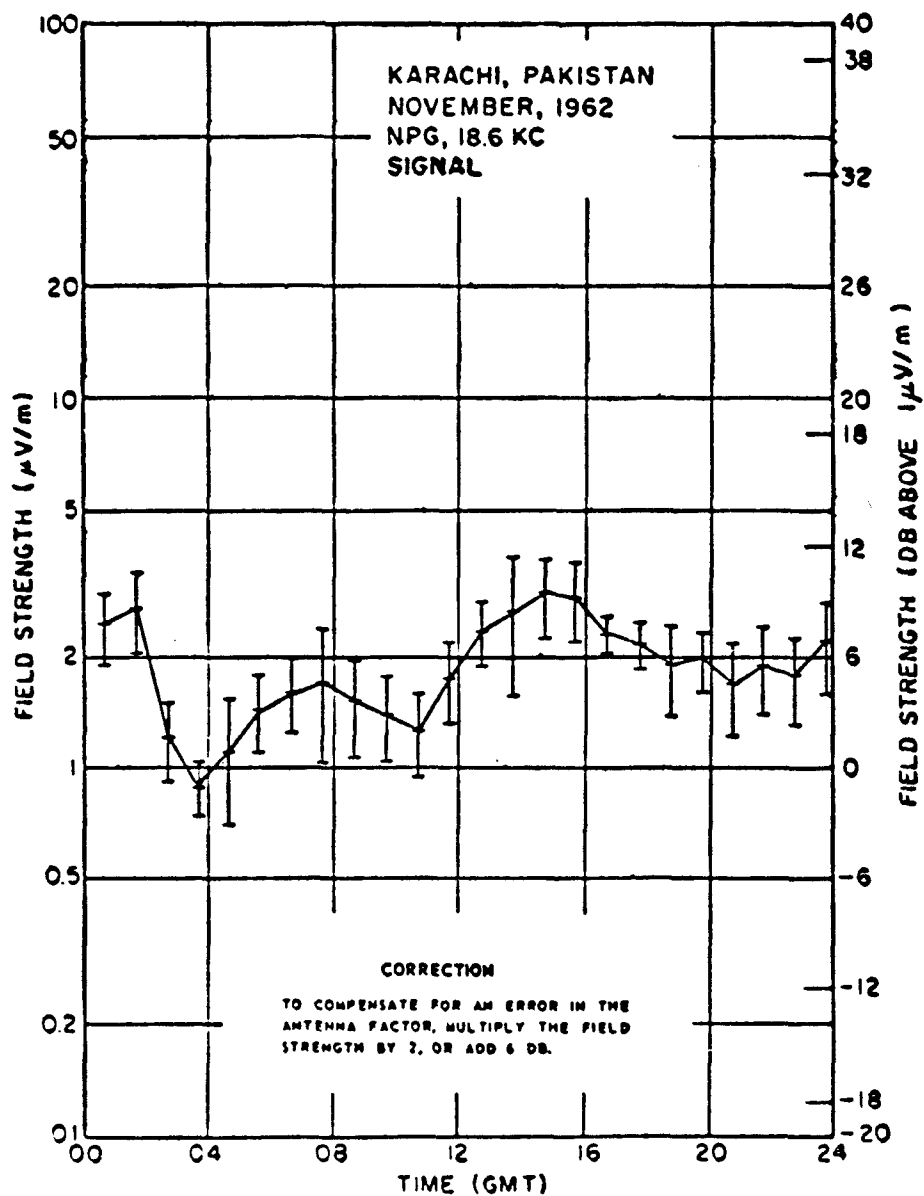


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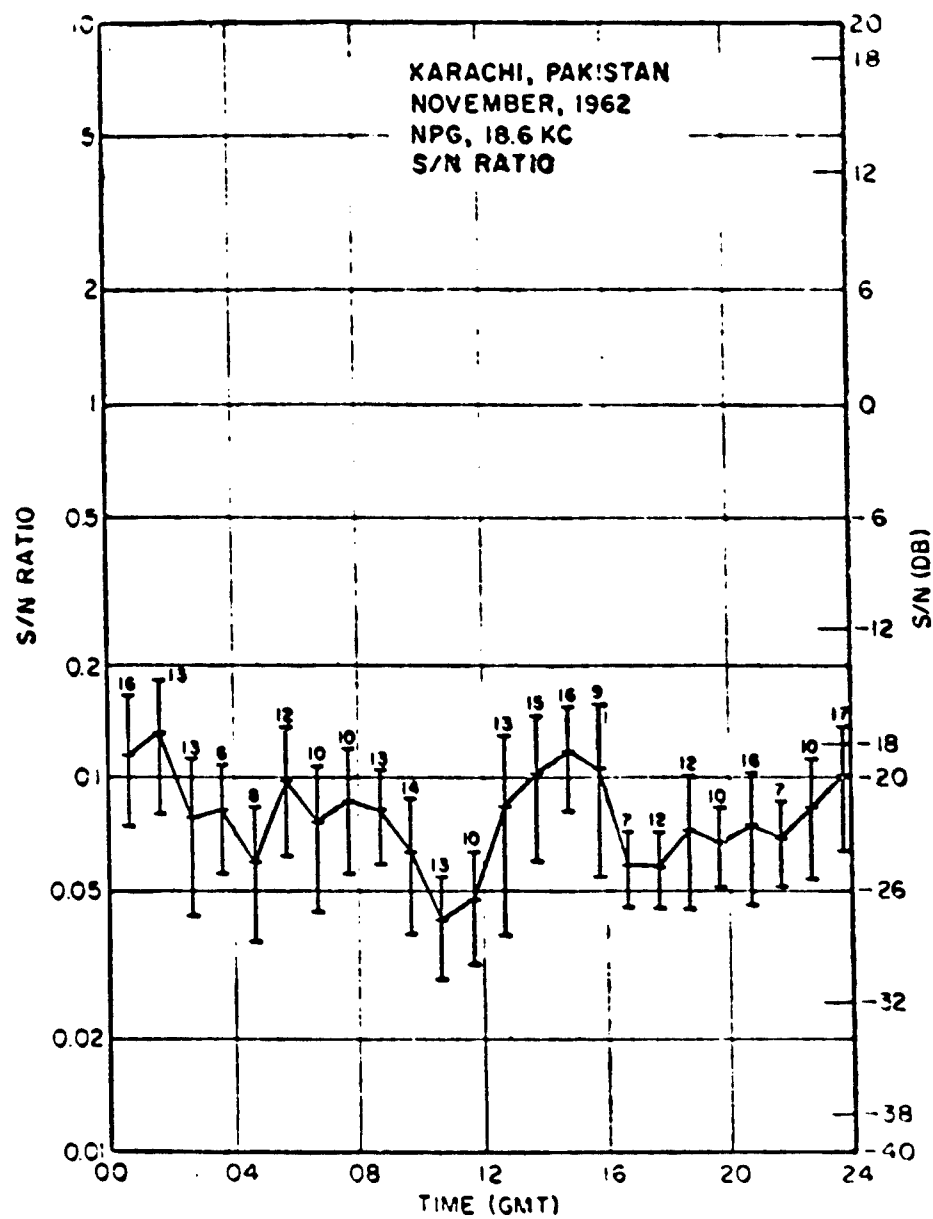


Figure 269

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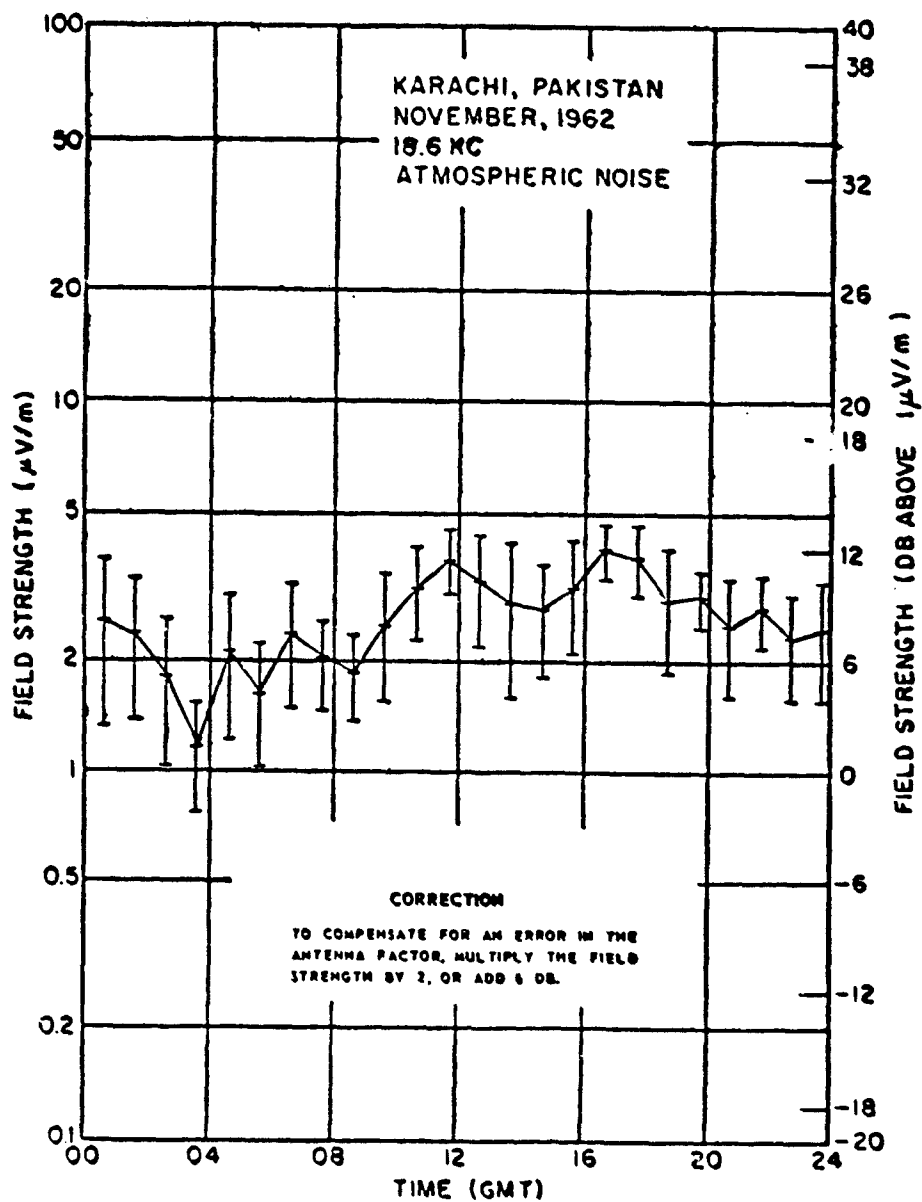


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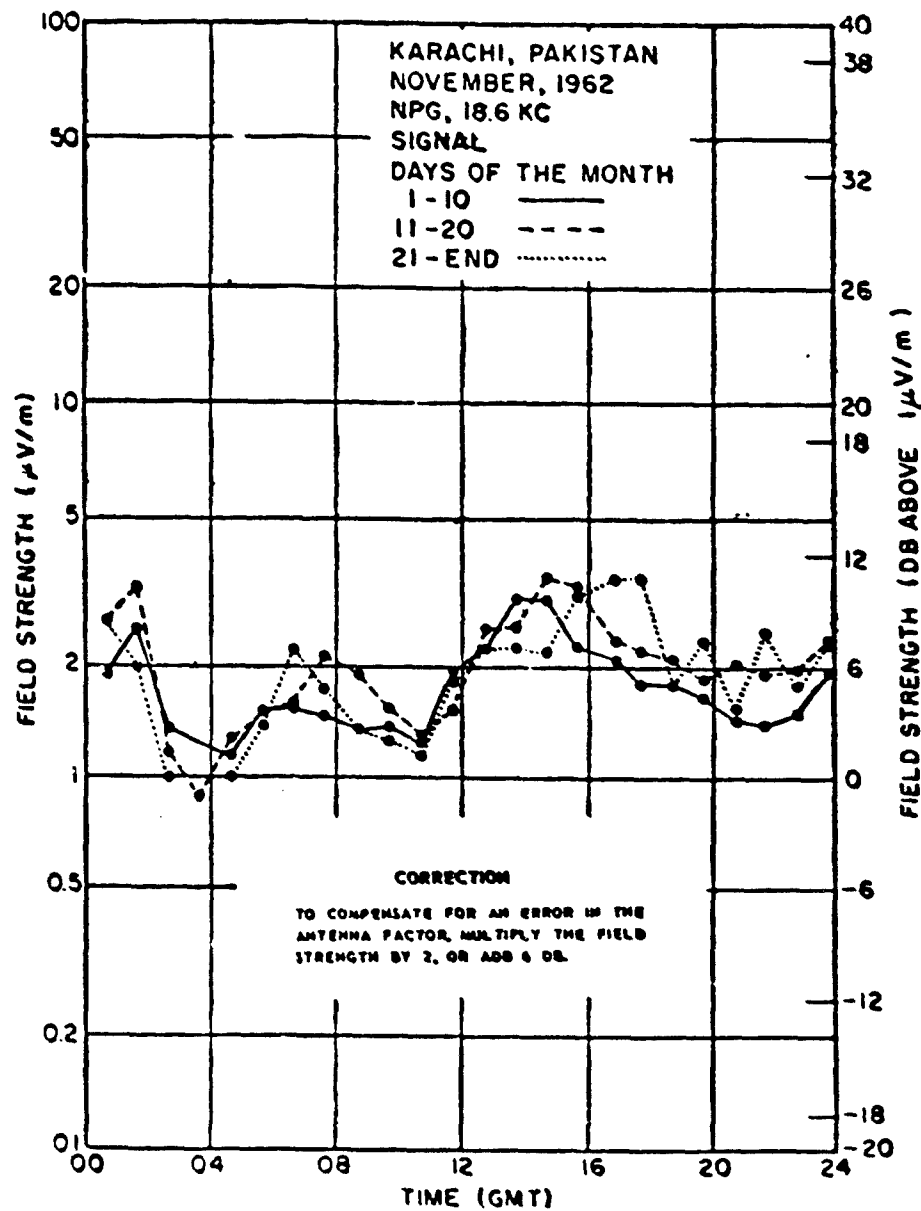


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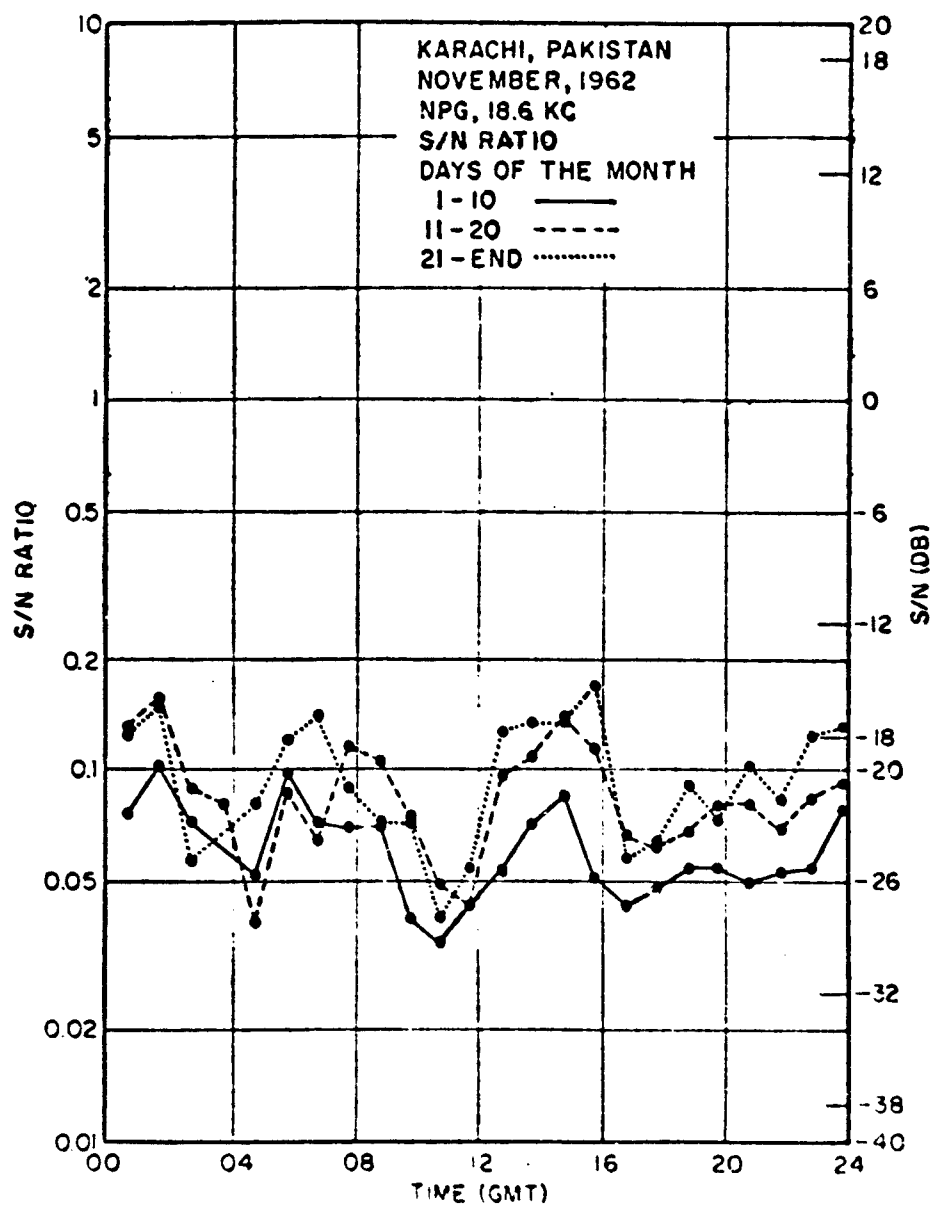


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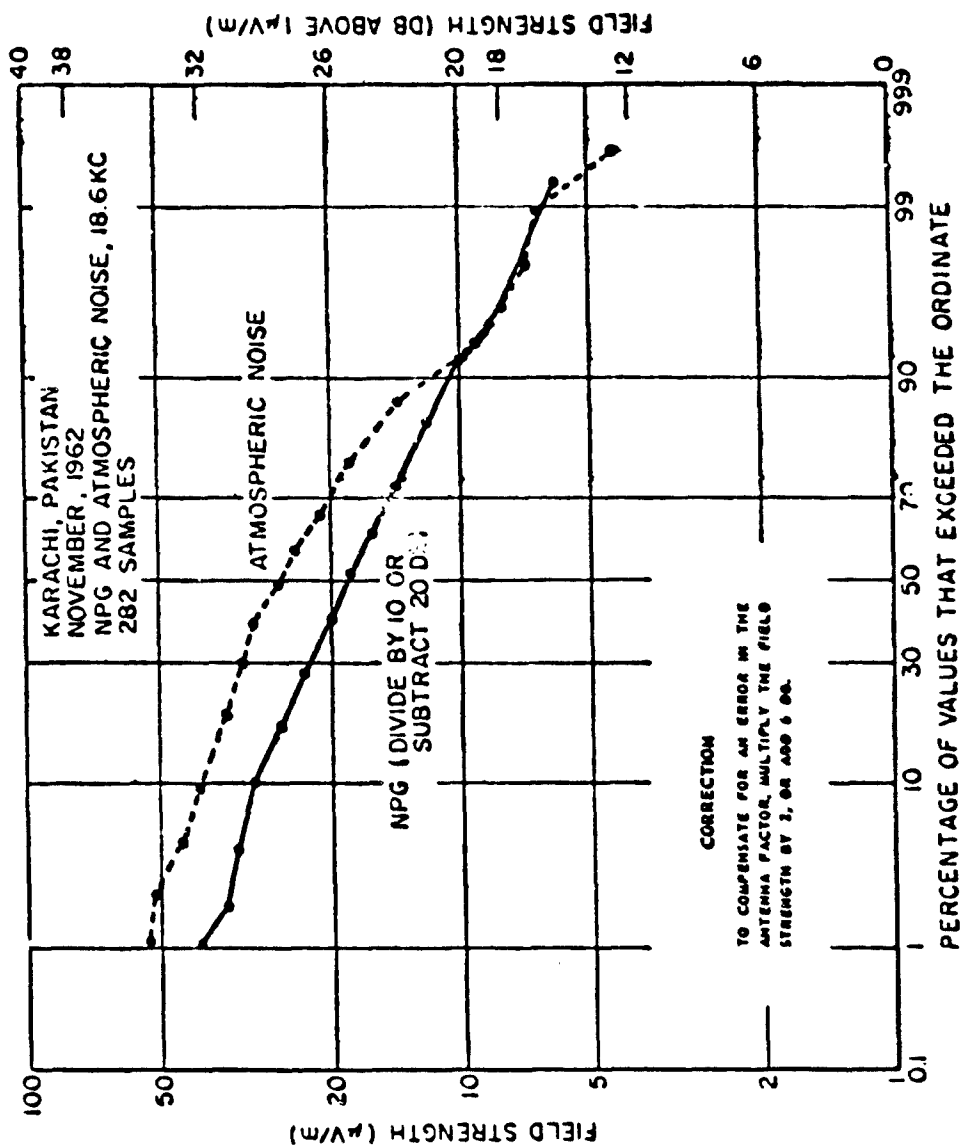


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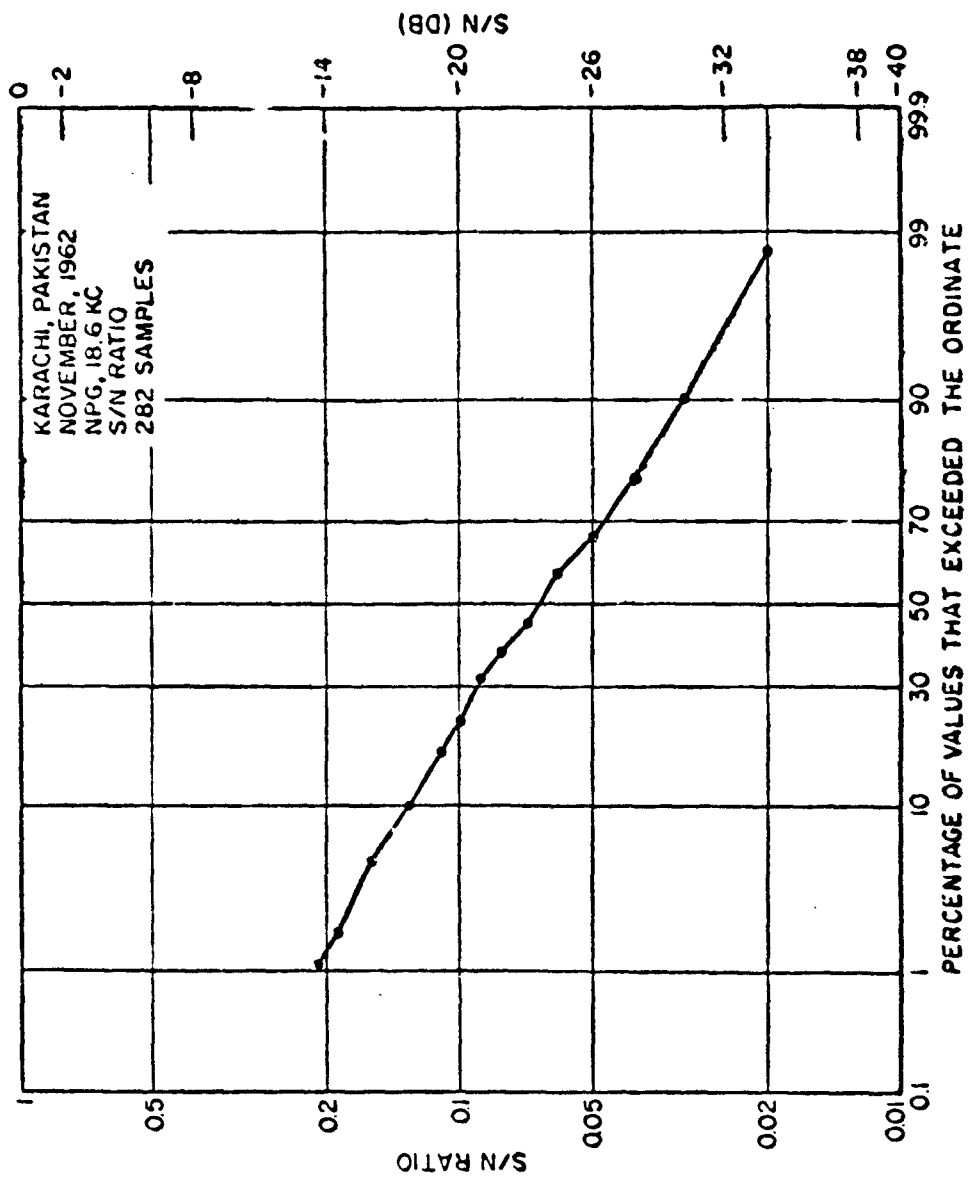


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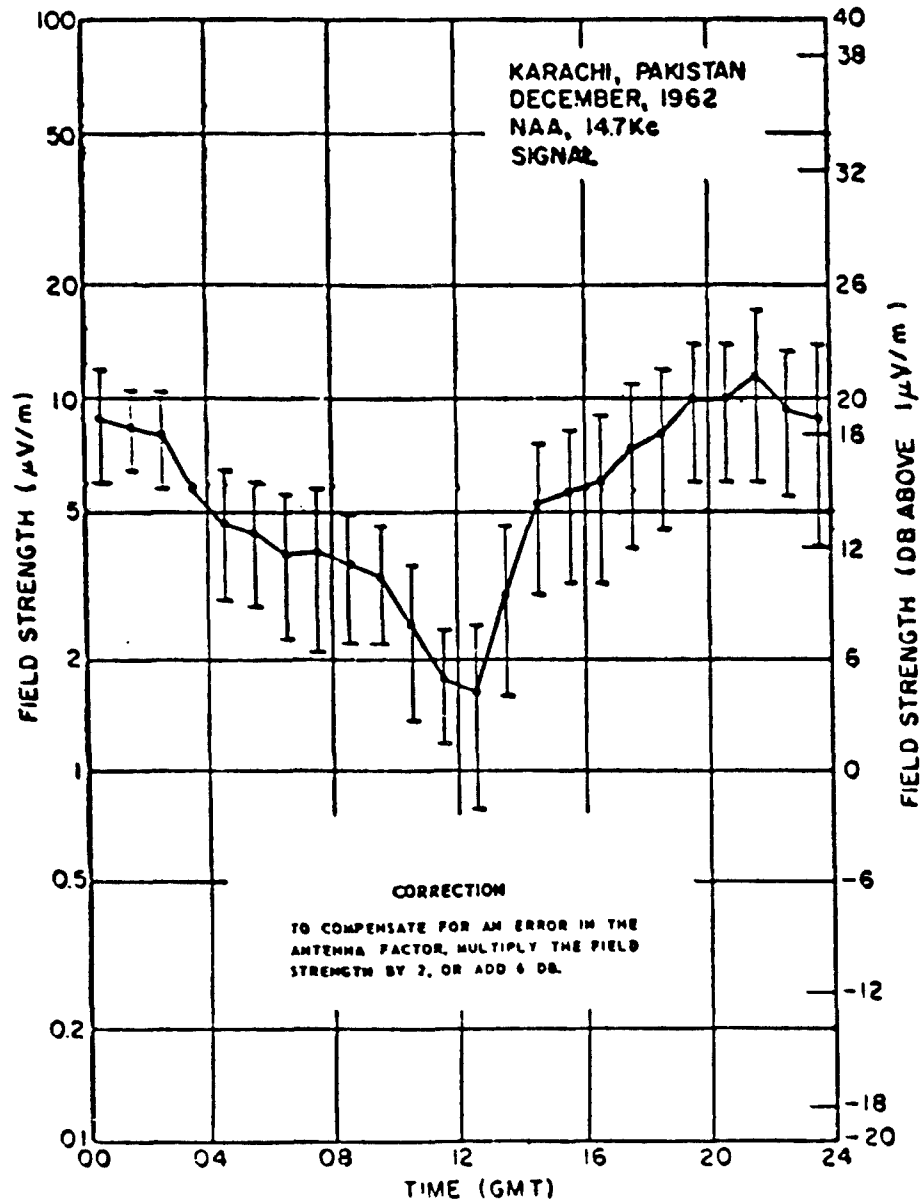


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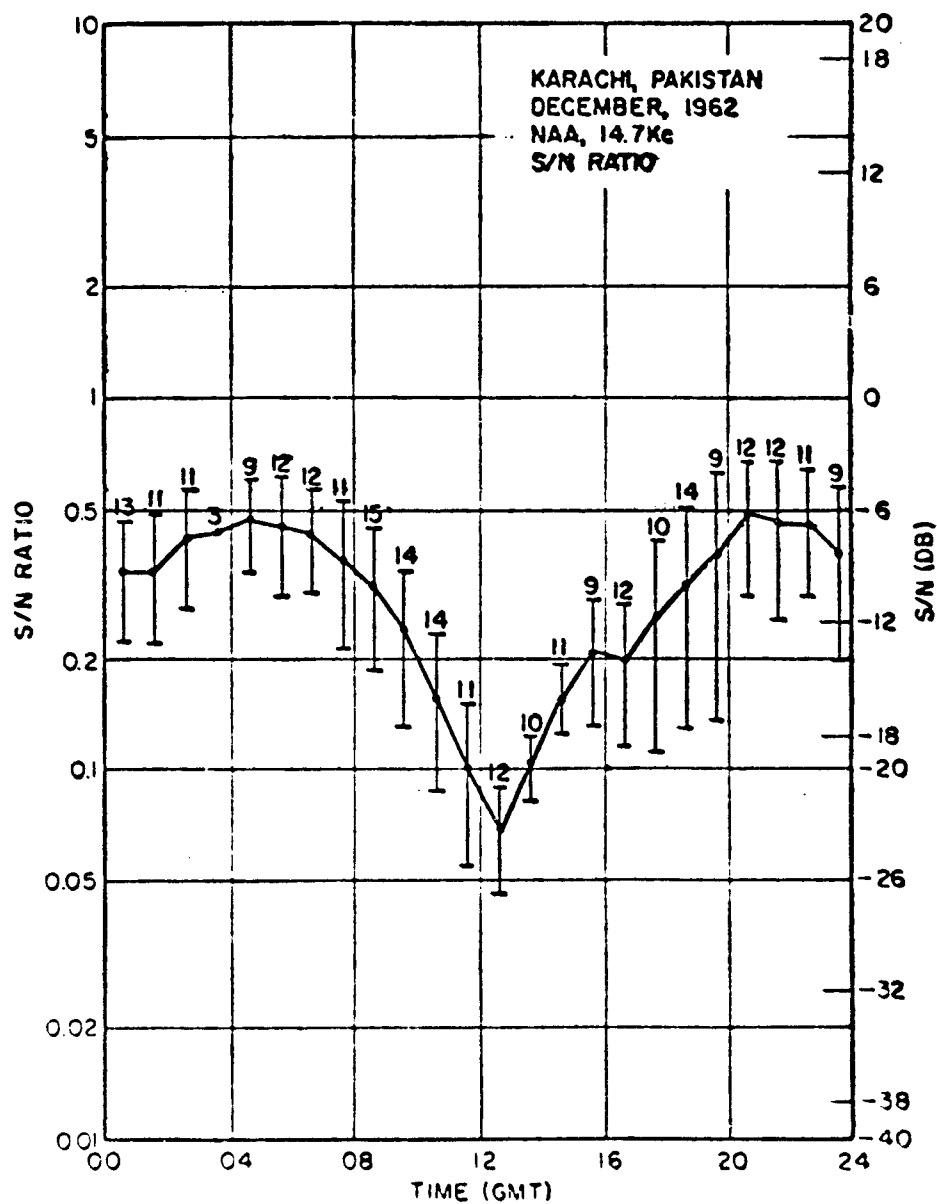


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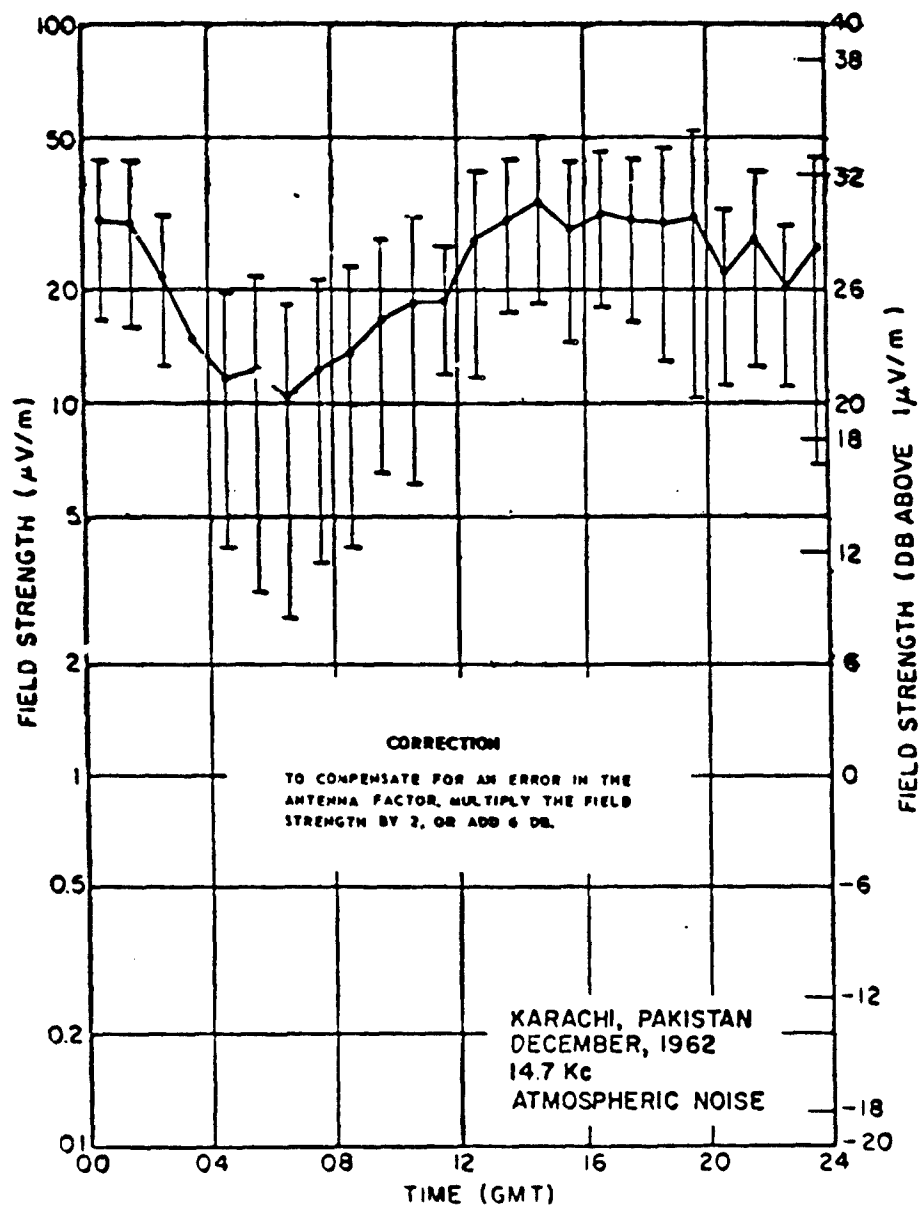


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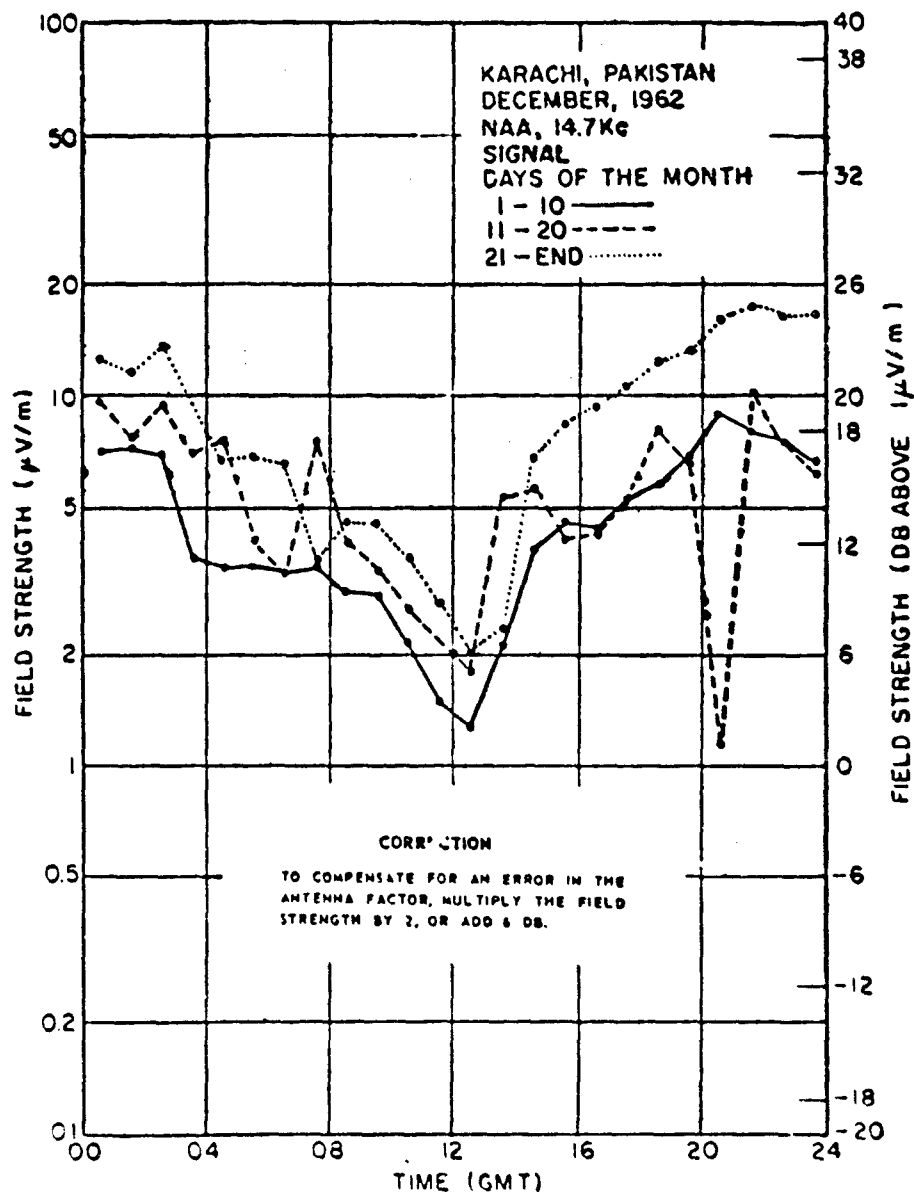


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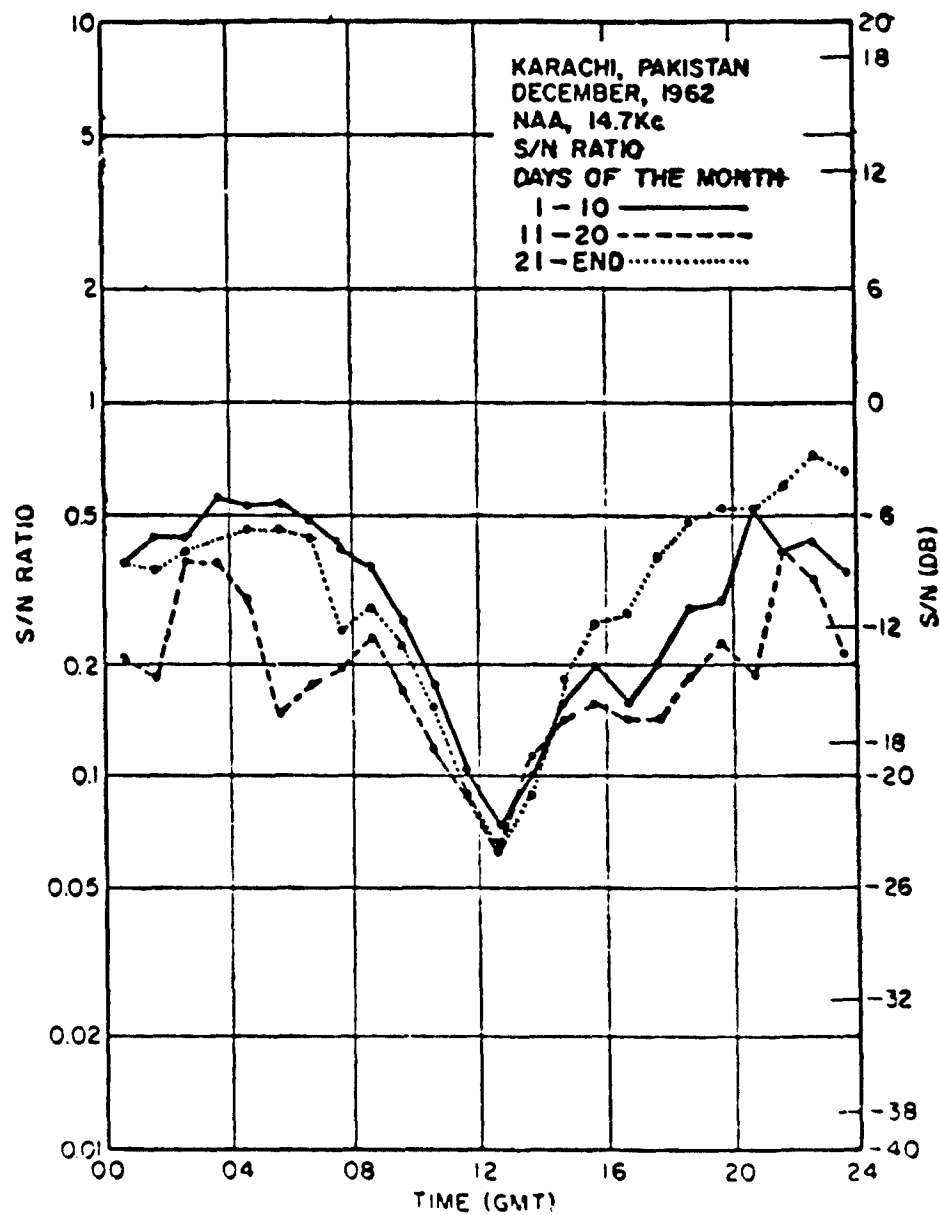


