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Technical Note No. 6

AN ANALYSIS OF PROPAGATION MEASUREMENTS MADE AT

418 MC WELL BEYOND THE RADIO HORIZON



U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS



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Well Beyond the Radio Horizon

by

H. B. Janes, J. C. Stroud and M. T. Decker

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Summary

This report presents the results of an analysis of transmission loss measurements made at 418 Mc over the 134-mile path from Cedar Rapids, Iowa to Quincy, Illinois during 1952 and 1953. The data consisted chiefly of continuous simultaneous recordings of signal level at several receiving antenna heights, ranging from 30 to 665 feet above ground. These data are reduced to tabulations of hourly median values of basic transmission loss and fading range. These values, as well as the hourly difference in transmission loss observed at two heights (height-gain) are also shown plotted in scatter diagrams versus time of day for each of the 13 two-week recording periods. The medians for each recording period of all hourly values of median basic transmission loss, fading range and height-gain are plotted versus time of year to show any seasonal variation in these statistics. A formula developed at NBS for predicting the median basic transmission loss in tropospheric scatter propagation is shown to be in good agreement with the data. The results of a study of the correlation of short-term signal variations observed at horizontally and vertically spaced antennas are given.

Introduction

This report covers a series of transmission loss measurements made by the National Bureau of Standards at a frequency of 418 Mc over a 134-mile path extending from Cedar Rapids, Iowa to Quincy, Illinois. The principal purpose of the measurements was to study: (1) the hourly,

diurnal and seasonal variations in basic transmission loss* experienced in transmissions made well beyond the radio horizon, (2) the corresponding long-term variability of height-gain, (3) the comparison of measured transmission loss and height-gain with predicted values and (4) the correlation of instantaneous signal levels measured at vertically and horizontally spaced antennas.

The experiment covered a period of approximately a year and a half from January, 1952 to May, 1953. The transmitter was located at Cedar Rapids and was operated by the Collins Radio Company under contract with NBS. The receiving and recording equipment were installed and operated by NBS. Space on a 750-foot tower was obtained through the cooperation of WTAD-FM in Quincy, and the receiving antennas were mounted on this tower at heights ranging from 30 to 665 feet above ground.

* In this experiment, the original calibrations of field strength recording equipment in terms of microvolts across the antenna terminals were converted to units of basic transmission loss. The only exception to this procedure are the data used in the study of correlation of instantaneous signal levels, which were left in terms of voltage. Basic transmission loss, denoted by the symbol L_b , is defined as the ratio, in decibels, of the total radiated power to the power that would be available from the receiving antenna if both antennas were isotropic, i. e.,

$$L_b = P_r - P_a + G_p \quad (1)$$

where P_r = total radiated power in dbw
 P_a = power, in dbw, available at the terminals of a loss-free receiving antenna
 G_p is the path antenna gain in decibels relative to the gain expected with isotropic antennas at both ends of the path. Since the path was a relatively short one, we have approximated G_p by $G_t + G_r$, the sum of the free space gains, in decibels, of the transmitting and receiving antennas. Both gains are relative to an isotropic antenna.

The equipment was operated for thirteen recording periods, each of approximately 2 to 3 weeks duration. During each period, continuous recordings of basic transmission loss were made simultaneously at 3 to 5 different antenna heights. Table II shows a schedule of the recording periods and the antenna heights used during each period. Also shown are the inclusive dates during which each antenna height was used, and the total number of hours of data recorded at each height during a given period.

Description of Propagation Path

Figure 1 shows a profile of the Cedar Rapids - Quincy path. Unfortunately, topographic maps are not available for a large part of the path, although detailed profiles were obtained for the regions near the path terminals. These regions are representative of the terrain over the entire path, however, and there are no significantly prominent terrain features in the unmapped portion. The profile is drawn with a radius of $4/3$ the actual earth's radius to allow for standard atmospheric refraction.

To describe a radio transmission path adequately, it is necessary to know not only the path distance and antenna heights, but also the elevation of, and distance to, the radio horizon as seen from each antenna. A parameter which takes all of these path characteristics into account is the angular distance, θ 1/. It is defined as the angle (usually expressed in milliradians) between the horizon rays of the transmitting and receiving antennas in the great circle plane containing the path. The horizon rays and corresponding values of θ for some of the antennas are shown in Figure 1. Table I gives the values of θ for each receiving antenna height. Throughout this report, the values of θ used were computed for an earth's radius equal to $4/3$ of its actual radius in order to allow for standard atmospheric refraction. It should be pointed out that in some cases, the receiving antenna horizon lies in the unmapped portion of the path so that θ can only be approximated. A uniform elevation of 700 feet for the unmapped terrain was assumed. If this elevation is changed by ± 100 feet, none of the θ values change by more than about ± 0.5 milliradians.

TERRAIN PROFILE OF CEDAR RAPIDS - QUINCY PATH

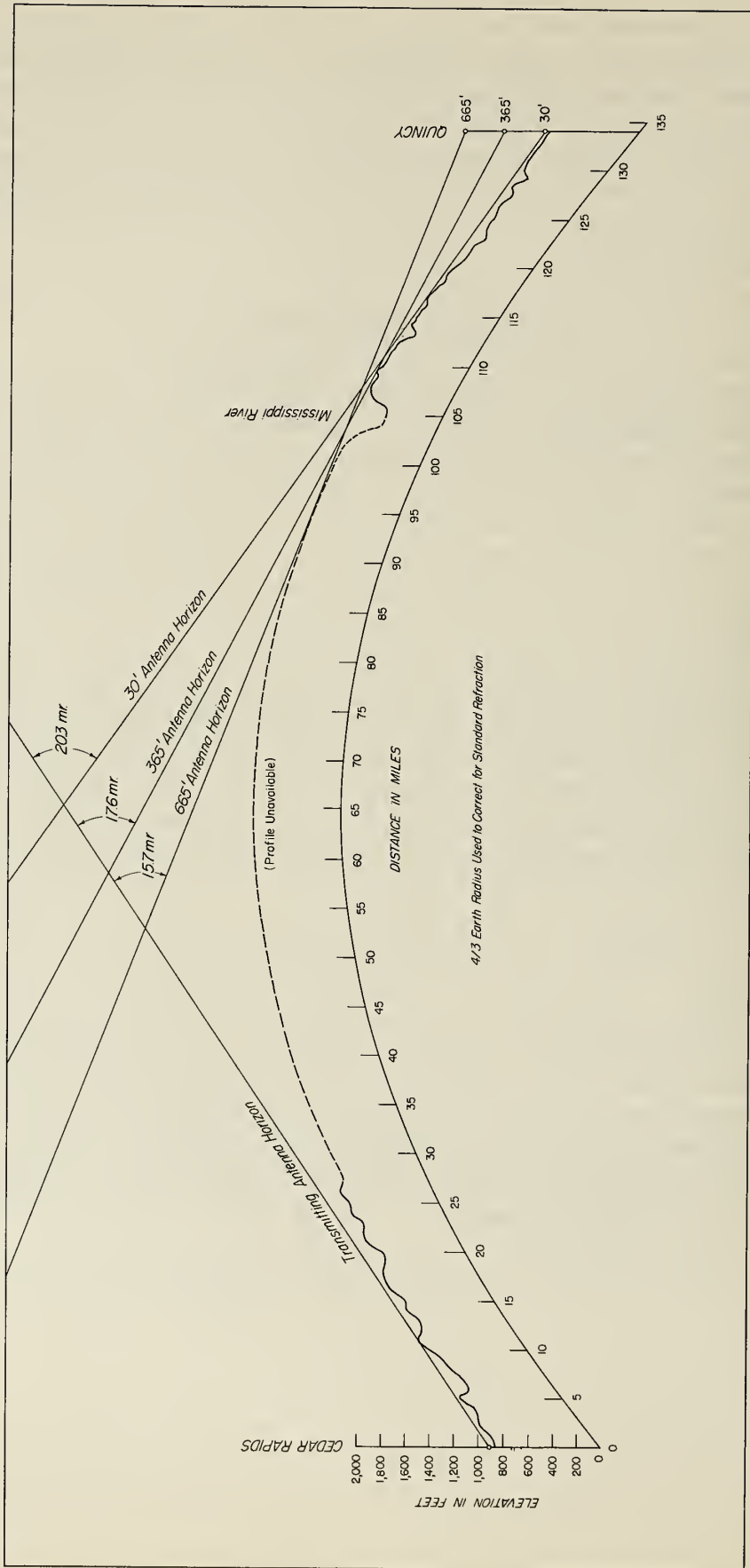


Figure 1

Table I

Receiving Antenna Height in Feet Above Ground	θ in Milliradians
30	20.3
165	19.1
365	17.6
465	16.8
565	16.2
665	15.7

Transmitting antenna height: 39 feet above ground.

Insofar as the long-term median basic transmission losses measured over paths having angular distances of this order (i. e. greater than about 10 milliradians) agree quite well with values predicted from scatter theory 1/, this might be considered to be a tropospheric scatter propagation path. However, analysis of the short-term variations in signal level reveals that for significant percentages of the time (especially during the night), mechanisms other than scattering appear to be important. It would seem that this path is in a transitional region between the shorter paths where diffraction and ducting provide most of the signal power and longer paths where scattering is the principal contributor.

Description of Transmitting, Receiving and Recording Equipment

The transmitter used was a resnatron providing a continuous wave output of approximately 20 KW. The output was monitored and the basic transmission loss data were corrected for any significant variation in transmitted power. The transmitting antenna was a pyramidal horn mounted on the roof of a hangar at the Cedar Rapids Municipal Airport. The height of its axis above local terrain was 39 feet. Its free-space gain relative to an isotropic antenna, G_t , was 14.5 db according to measurements made by the Collins Radio Company. Horizontal polarization was used throughout the experiment.

The receiving antennas used in the long-term recordings each consisted of a half-wave dipole mounted in a corner reflector. Measurements of the combined gain of the transmitting horn and one of the receiving corner reflectors yielded a value of 26.2 db for the total of the free-space antenna gains, or $G_t + G_r$.

The output of the receivers was recorded in two ways. A continuous recording was made with Esterline-Angus graphic ammeters at a chart speed of 3 inches per hour. Examples of these recordings are shown in Figure 2. In addition, the output of each receiver was fed into time totalizing recorders, which indicate on counters the total length of time that each of ten pre-set levels of receiver input voltage is exceeded. The totalizer counters were photographed once each hour by an automatically-actuated 35 mm camera. These totalizer pictures and the slow-speed chart recordings furnished all of the raw data used in the analysis described in this report, with the exception of the study of cross-correlation of signals received simultaneously on spaced antennas. In the latter case, the data were recorded on Esterline-Angus charts moving at speeds from 3 to 12 inches per minute.

Data Reduction

The totalizer and slow-speed chart data were analyzed to obtain hourly cumulative distributions of basic transmission loss, L_b . By taking the difference between the totalizer counter readings appearing in successive pictures, the percentage of time that L_b was less than each level during the hour was computed. This information was plotted on a graph having basic transmission loss as the ordinate and per cent time as the abscissa. Both propagation theory and previous experiments indicate that the amplitude of a signal received well beyond the radio horizon tends to be distributed according to the Rayleigh distribution. For this reason, the abscissa scale was adjusted so that a Rayleigh cumulative distribution would be represented by a straight line with a slope of -1. The plotted points were joined by straight line segments for purposes of interpolation. From these graphs the levels of L_b exceeded 10, 50 and 90 per cent of each hour were tabulated. The difference between the 10% and 90% levels is defined as the fading range. The hourly values of fading range and the 50% level, or hourly median, are listed in Table III at the end of this report. The asterisks appearing by some of the numbers indicate that they were obtained by extrapolation of the hourly distribution curve. For the sake of convenience, the median value of L_b is often referred to as L_{bm} .

SIMULTANEOUS SLOW SPEED RECORDINGS OF BASIC TRANSMISSION LOSS
AT THREE RECEIVING ANTENNA HEIGHTS

418 Mc

Cedar Rapids-Quincy Path

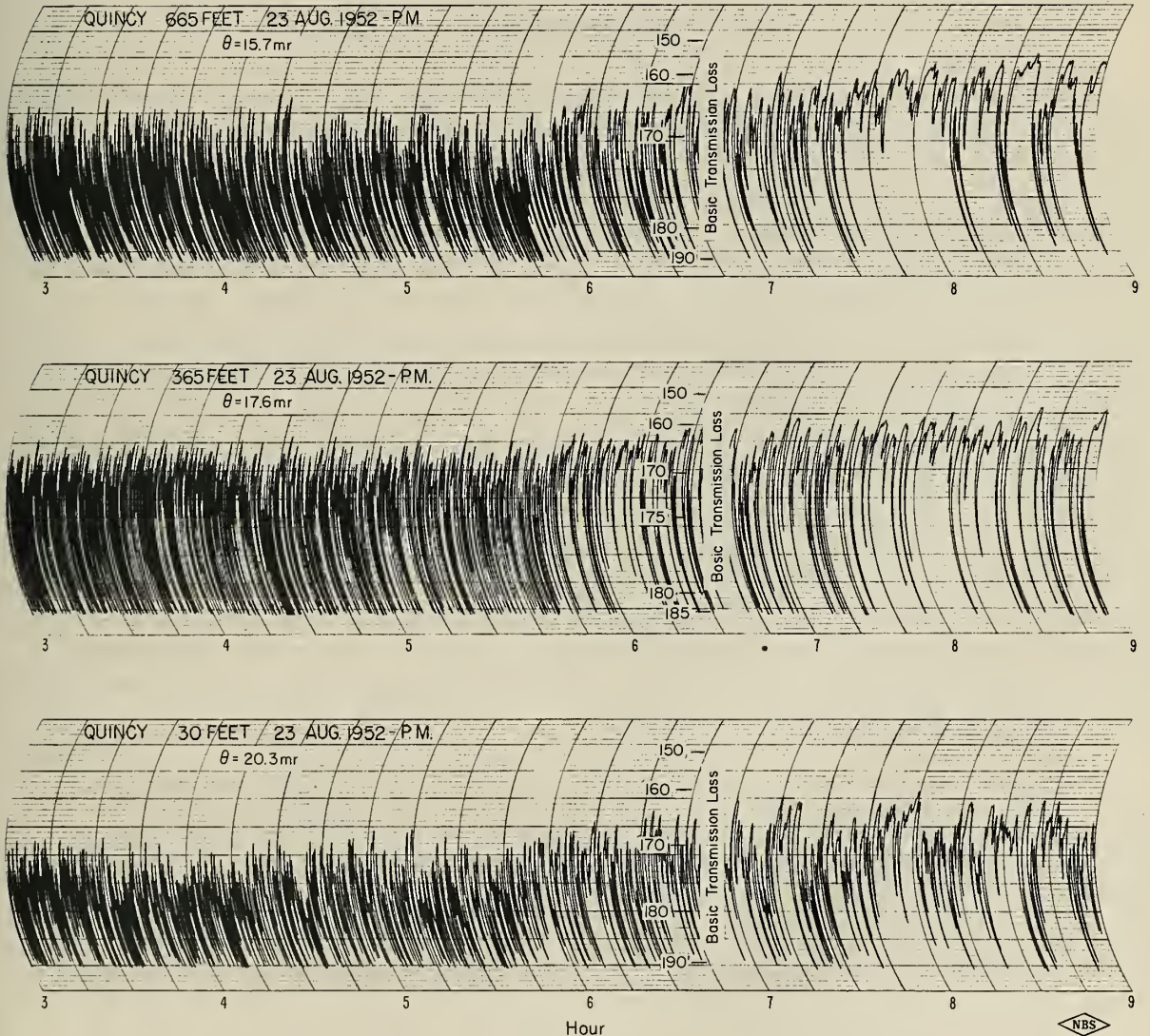


Figure 2

Quite frequently the range of variation in L_b during an hour was so small that a distribution could not be obtained from the totalizer data. This was particularly true during some nights when the signal became strong and steady for prolonged periods. In these instances, the slow-speed Esterline-Angus recording was scaled manually to determine L_{bm} and the fading range. These recordings were also used as a monitor to detect equipment failures or other unusual conditions that might not have been detected in the totalizer data.

Analysis of L_b Data

Figures 3 through 15 show all of the hourly L_{bm} values measured during a given recording period at three antenna heights plotted as a function of the time of day. In these graphs and in Figure 20, the L_{bm} values on the ordinates increase downward so that high signal levels are plotted near the top of the graph. The dots with arrows represent medians falling outside the calibrated range of the receiver and should be read as "greater than" or "less than" the indicated level. The three heights chosen were 30 feet, 365 feet, and the highest antenna, either 565 or 665 feet. The line drawn on each graph joins the median of hourly L_{bm} values observed at a given hour and serves to indicate the magnitude of the diurnal variation. The dots representing individual L_{bm} values are shown for two reasons. They illustrate the wide range of variation in L_{bm} measured from day to day at the same hour. Also the reader can assess, at least intuitively, the confidence that should be placed on the diurnal variation curve by counting the dots plotted at a given hour. For example, the equipment was usually checked and calibrated between 9 and 10 AM and fewer medians were obtained during this hour. Consequently, the median of the few L_{bm} values shown for that time should not be taken too seriously.

It will be noted that there is little or no diurnal cycle during the winter months although such a cycle becomes quite pronounced during the summer, with low L_{bm} values at night and maximum L_{bm} during the afternoon. It should be pointed out that the variations in L_{bm} measured at the same hour for 15 or 20 consecutive days are in general larger than the range of the diurnal trend as shown by the median of hourly L_{bm} values.

These scatter diagrams also give a rough indication of the height-gain to be realized in raising an antenna from 30 feet to 665 feet. (A detailed study of height-gain measured hour-by-hour will be discussed later.)