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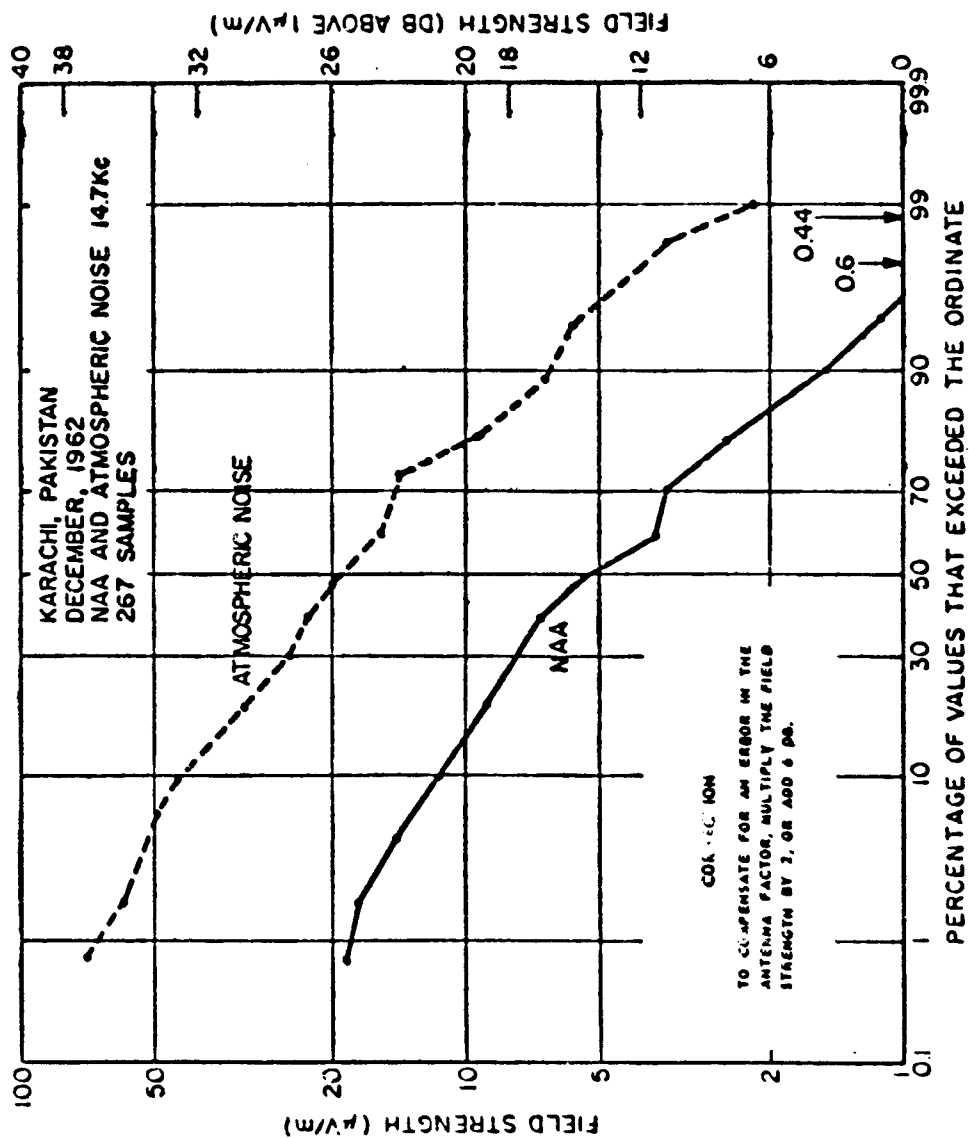


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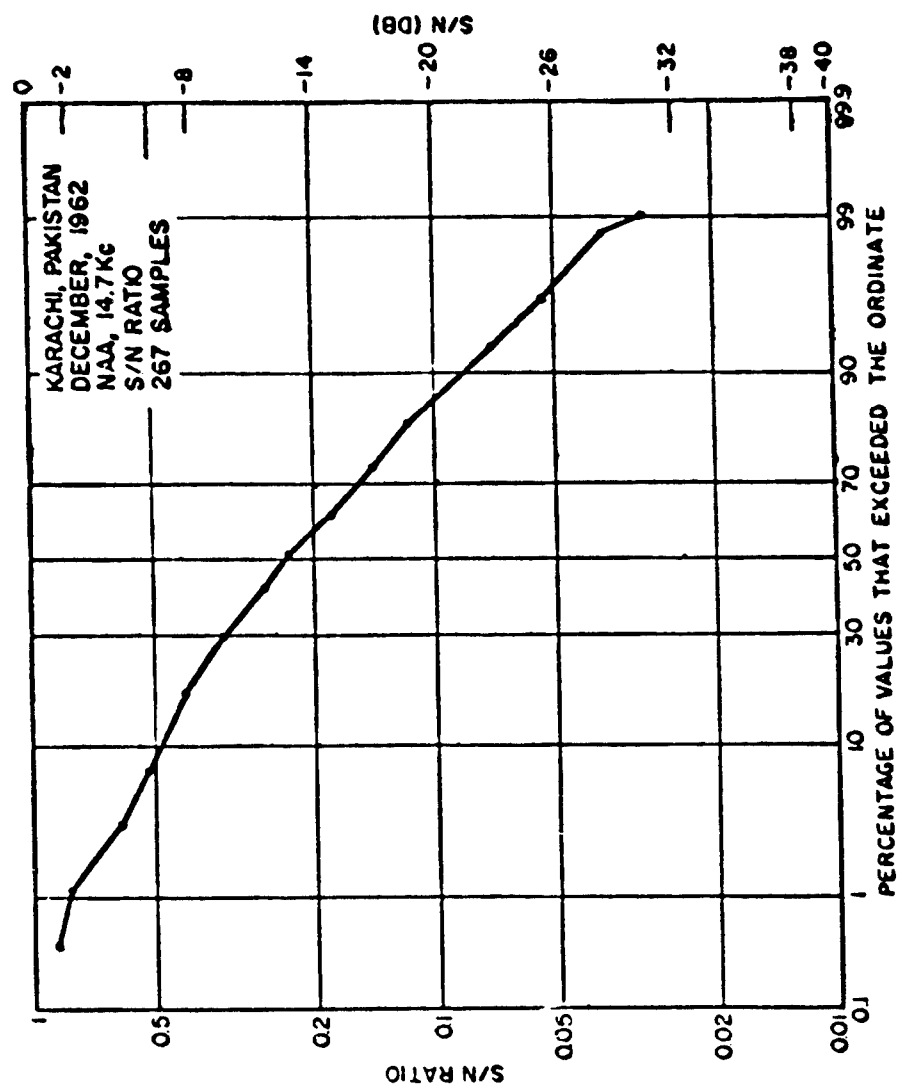


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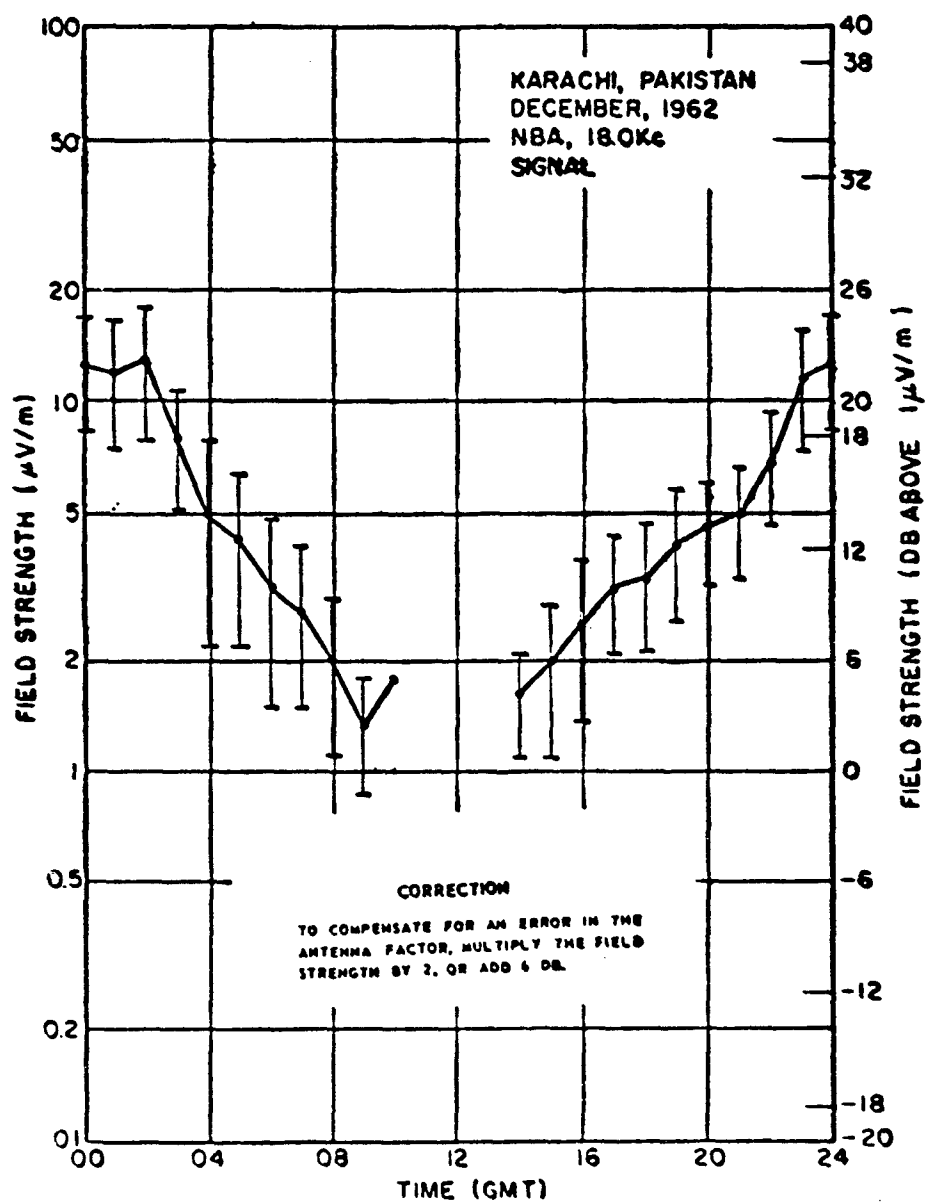


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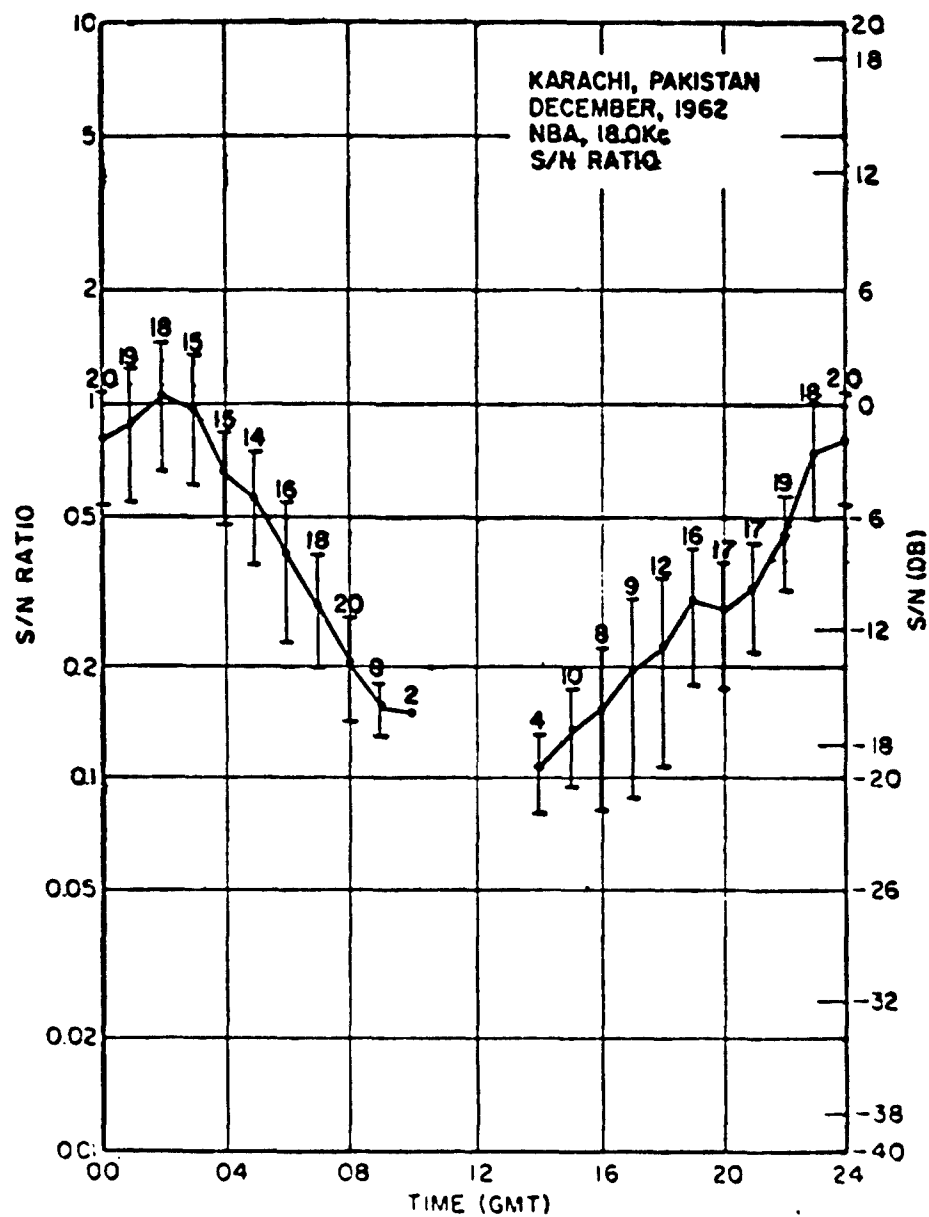


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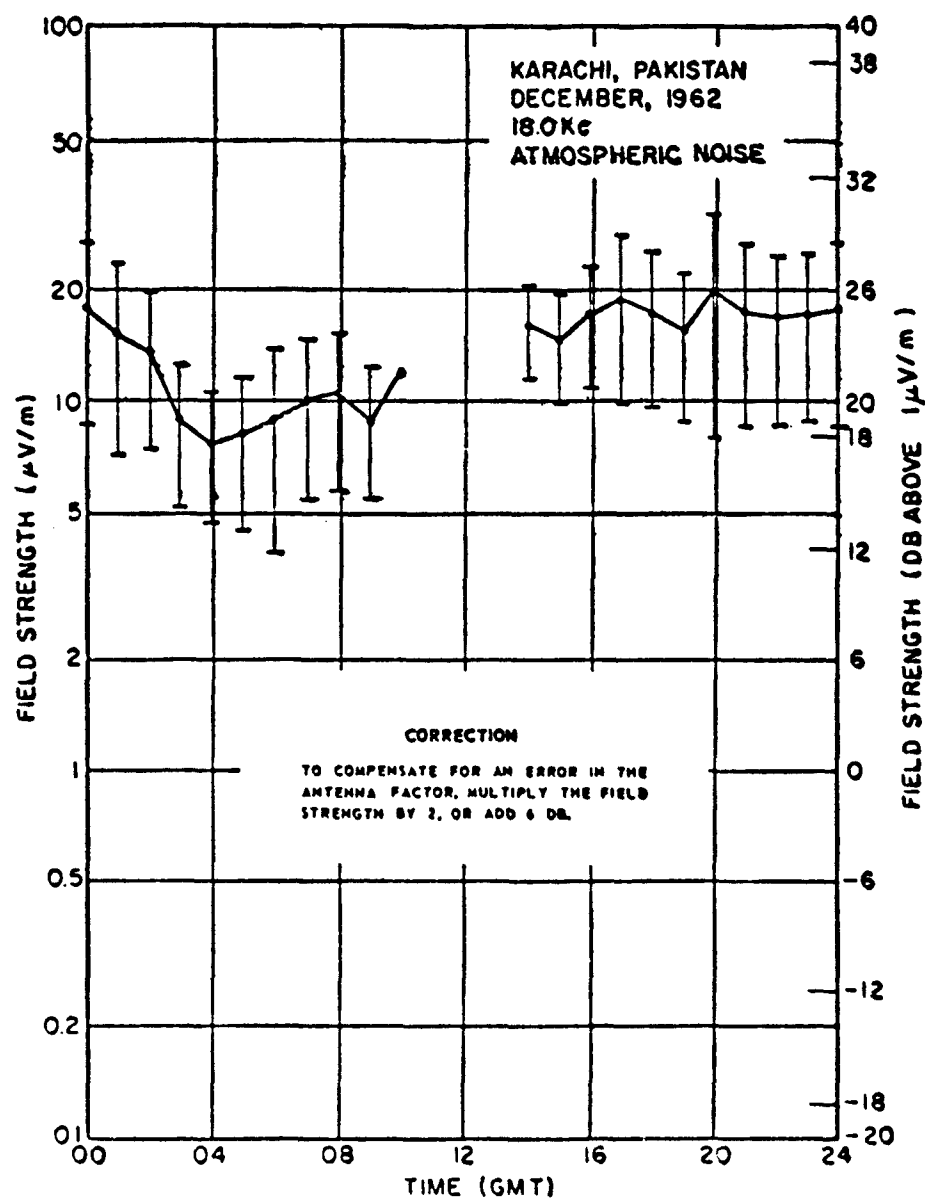


Figure 264

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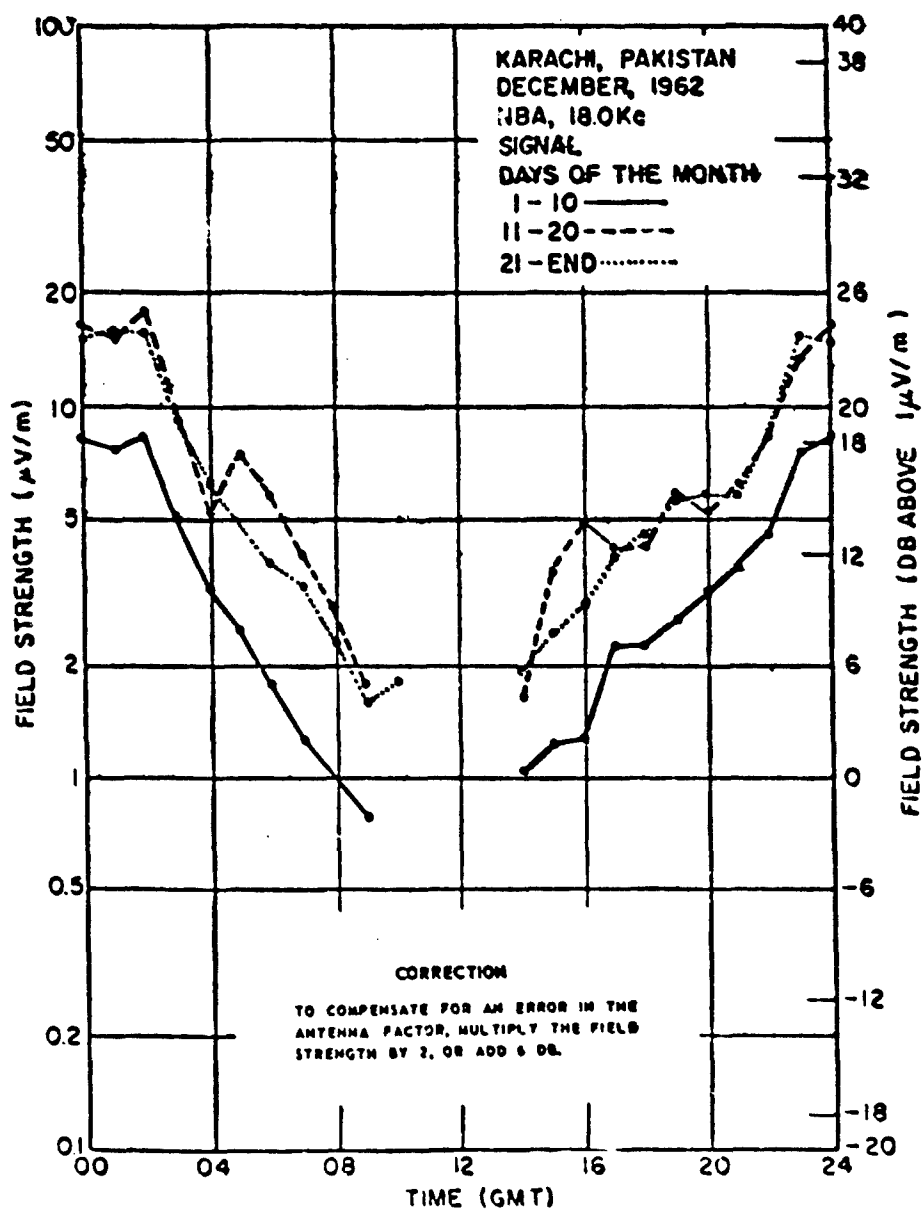


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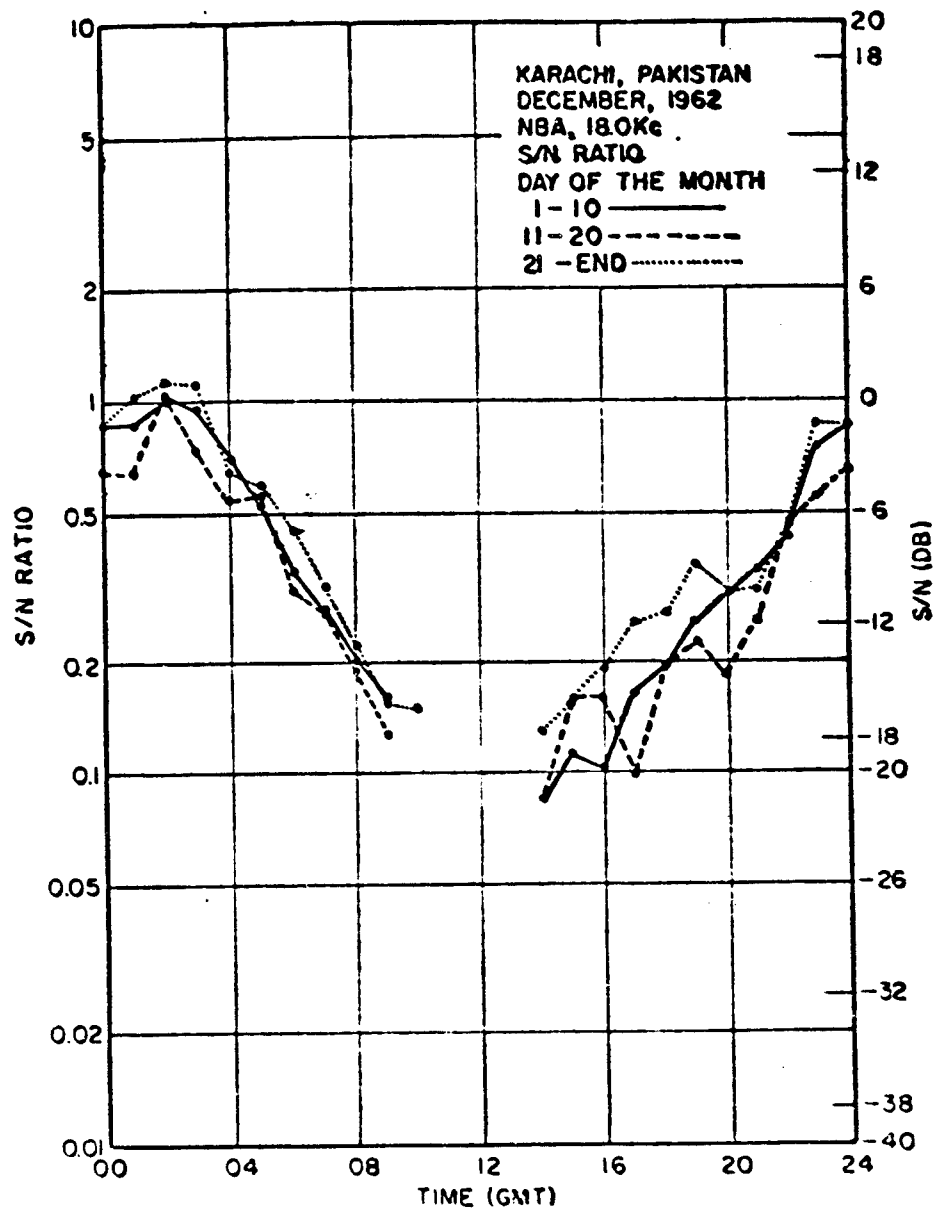


Figure 26a

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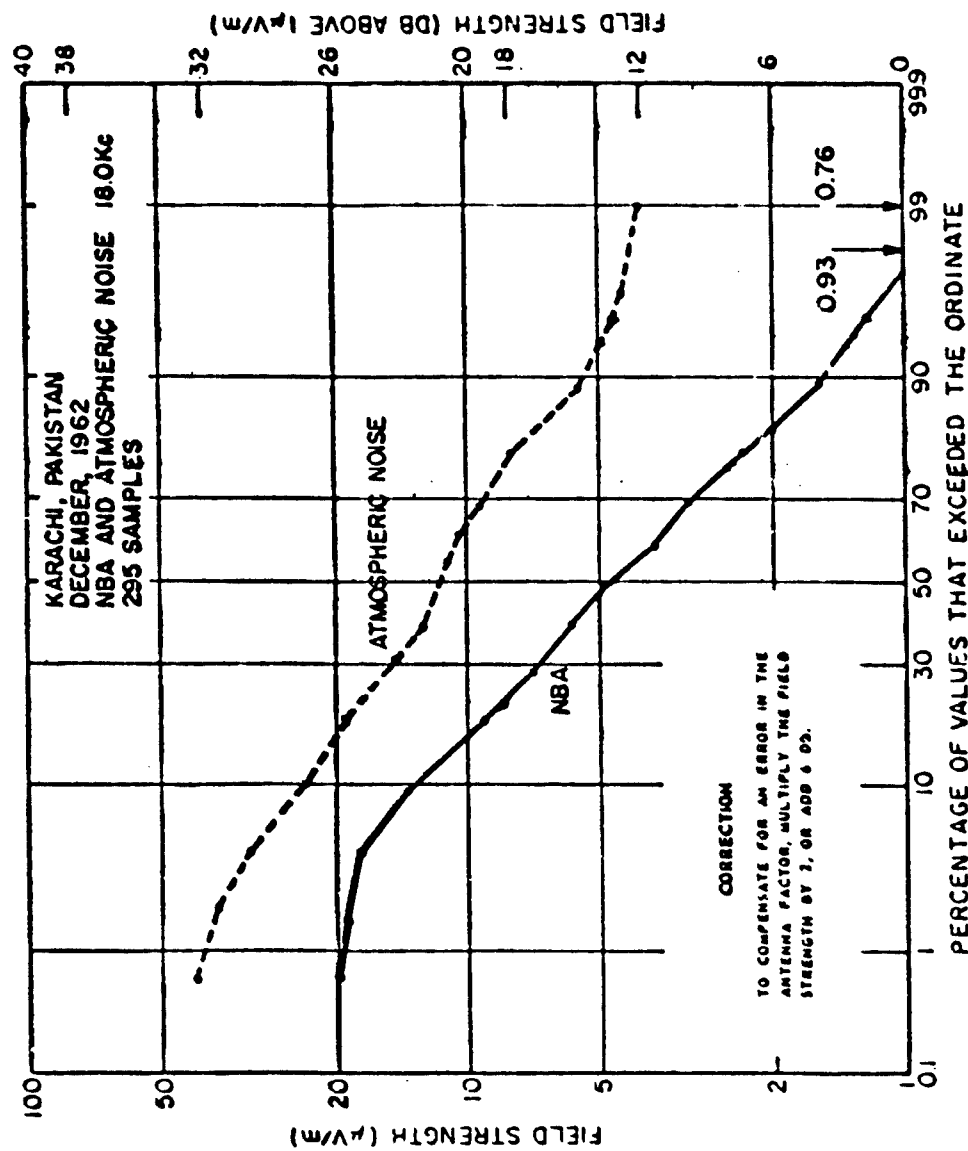


Figure 267

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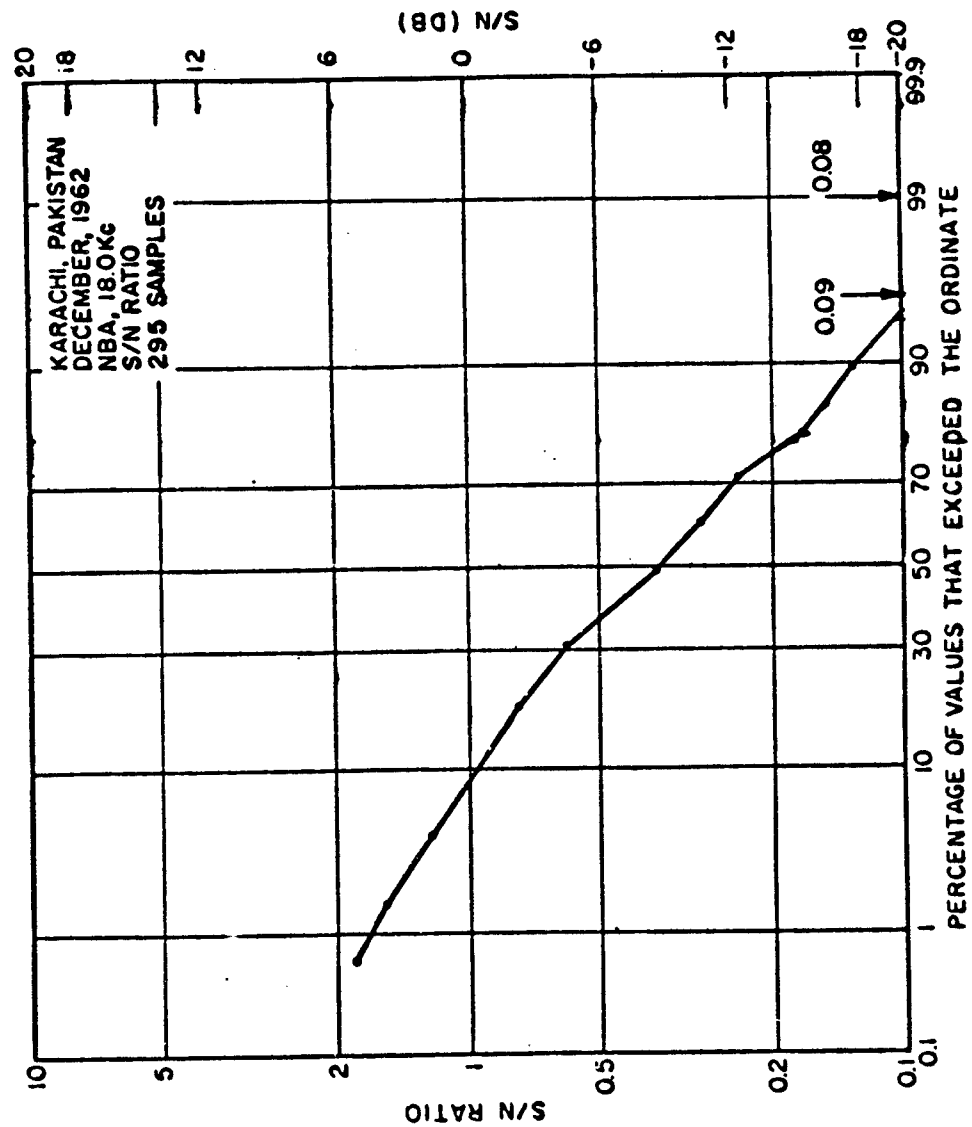


Figure 268

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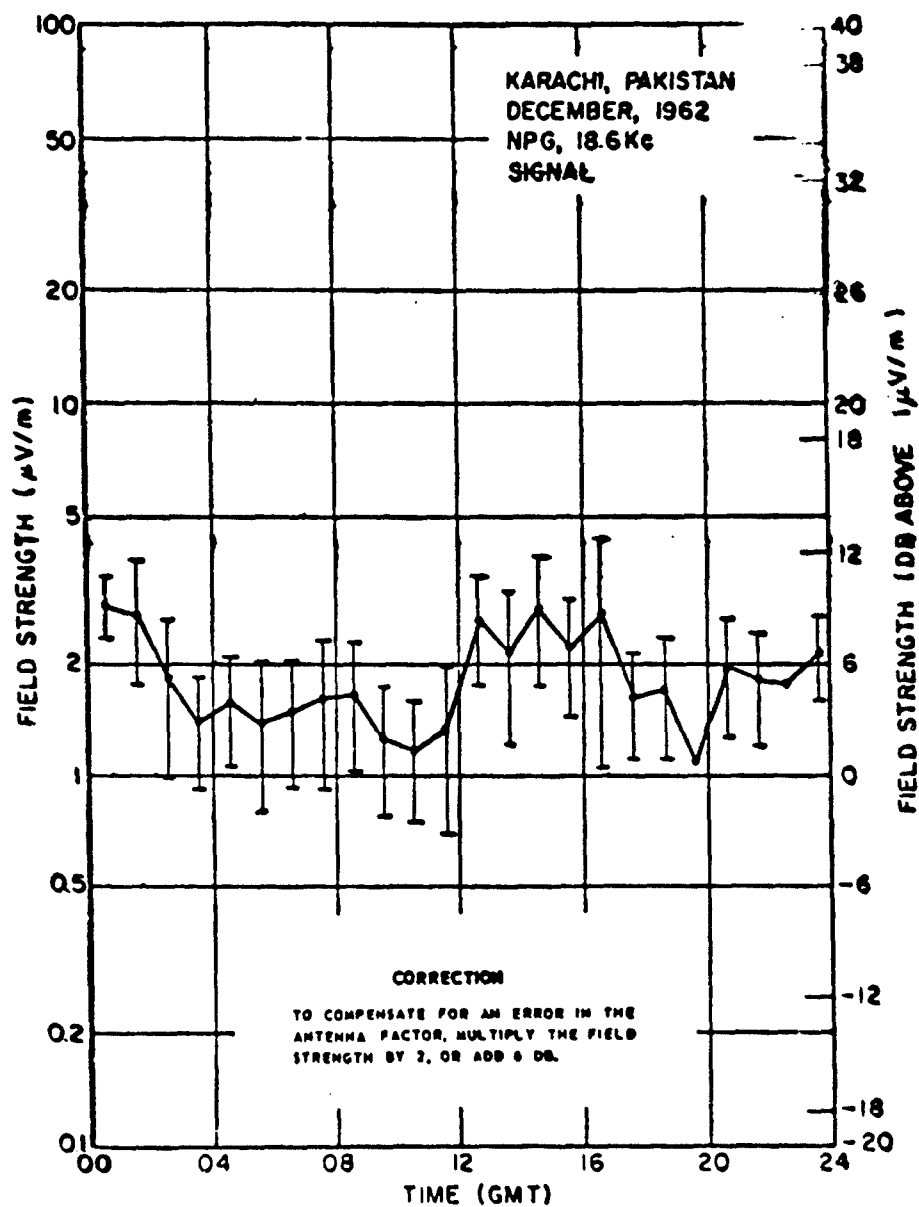


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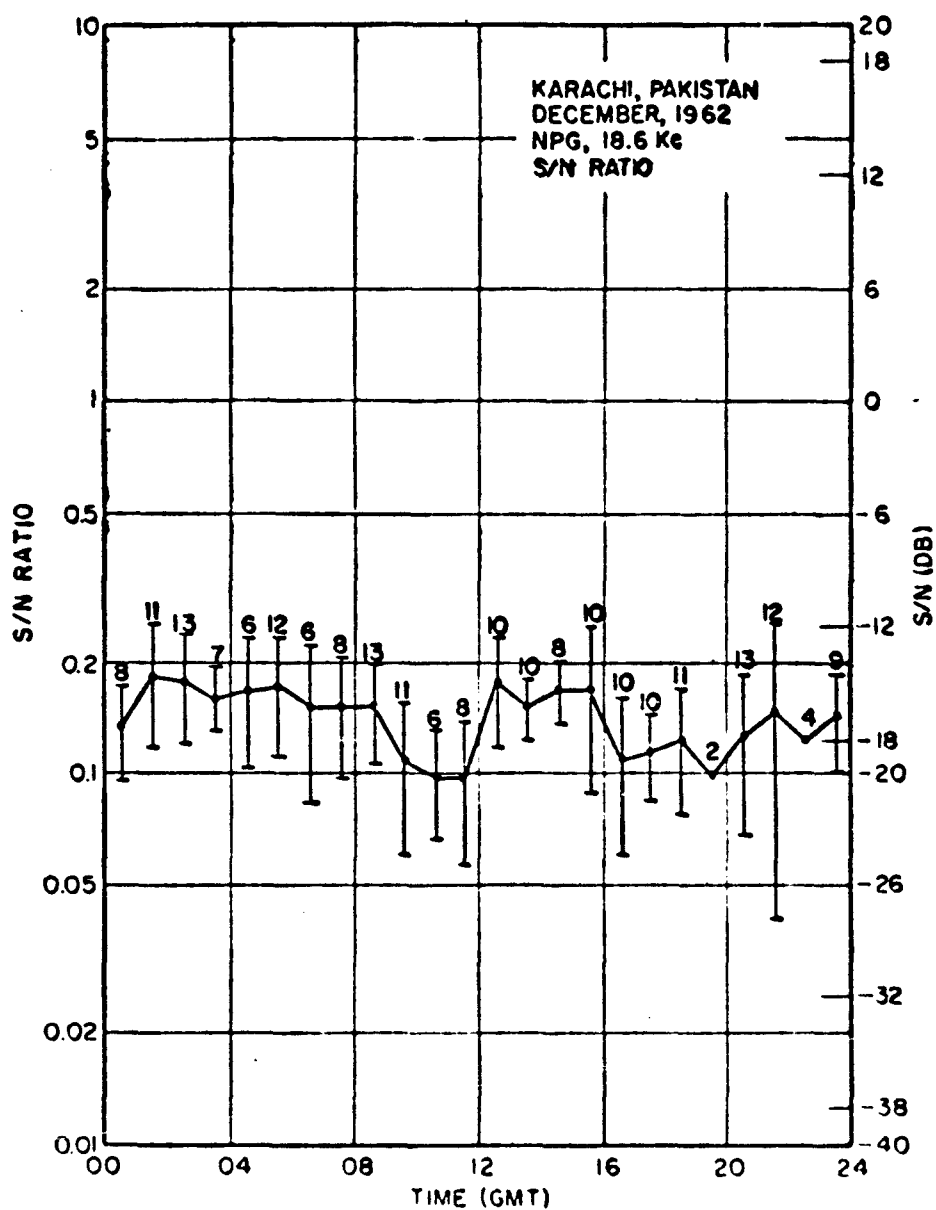


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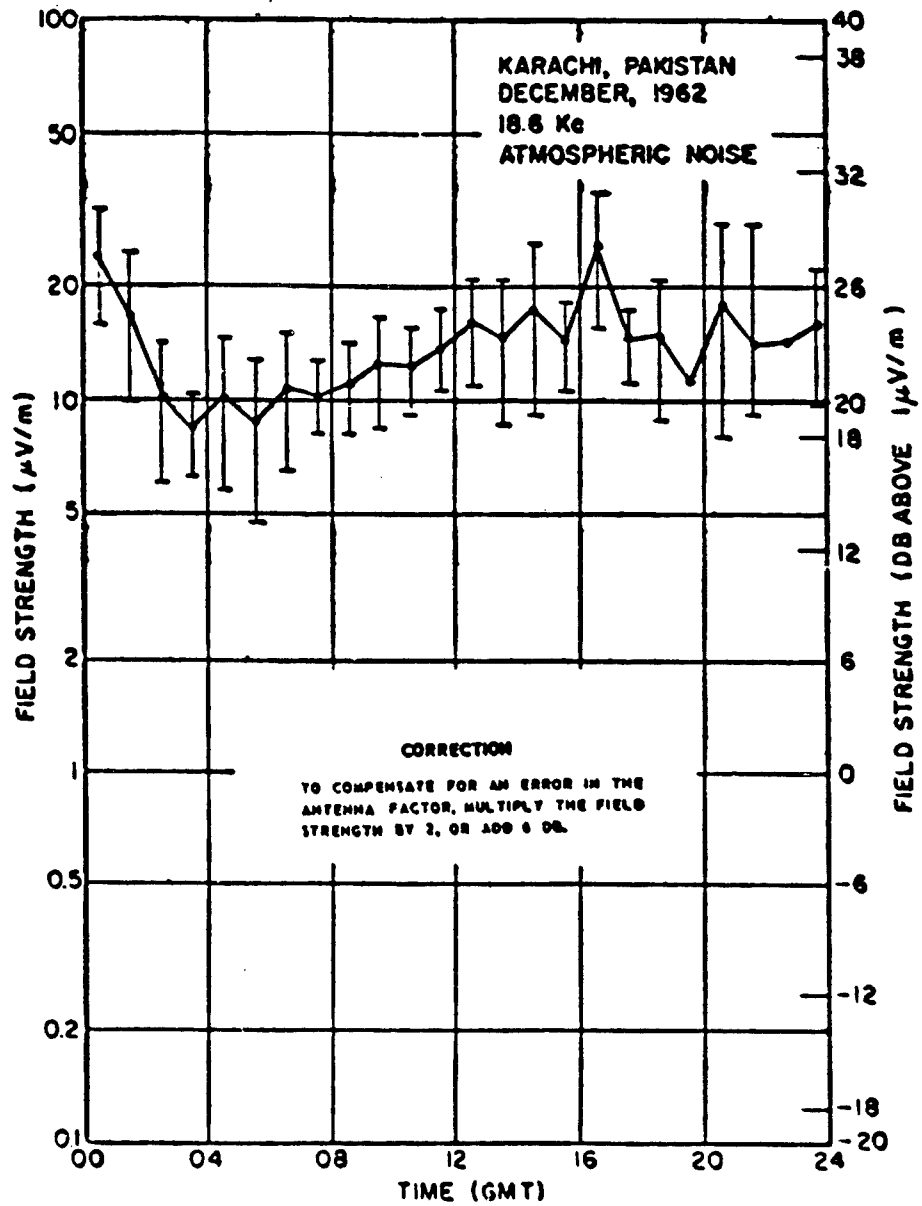