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

January 14 to February 2, 1952

418 Mc Cedar Rapids - Quincy Path

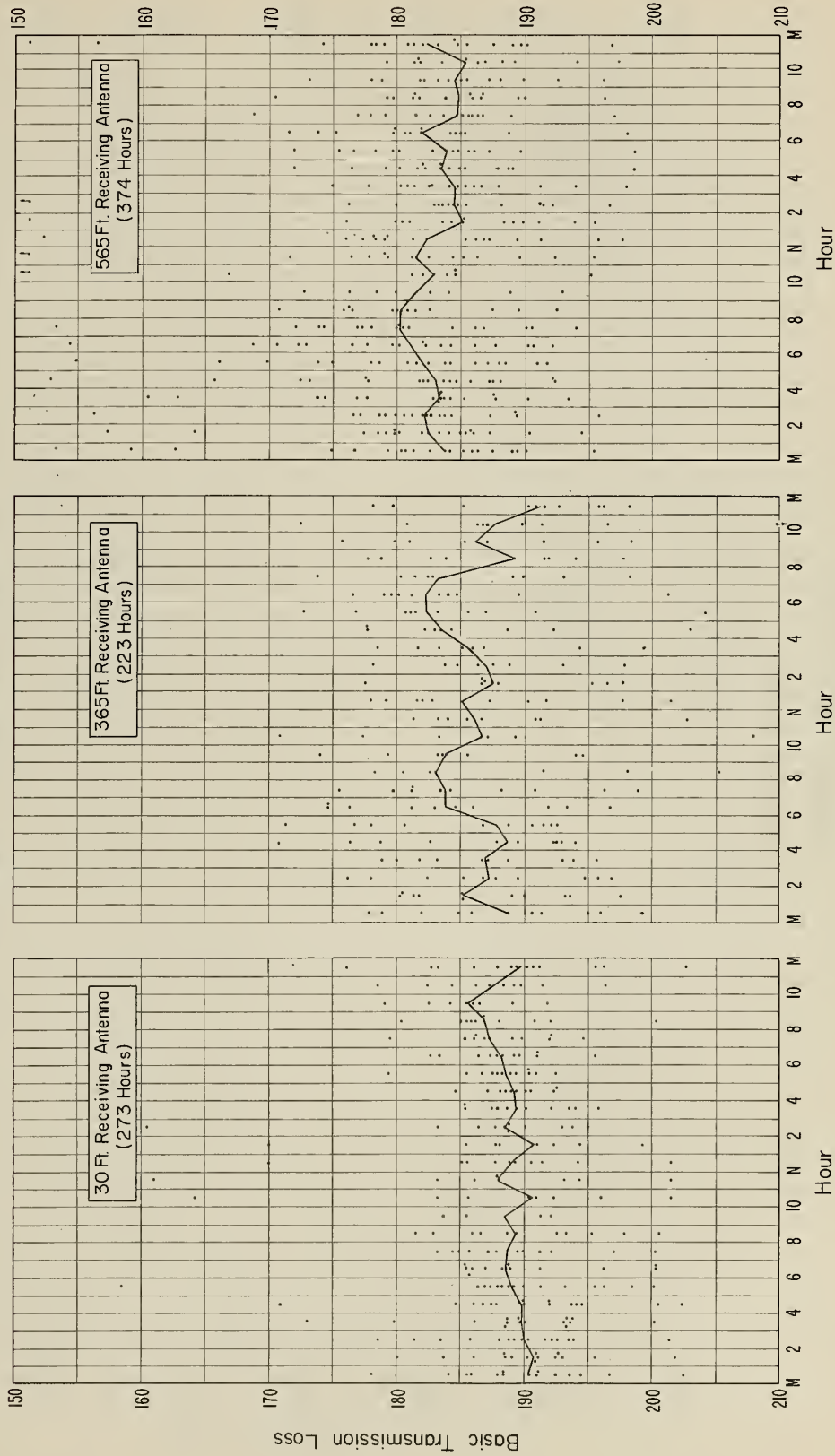


Figure 3

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

February 18 to March 2, 1952

418 Mc

Cedar Rapids - Quincy Path

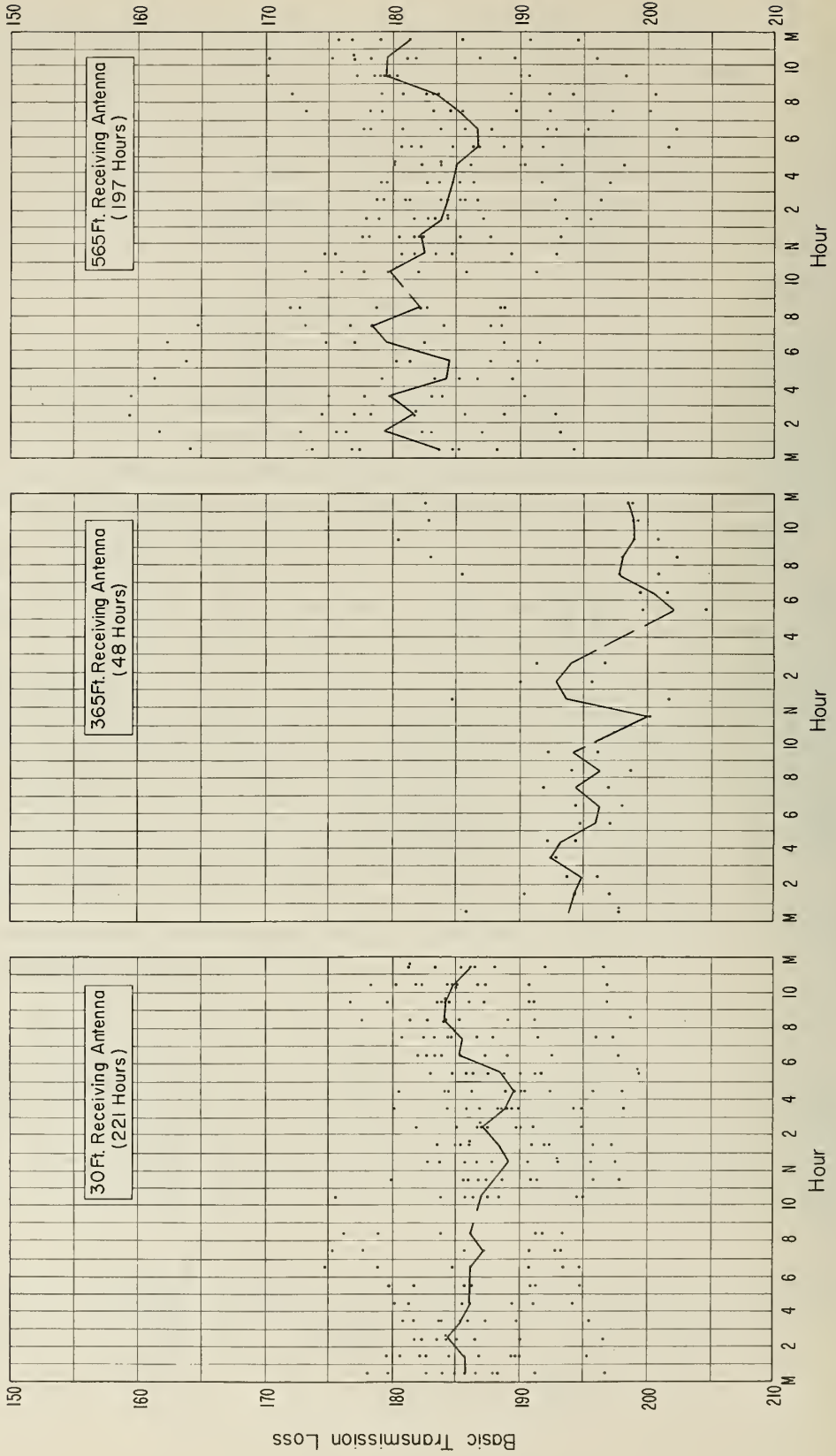


Figure 4

HOURLY MEDIAN BASIC TRANSMISSION LOSS VERSUS TIME OF DAY

March 17 to March 29, 1952

418 Mc Cedar Rapids - Quincy Path

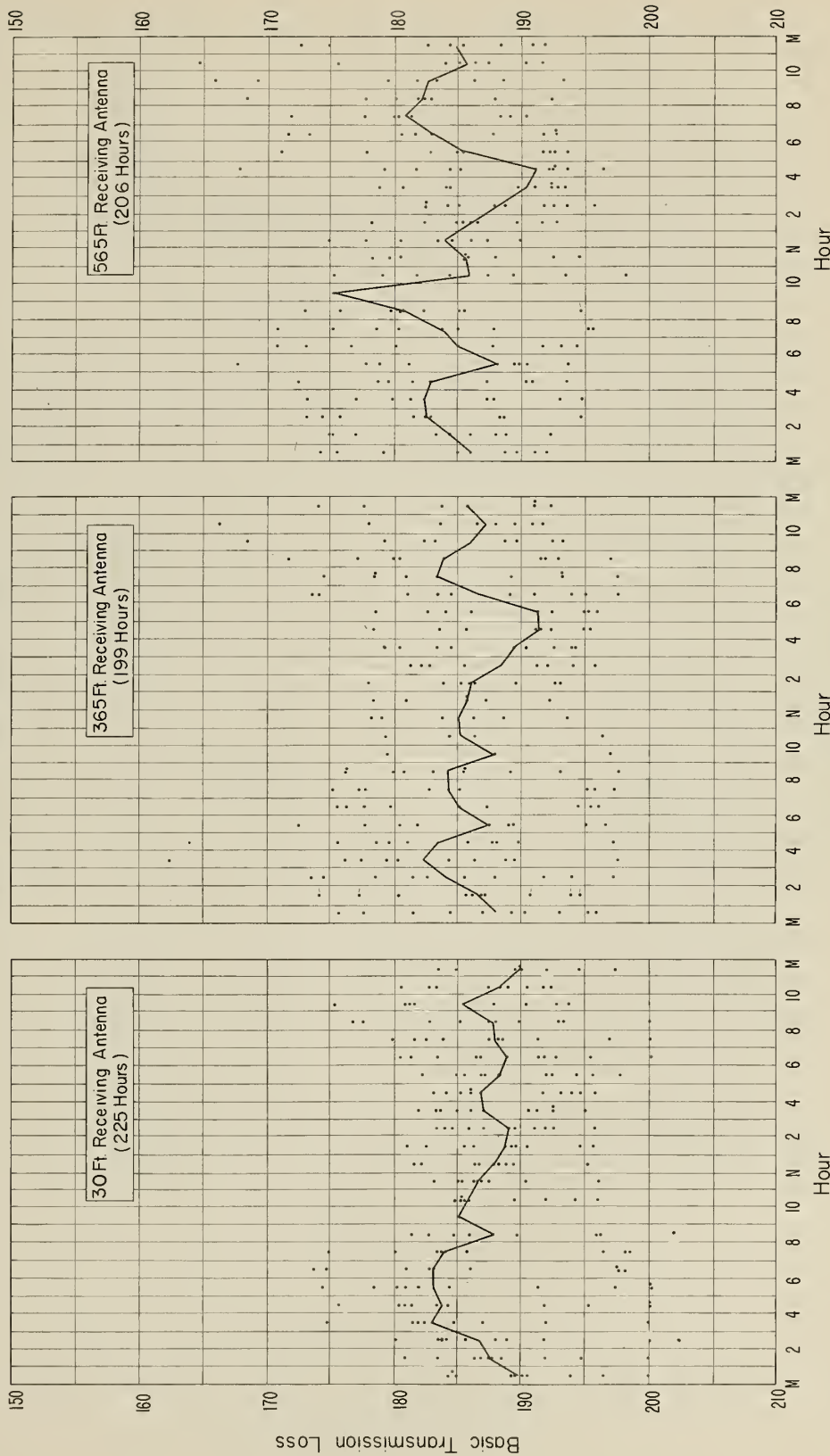


Figure 5

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

April 15 to April 26, 1952

418 Mc

Cedar Rapids - Quincy Path

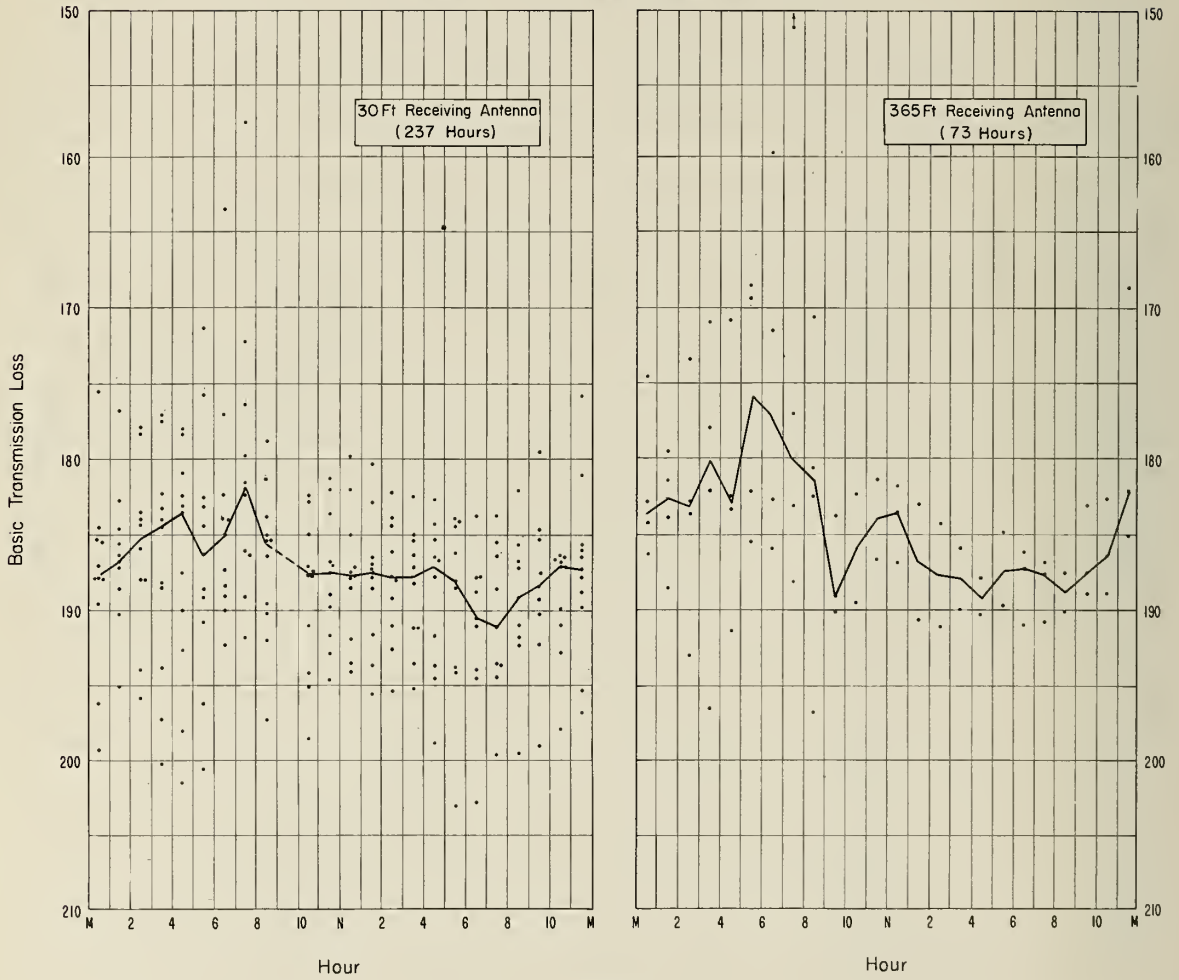


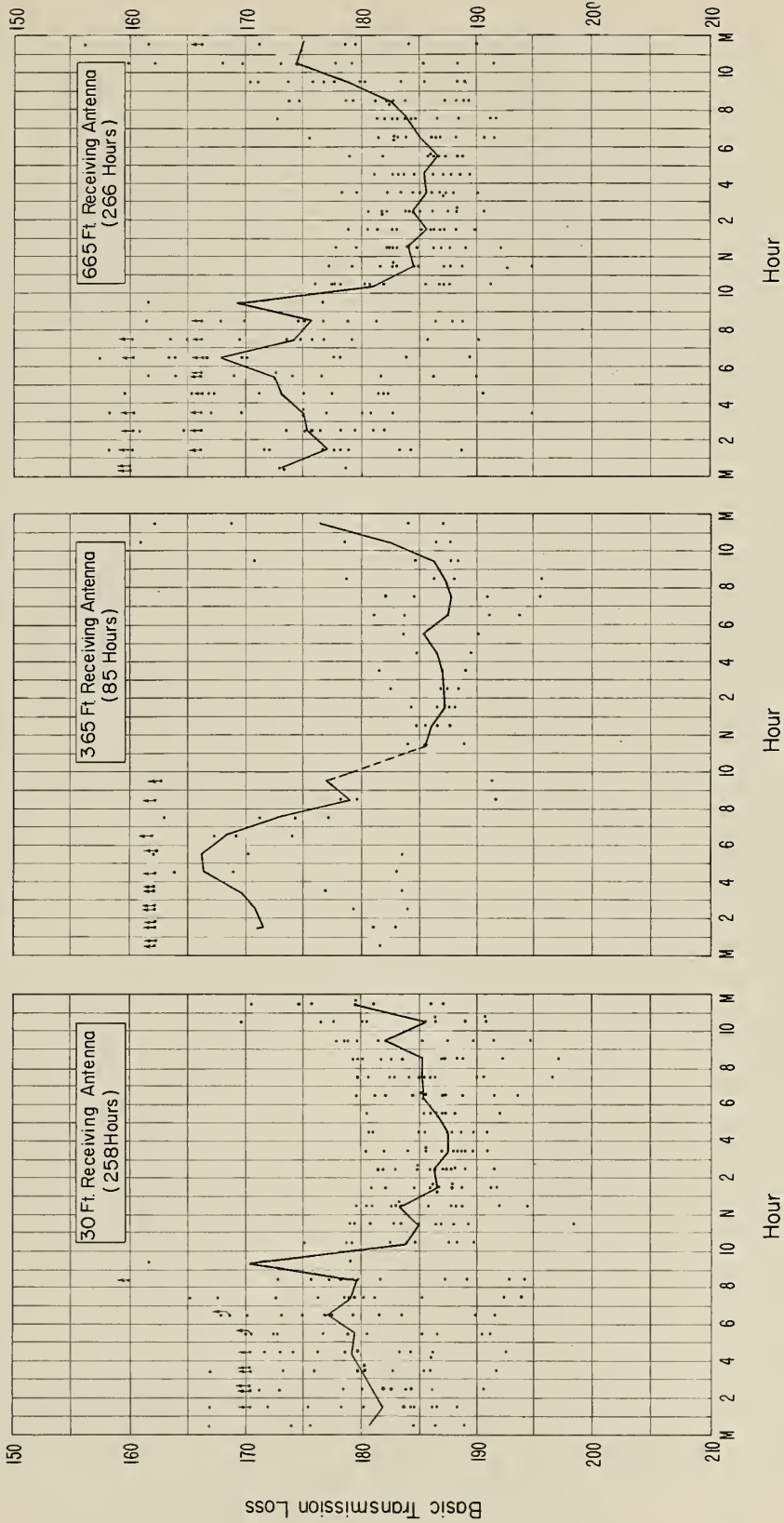
Figure 6

HOURLY MEDIAN BASIC TRANSMISSION LOSS VERSUS TIME OF DAY

May 12 to May 24, 1952

418 Mc

Cedar Rapids - Quincy Path



Hour
Figure 7

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

June 9 to June 30, 1952

418 Mc Cedar Rapids - Quincy Path

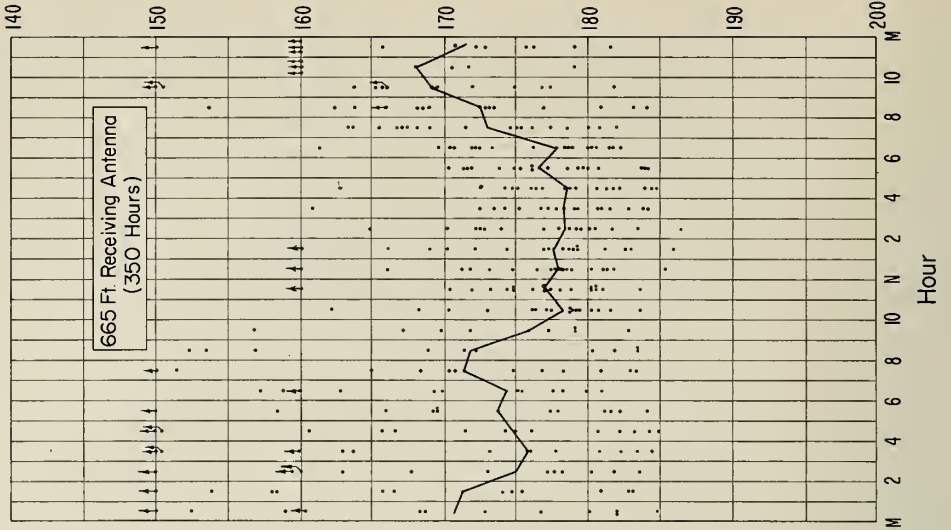
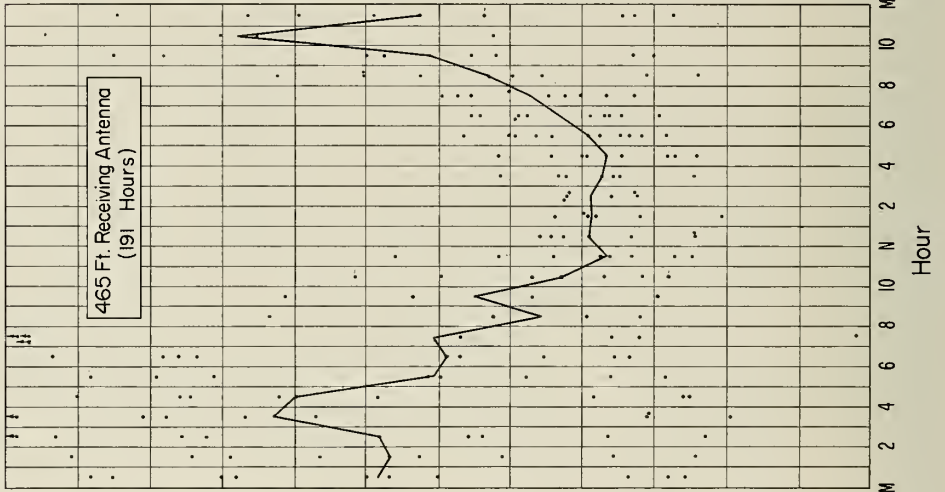
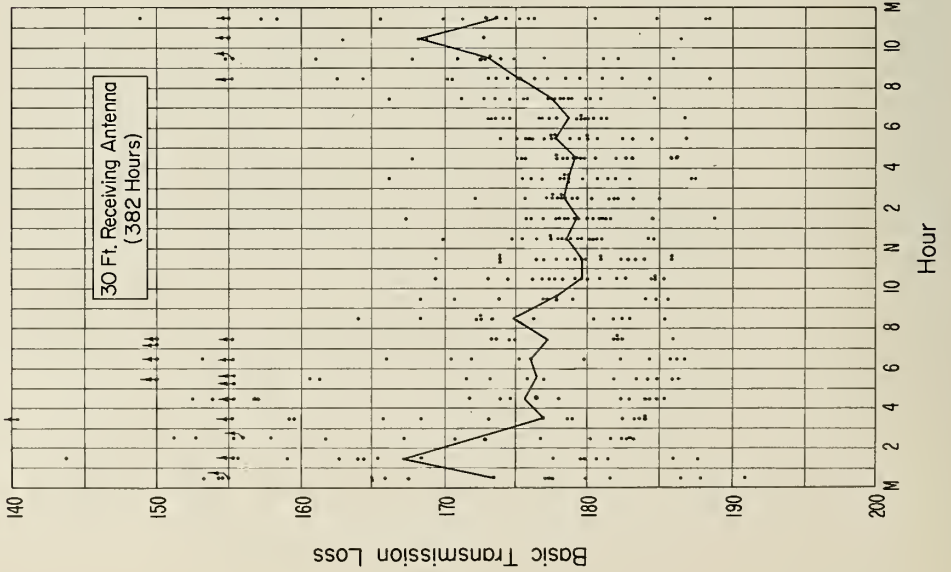