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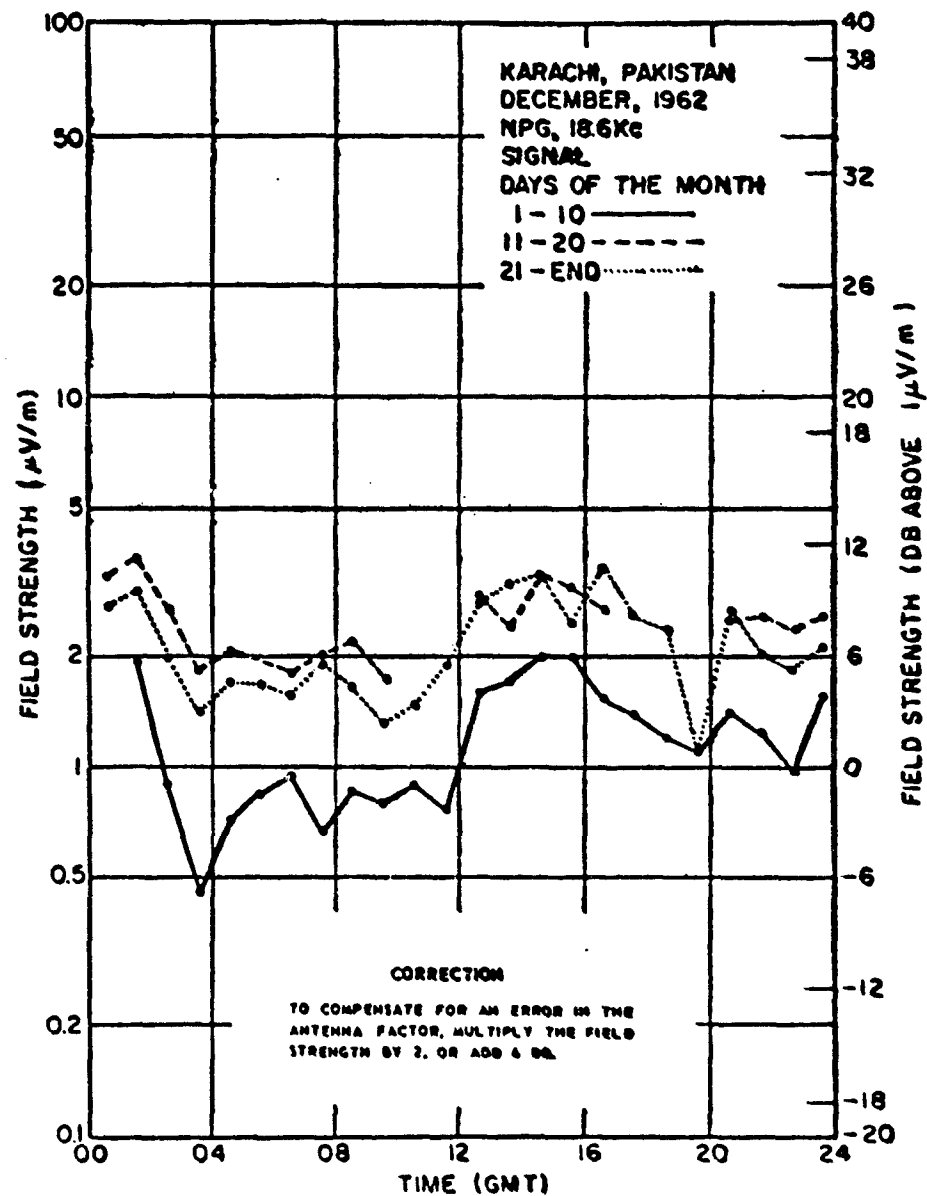


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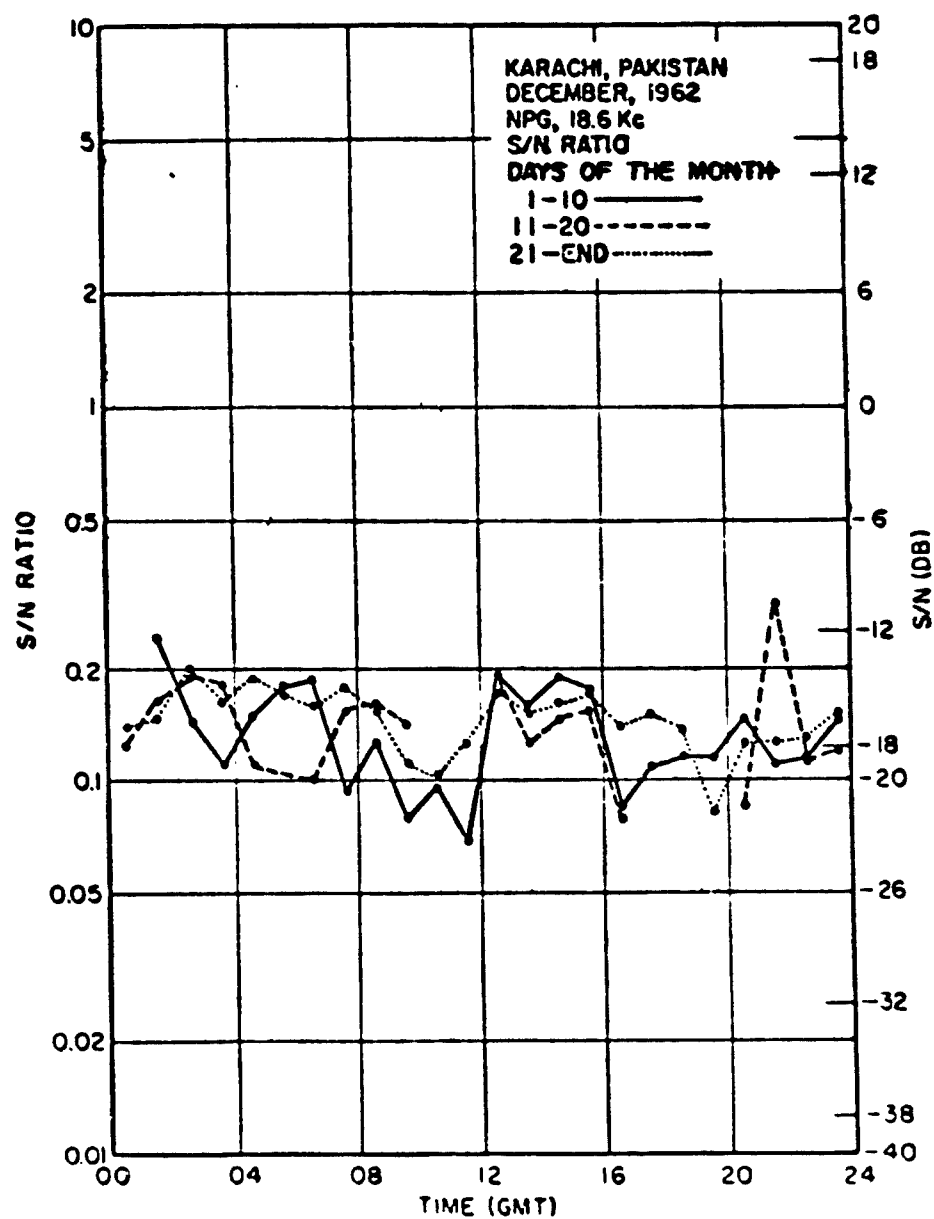


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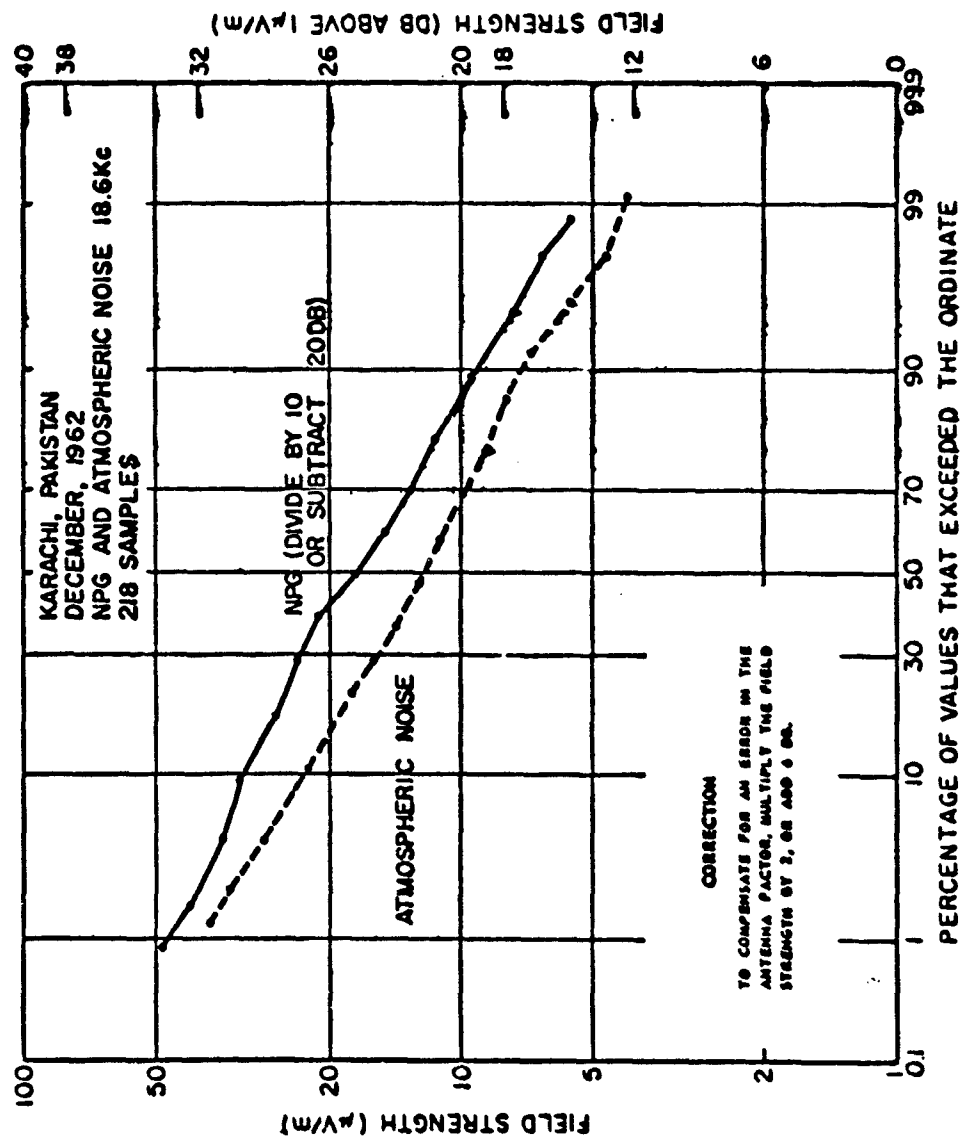


Figure 274

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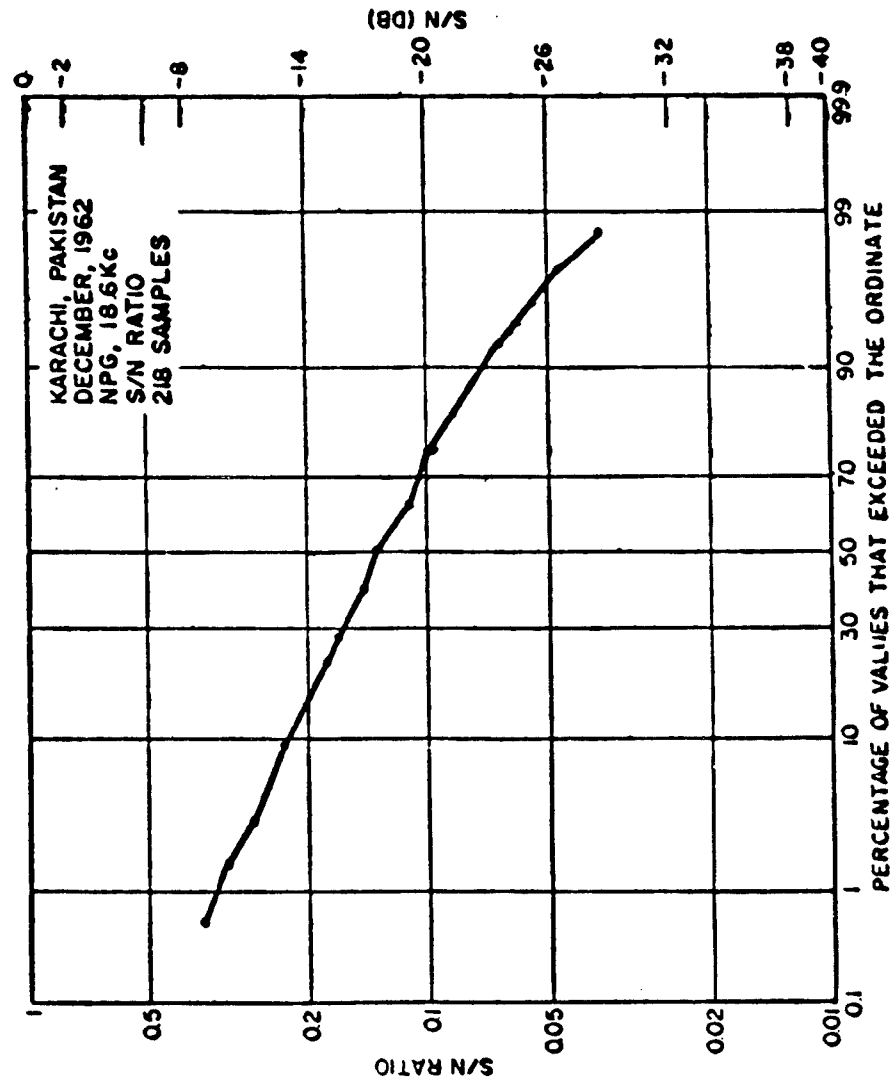


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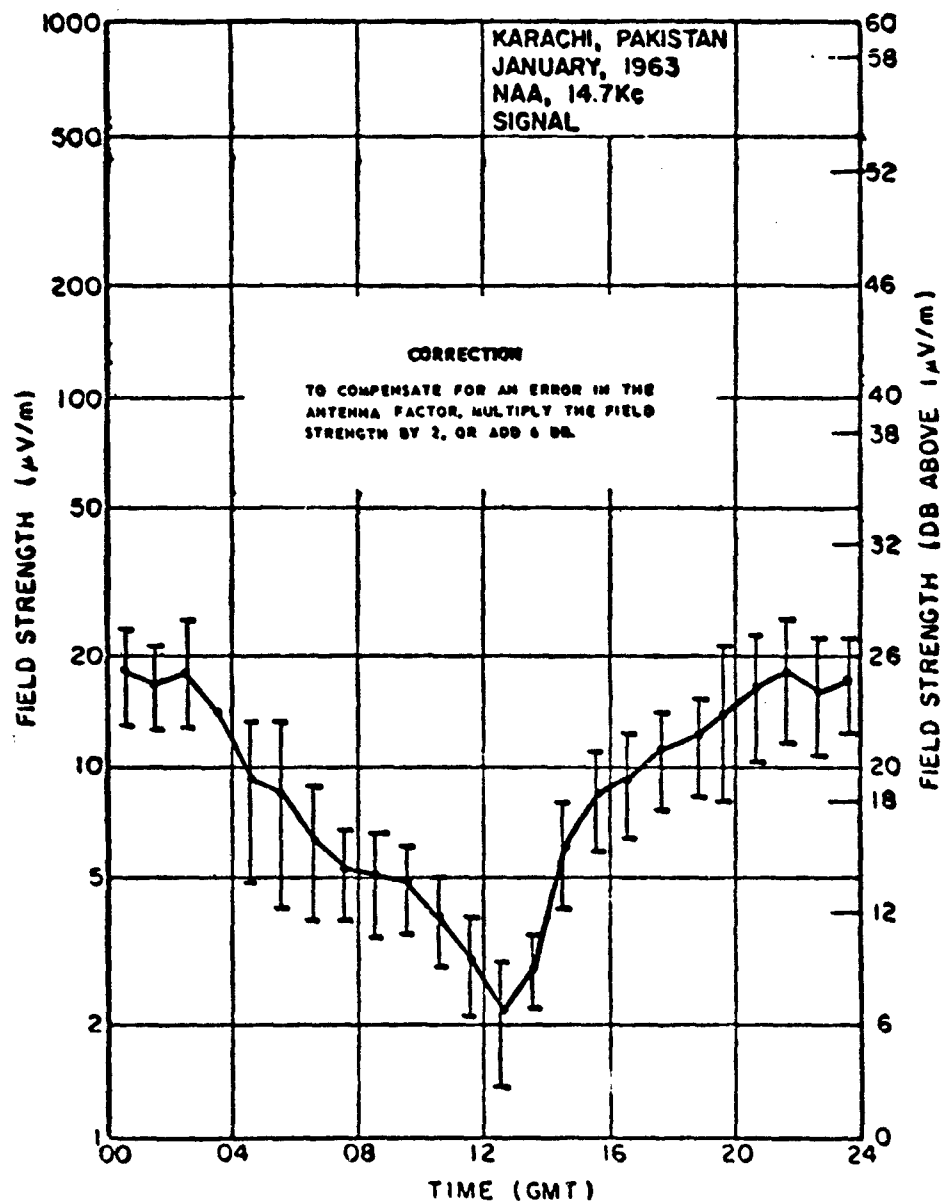


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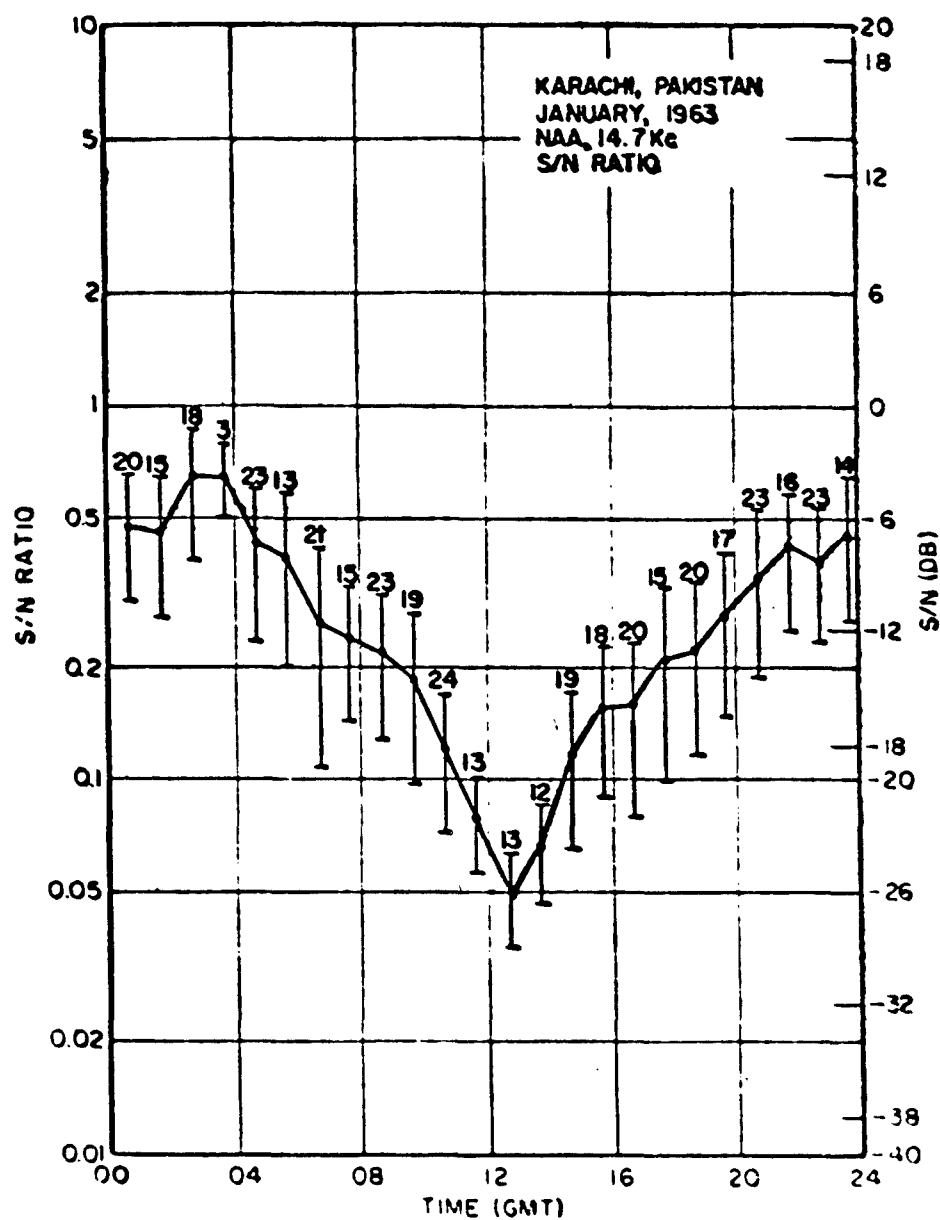


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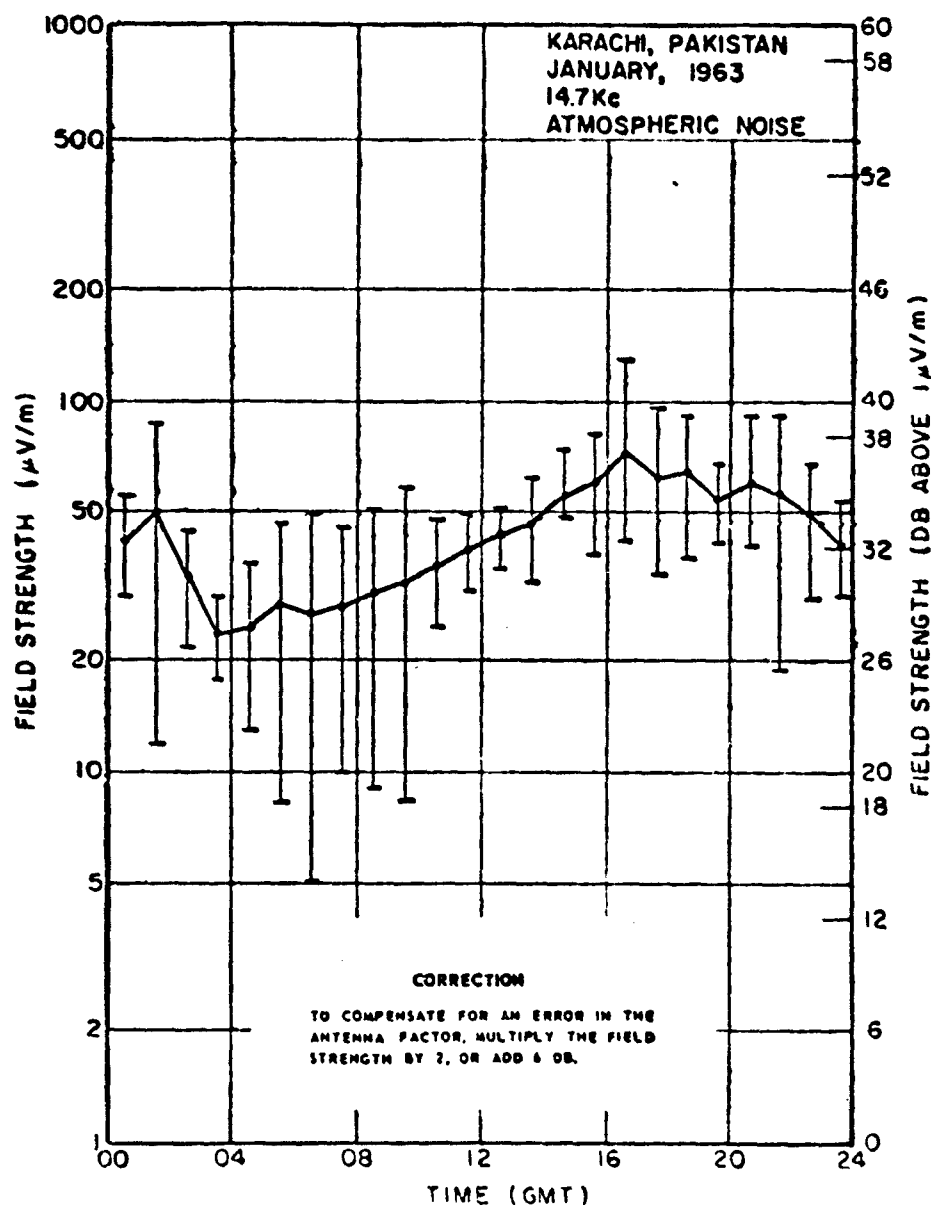


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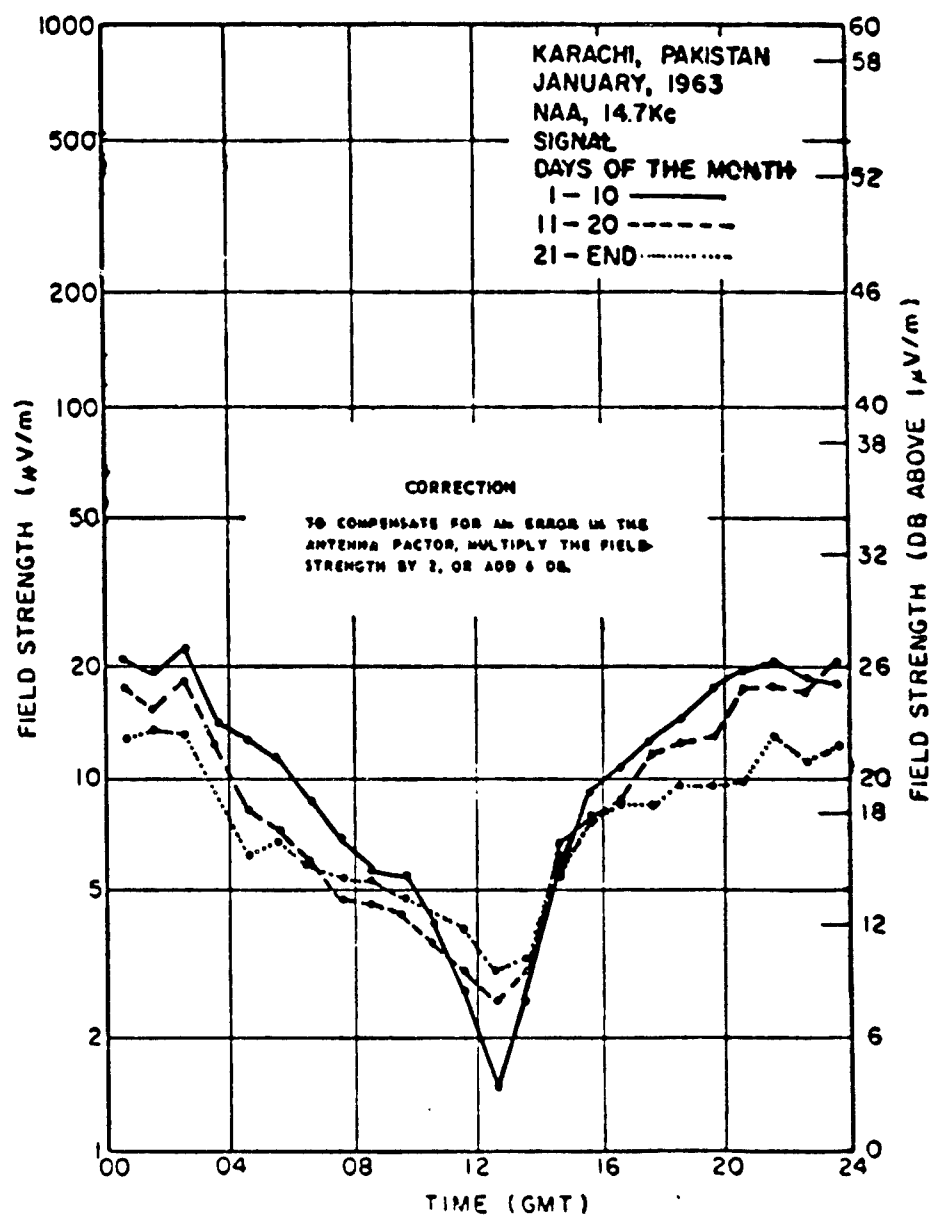


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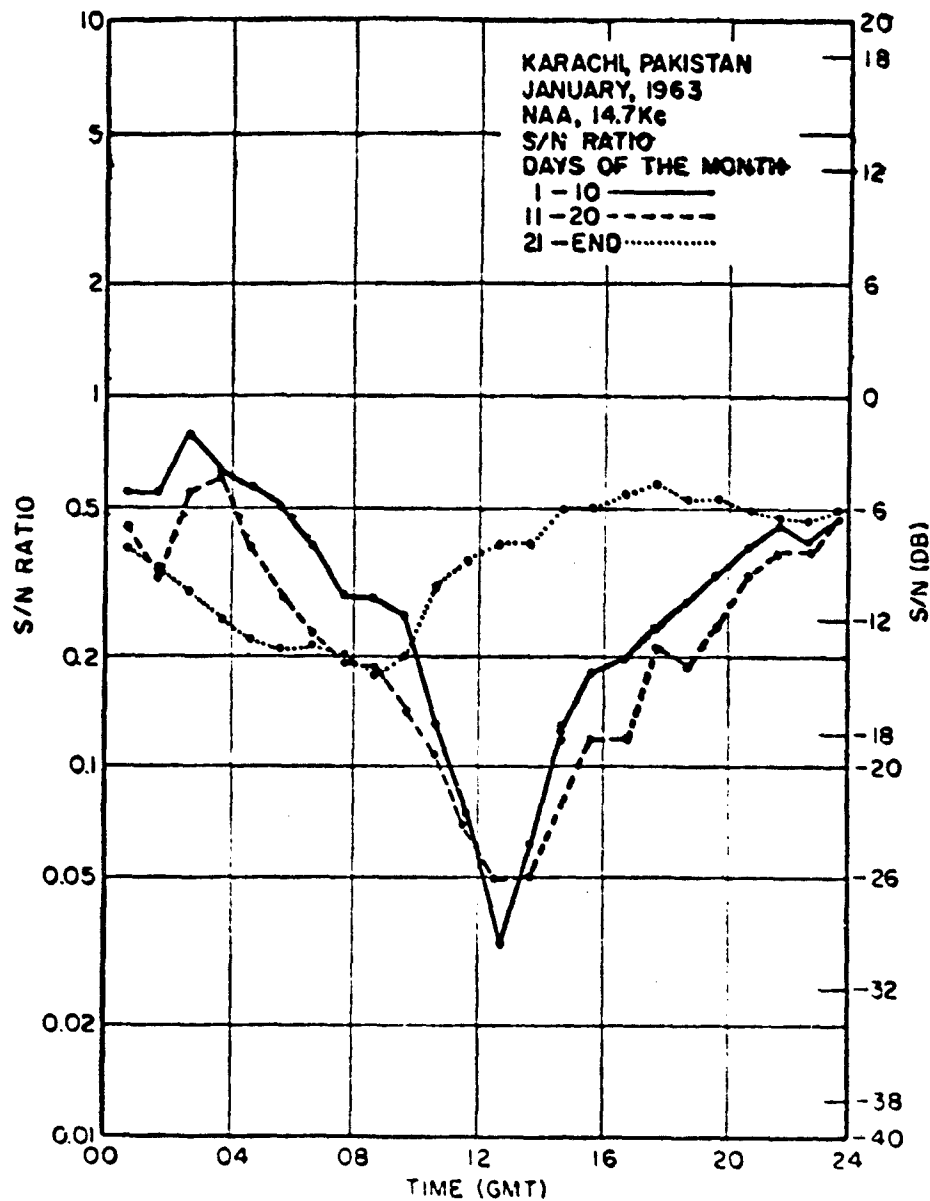


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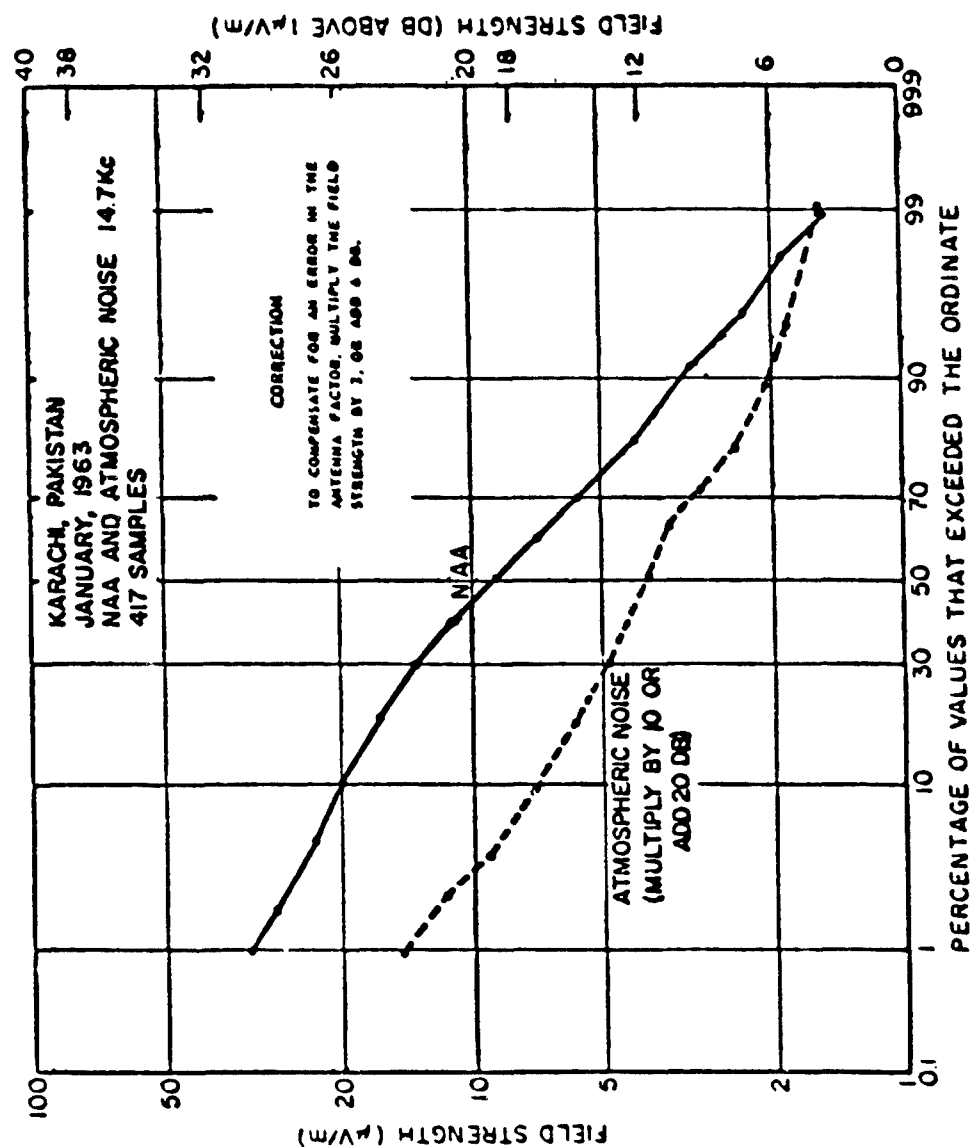


Figure 281

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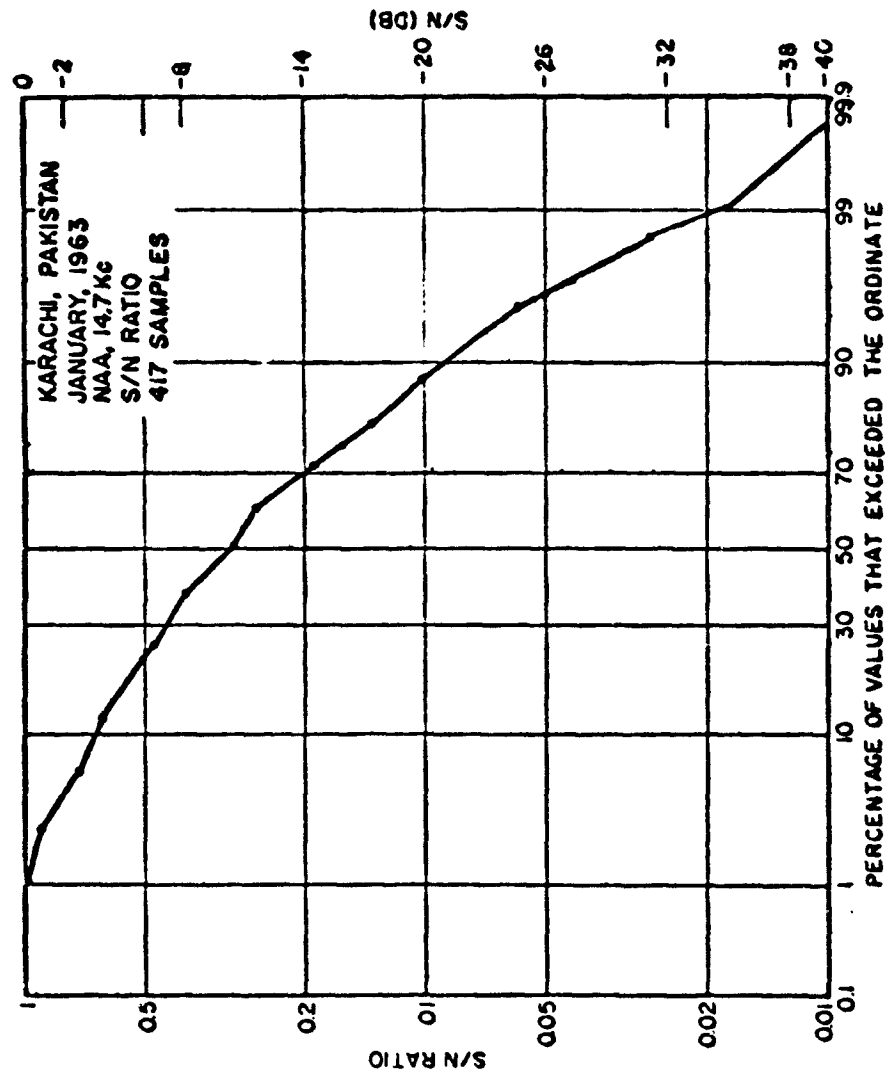


Figure 282

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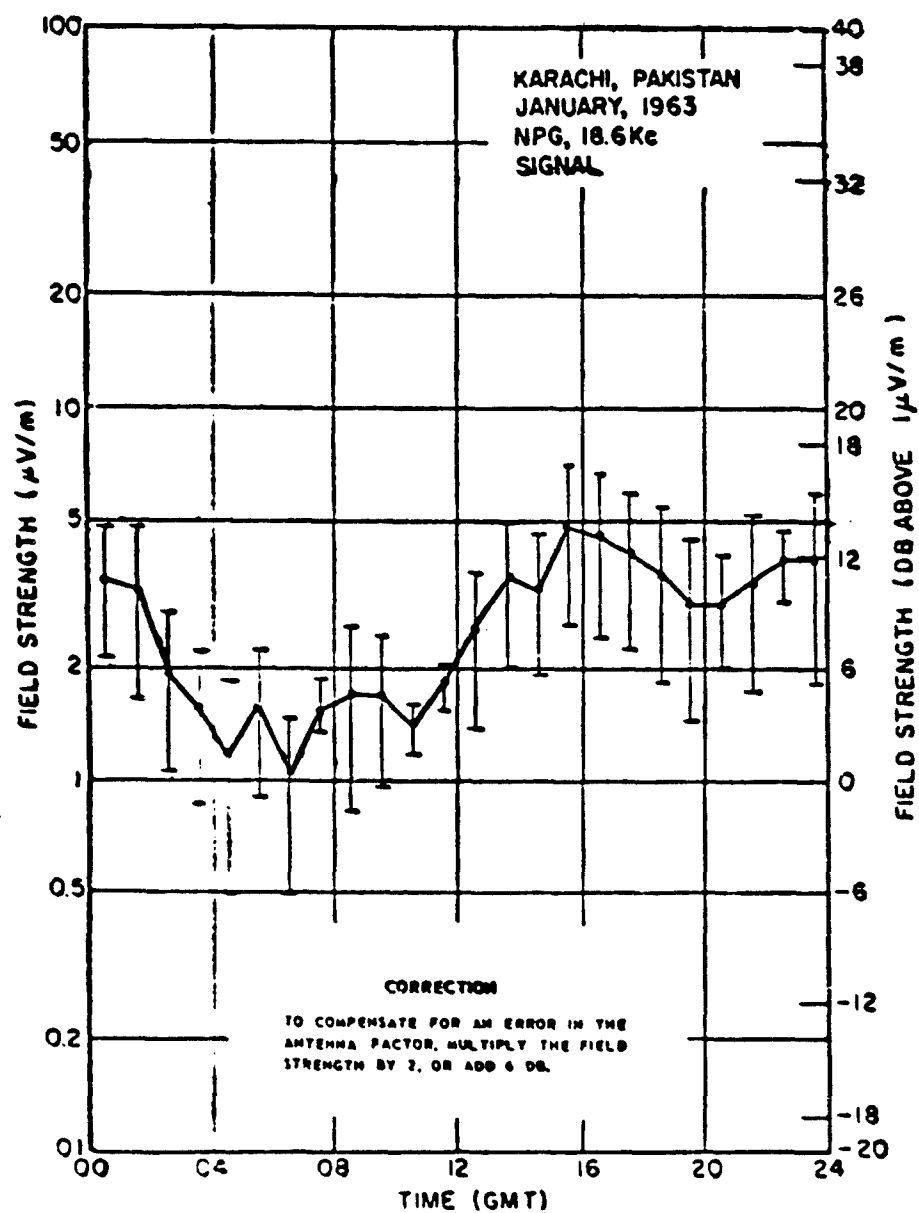


Figure 283

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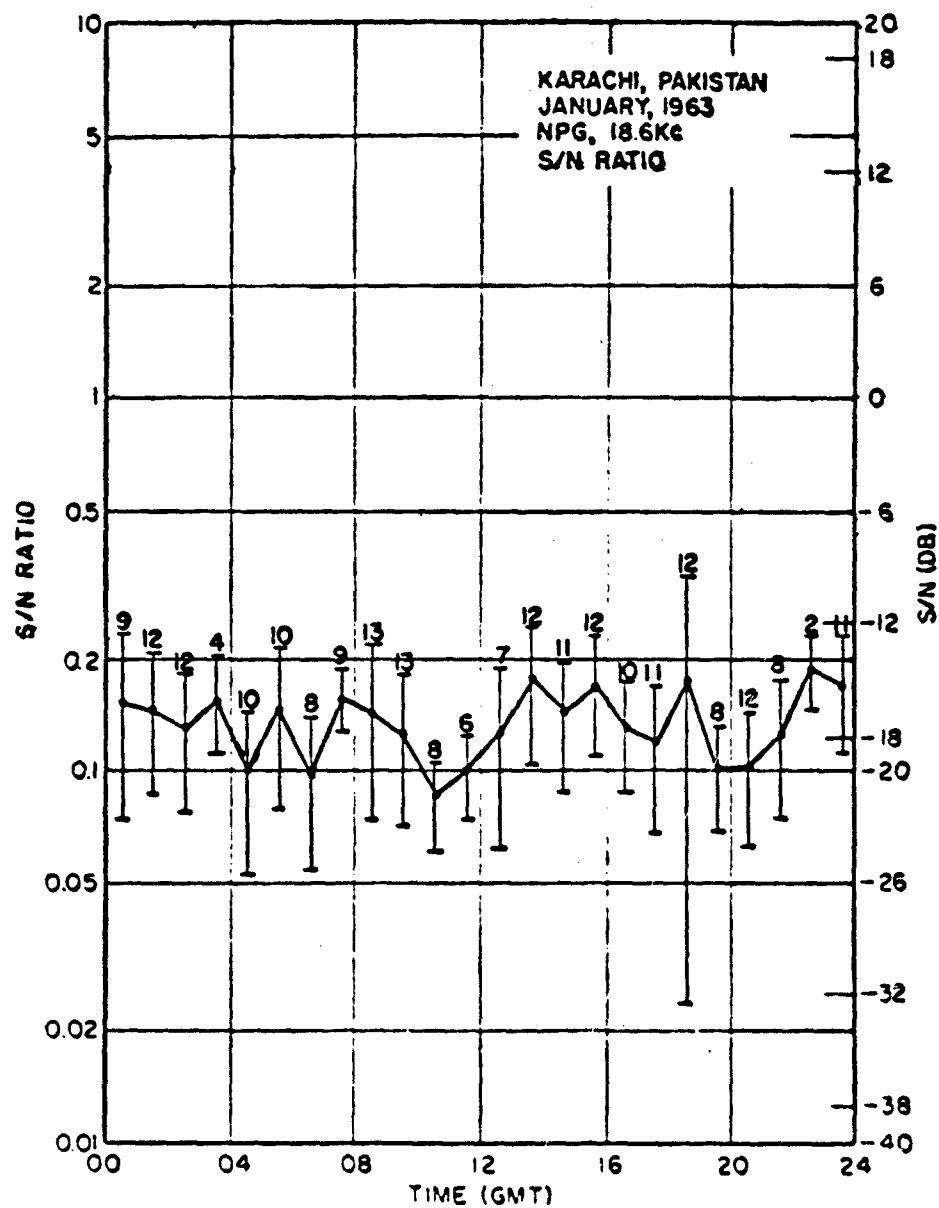


Figure 284

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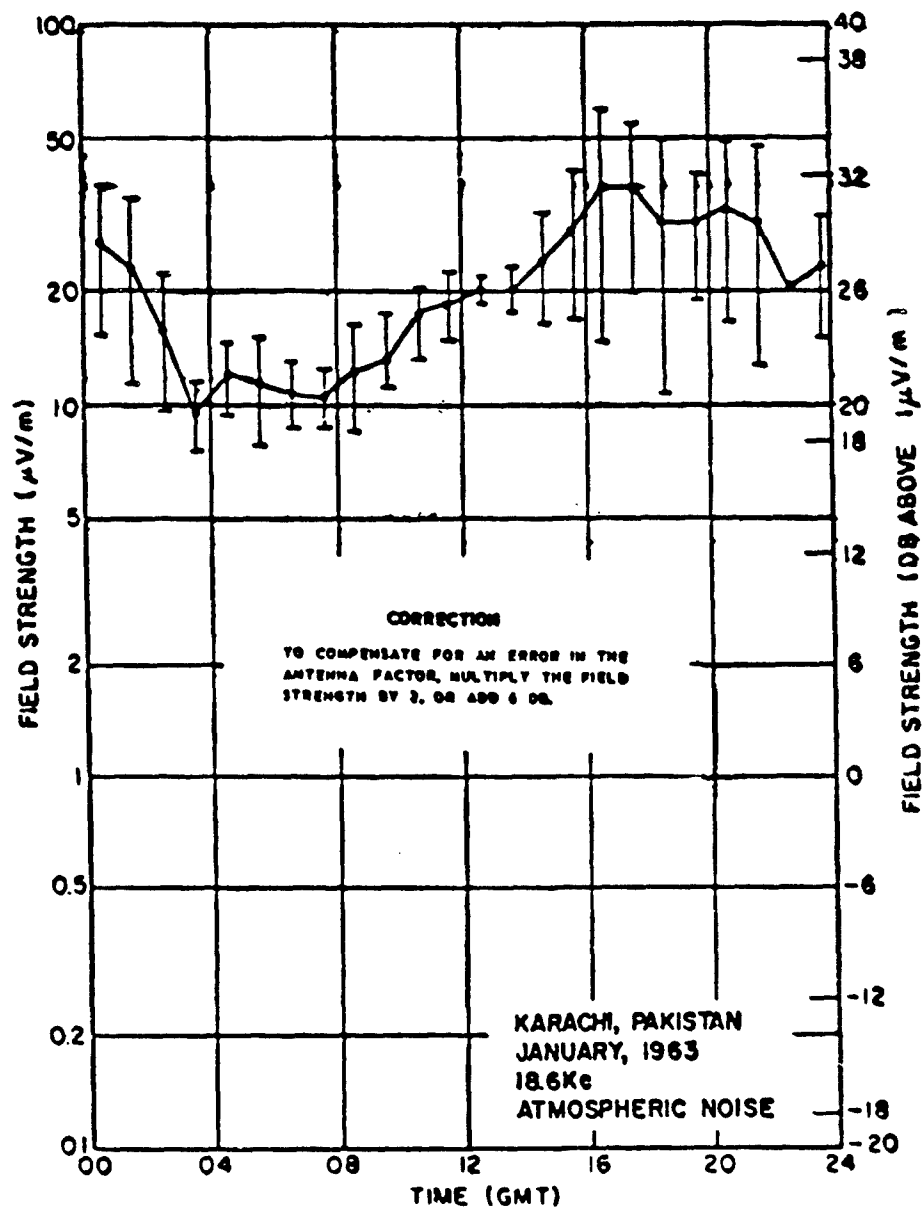


Figure 285

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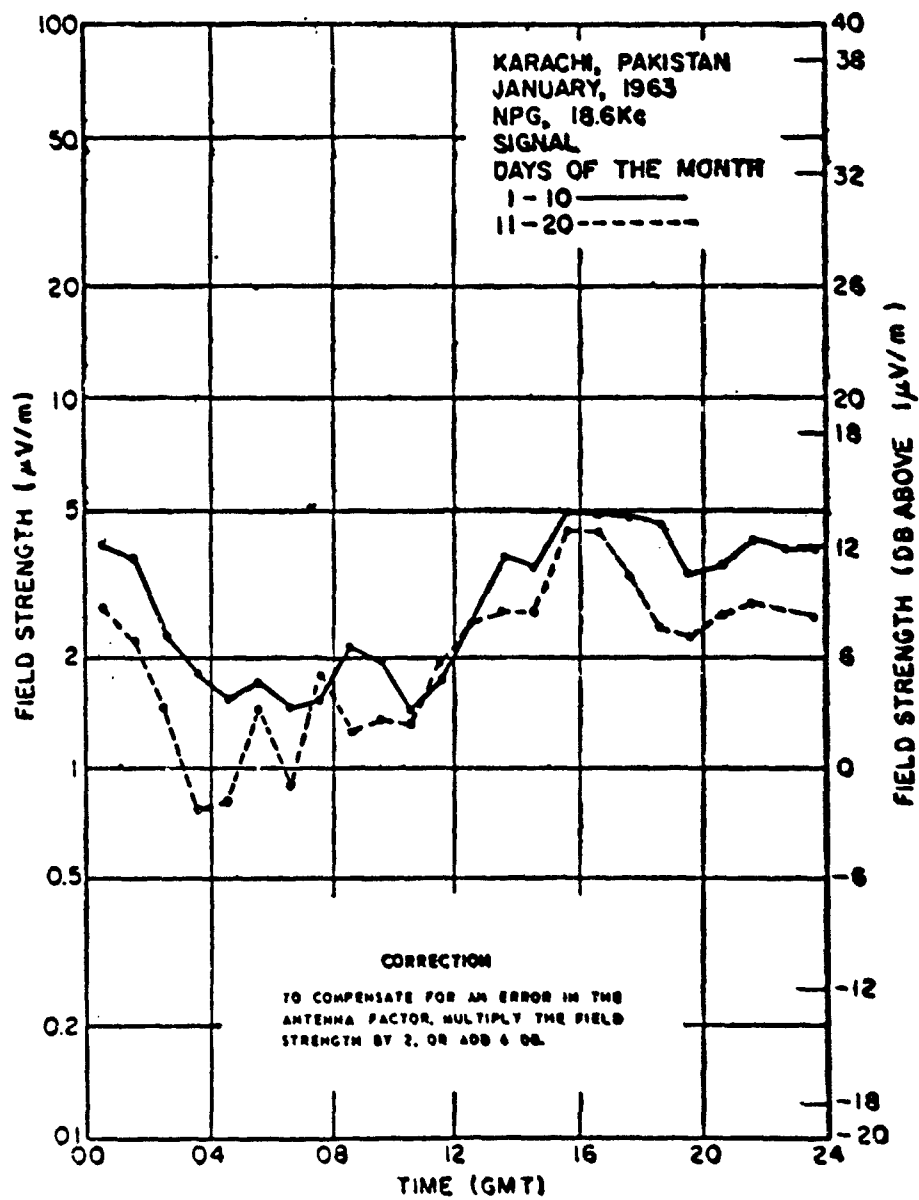


Figure 286

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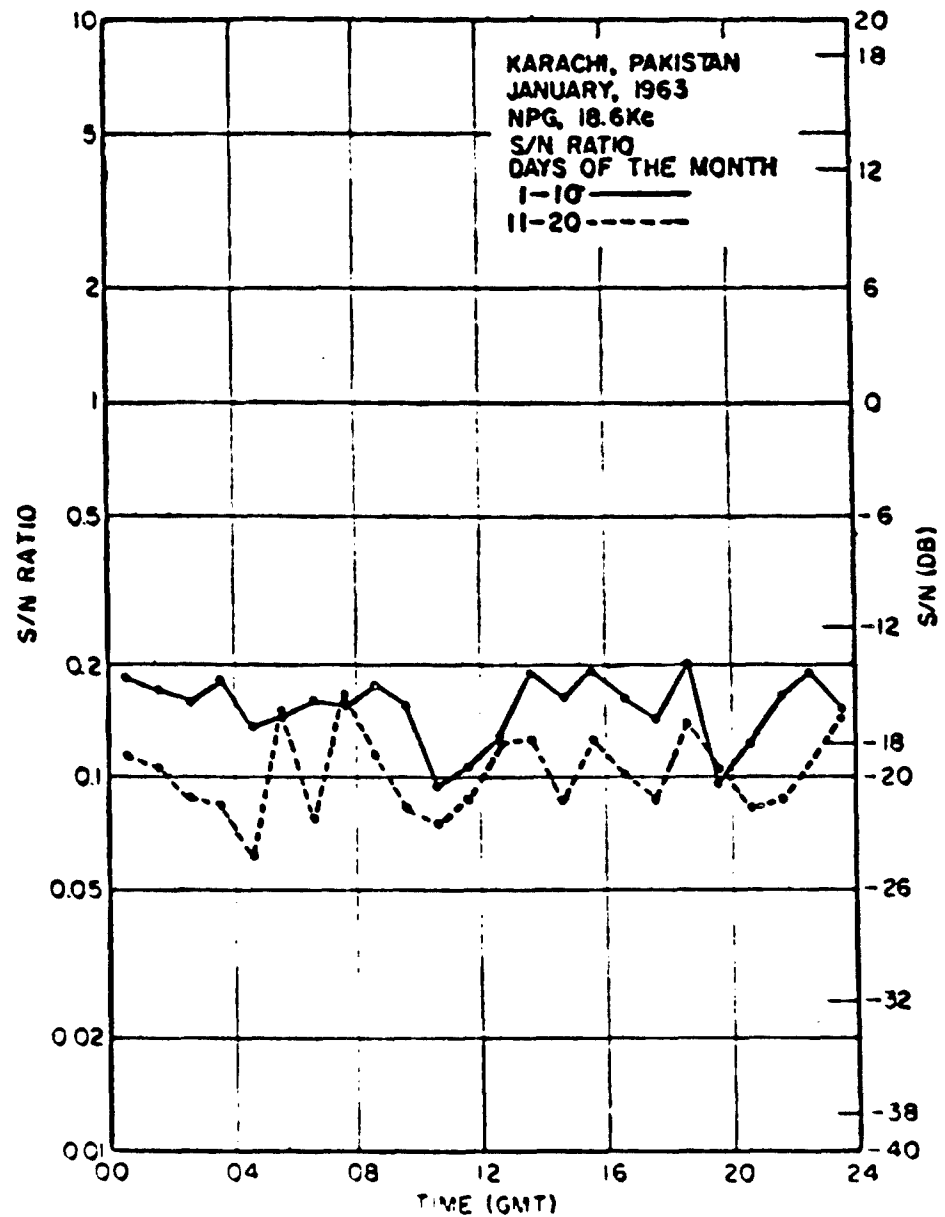


Figure 287

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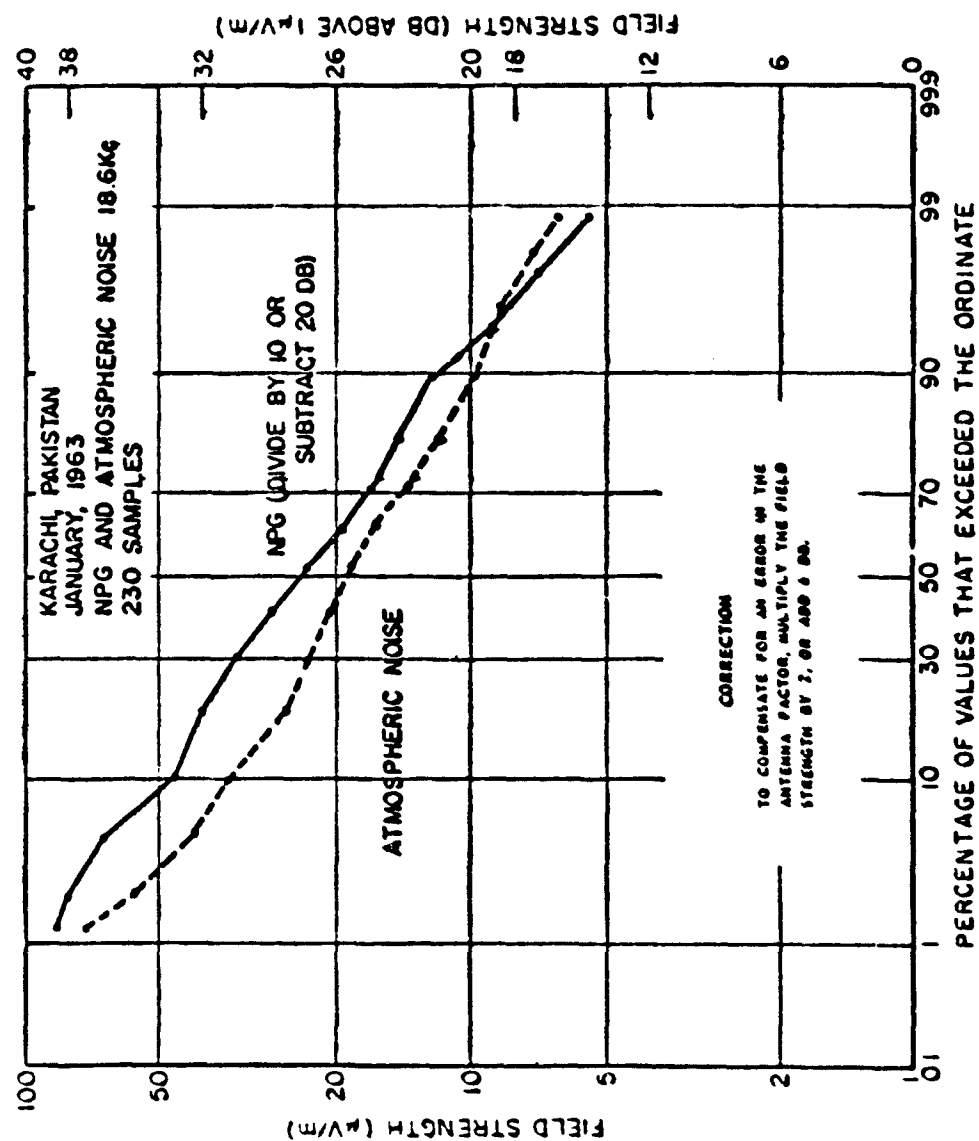


Figure 288

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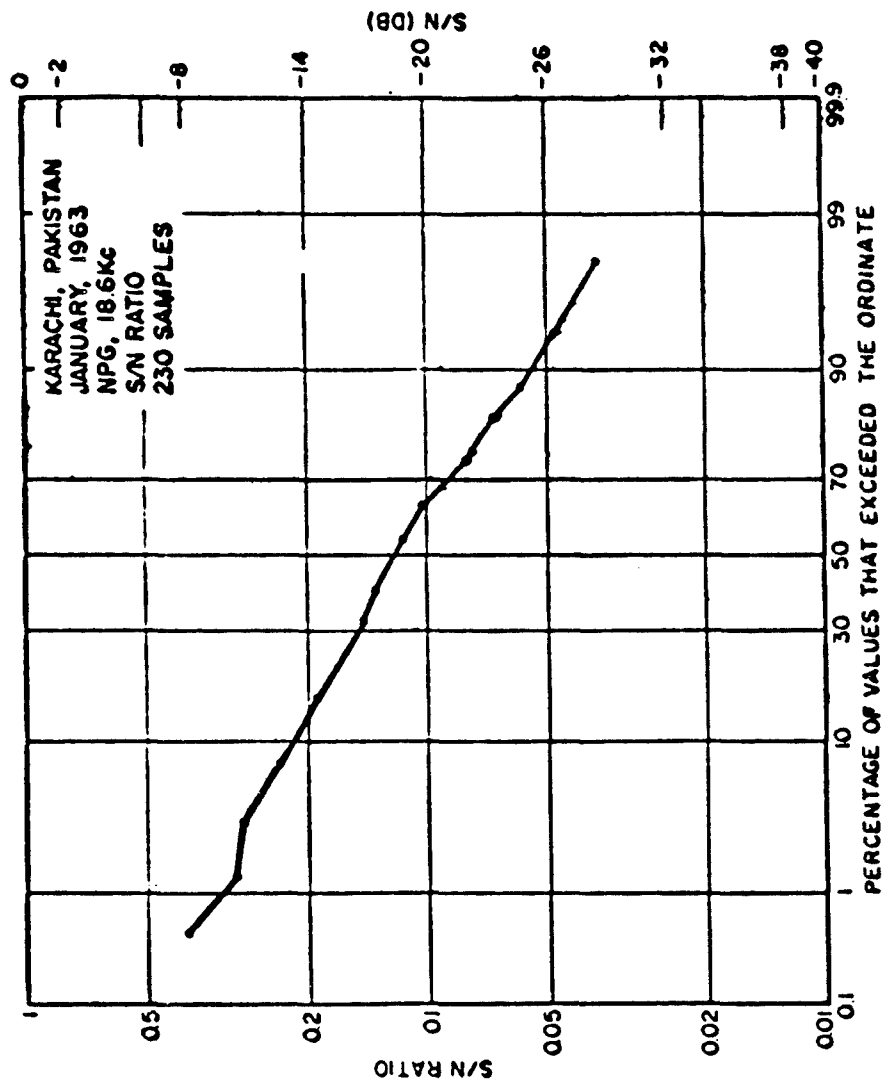


Figure 289

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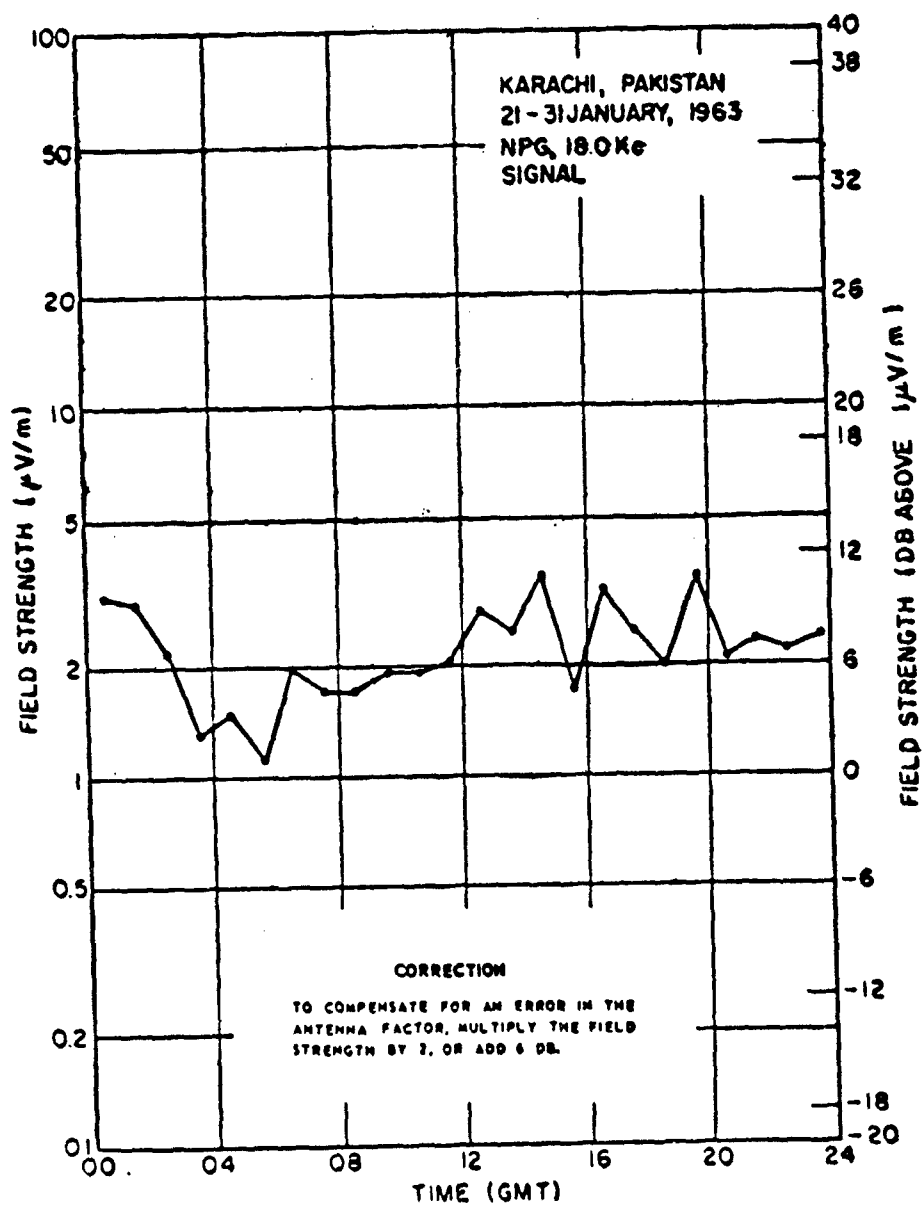


Figure 290

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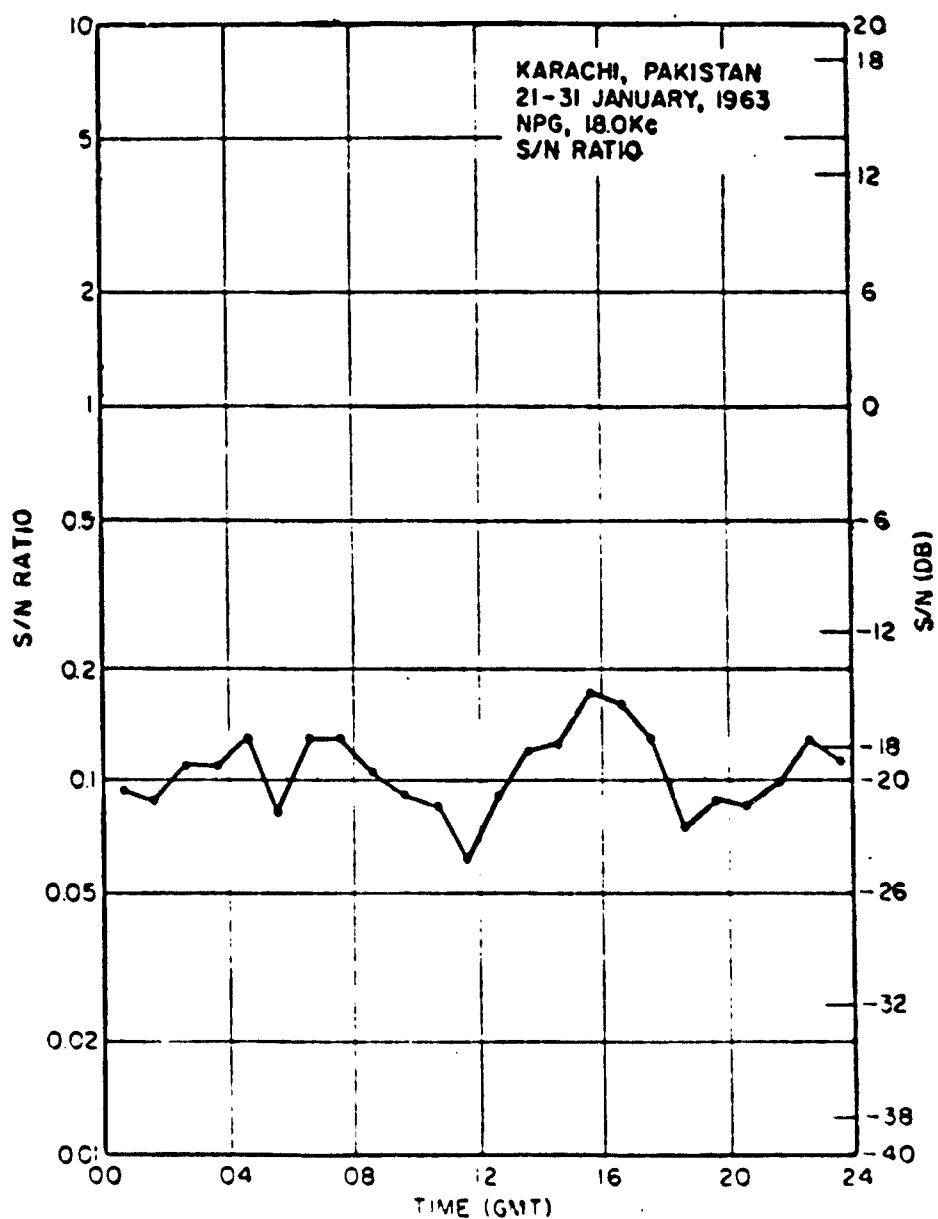


Figure 291

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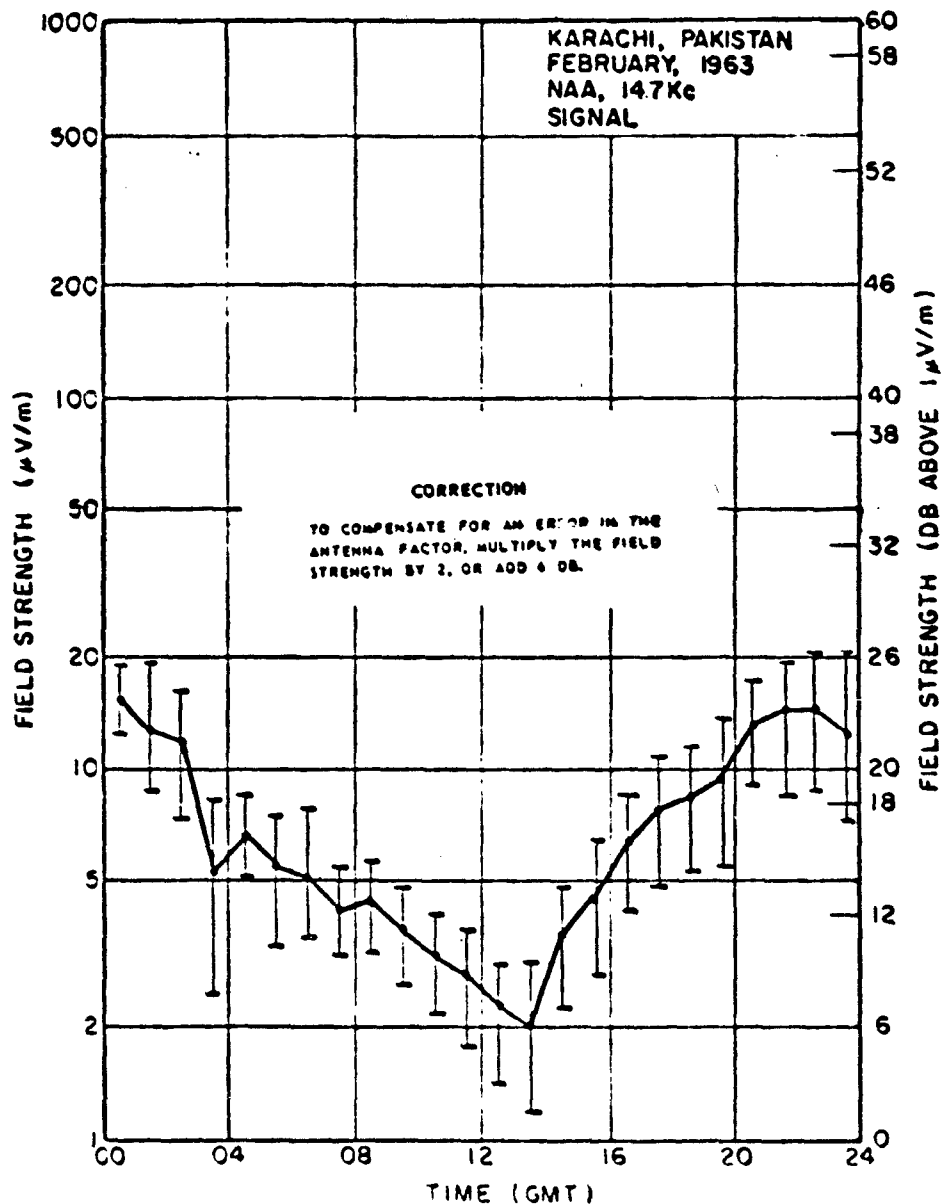


Figure 292

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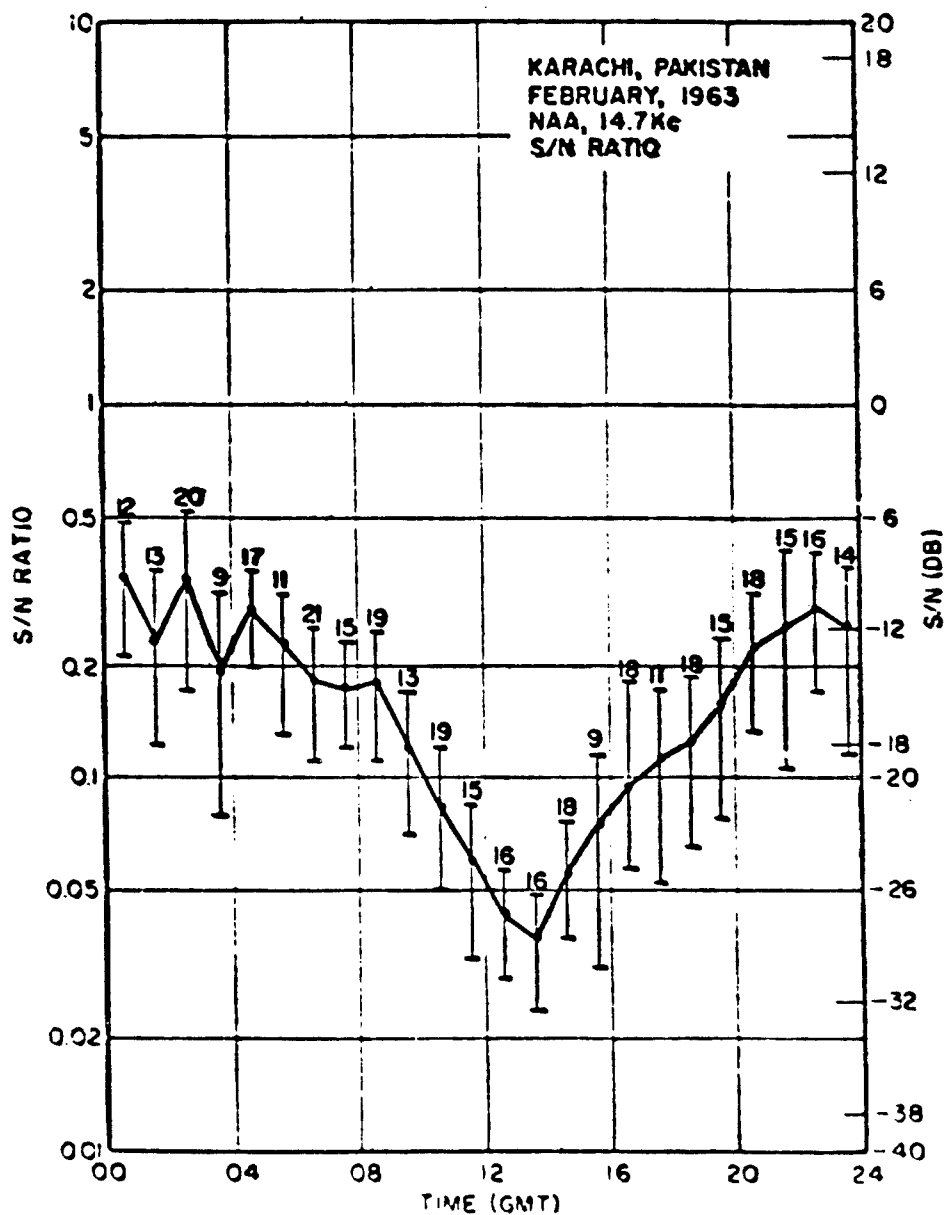


Figure 293

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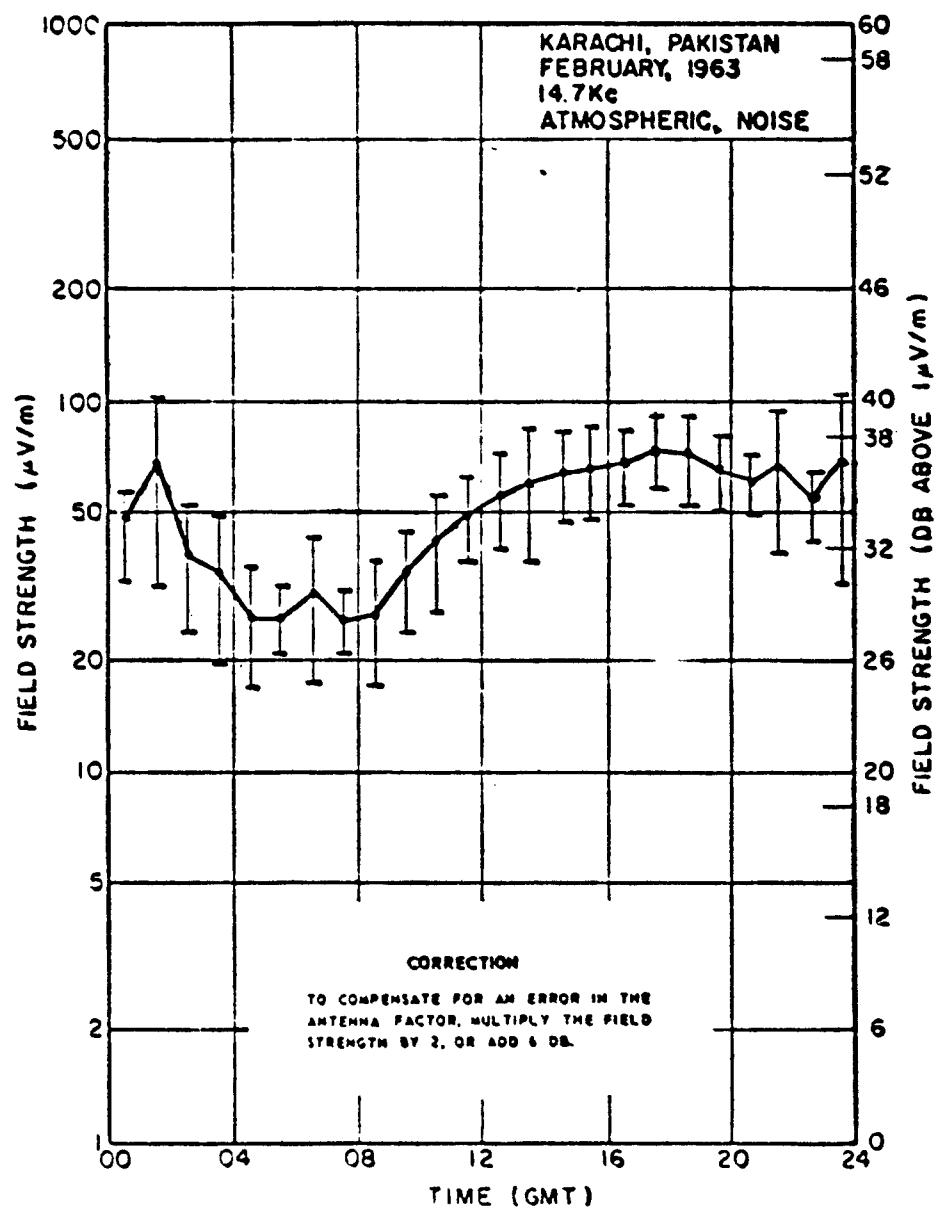


Figure 294

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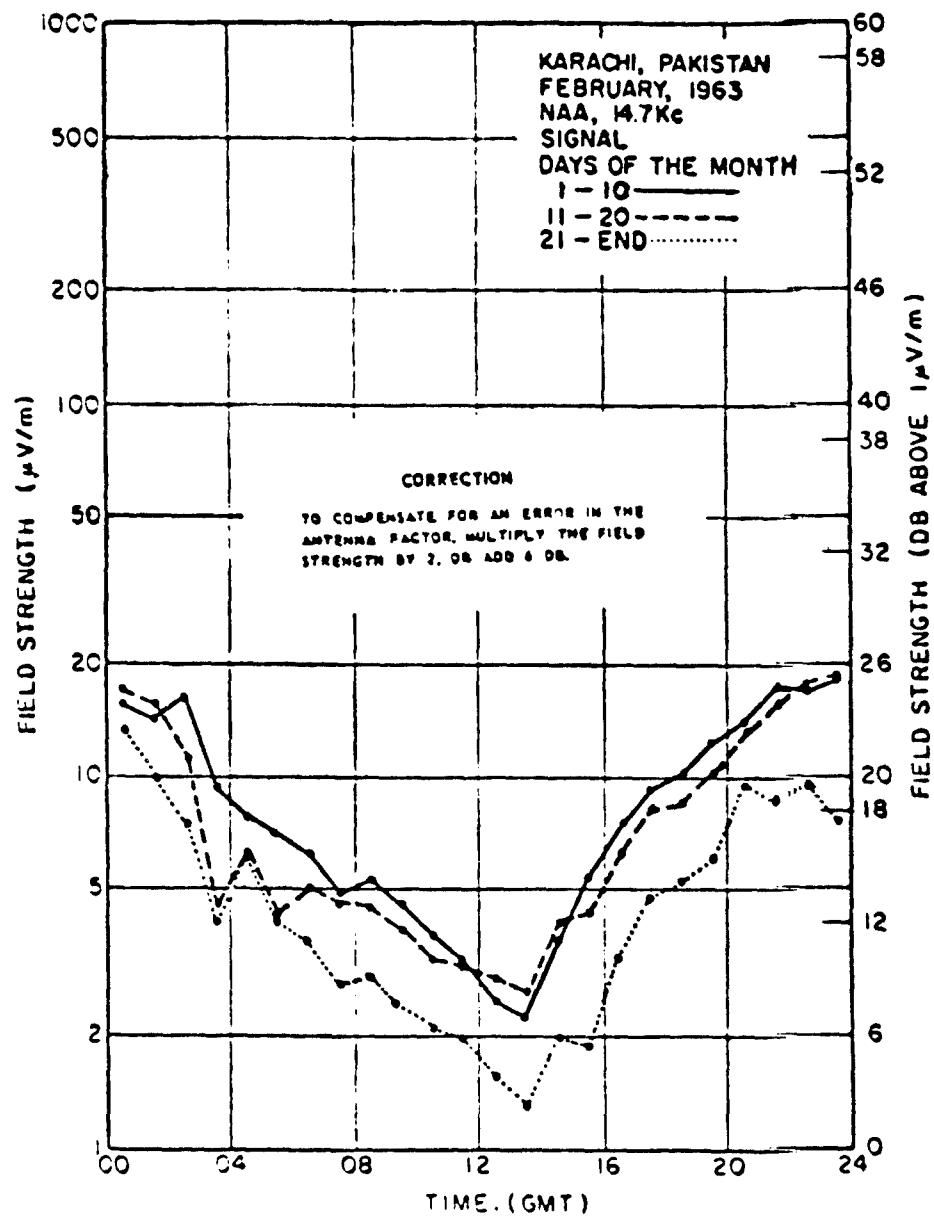


Figure 295

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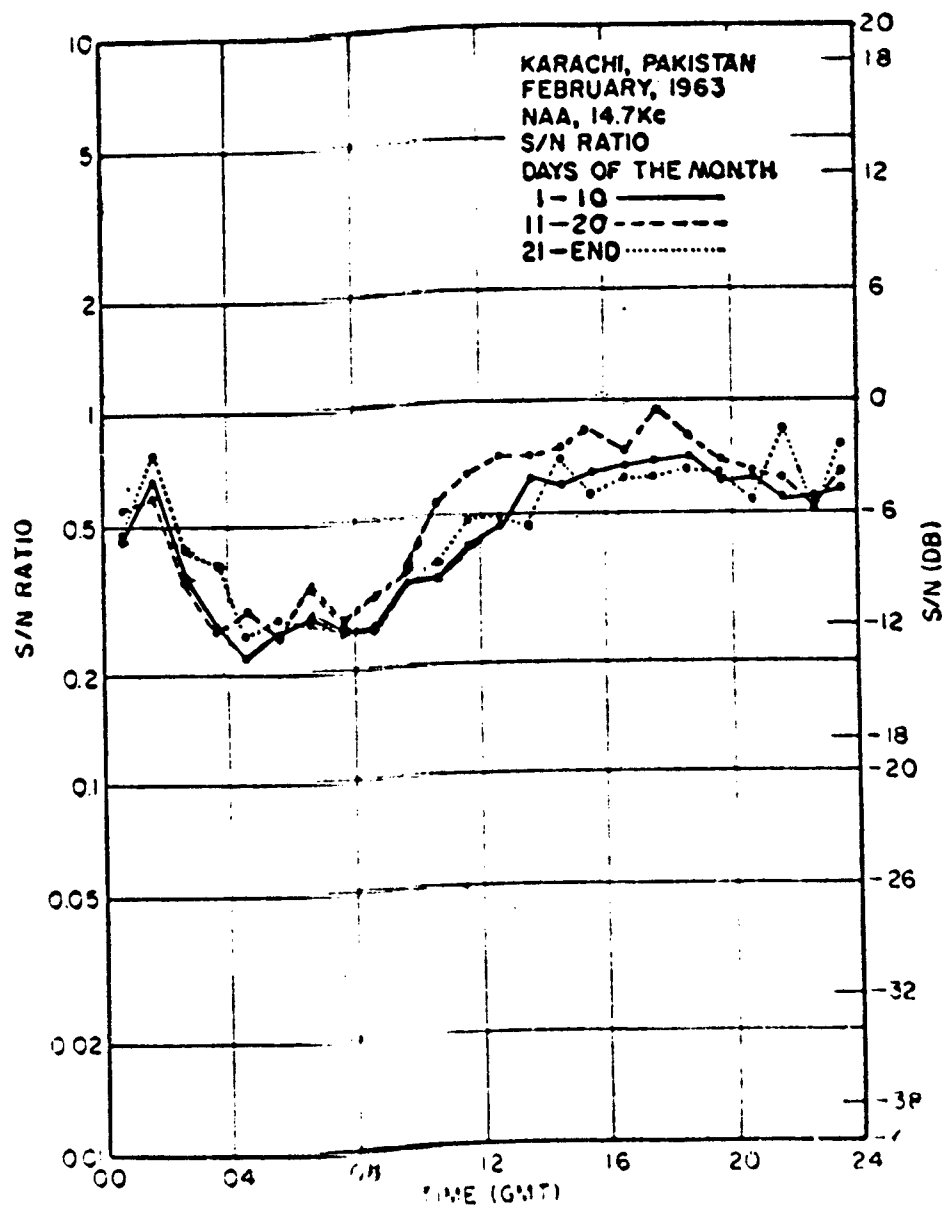