Figure 8

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

August 12 to August 23, 1952

418 Mc

Cedar Rapids - Quincy Path

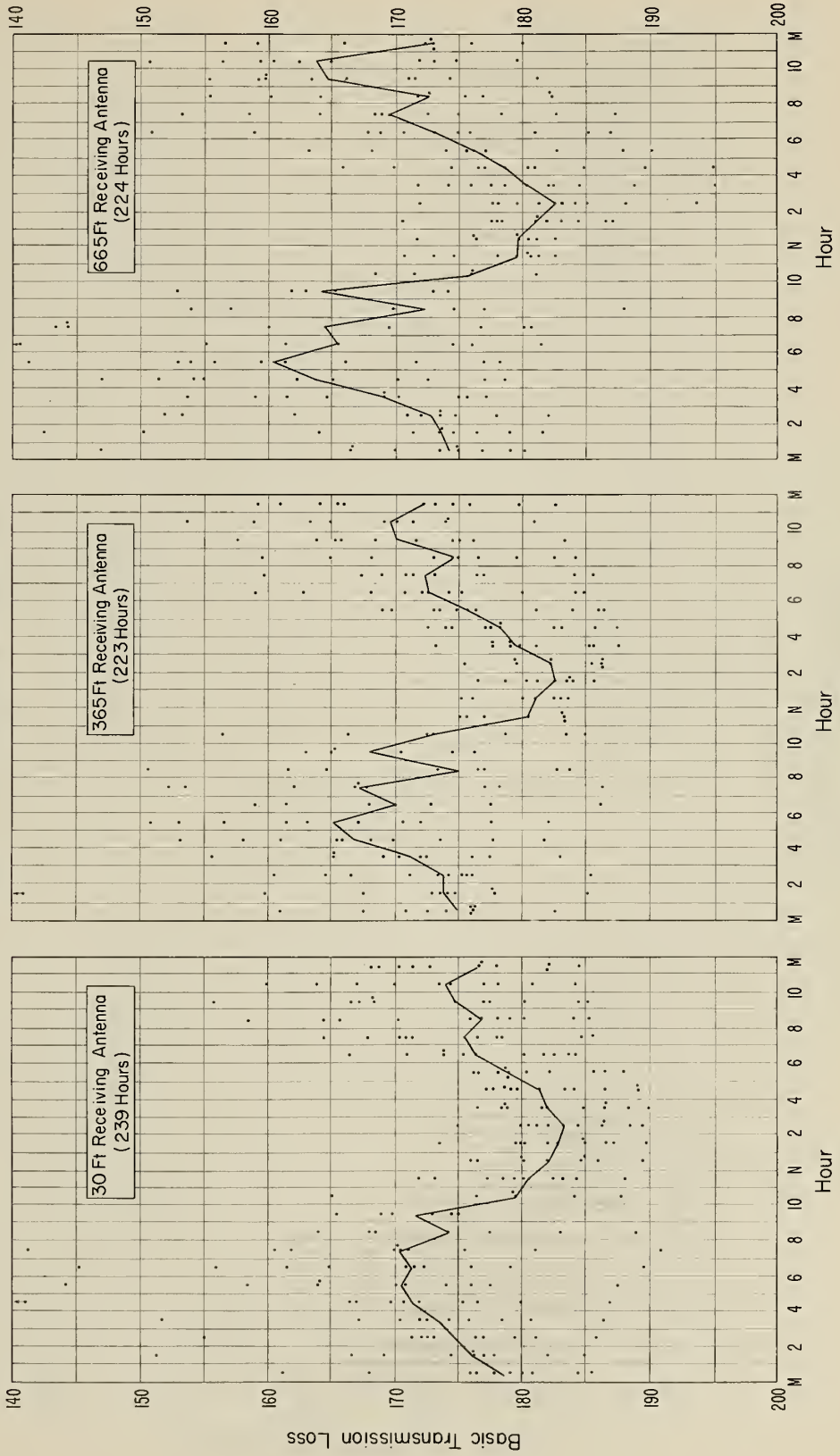


Figure 9

HOURLY MEDIAN BASIC TRANSMISSION LOSS VERSUS TIME OF DAY

September 15 to September 27, 1952

418 Mc

Cedar Rapids - Quincy Path

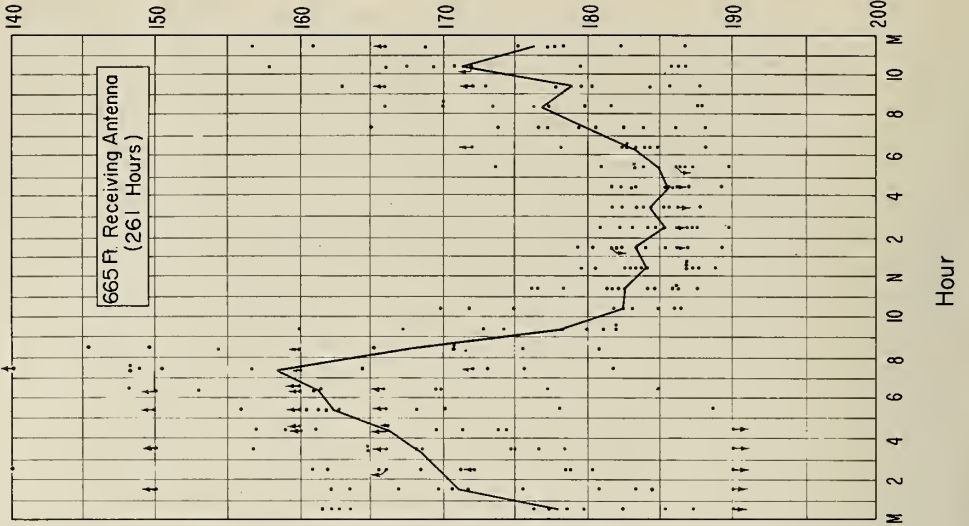
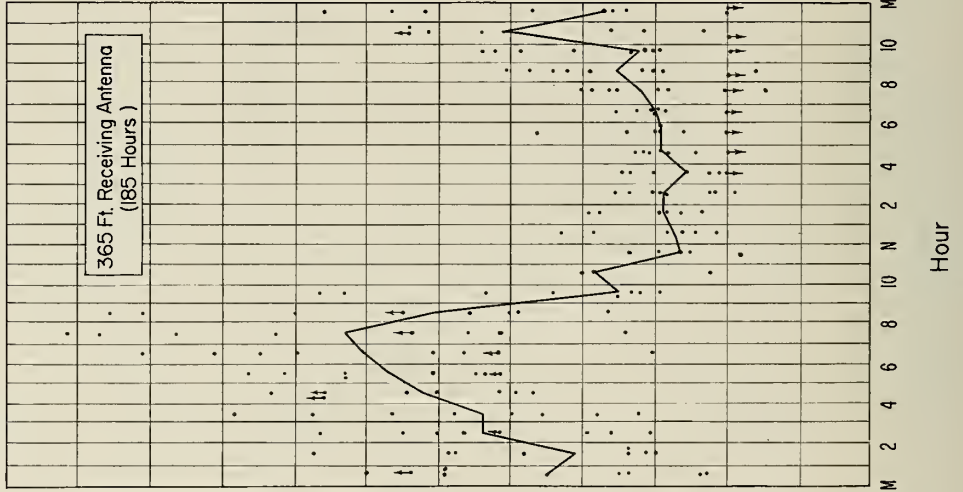
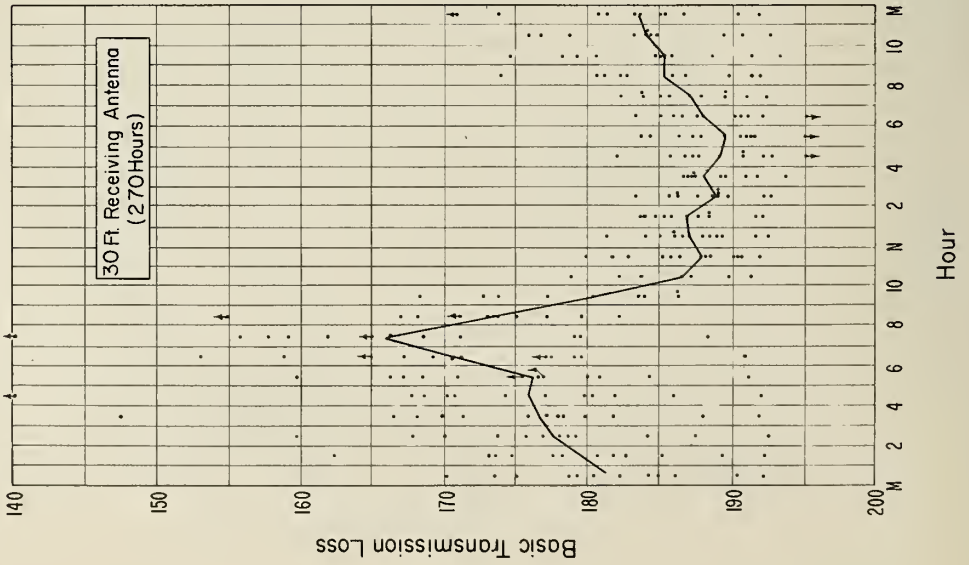
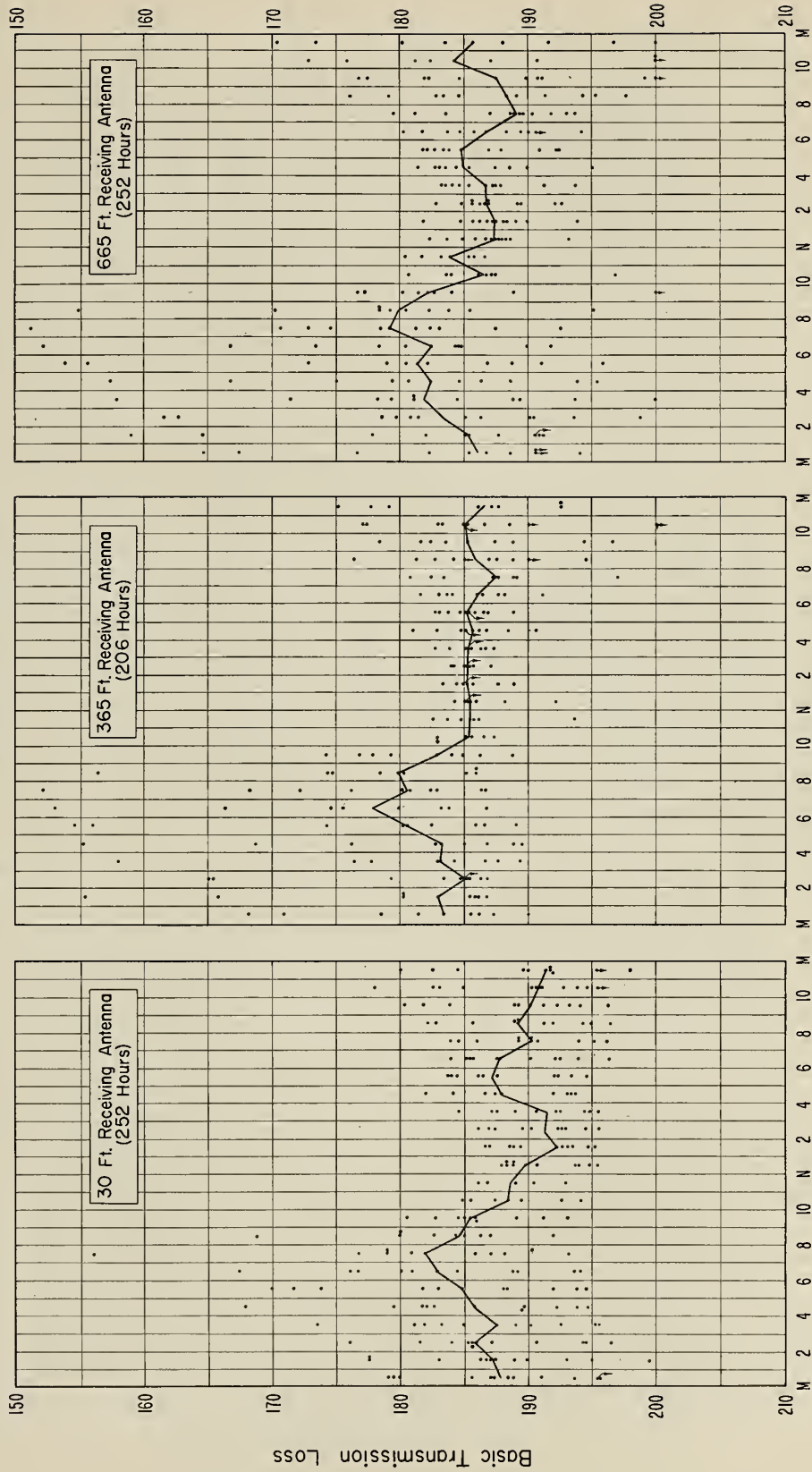