Figure 296

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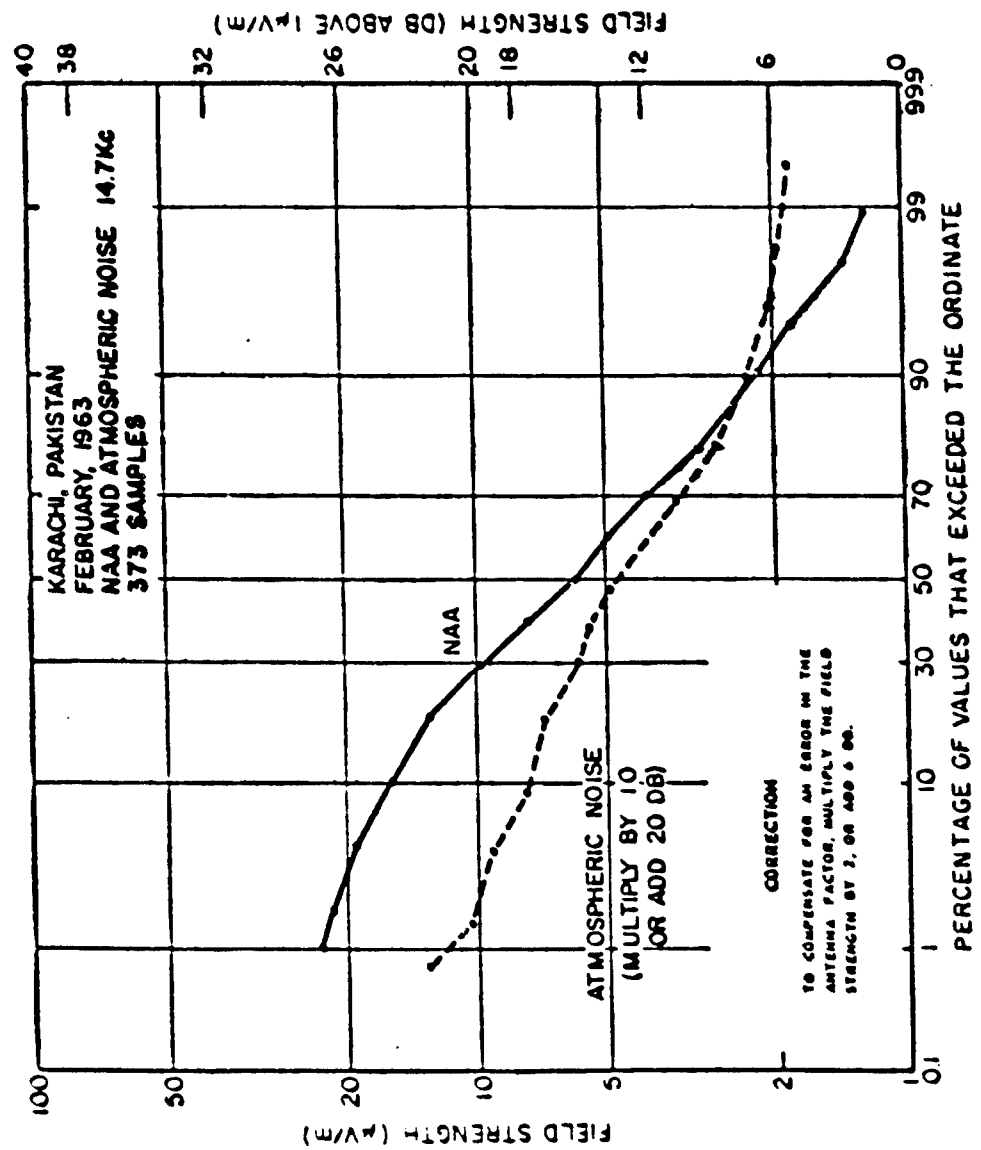


Figure 297

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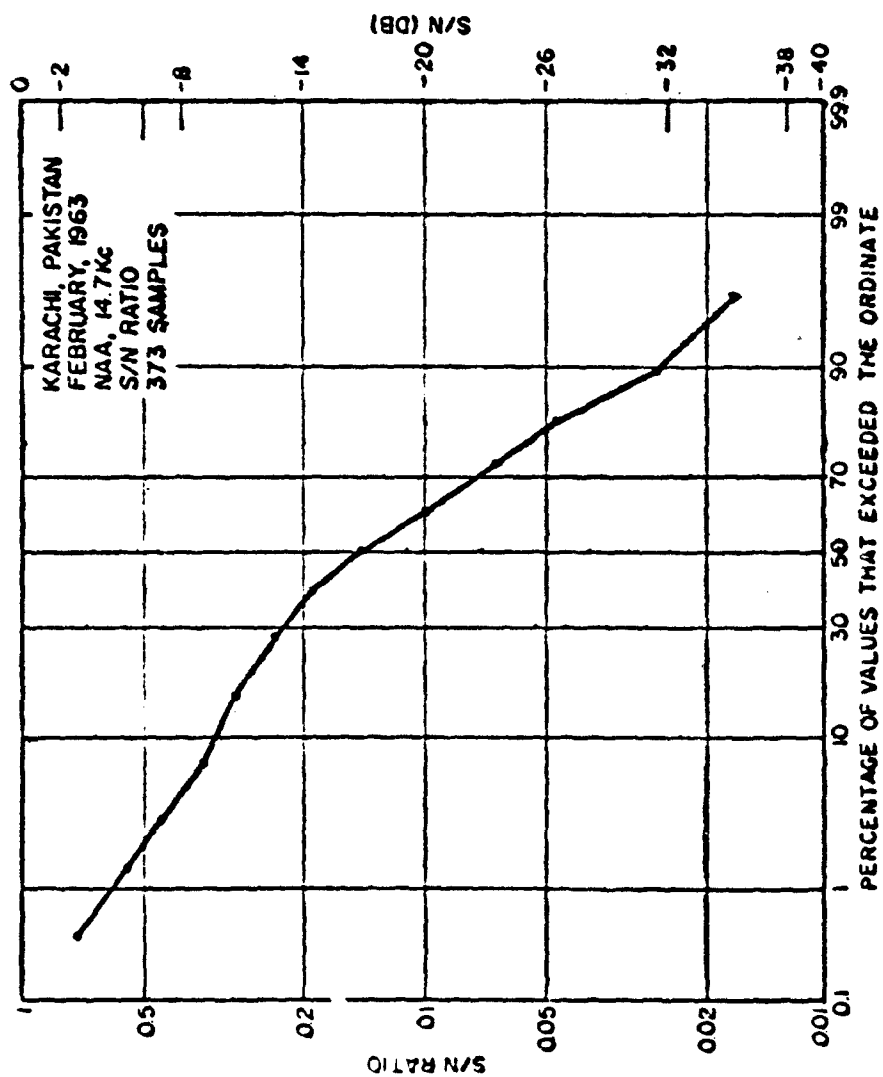


Figure 29a

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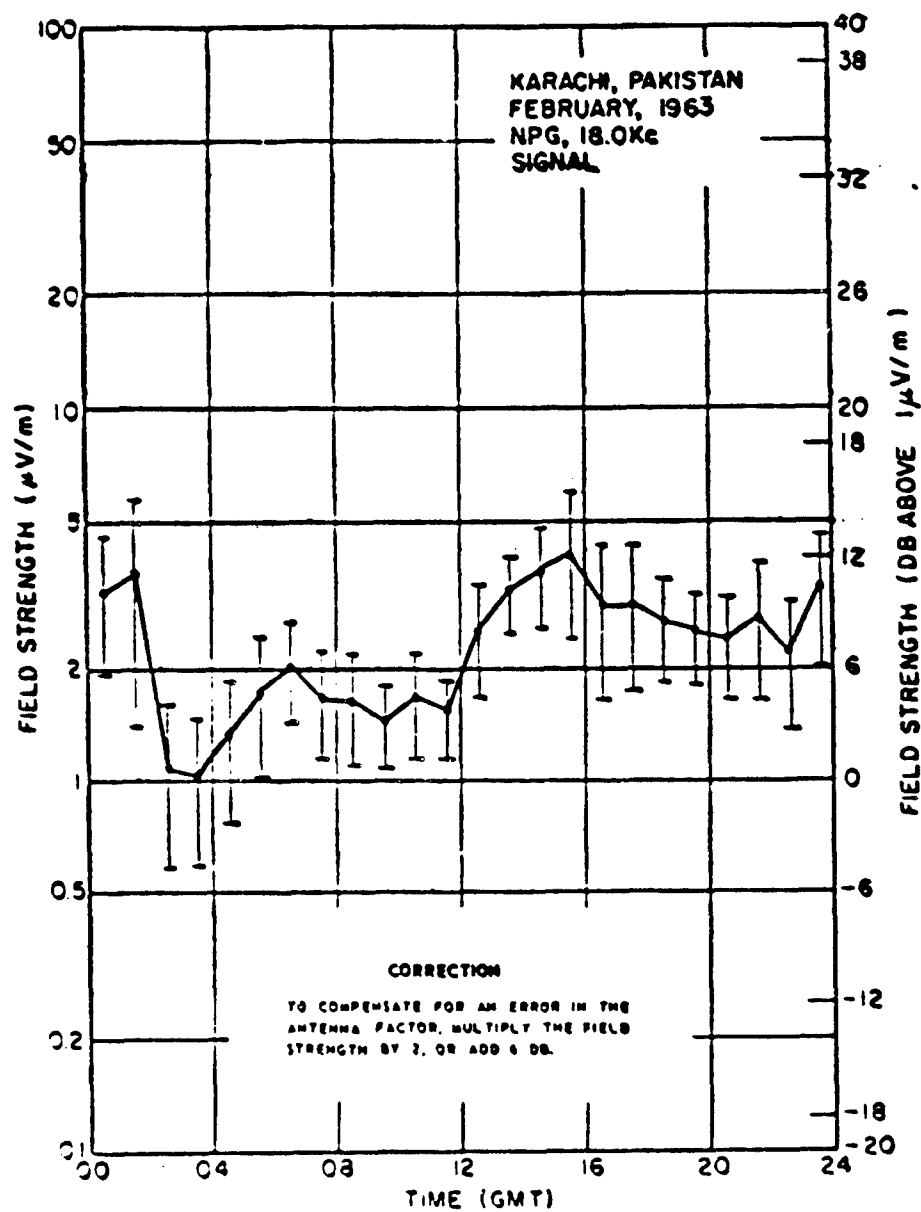


Figure 299

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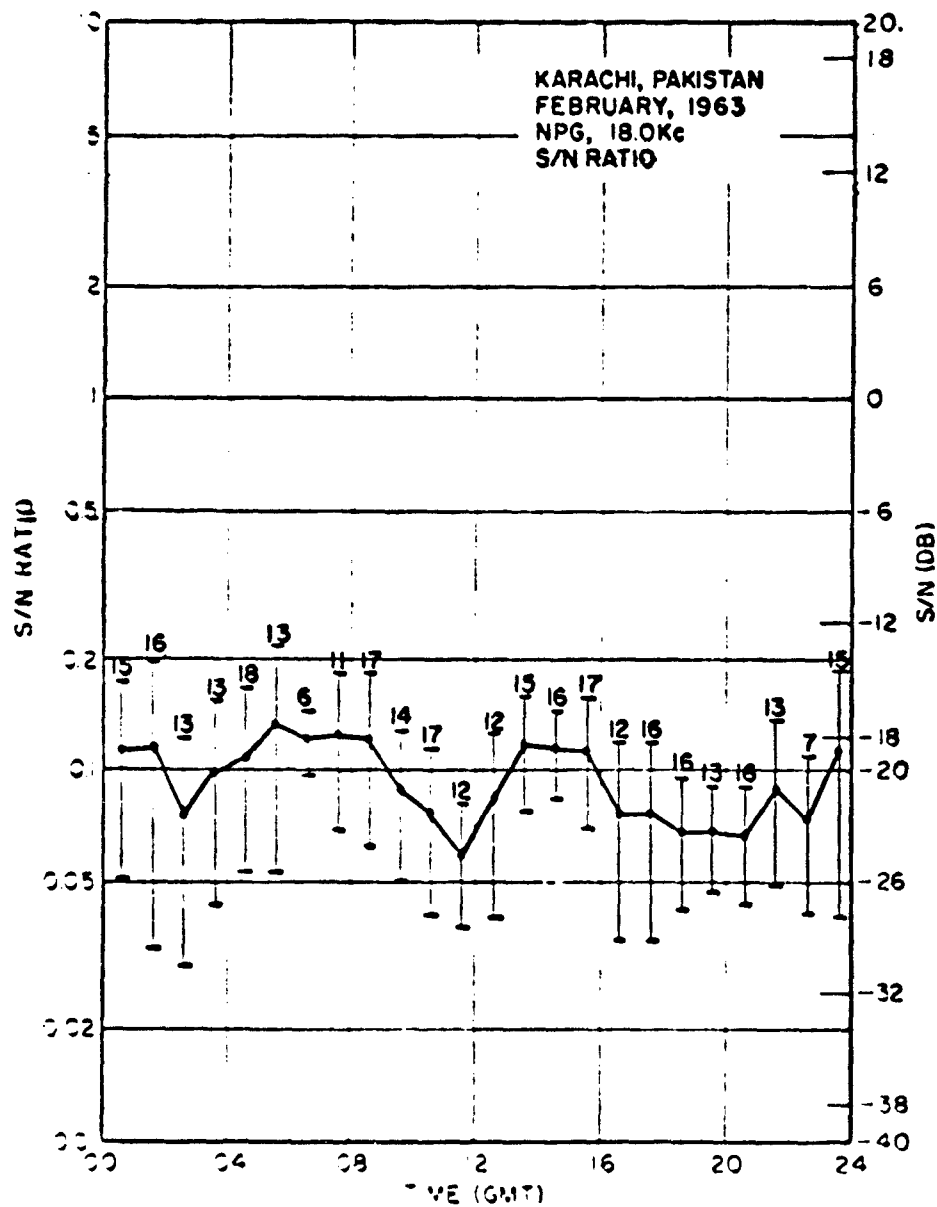


Figure 300

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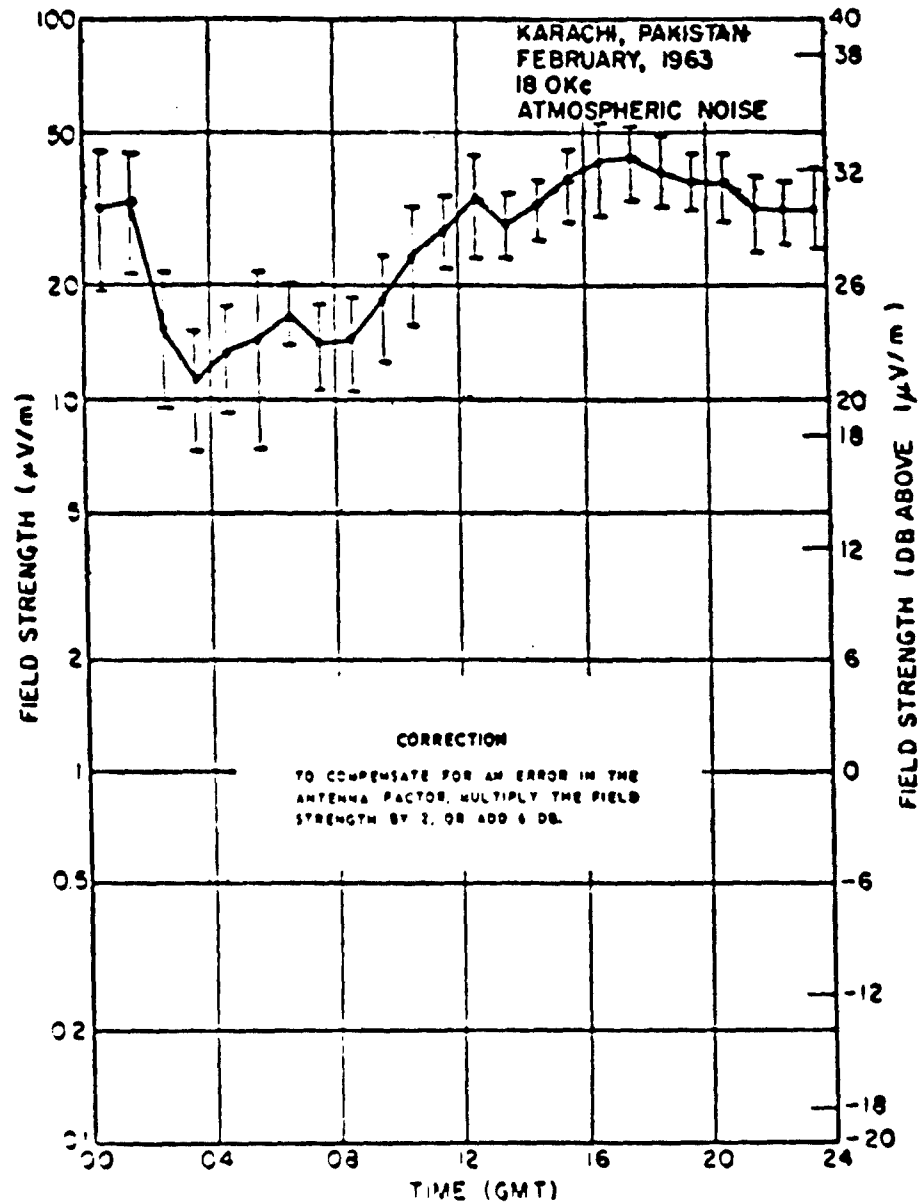


Figure 301

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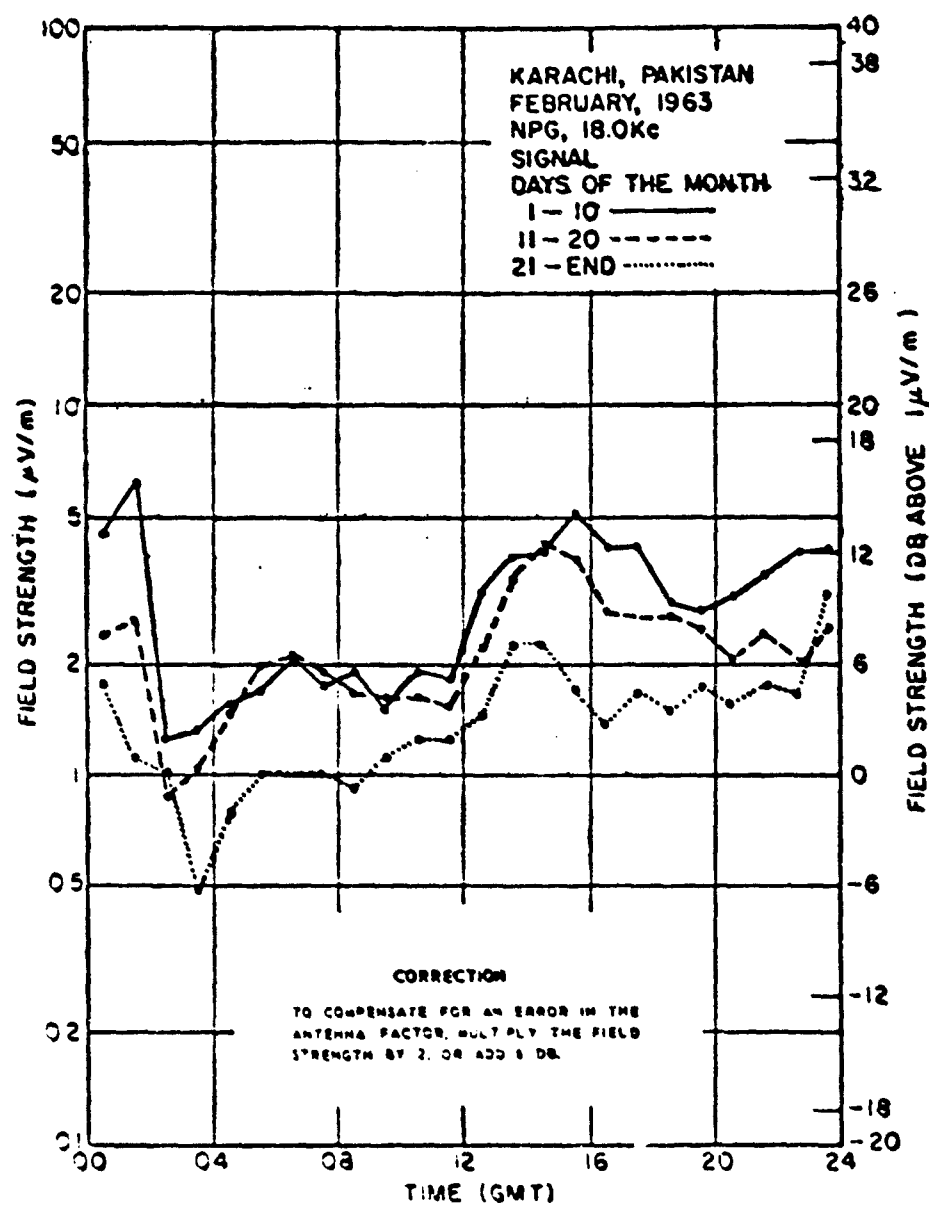


Figure 302

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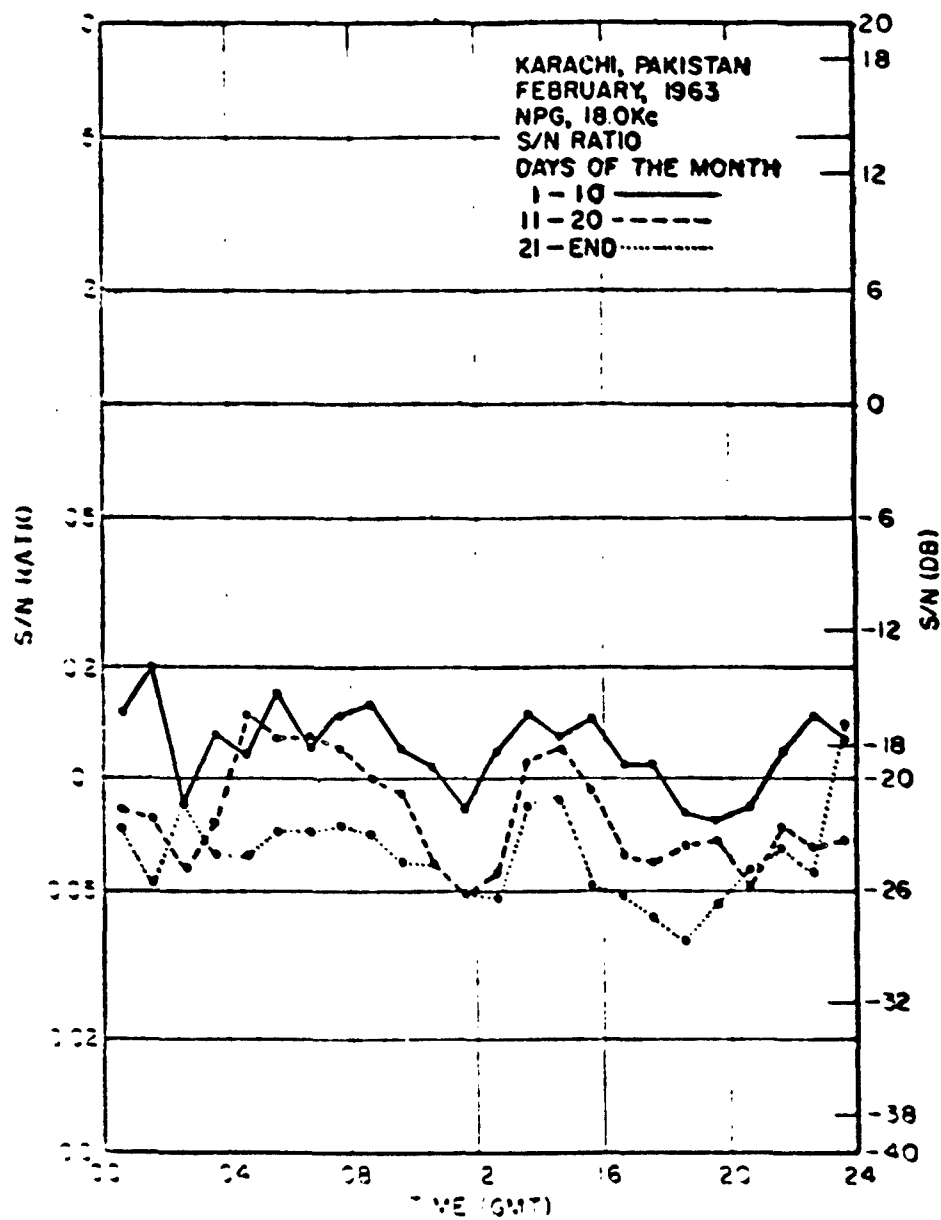


Figure 303

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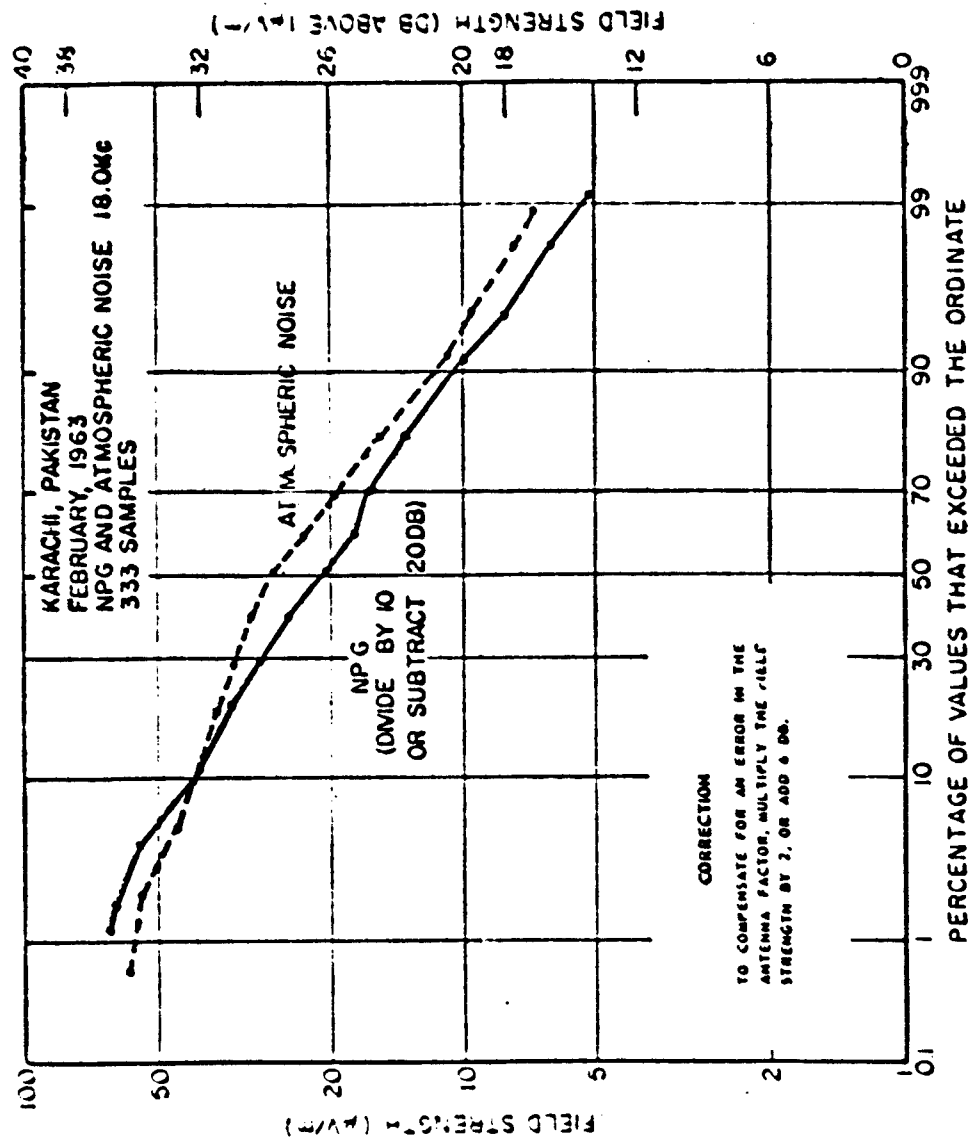


Figure 304

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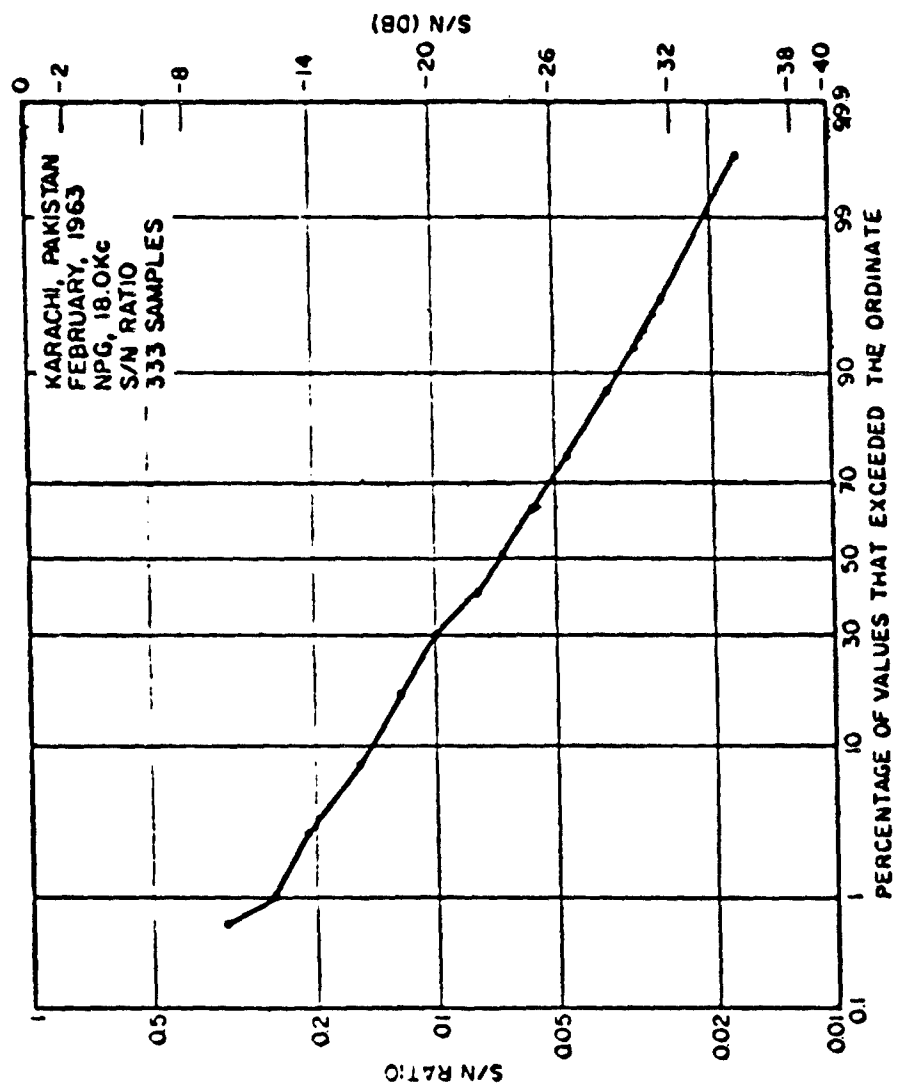


Figure 305

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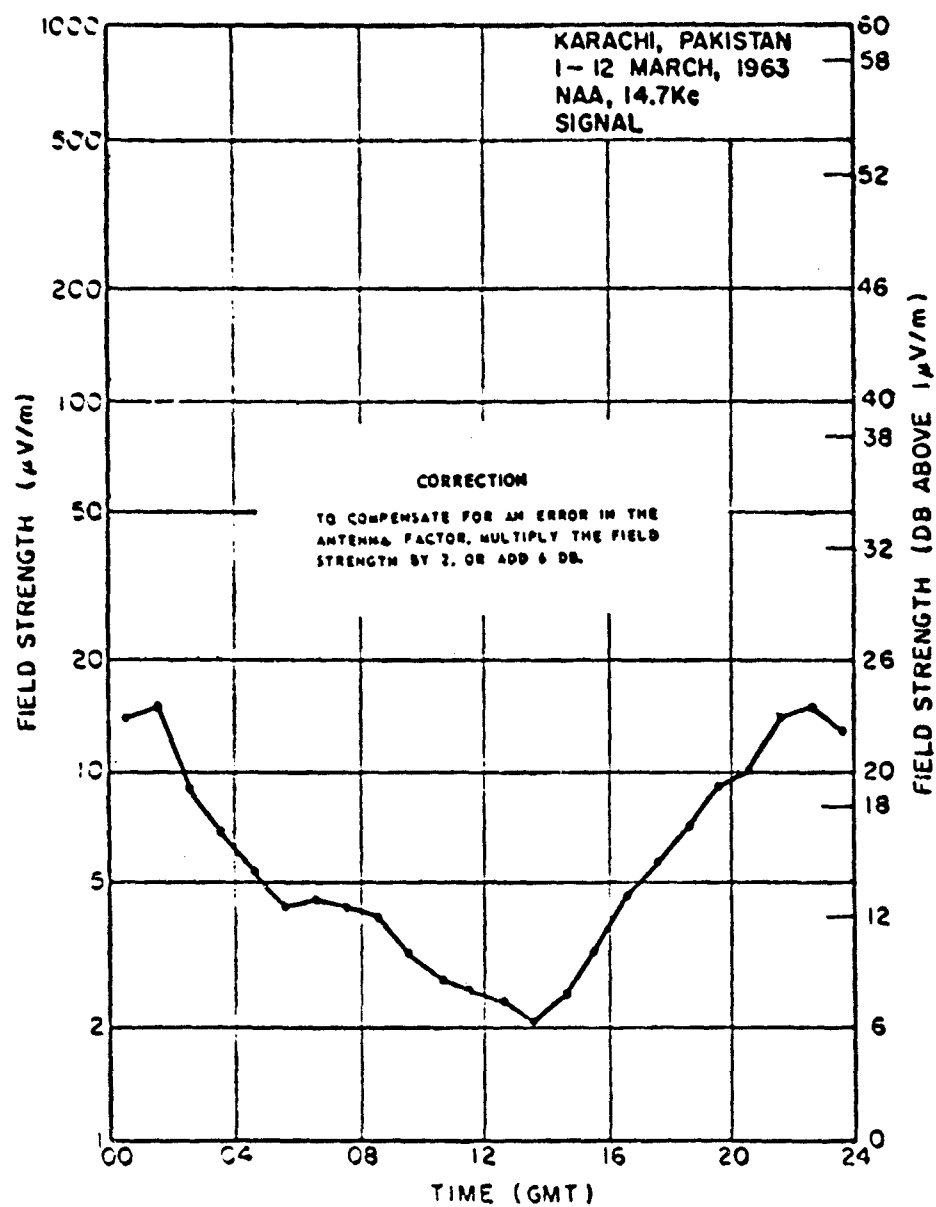


Figure 306

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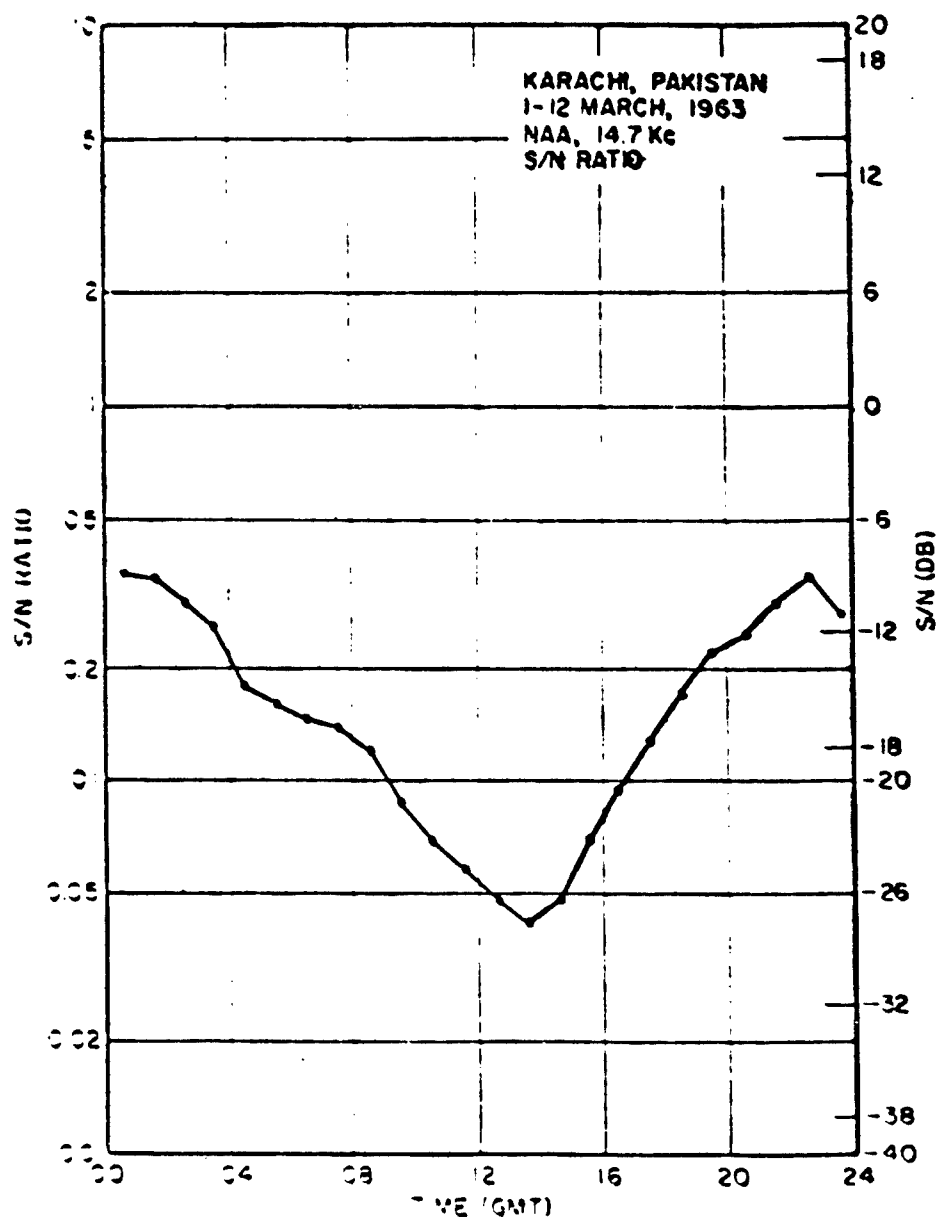


Figure 307

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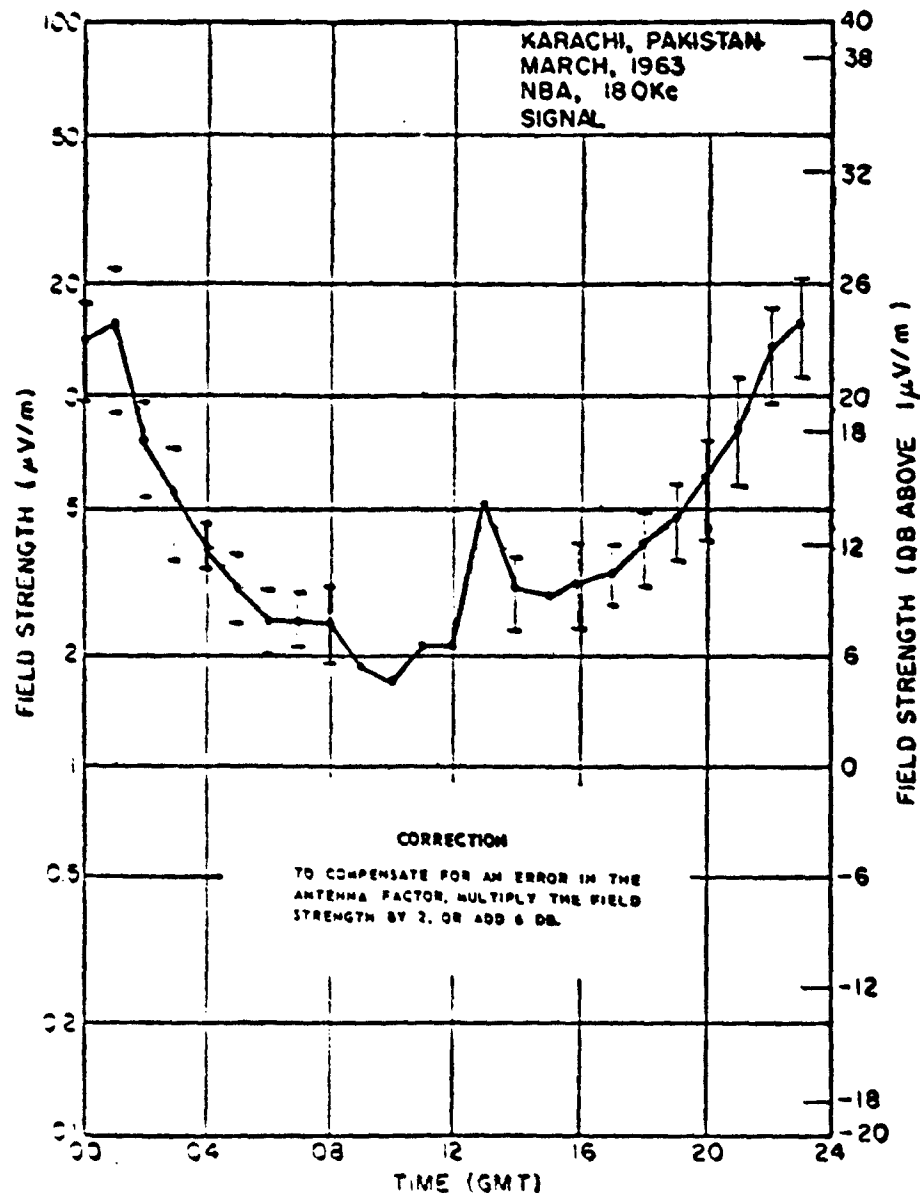


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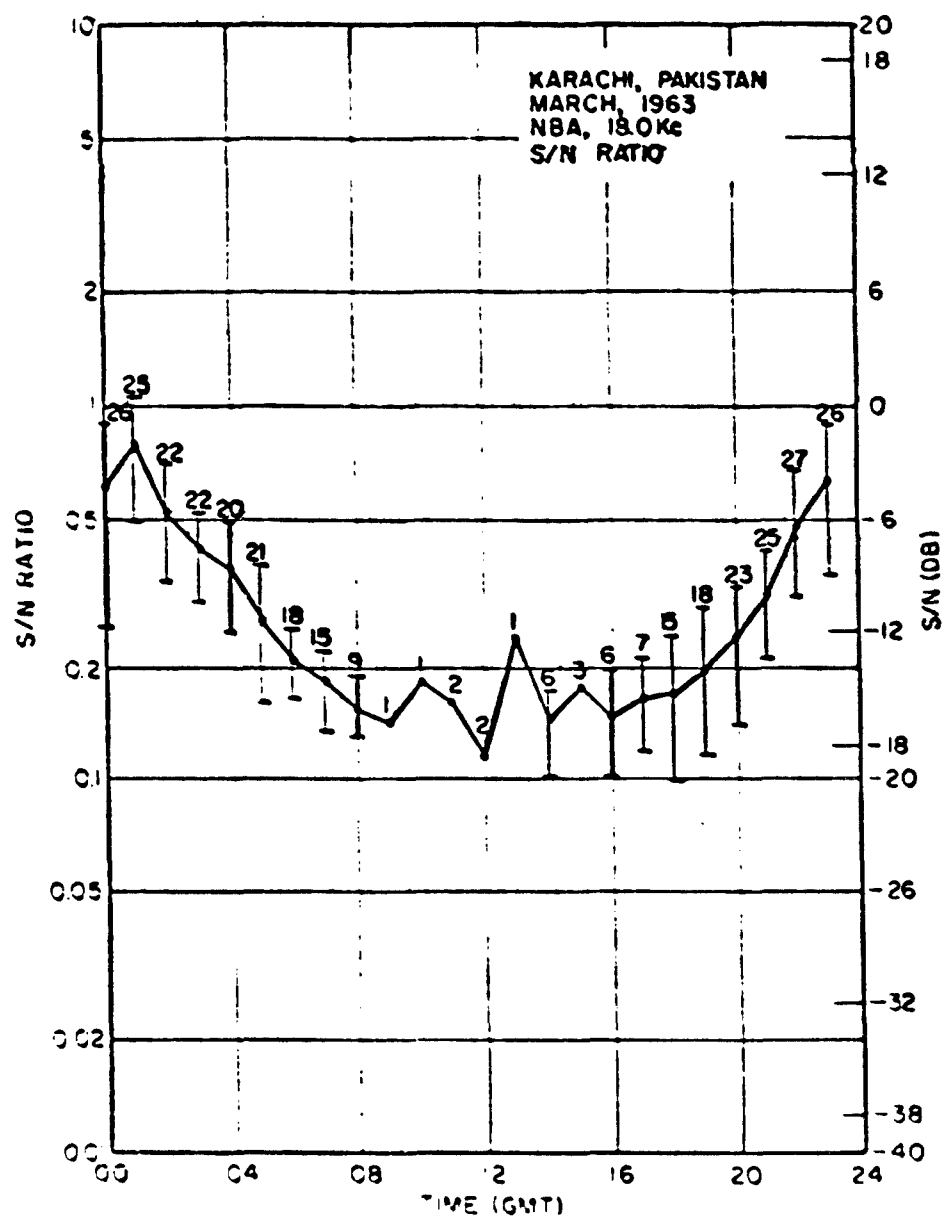


Figure 309

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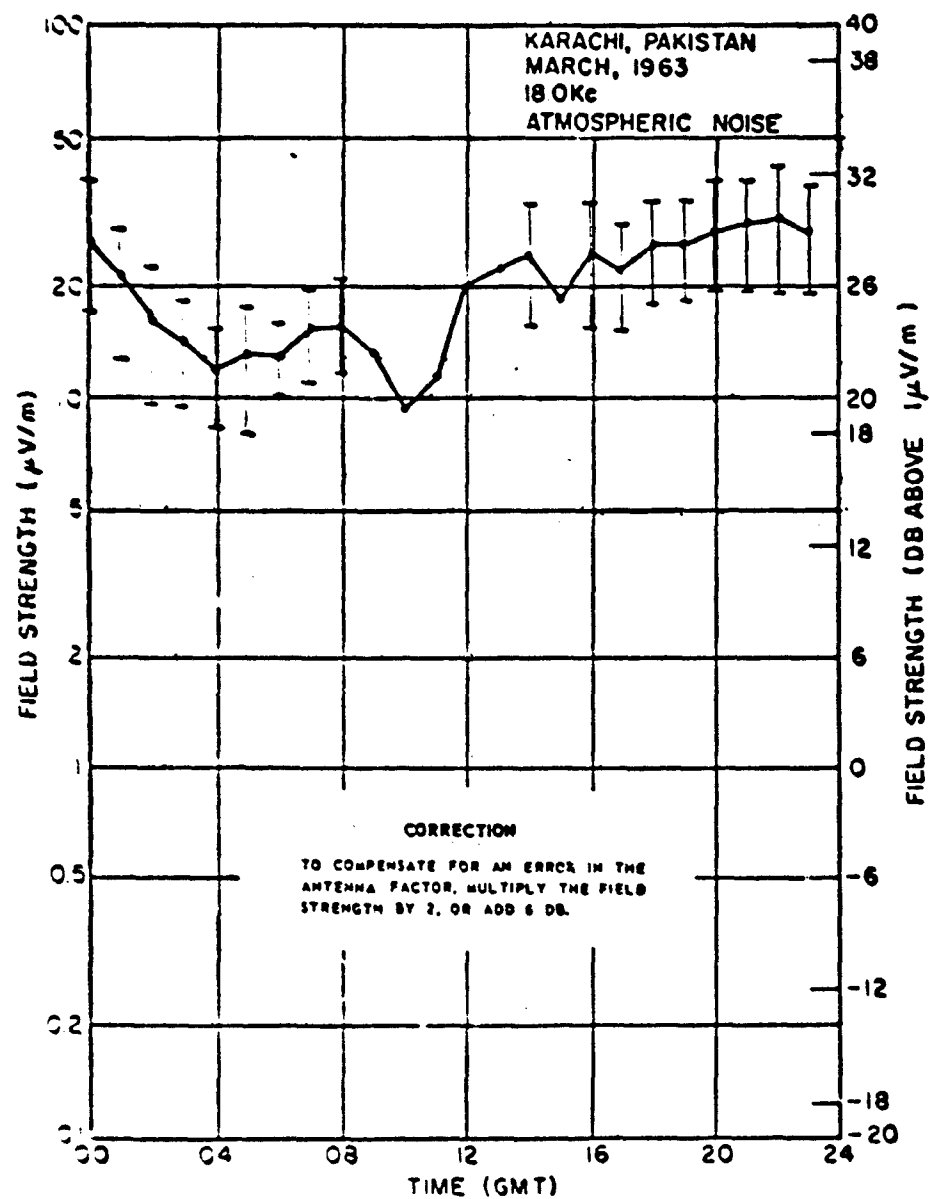


Figure 310

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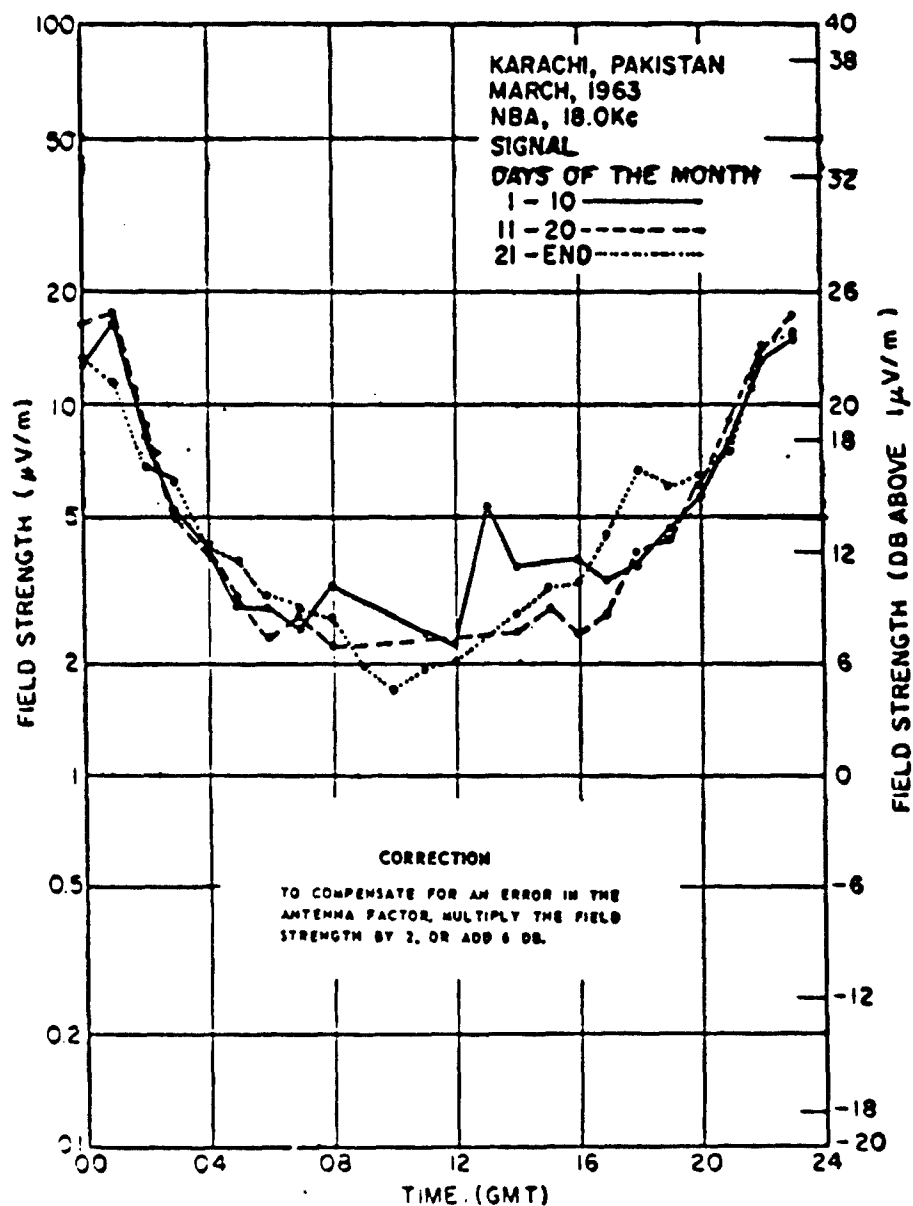


Figure 311

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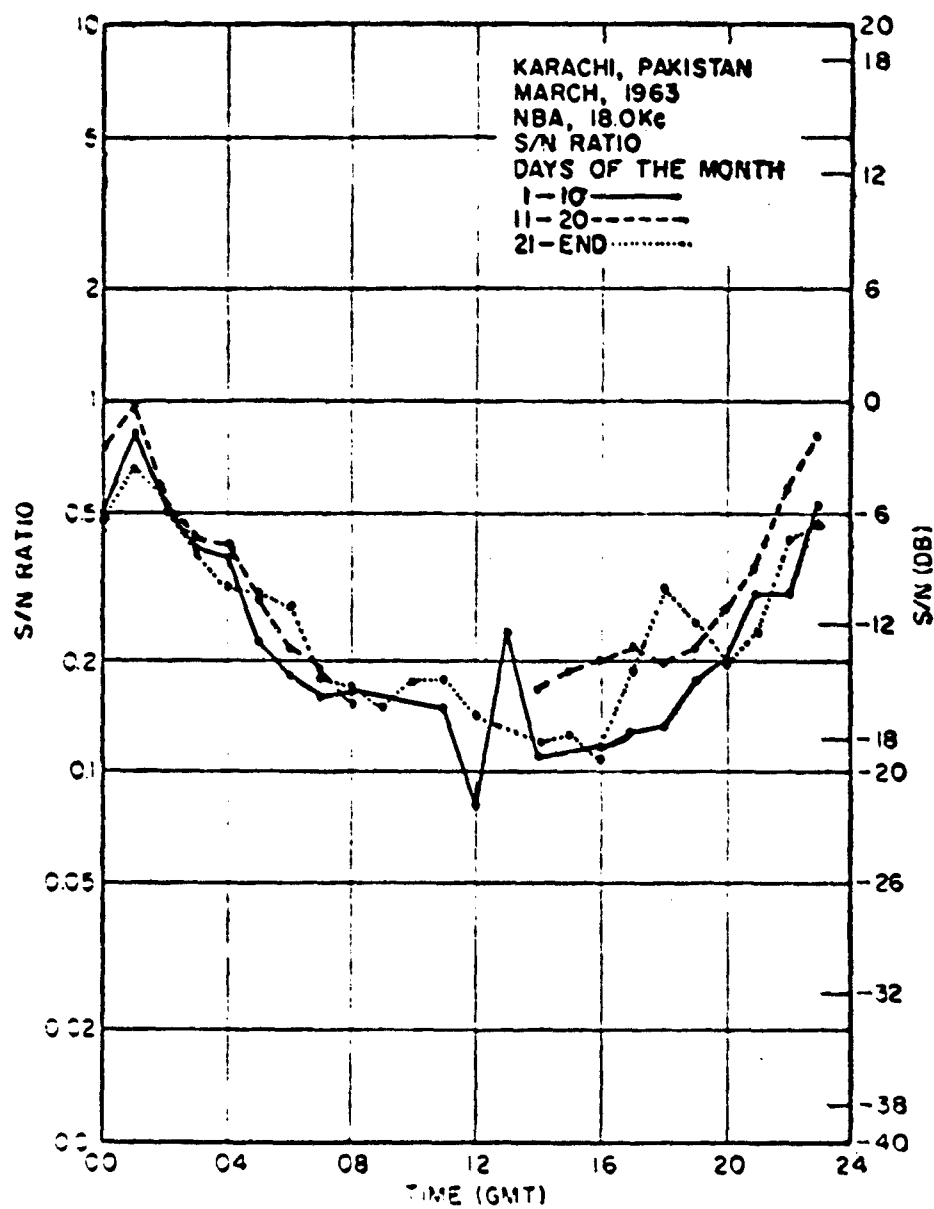


Figure 312

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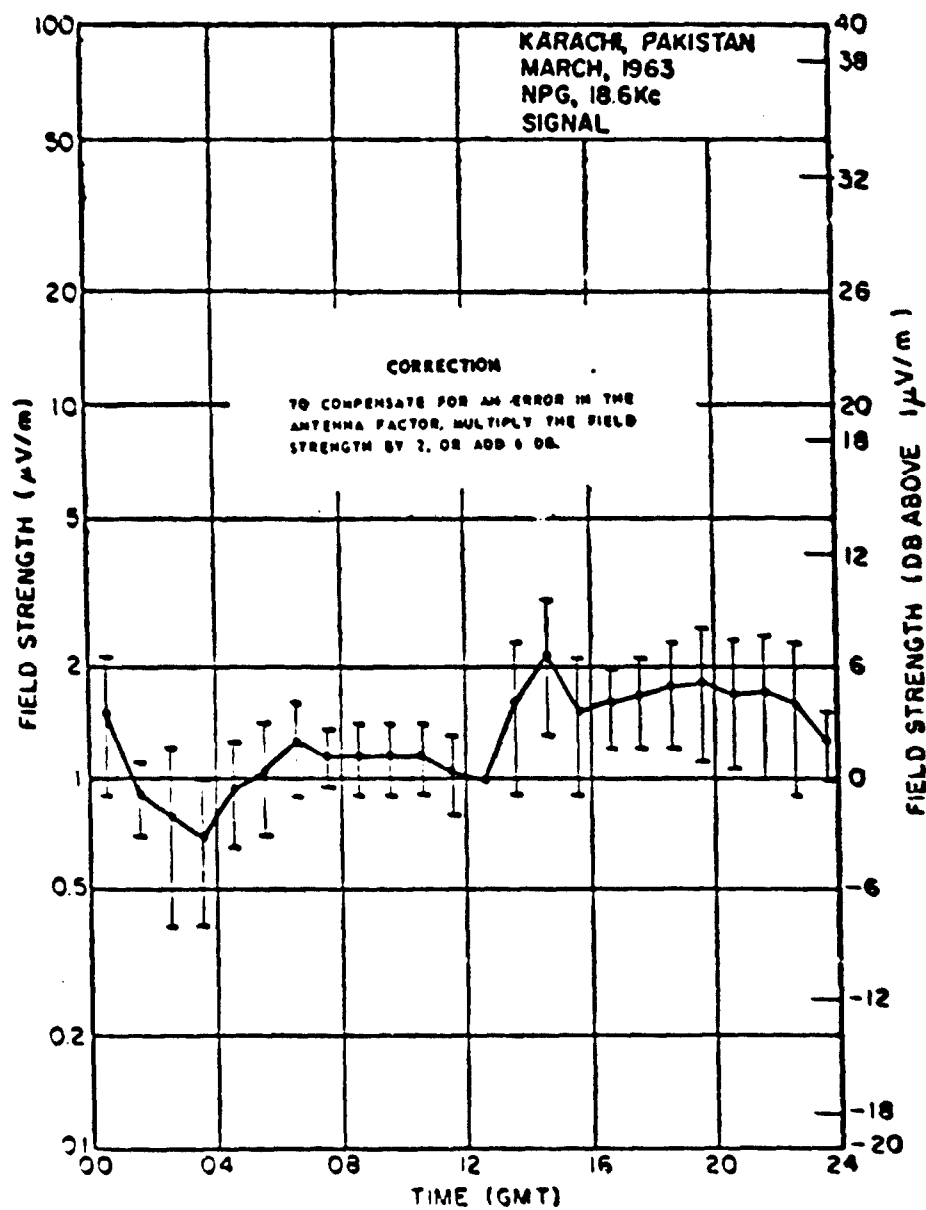


Figure 313

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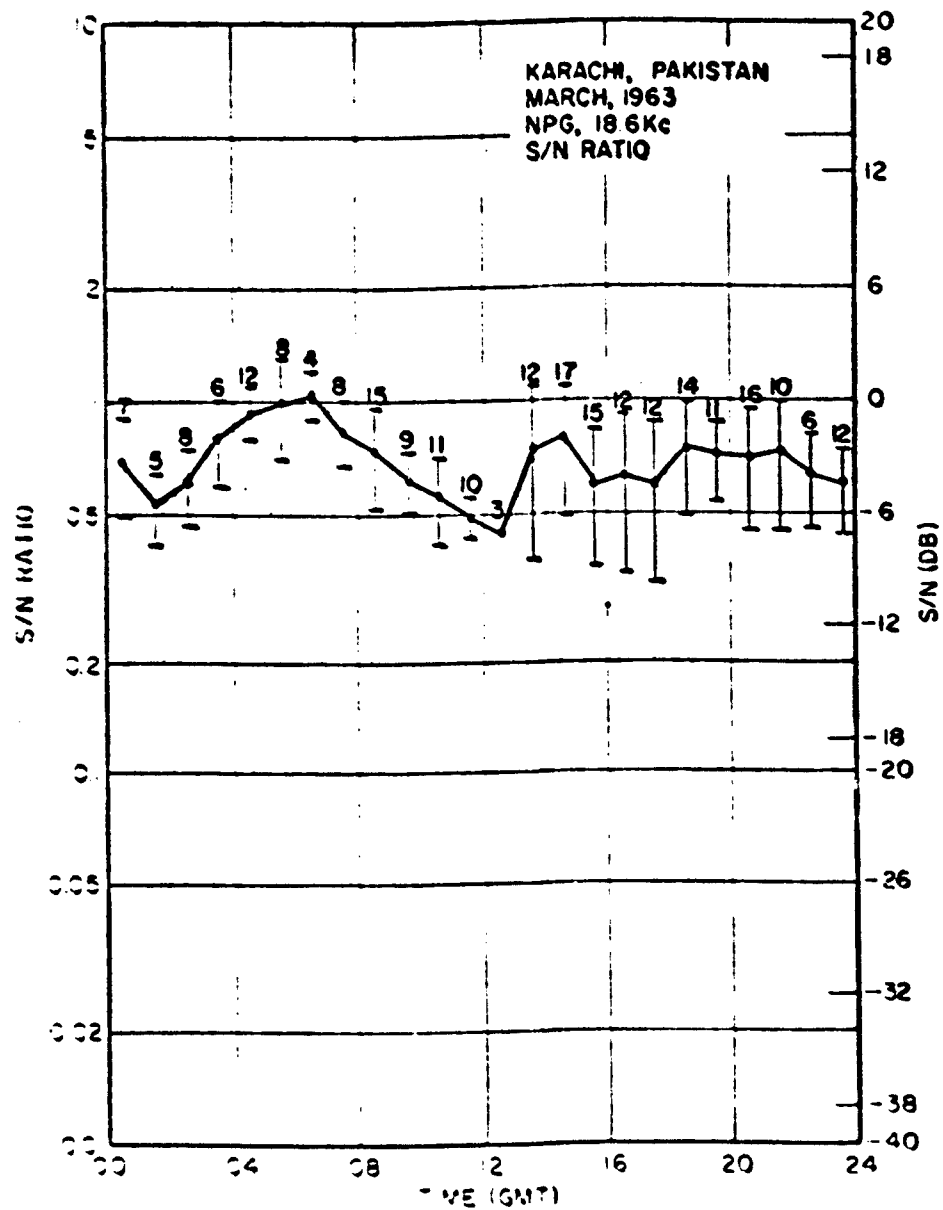


Figure 314

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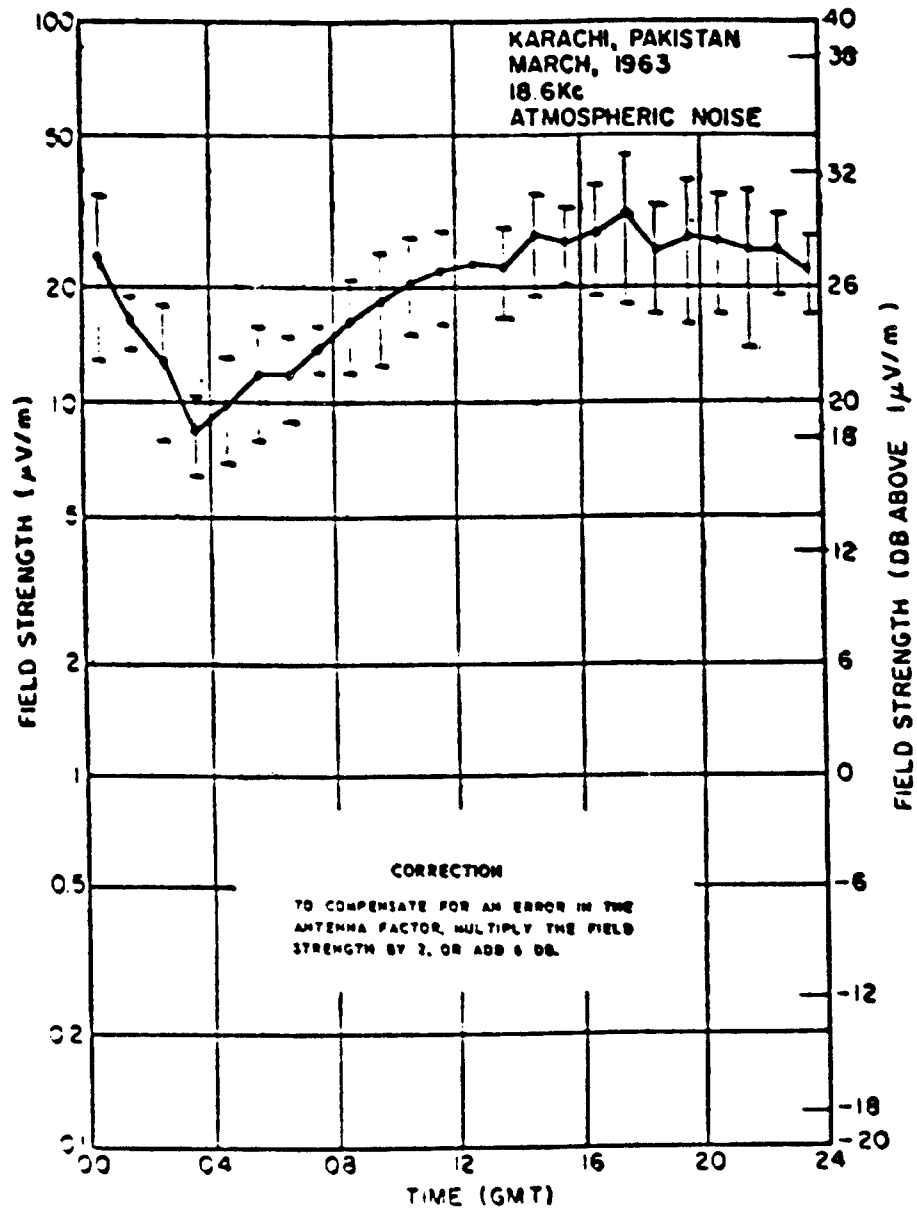


Figure 315

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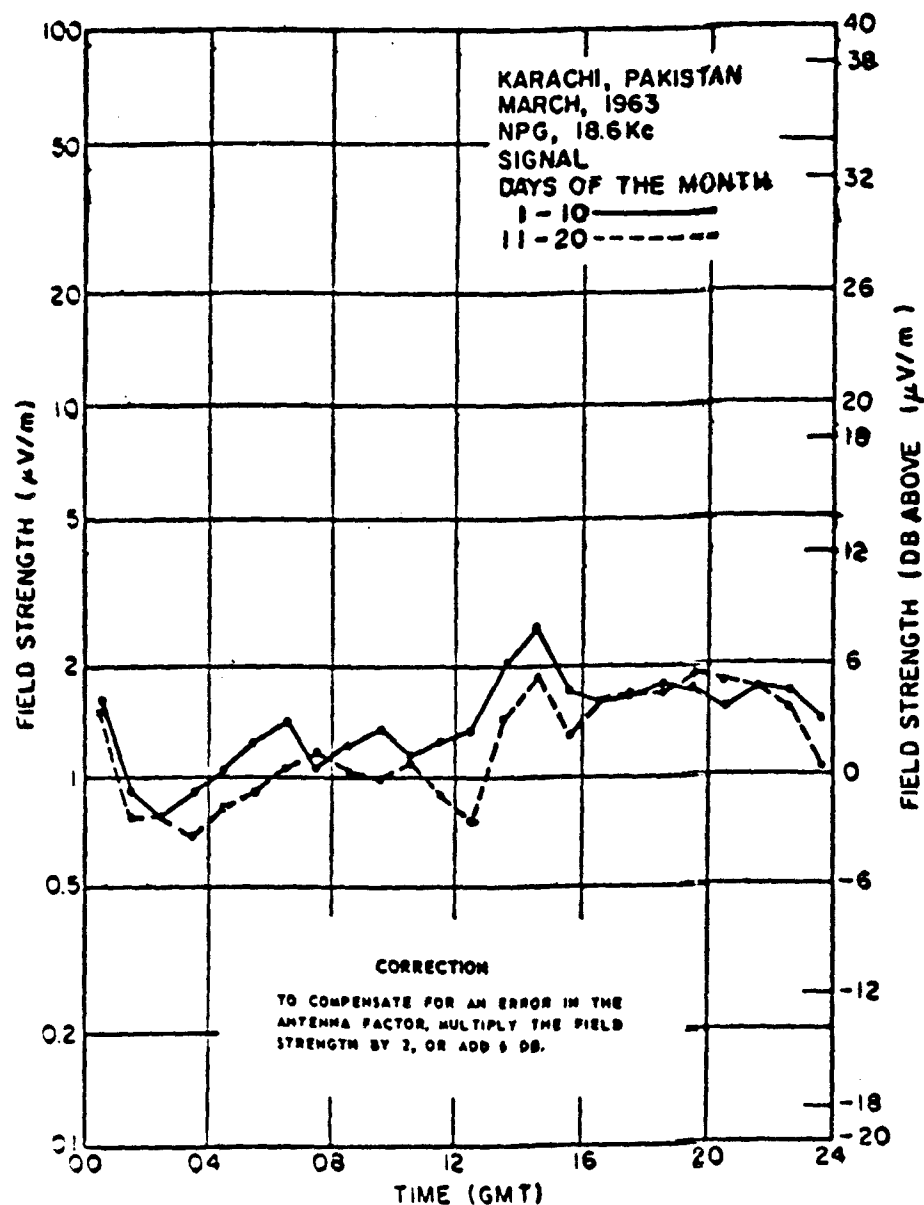


Figure 316

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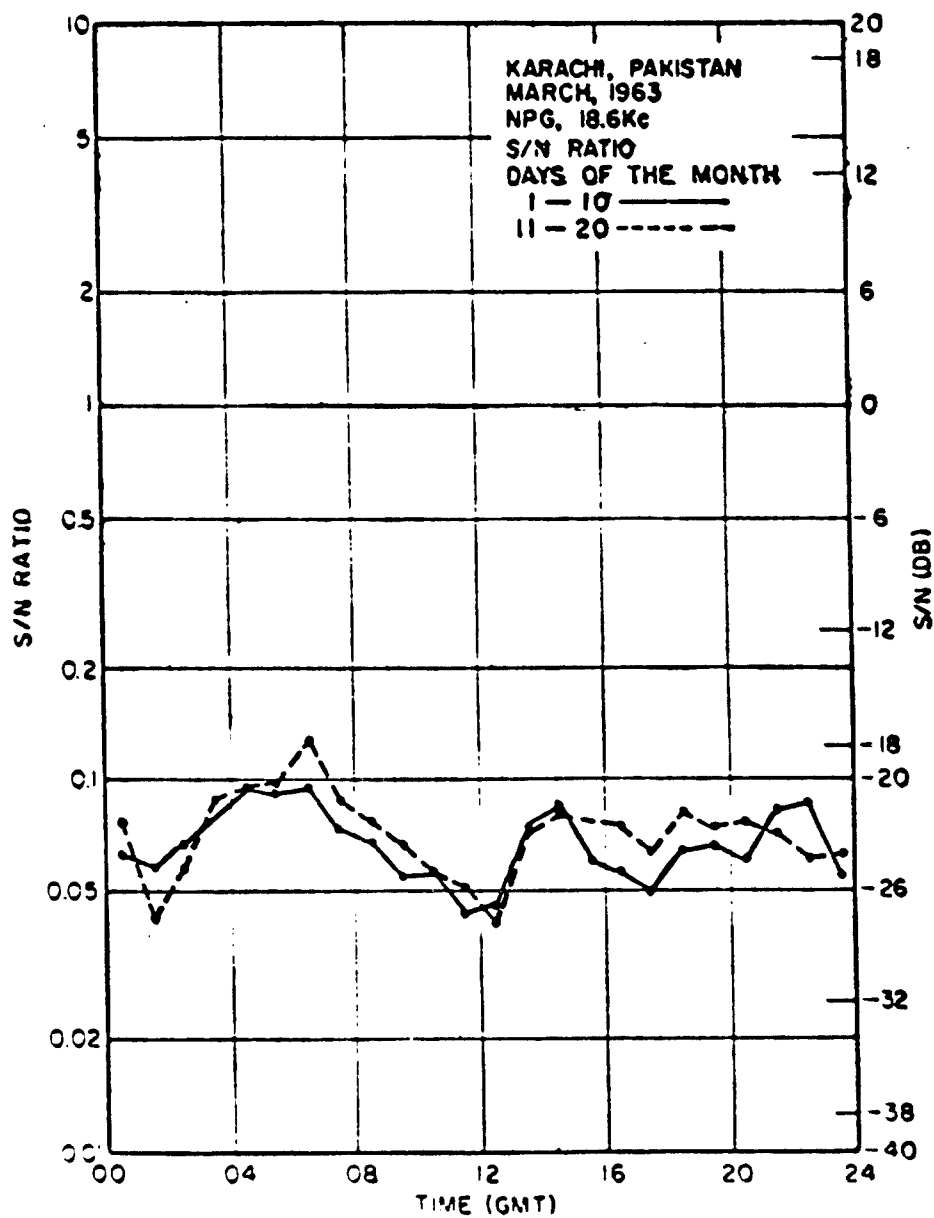


Figure 317

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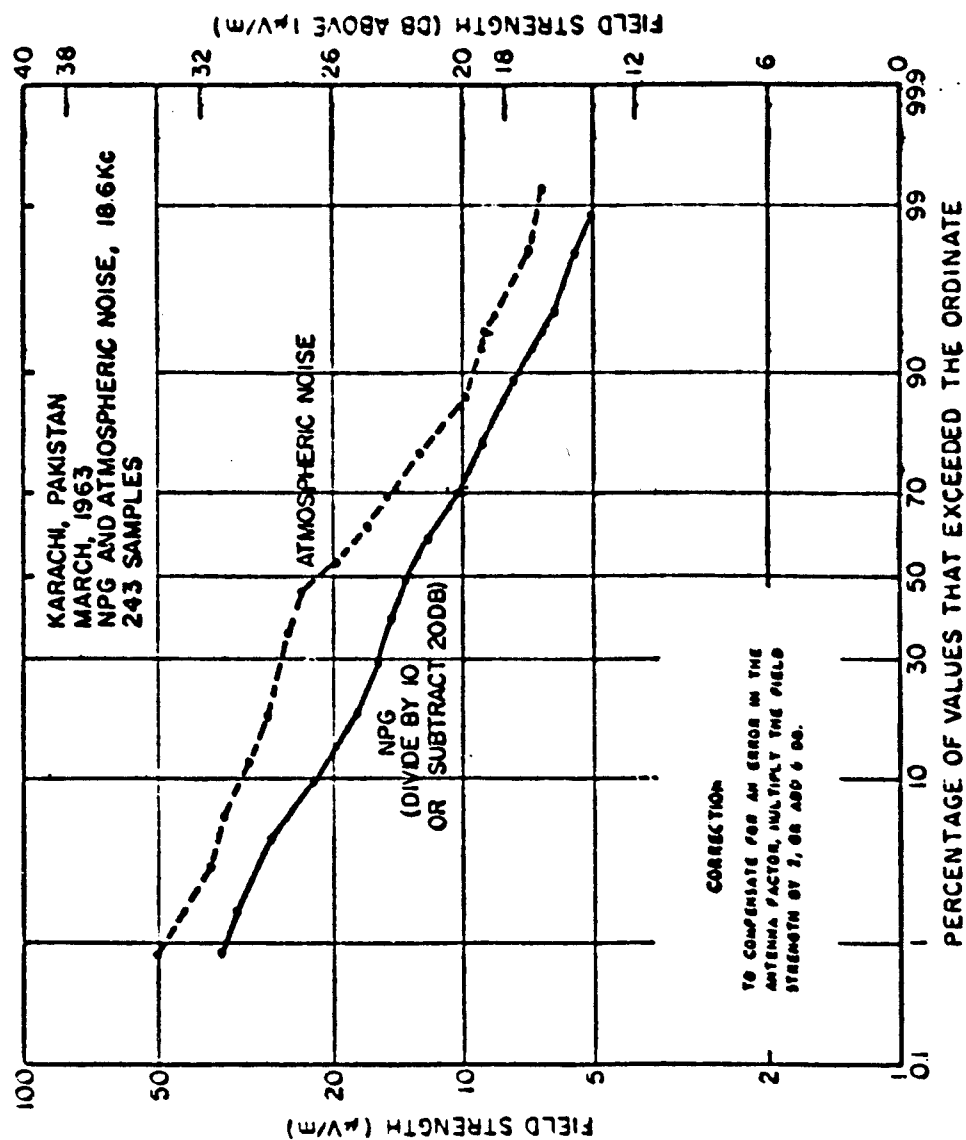


Figure 318

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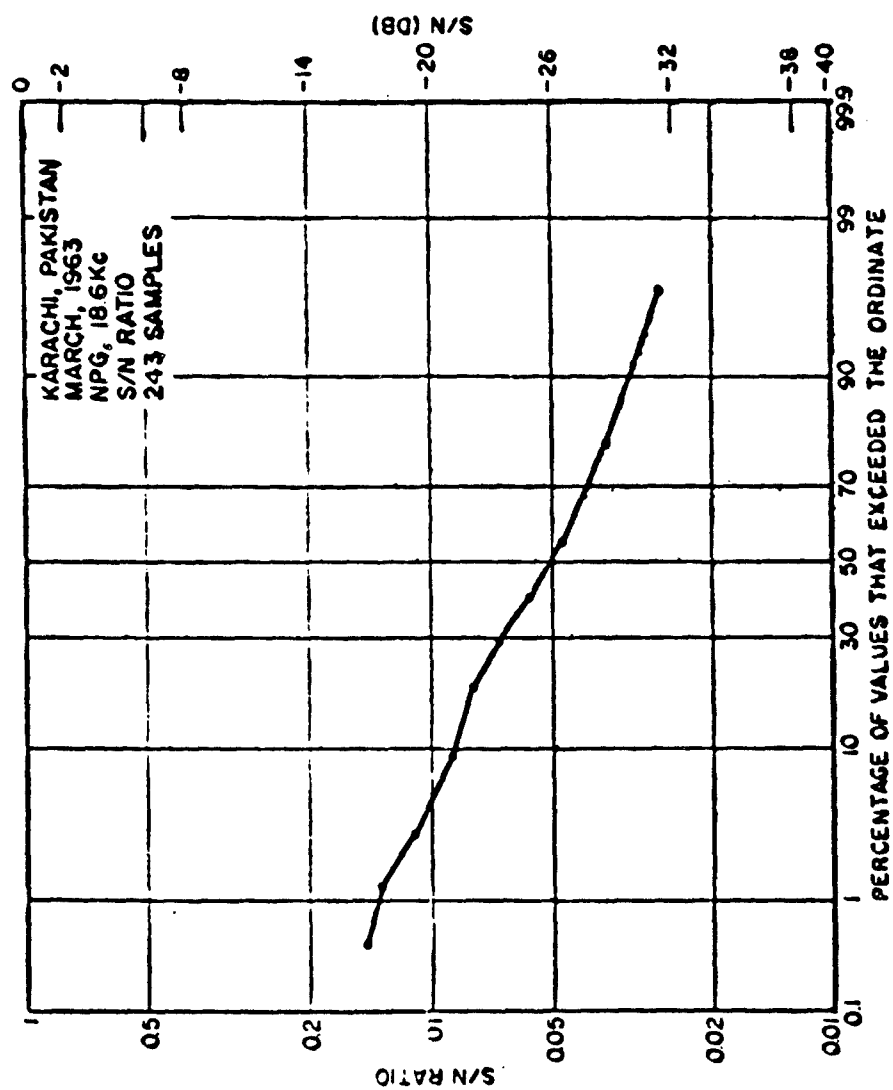


Figure 319

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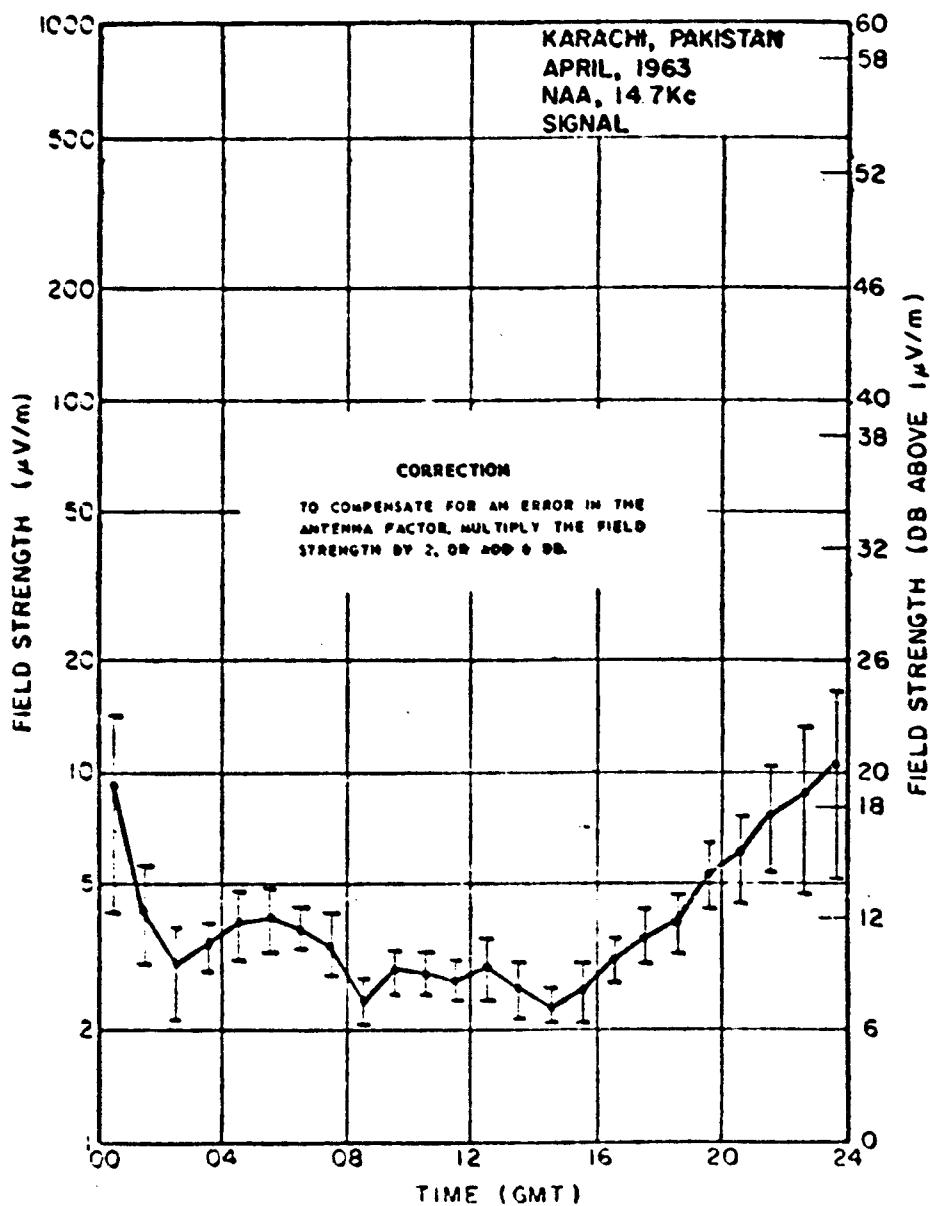