Figure 10

HOURLY MEDIAN BASIC TRANSMISSION LOSS VERSUS TIME OF DAY

October 20, to November 2, 1952

418 Mc Cedar Rapids—Quincy Path



Hour

Hour

Hour

Figure II

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

January 20 to January 31, 1953

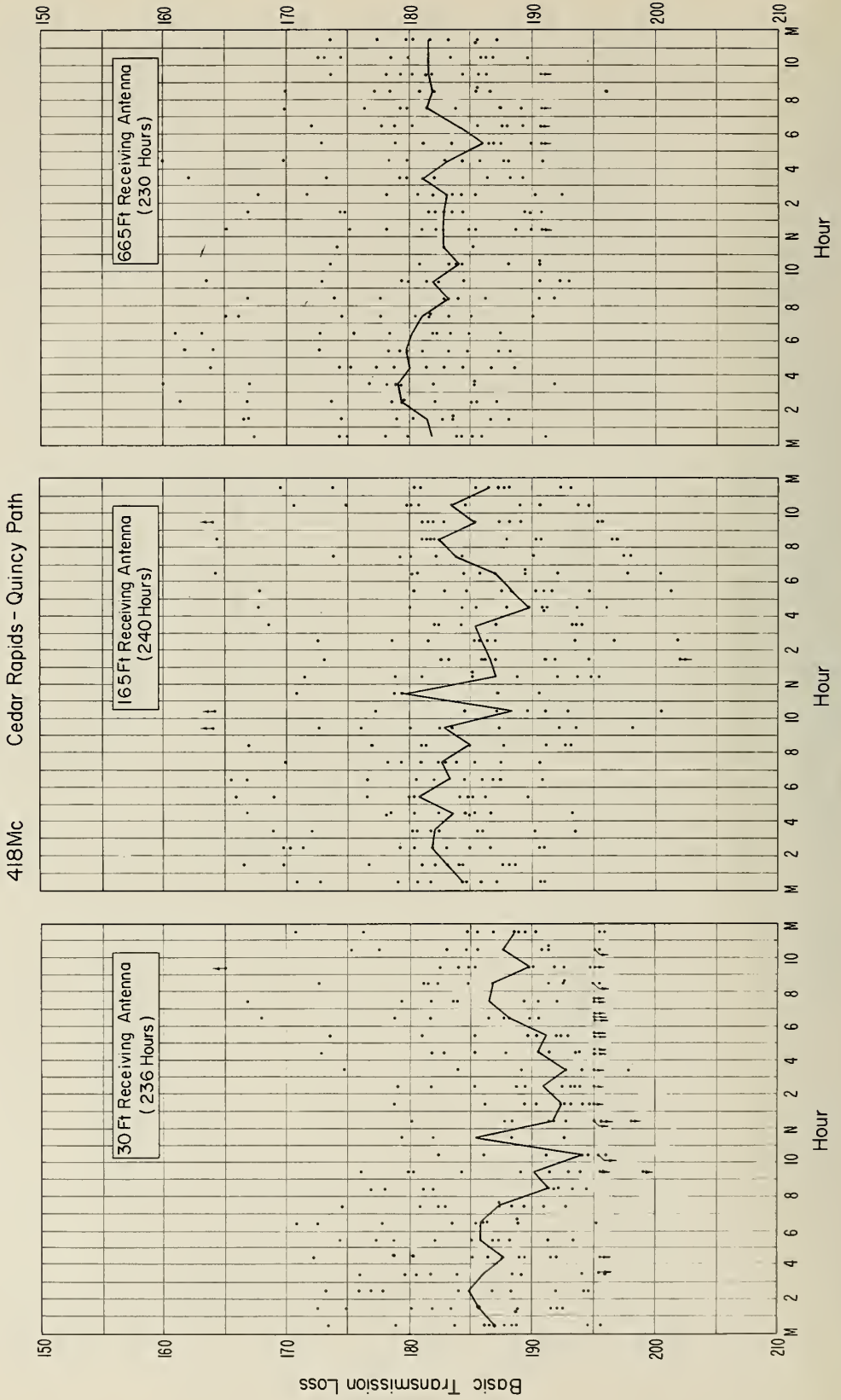


Figure 12

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

February 23 to March 7, 1953

418 Mc Cedar Rapids - Quincy Path

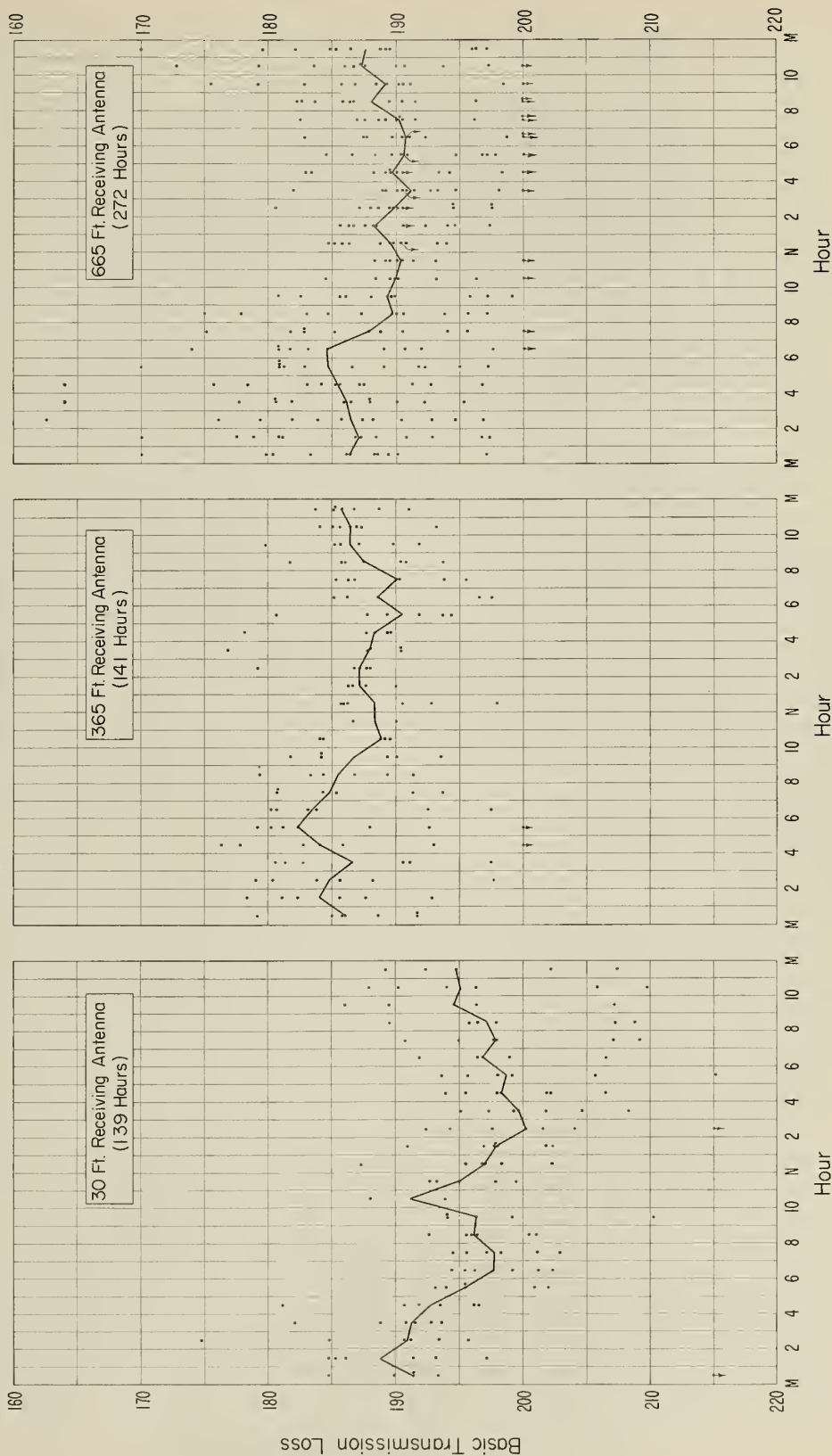
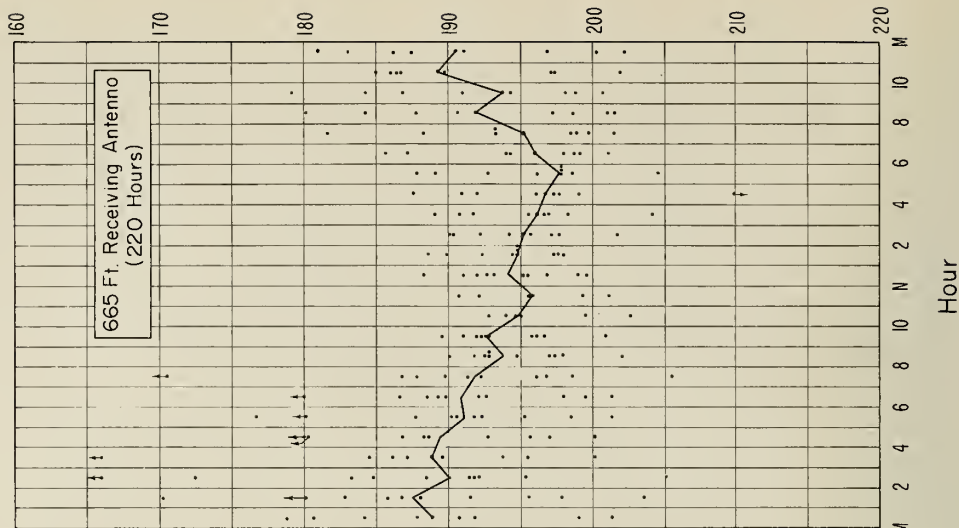
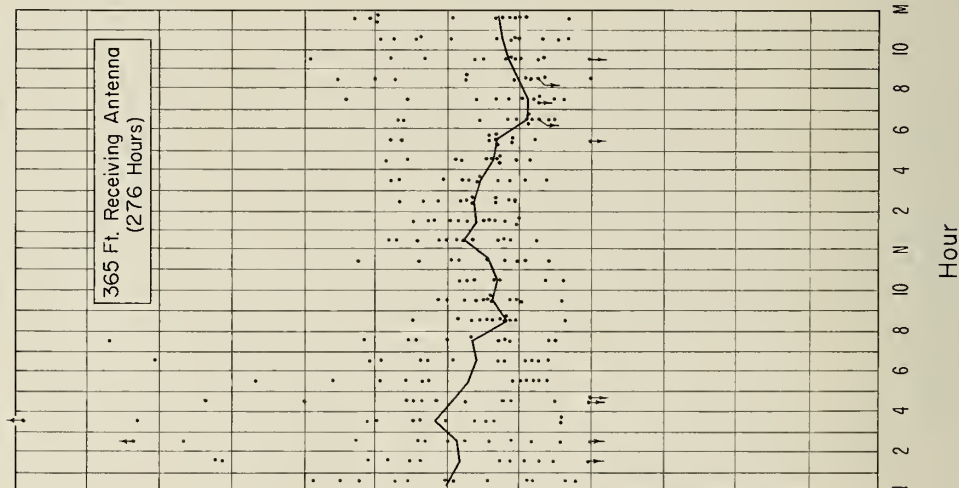
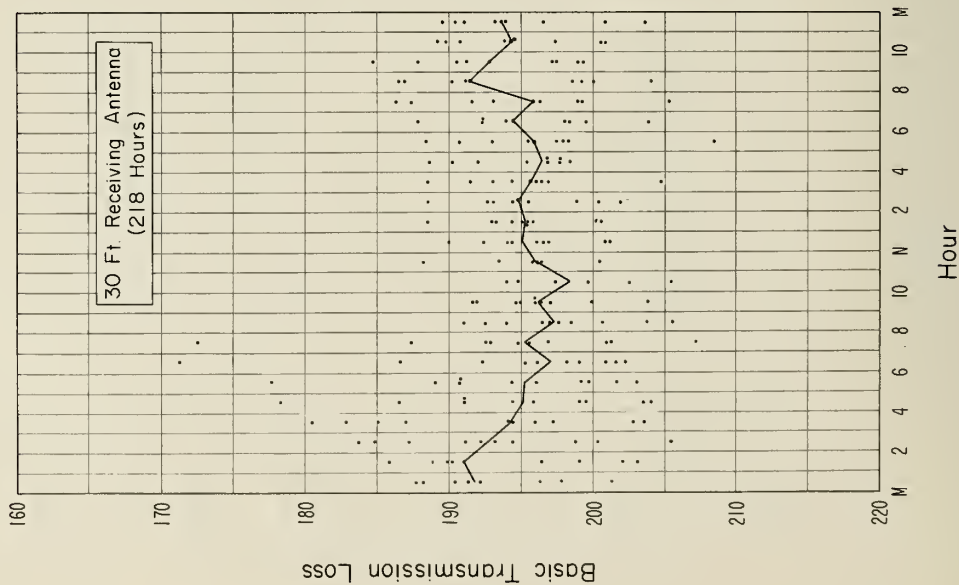