Figure 320

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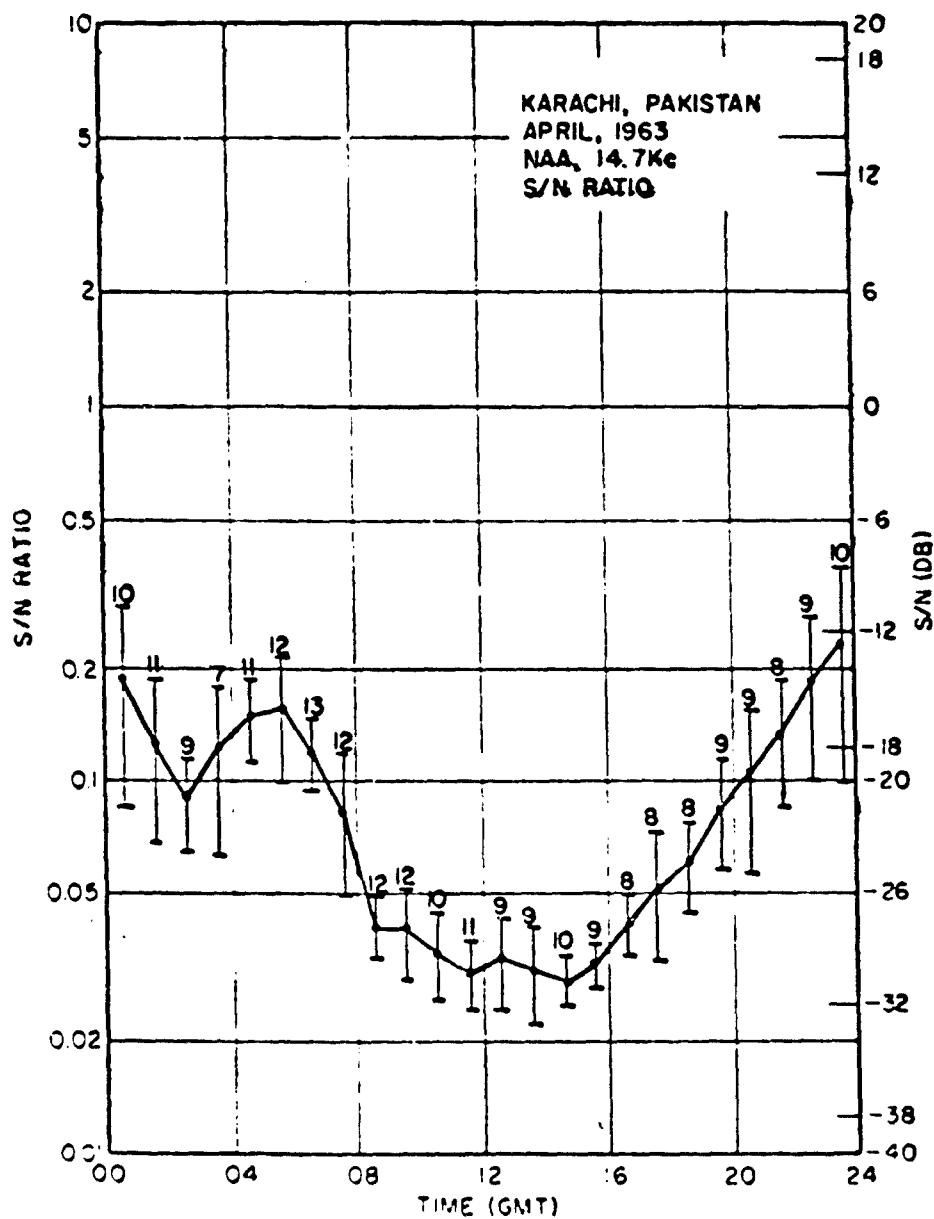


Figure 321

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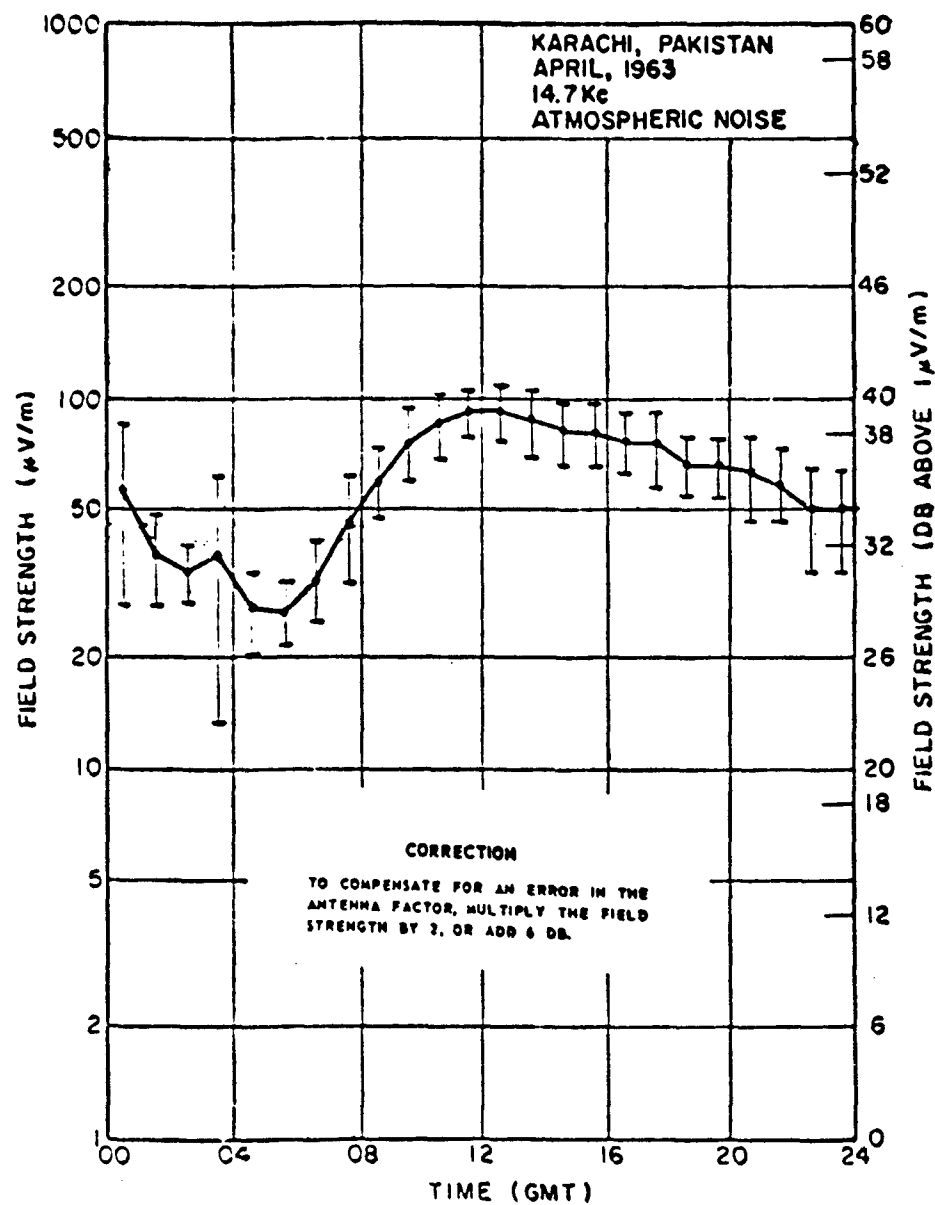


Figure 322

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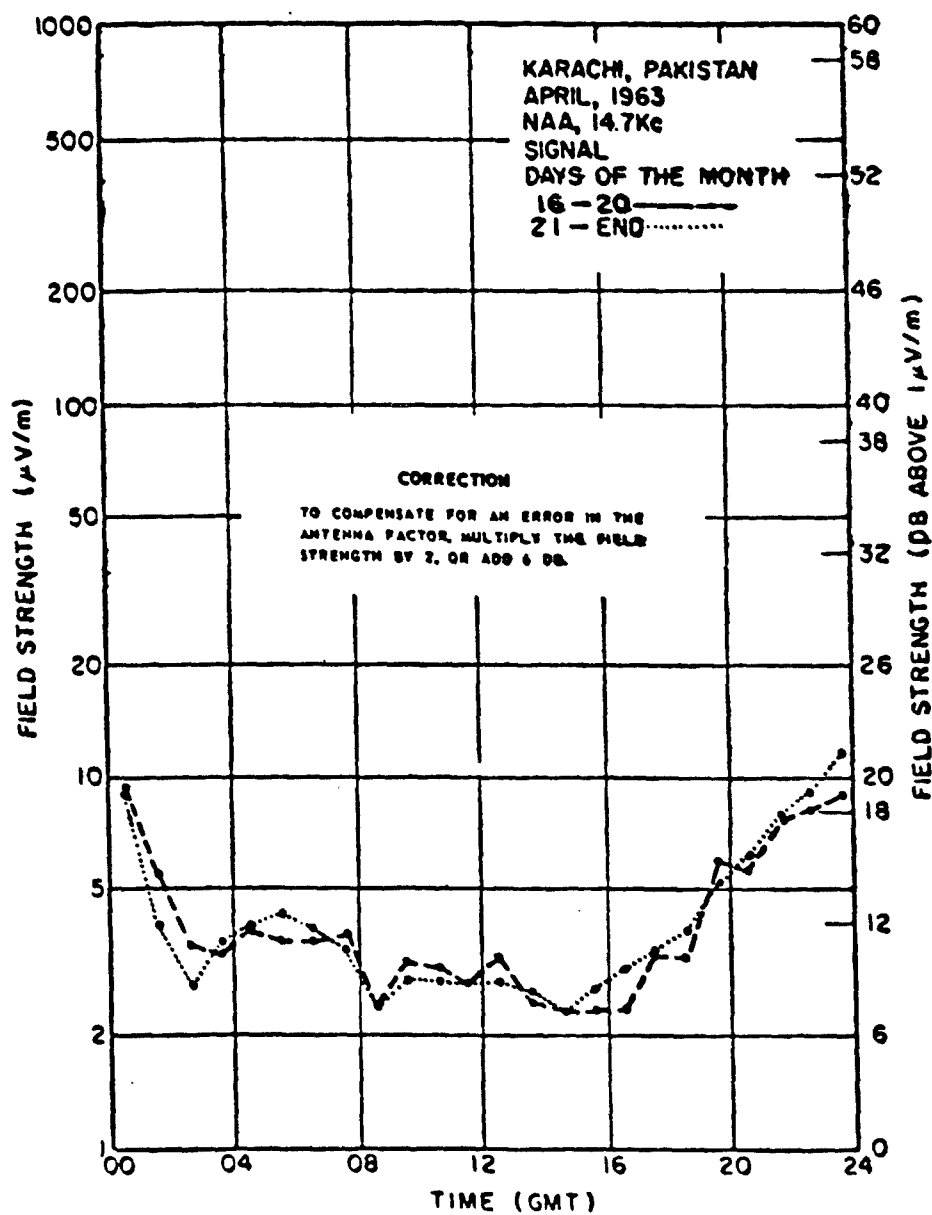


Figure 323

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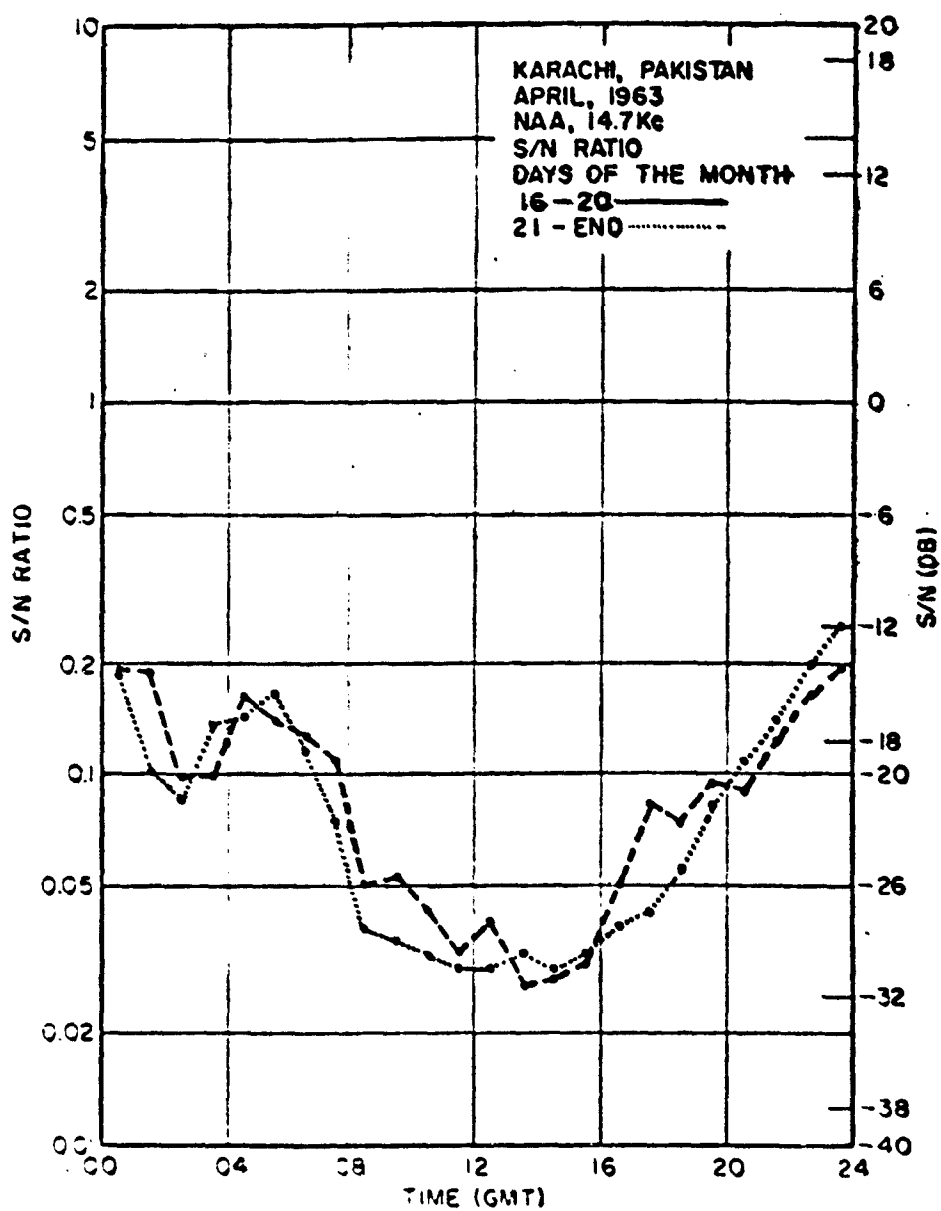


Figure 324

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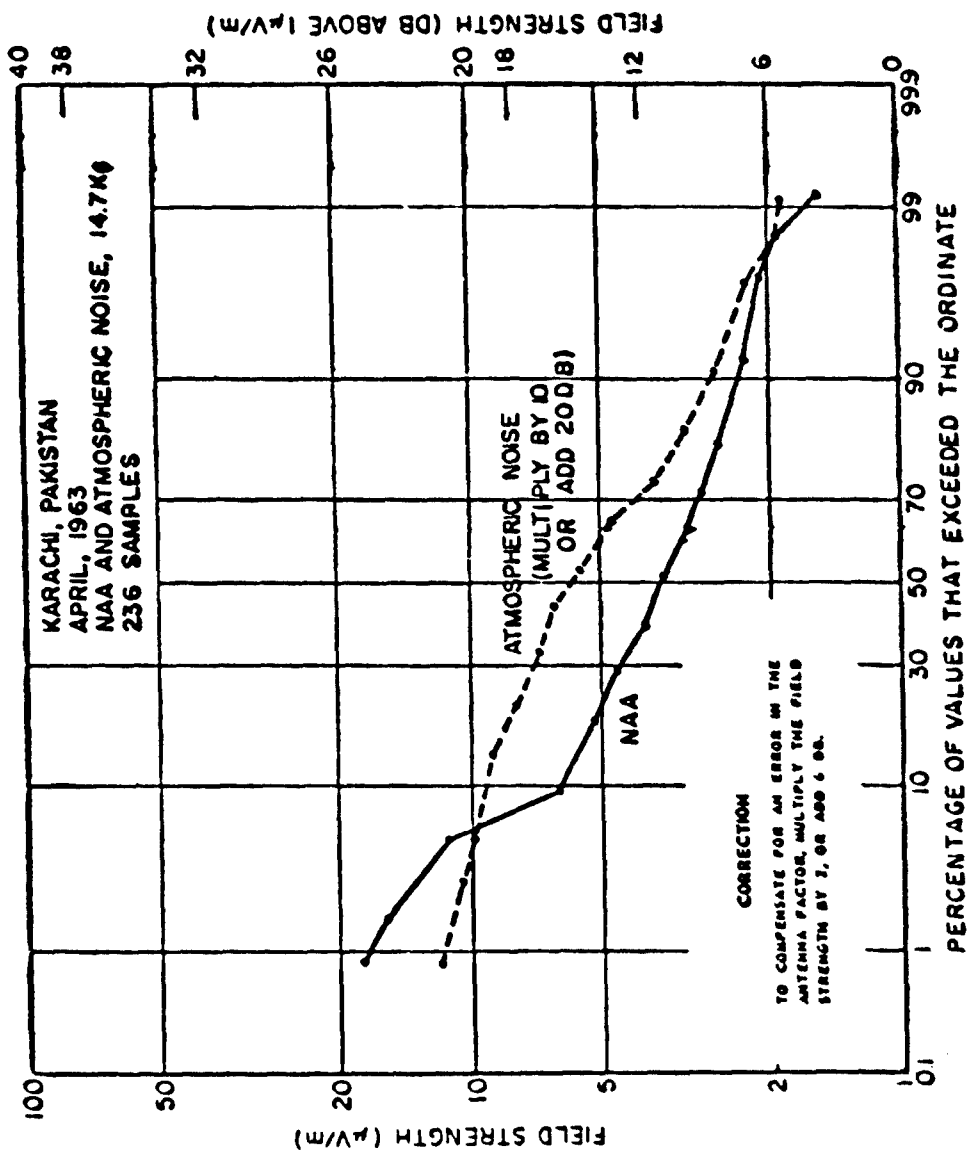


Figure 325

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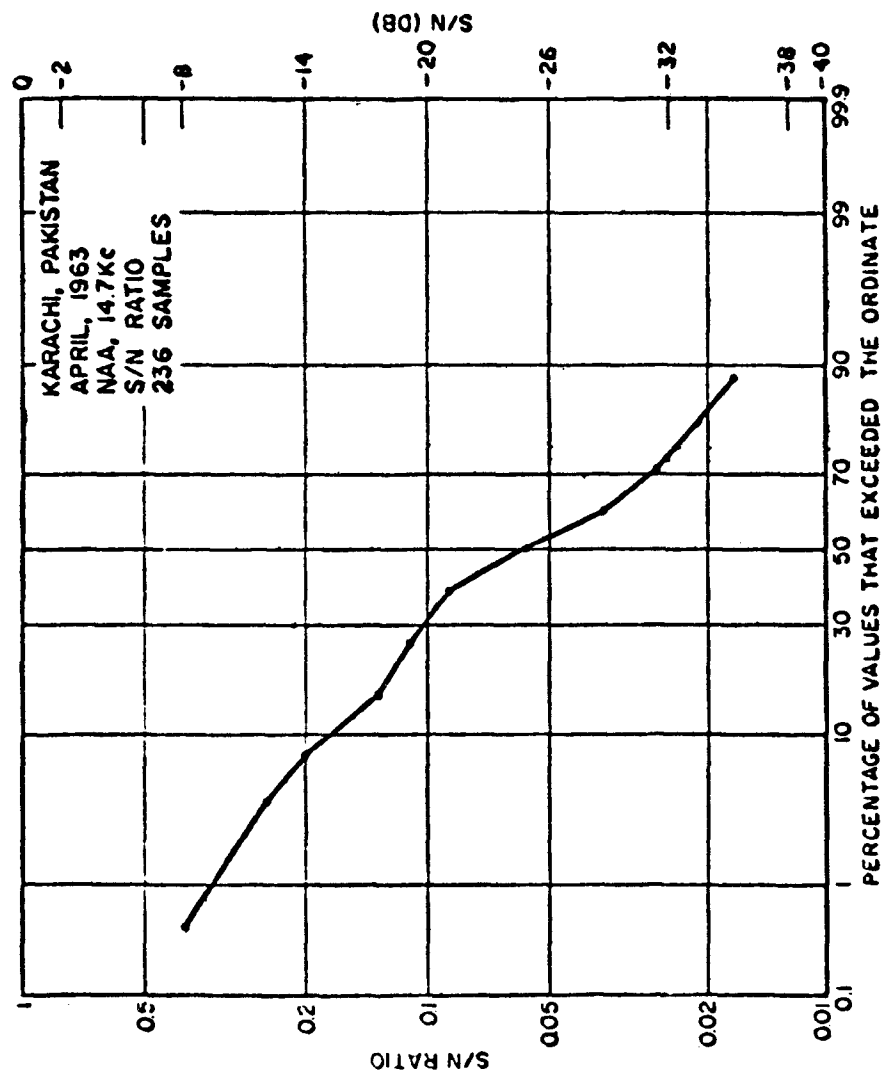


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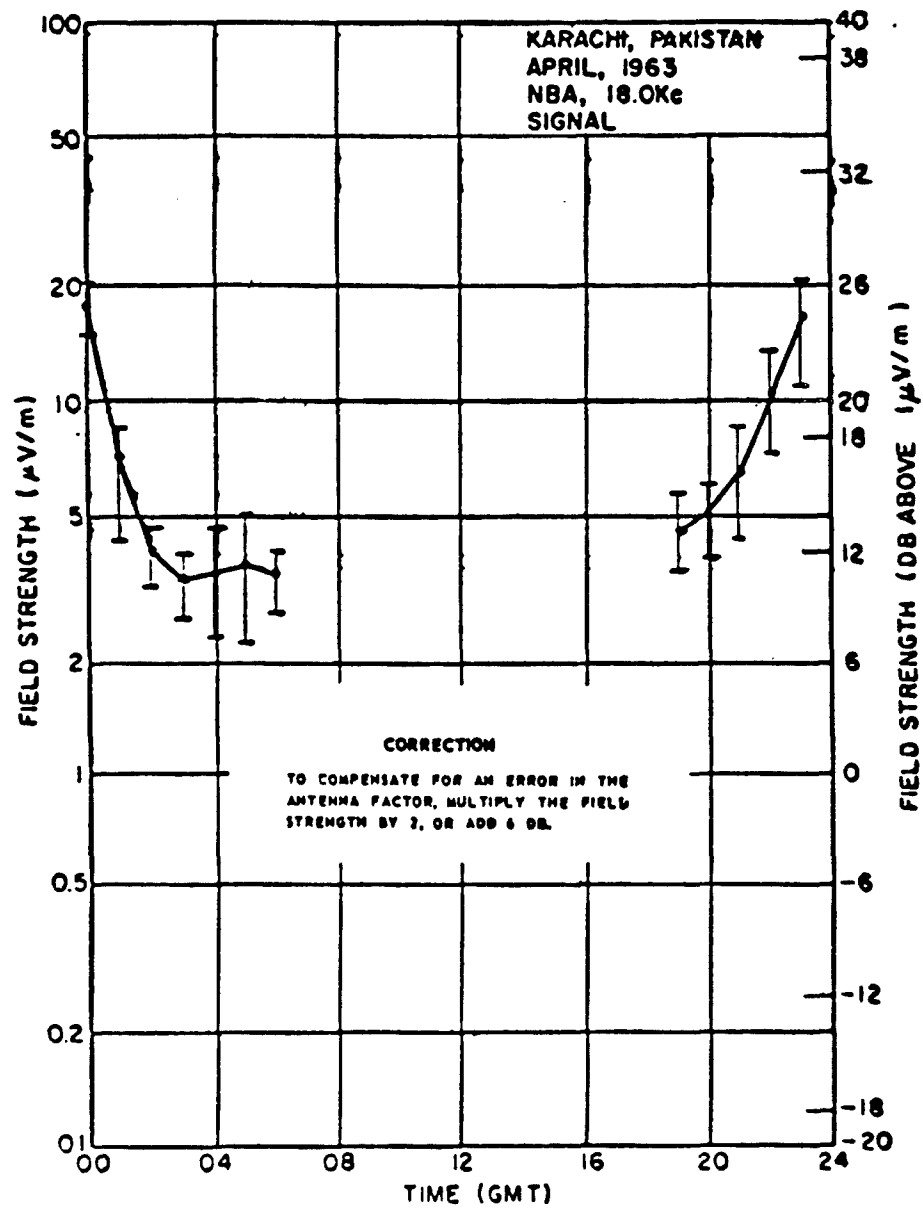


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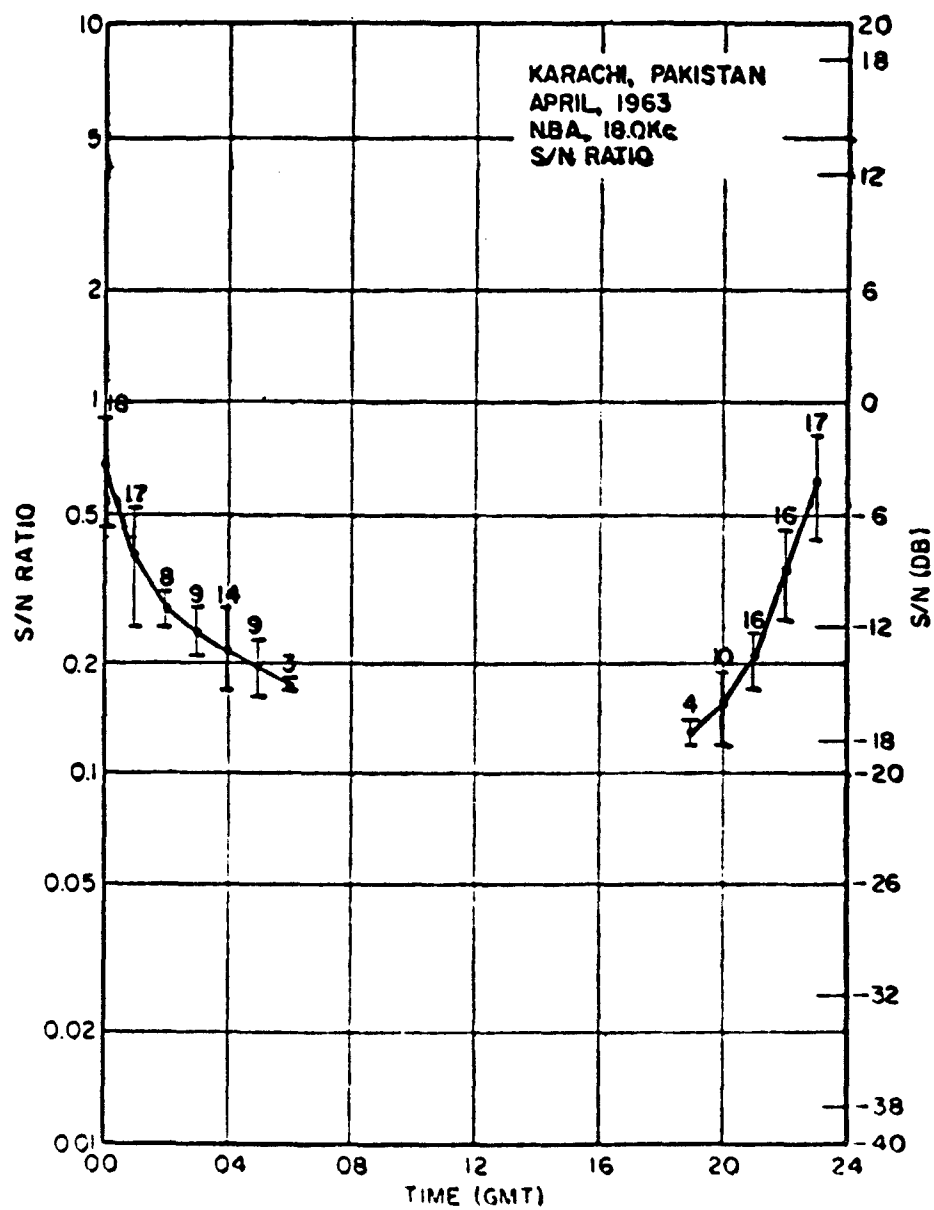


Figure 328

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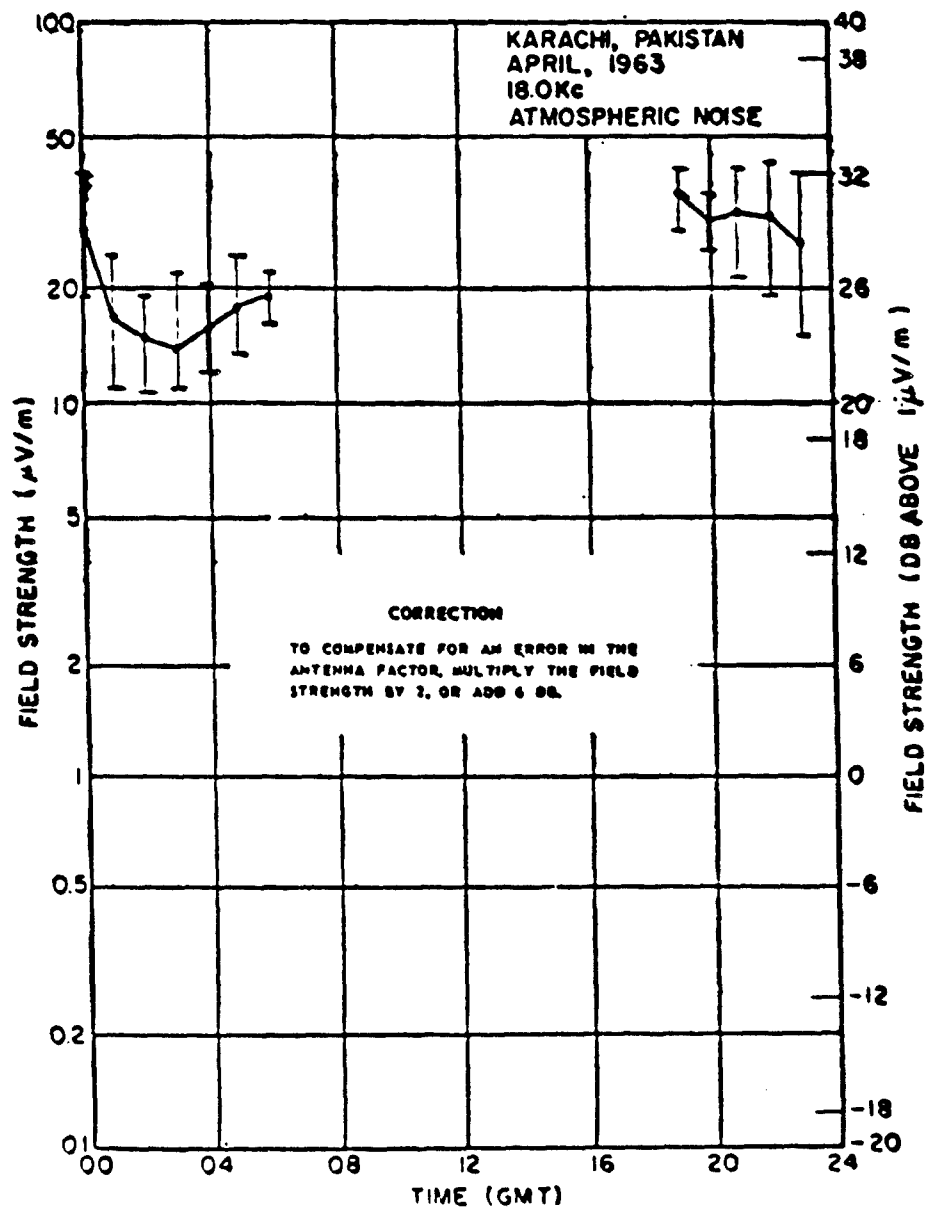


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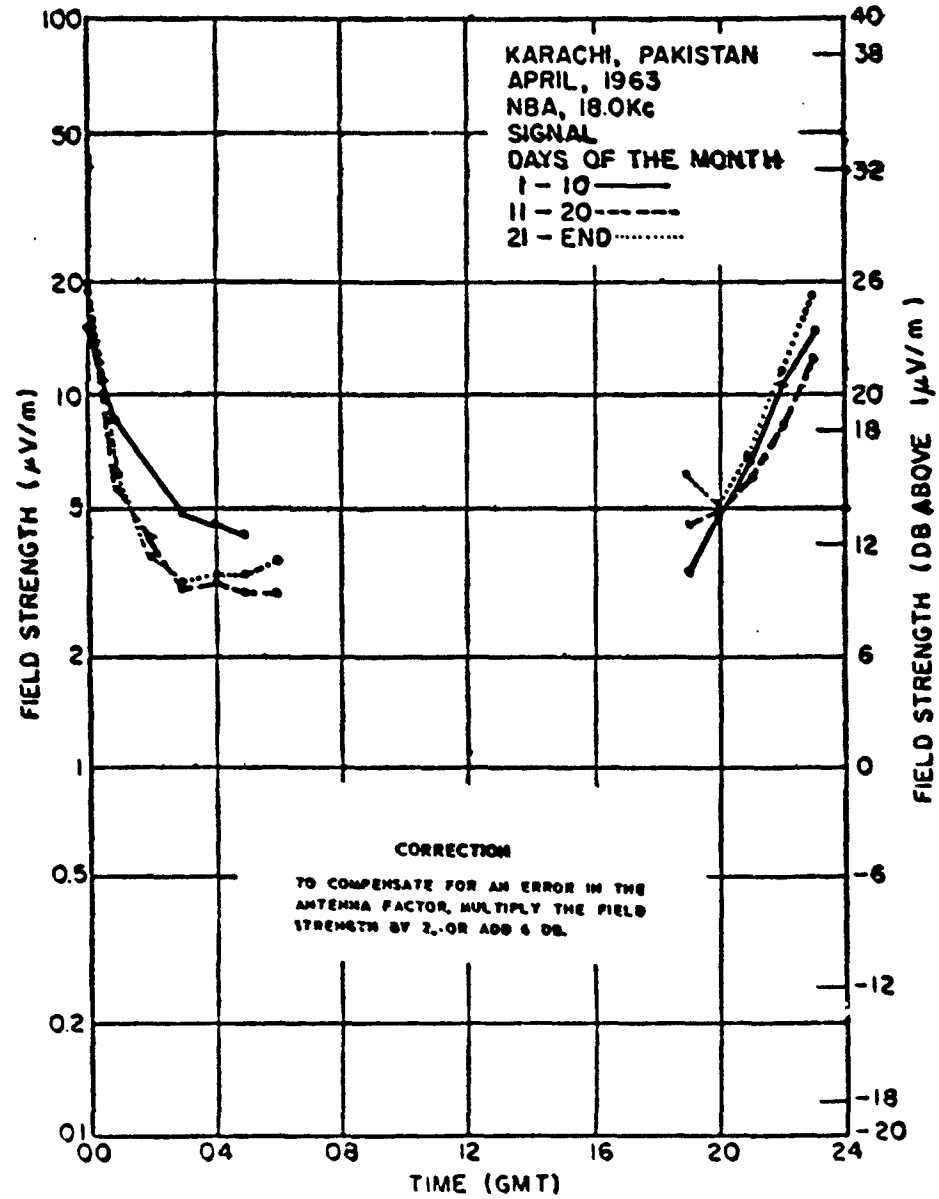


Figure 330

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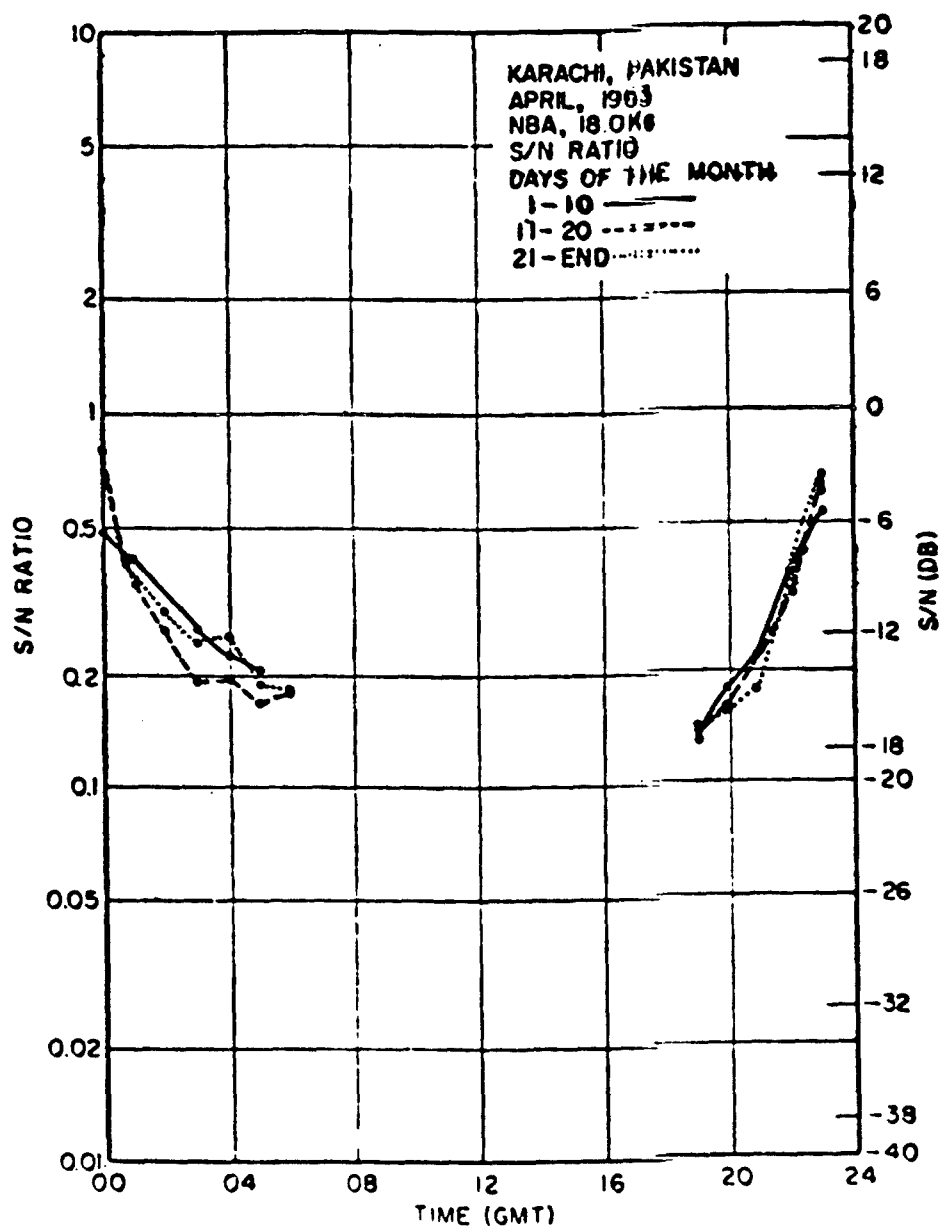


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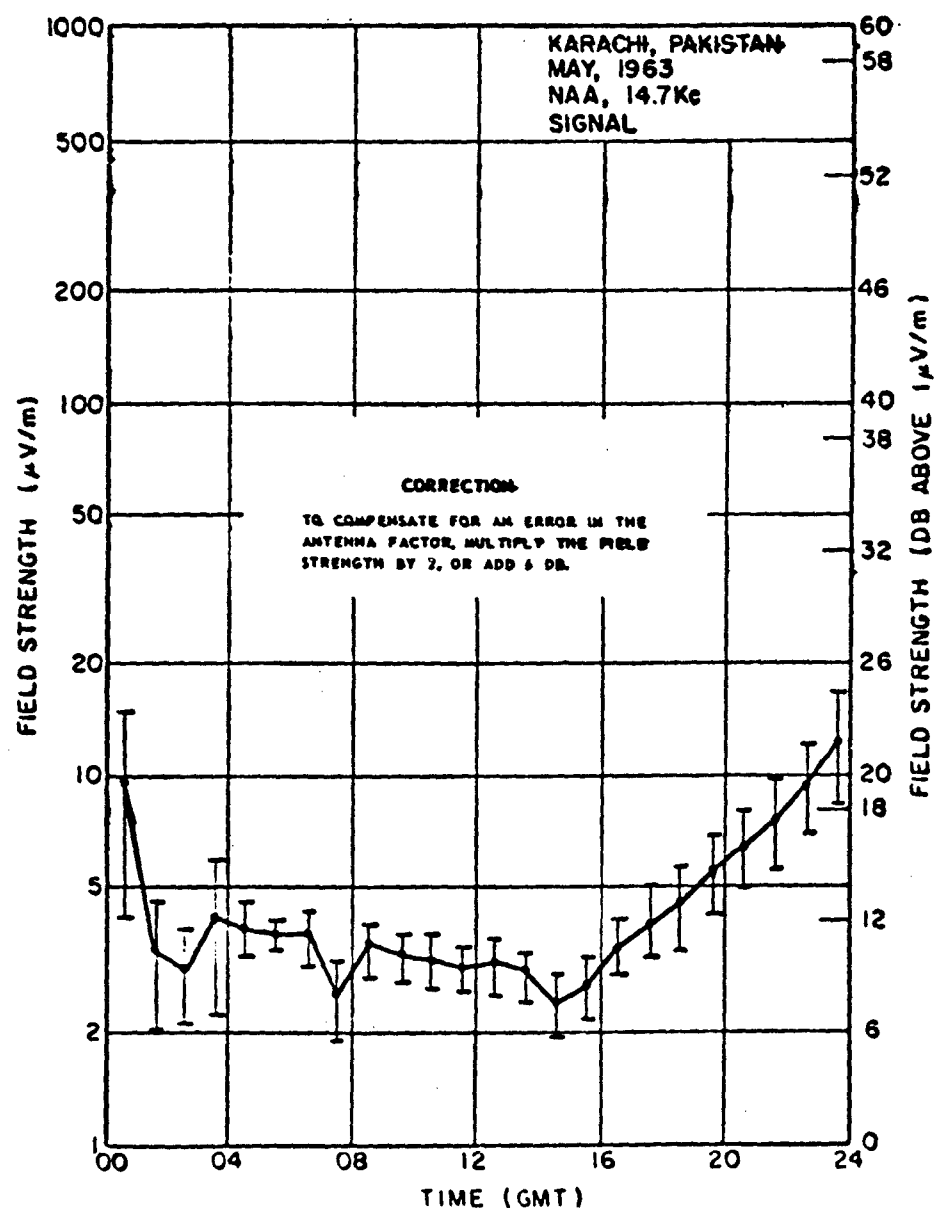


Figure 332

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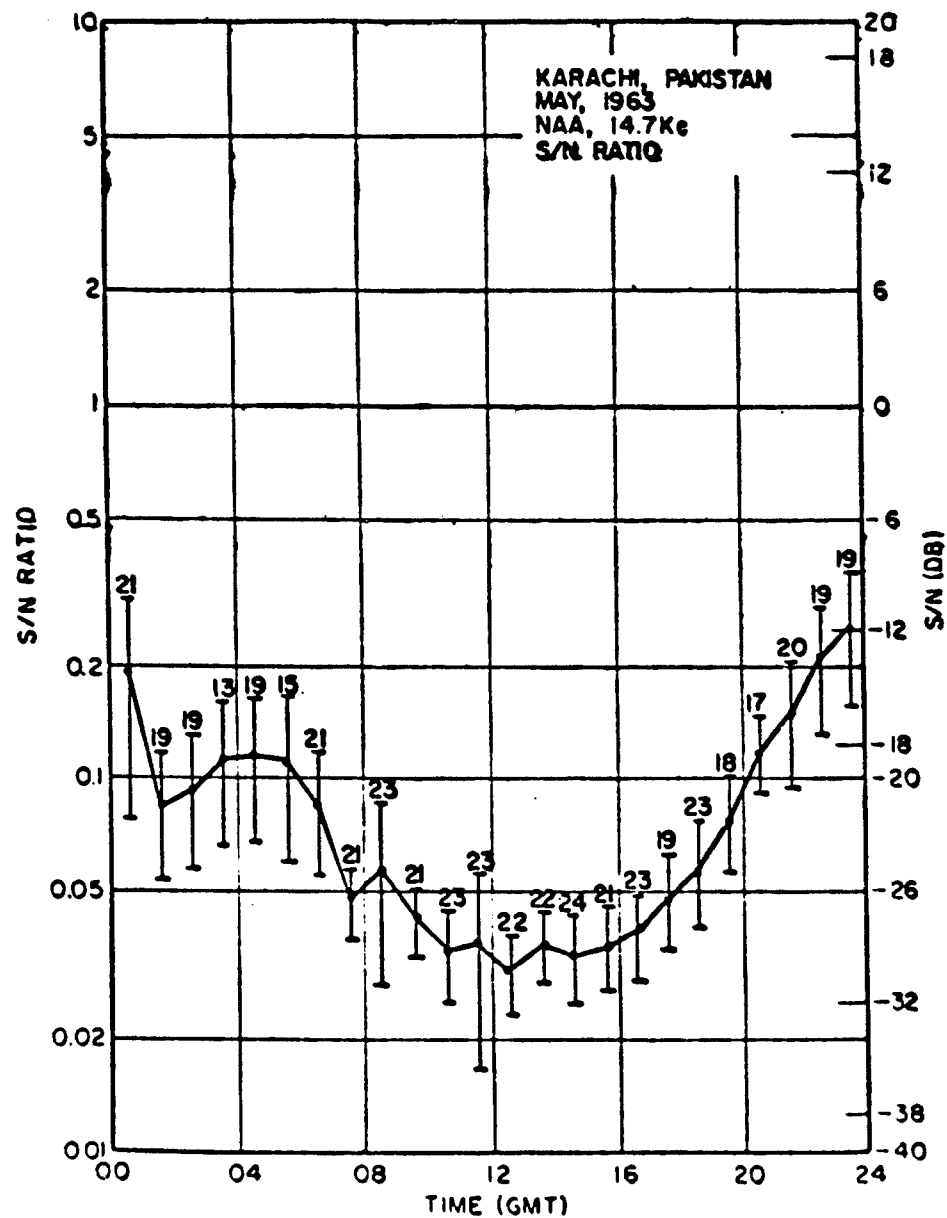


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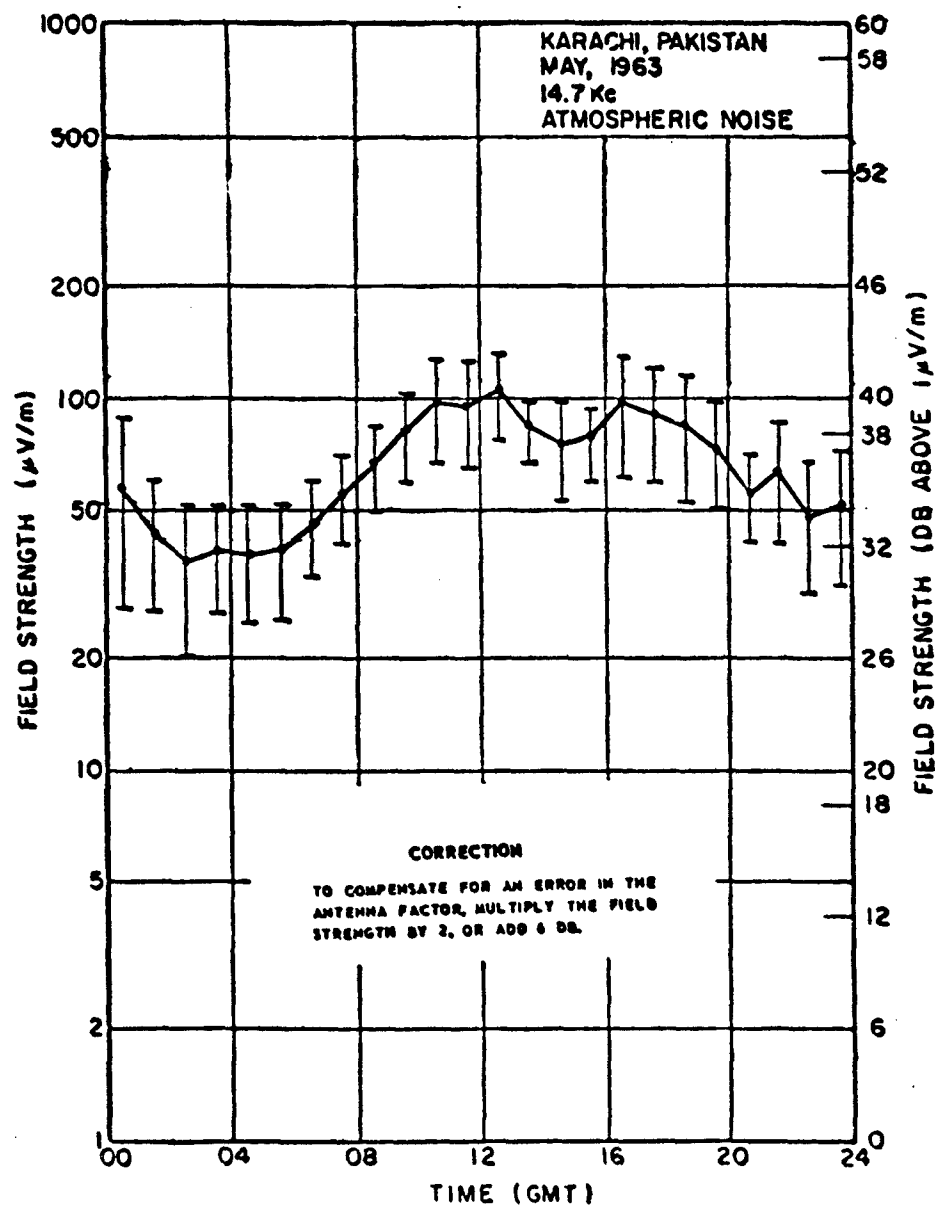


Figure 334

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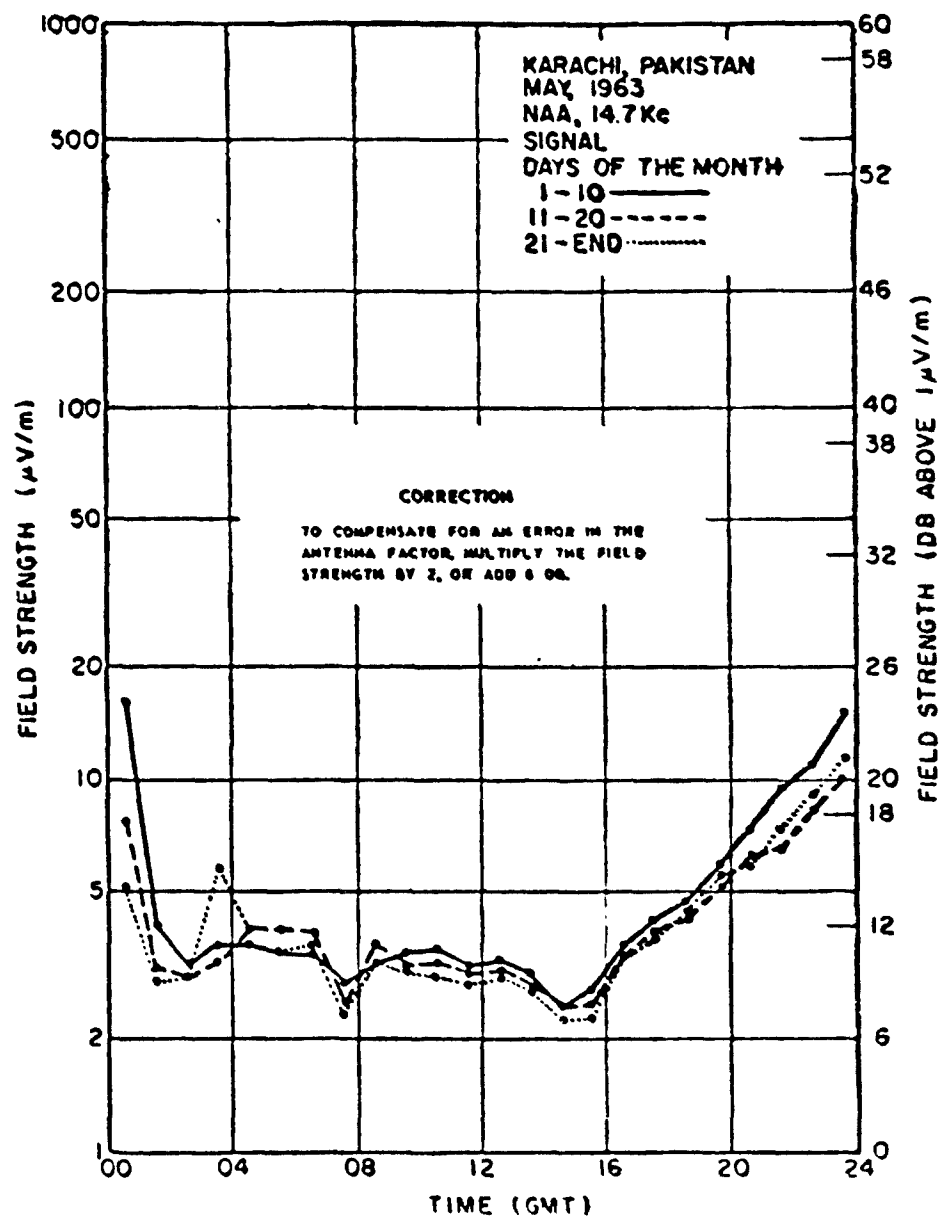


Figure 335

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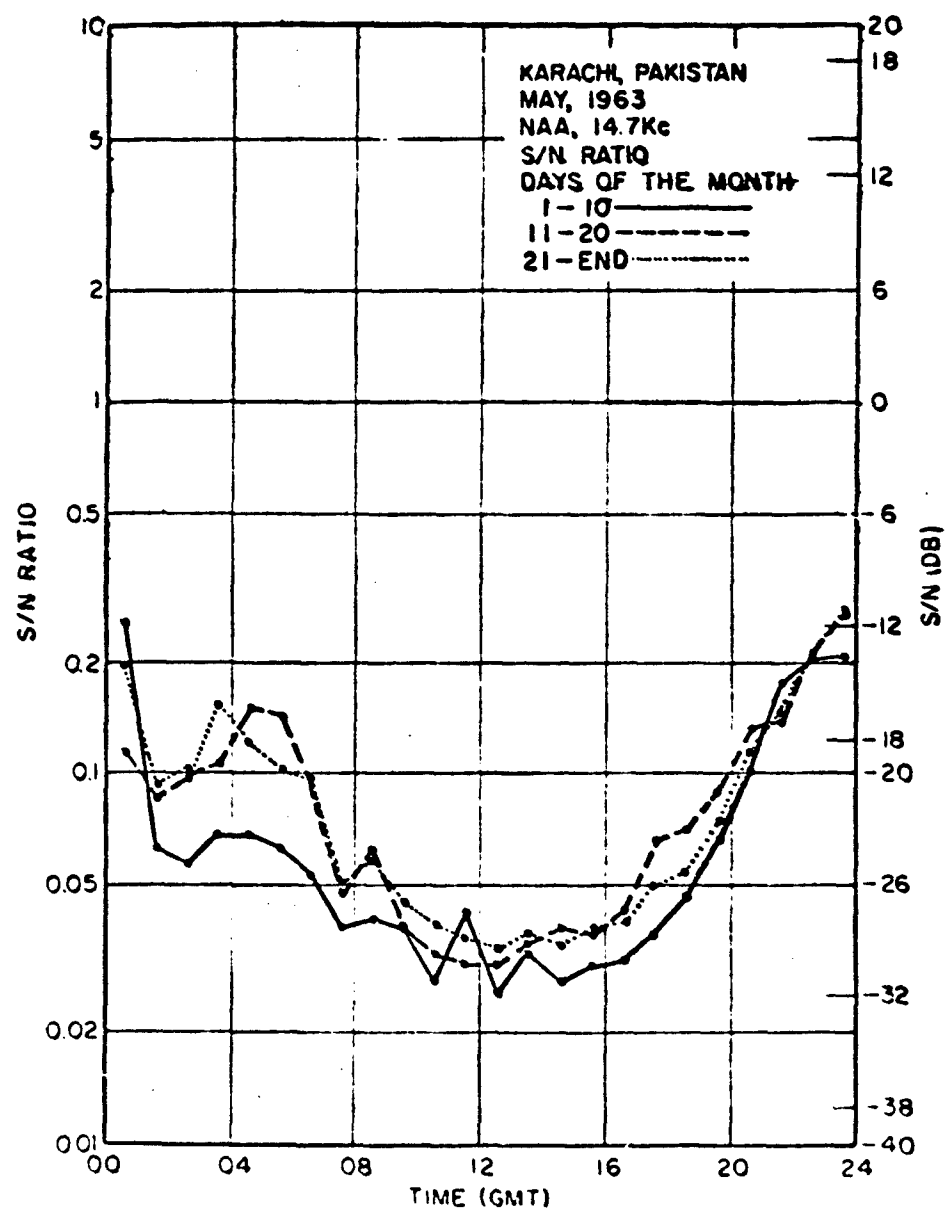


Figure 336

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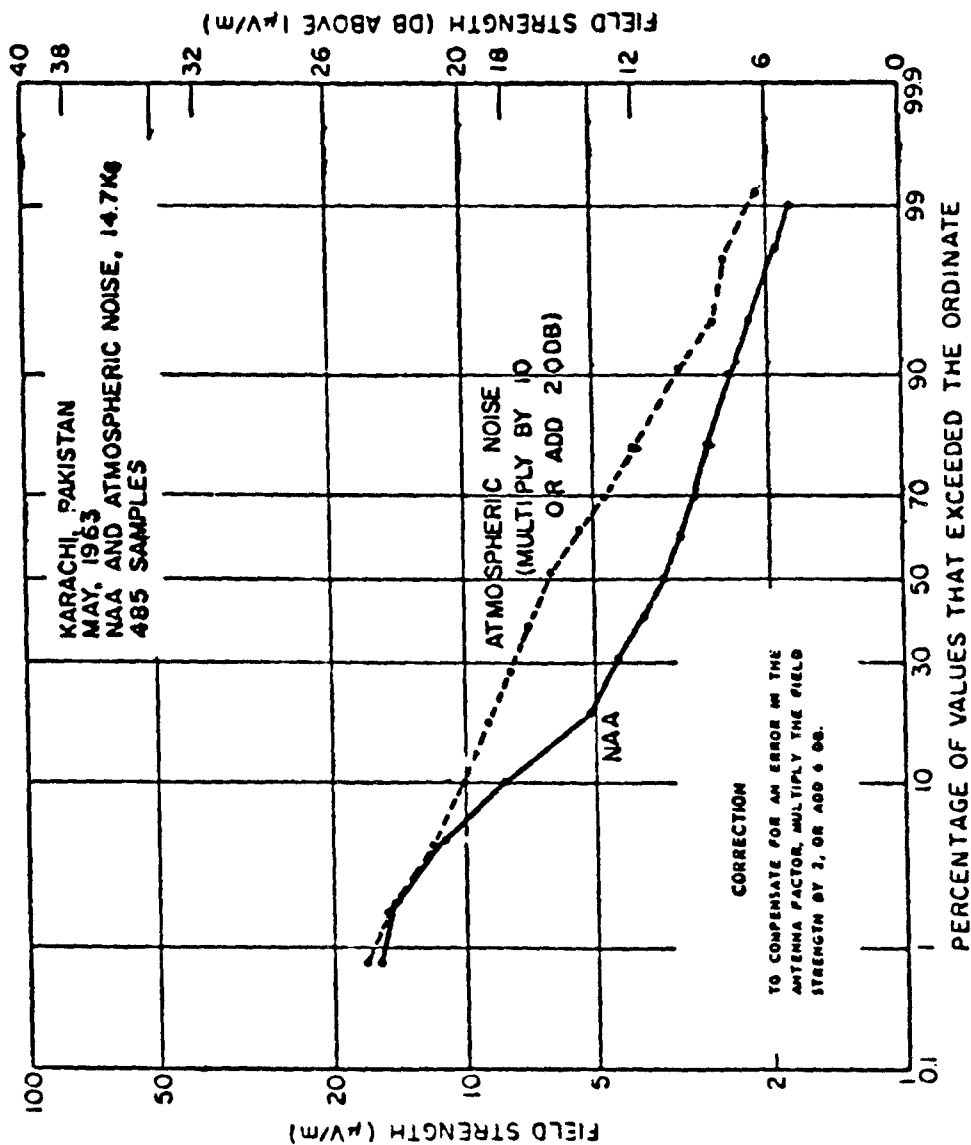


Figure 337

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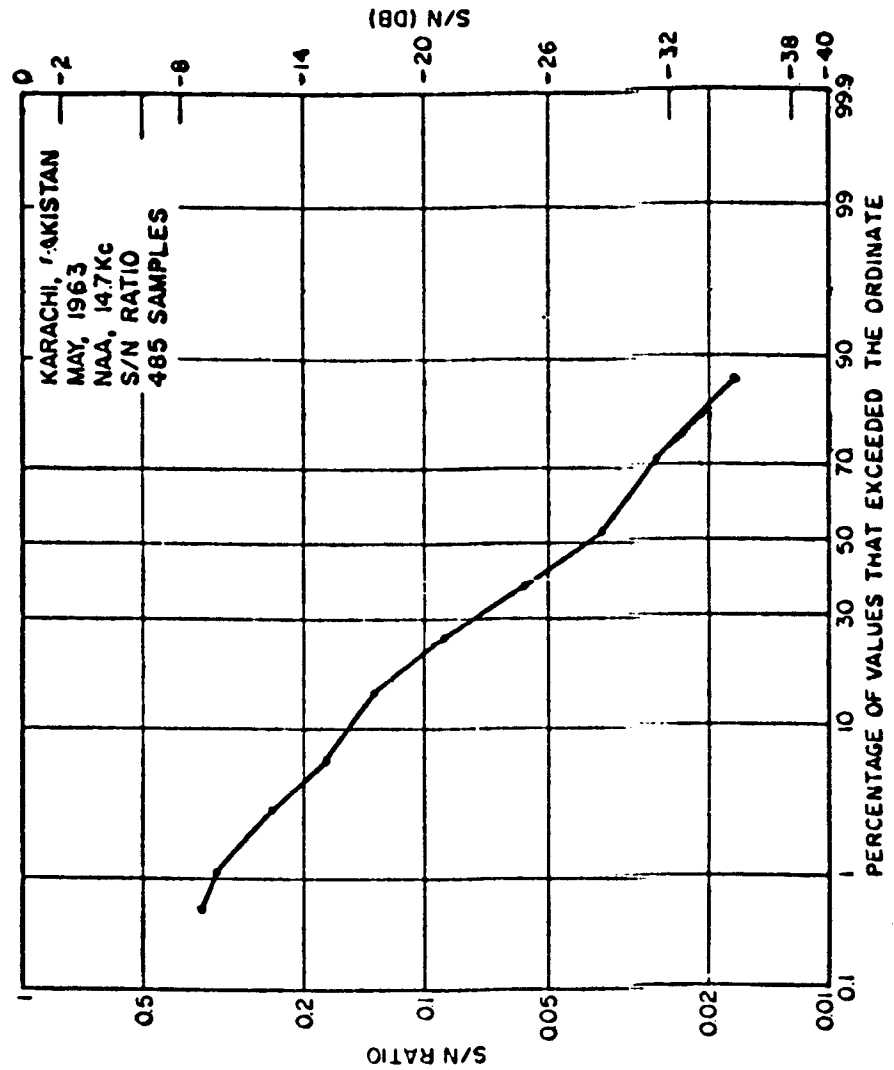


Figure 338

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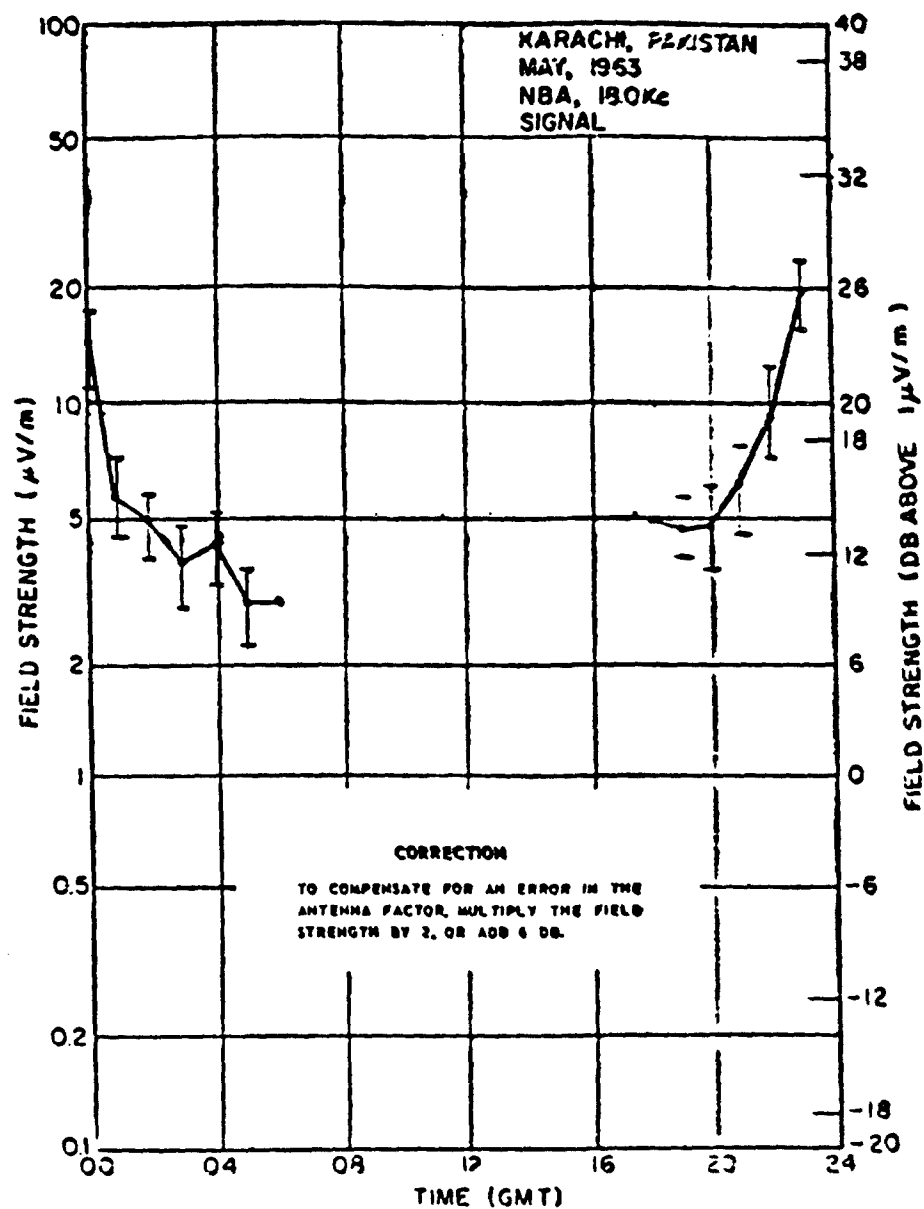


Figure 339

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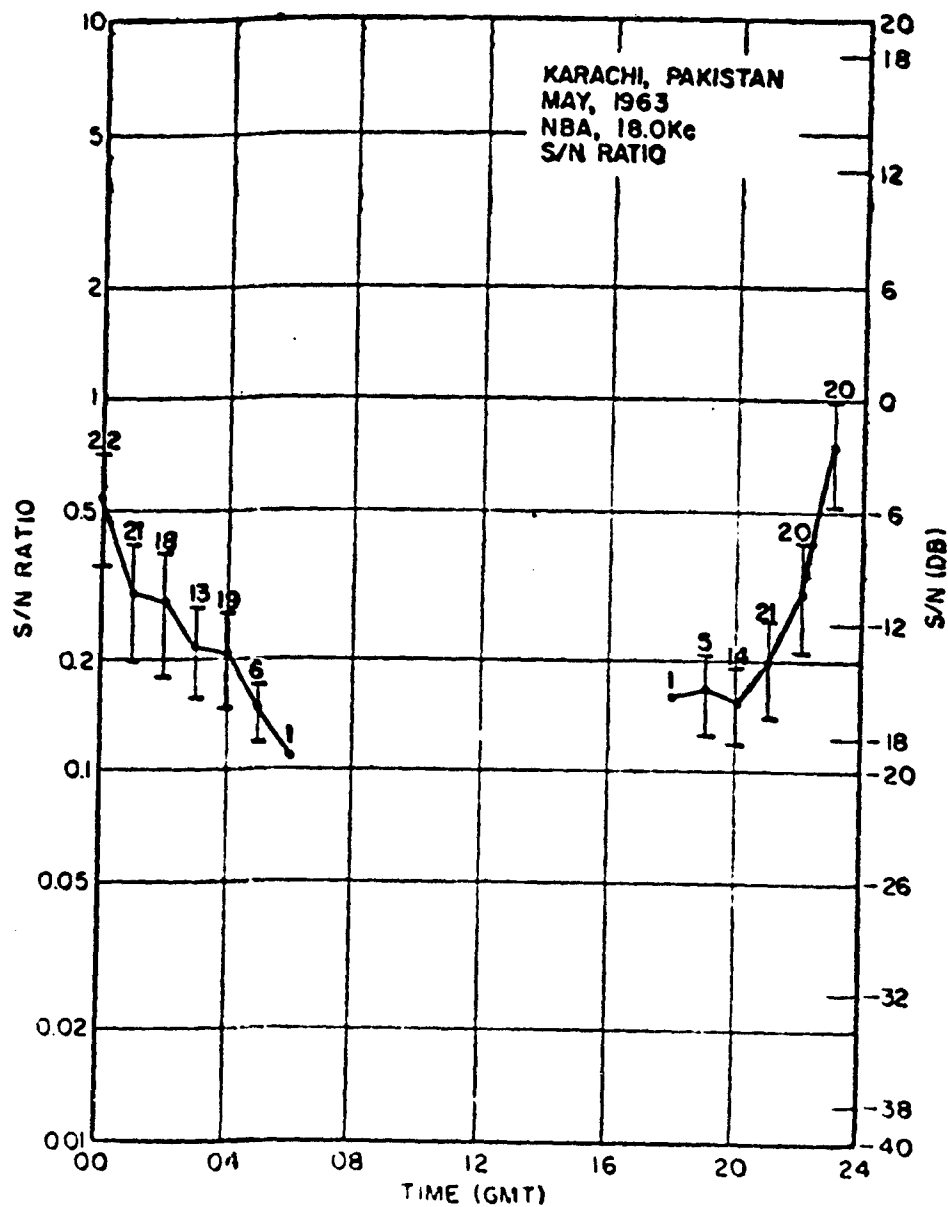


Figure 340

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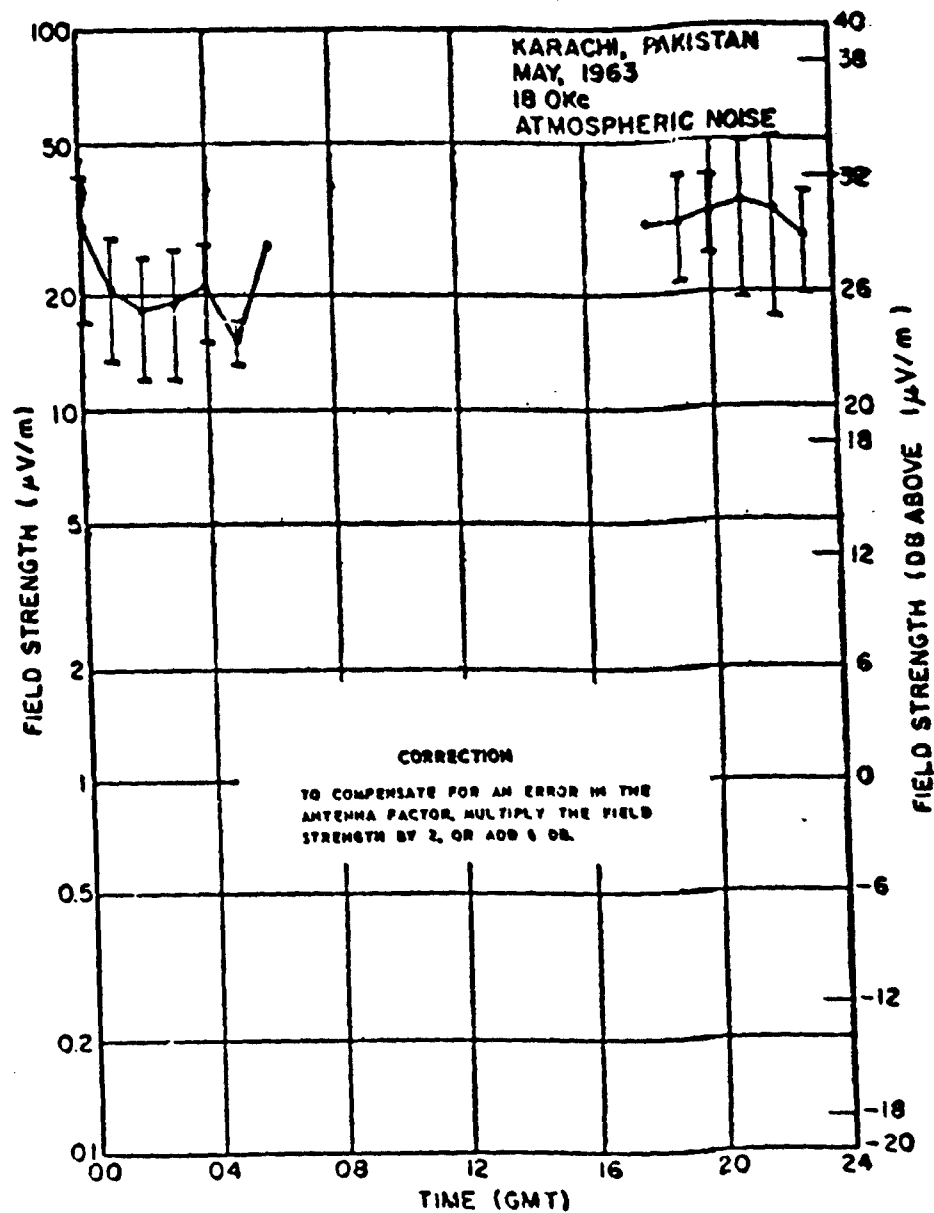


Figure 341

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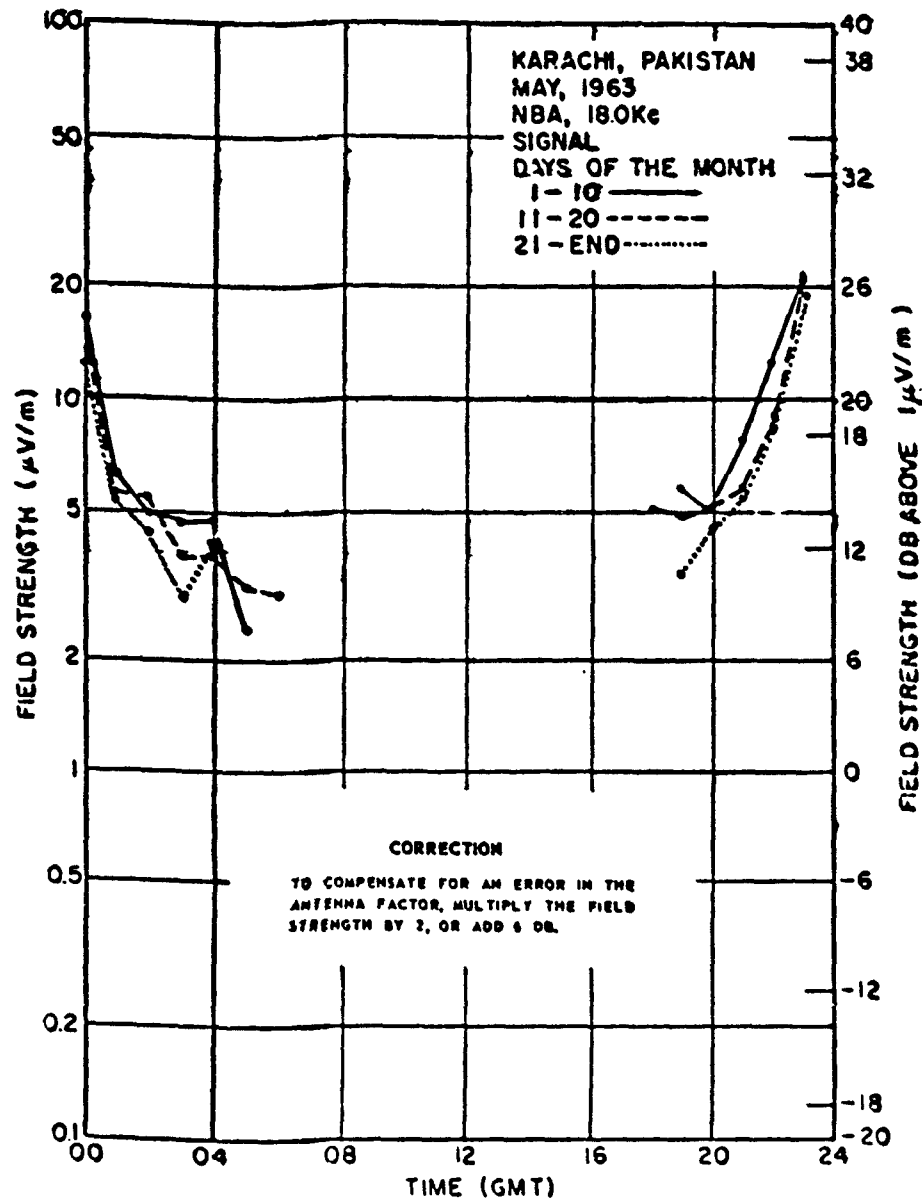


Figure 342

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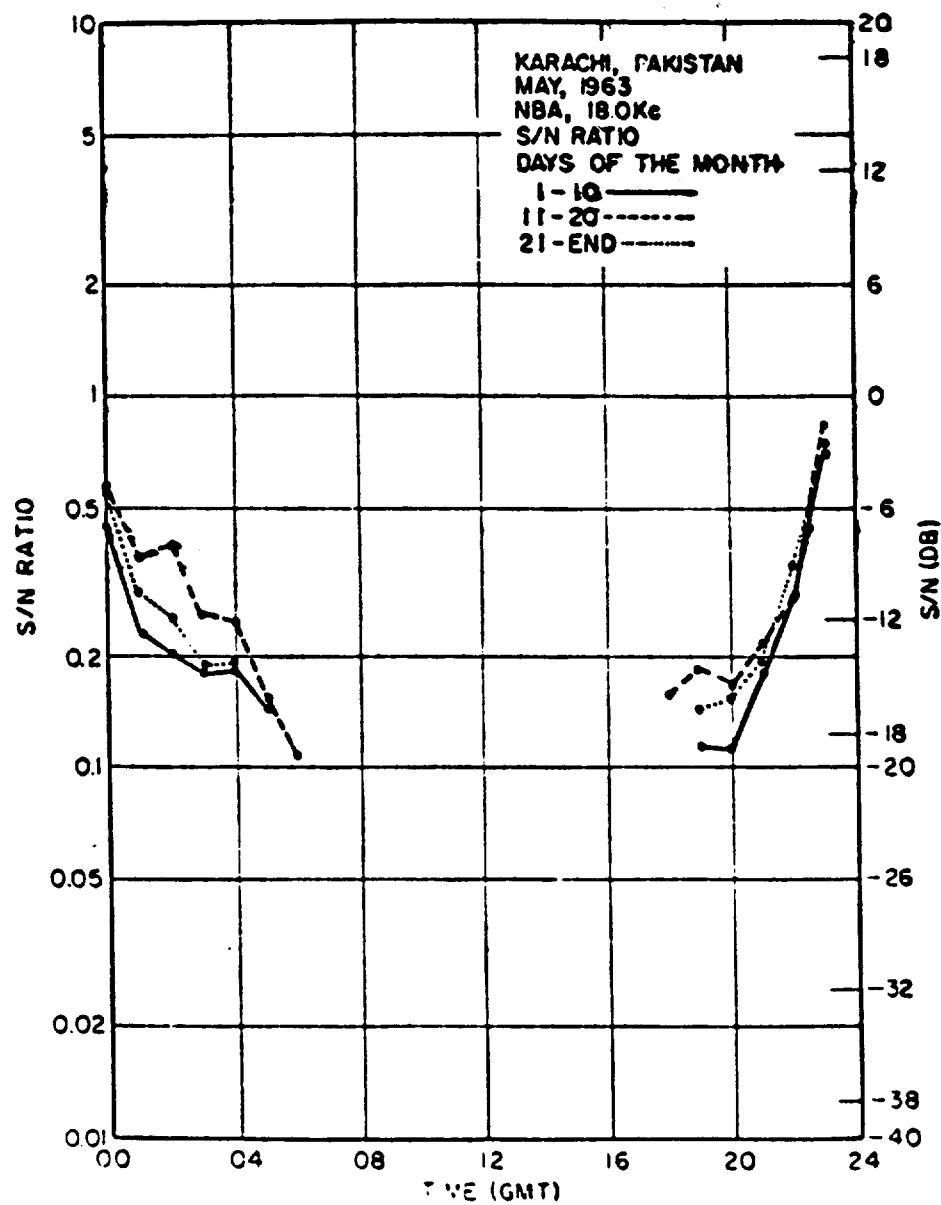


Figure 343

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**Naval Research Laboratory
Technical Library
Research Reports Section**

DATE: June 19, 2002

FROM: Mary Templeman, Code 5227

TO: Code 5300 Paul Hughes

CC: Tina Smailwood, Code 1221.1 *f2 6/21/02*

SUBJ: Review of NRL Reports

Dear Sir/Madam:

1. Please review NRL MR -1184, MR-1193, MR-1417, MR-1571, MR-1595, MR-1635, and MR-1667 for:

- ☒ Possible Distribution Statement
☒ Possible Change in Classification

Thank you,

Mary Templeman

Mary Templeman

(202)767-3425

maryt@library.nrl.navy.mil

The subject report can be:

- ☒ Changed to Distribution A (Unlimited)
☒ Changed to Classification Unclassified
☐ Other:

Paul K. Hughes II *6/21/02*
Signature Date

-- 1 OF 1
-- 1 - AD NUMBER: 359527
-- 2 - FIELDS AND GROUPS: 20/14, 25/2
-- 3 - ENTRY CLASSIFICATION: UNCLASSIFIED
-- 5 - CORPORATE AUTHOR: NAVAL RESEARCH LAB WASHINGTON D C
-- 6 - UNCLASSIFIED TITLE: FIELD STRENGTHS OF SOME VLF TRANSMISSIONS
-- AND ATMOSPHERIC NOISE MEASURED IN EUROPEAN AND ASIAN AREAS JUNE
-- 1962 THROUGH MAY 1963
-- 8 - TITLE CLASSIFICATION: UNCLASSIFIED
-- 9 - DESCRIPTIVE NOTE: QUARTERLY REPT. NO. 14, JUN 62-MAY 63,
--10 - PERSONAL AUTHORS: GARNER,W. E. ;RHOADS,F. J. ;SCHAUER,R. L. ;
--11 - REPORT DATE: 2 MAR 1965
--12 - PAGINATION: XXXXXX MEDIA COST: \$ 7.00 PRICE CODE: AA
--14 - REPORT NUMBER: NRL-MR-1595
--16 - PROJECT NUMBER: SR008 01 01
--20 - REPORT CLASSIFICATION: ~~CONFIDENTIAL~~
--23 - DESCRIPTORS: (*PROPAGATION, VERY LOW FREQUENCY), (*RADIO WAVES,
-- PROPAGATION), (*RADIO TRANSMISSION, VERY LOW FREQUENCY), TIME,
-- RANGES (DISTANCE), ATMOSPHERIC ELECTRICITY, ELECTROMAGNETIC FIELDS,
-- SIGNAL-TO-NOISE RATIO, EXPERIMENTAL DATA, WESTERN EUROPE, ASIA,
-- NOISE (RADIO)
--24 - DESCRIPTOR CLASSIFICATION: UNCLASSIFIED
--29 - INITIAL INVENTORY: 20

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--30 - ANNOTATION: FIELD STRENGTHS OF SOME VLF TRANSMISSIONS AND
-- ATMOSPHERIC NOISE MEASURED IN EUROPEAN AND ASIAN AREAS JUNE 1962
-- THROUGH MAY 1964.
--32 - REGRADE CATEGORY: C
--33 - LIMITATION CODES: 9
--34 - SOURCE SERIES: 14
--35 - SOURCE CODE: 251950
--36 - ITEM LOCATION: DTIC
--38 - DECLASSIFICATION DATE: OADR
--40 - GEOPOLITICAL CODE: 1100
--41 - TYPE CODE: N
--43 - IAC DOCUMENT TYPE:

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