Figure 13

HOURLY MEDIAN BASIC TRANSMISSION LOSS VERSUS TIME OF DAY

April 13 to April 25, 1953

418 Mc Cedar Rapids - Quincy Path

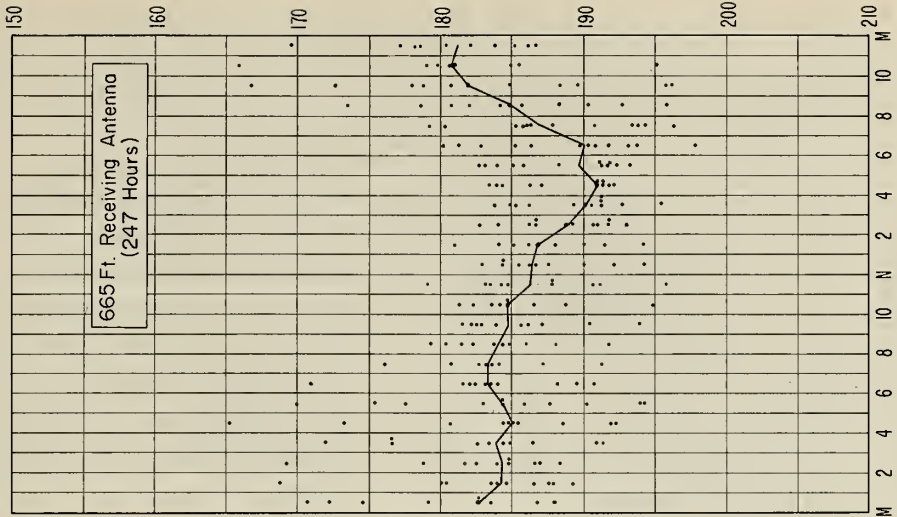
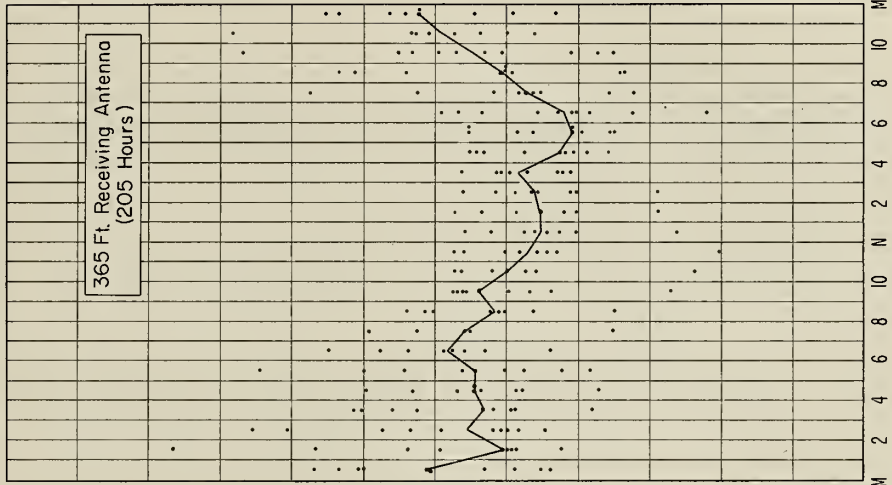
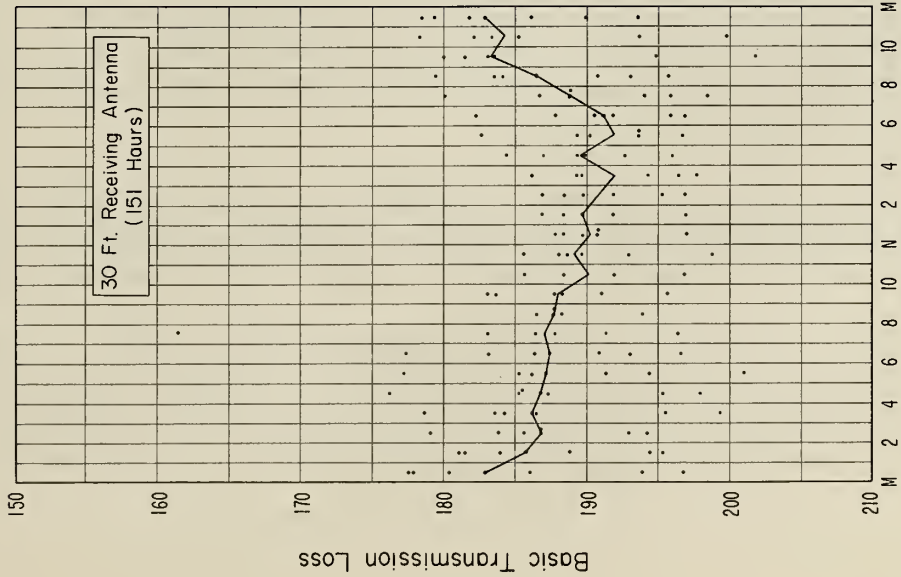


Hour
Figure 14

HOURLY MEDIAN BASIC TRANSMISSION LOSS
VERSUS TIME OF DAY

May 11, to May 23, 1953

418 Mc Cedar Rapids - Quincy Path



Hour

Hour
Figure 15

Hour

As noted previously, Table III lists the fading range for each hour of recording. Although these ranges show considerable variance, they consistently cluster in the vicinity of the 13.4 db fading range that would be obtained from a pure Rayleigh distributed signal. This tendency is apparent regardless of time of day, although the variance of fading ranges measured at a given hour is somewhat larger during the night than during the day, particularly in the summer months. The lack of a diurnal cycle in fading range and the tendency to approximate the Rayleigh distribution fading range should not, however, be interpreted as evidence that the signals recorded at Quincy were the result of scattering regardless of the time of day. It can be seen in the data samples shown in Figure 2 that the character of short-term variations in signal level changes considerably in going from afternoon to night. The slow, deep fading occurring at night often covered a range equal to, or greater than, the Rayleigh fading range.

One of the principal objectives of the Quincy experiment was to study the effects of antenna height on the signals received far below the radio horizon. During most of the recording periods simultaneous transmission loss recordings were made at three or more receiving antenna heights. We define the height-gain associated with two antenna heights to be the difference between hourly median L_b values measured simultaneously at these two heights. A positive height-gain indicates a reduction in L_{bm} with increasing height. The hourly height-gain values obtained for each pair of antennas during each recording period were plotted versus time of day. It was found that although the median of hourly L_{bm} values tended to decrease slowly with height, there was a large variance in the height-gain observed on any one pair of antennas at a given hour of the day during a given recording period. To illustrate this variance and the small diurnal trend noticeable during some periods, height-gain scatter diagrams for the greatest height separations are shown in Figures 16 through 18.

The medians of the hourly height-gain values observed on each pair of antennas during each recording period are shown in Figure 19, where they are plotted as a function of the ratio of antenna heights.

The seasonal or month-to-month variations in L_{bm} , fading range and height-gain are shown in Figures 20, 21 and 22, respectively. In each case the points represent the median of all hourly values of the variable measured during the recording period at the antenna heights

DIFFERENCE BETWEEN L_{bm} AT 30 FEET AND
 L_{bm} AT INDICATED HEIGHT VERSUS TIME OF DAY

418 Mc CEDAR RAPIDS-QUINCY PATH

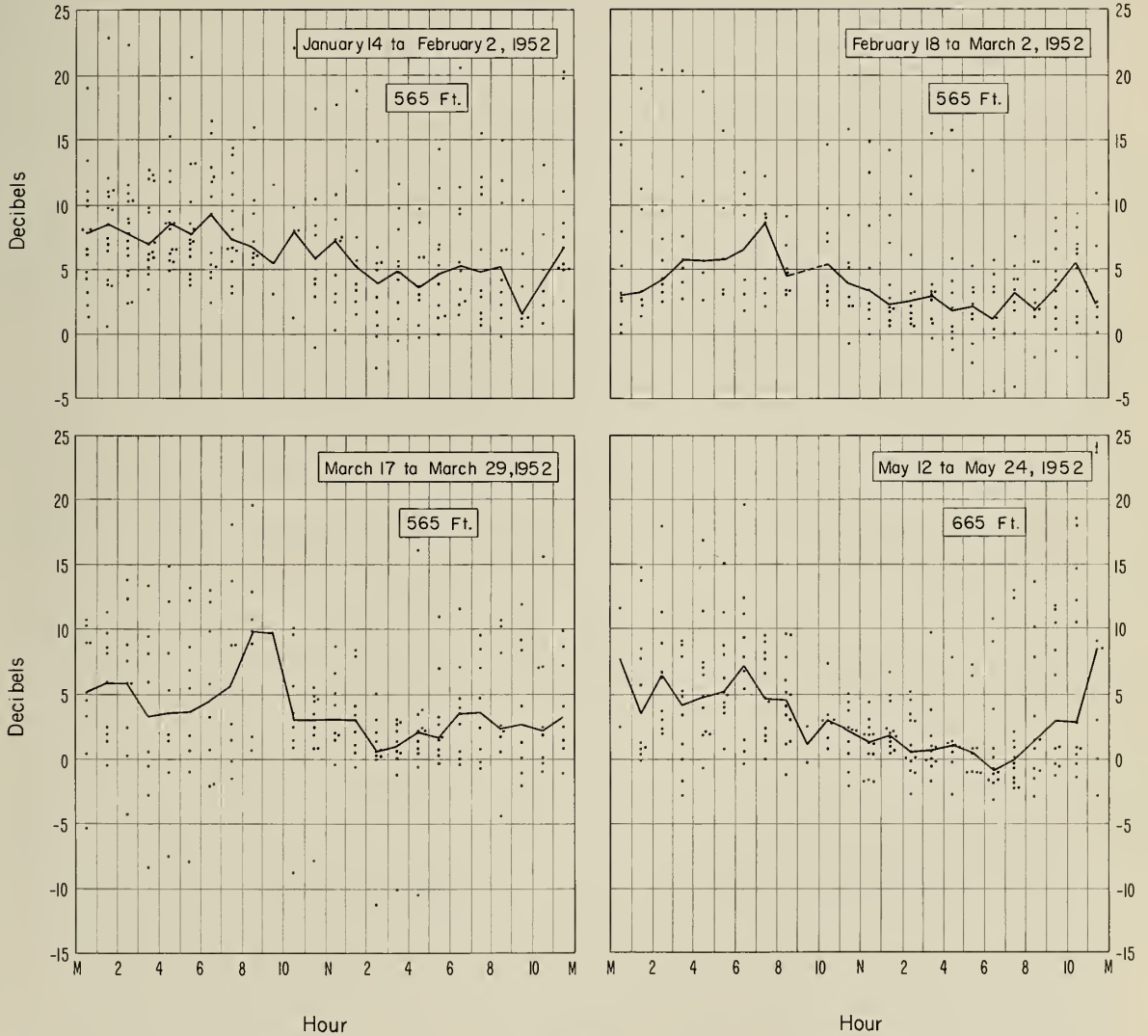


Figure 16

DIFFERENCE BETWEEN L_{bm} AT 30 FEET AND
 L_{bm} AT 665 FEET VERSUS TIME OF DAY

418 Mc CEDAR RAPIDS-QUINCY PATH

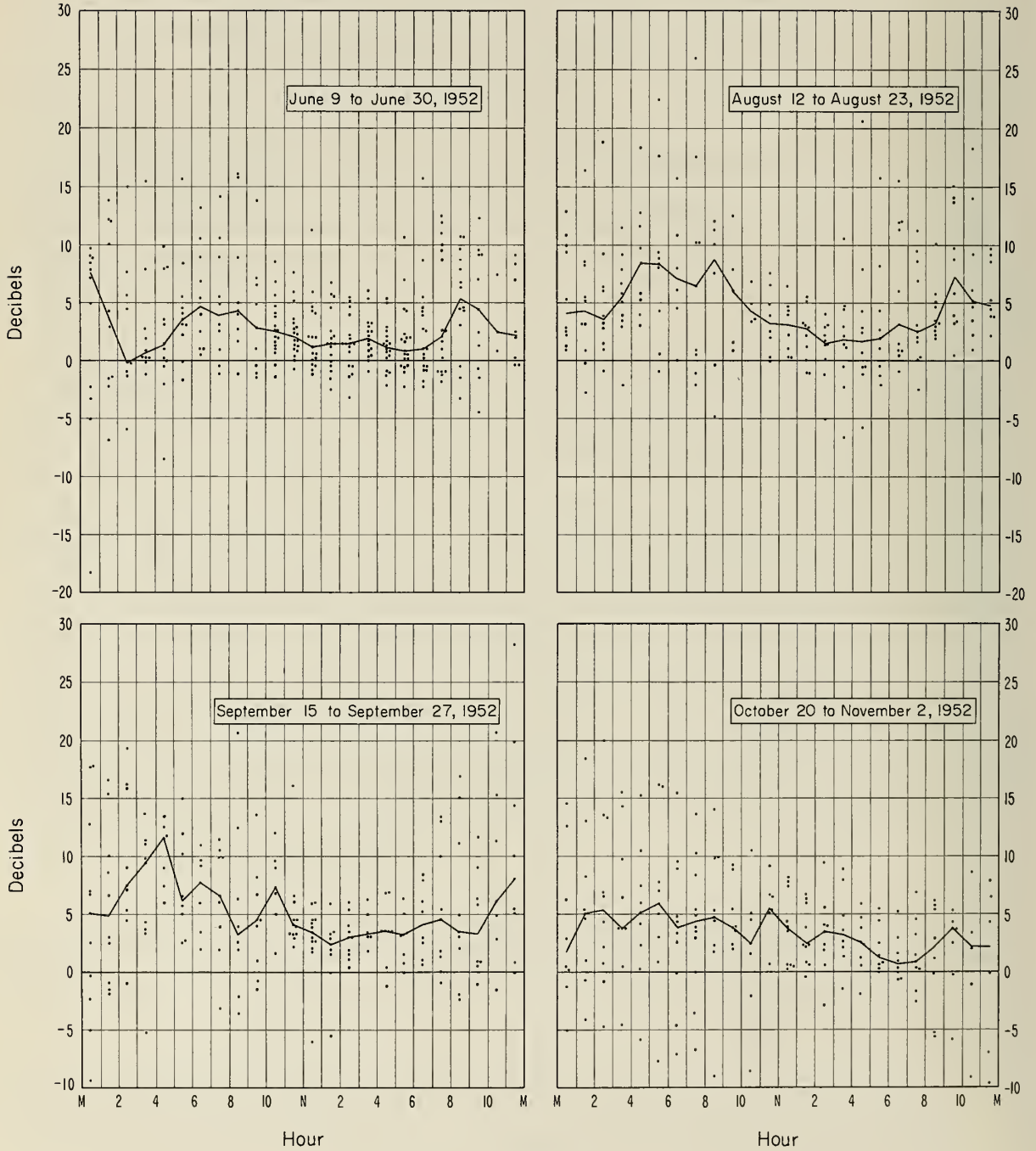


Figure 17

DIFFERENCE BETWEEN L_{bm} AT 30 FEET AND
 L_{bm} AT 665 FEET VERSUS TIME OF DAY

418 Mc CEDAR RAPIDS-QUINCY PATH

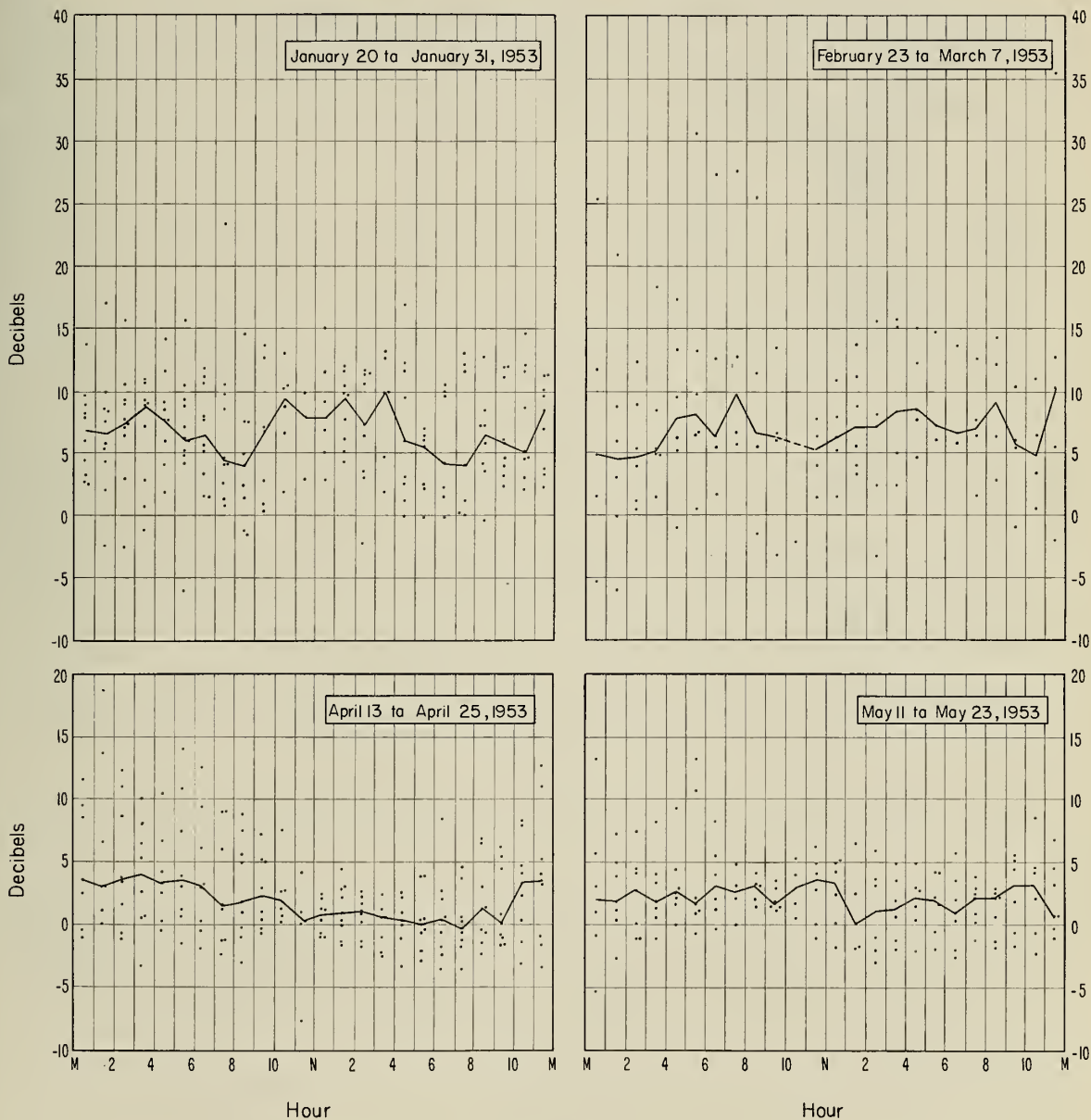


Figure 18

MEDIAN HEIGHT-GAIN vs RATIO OF ANTENNA HEIGHTS
(Ordinate is Median of Hourly Differences of L_{bm} Measured at Two Heights)
418 Mc Cedar Rapids - Quincy Path All Periods 1952-1953

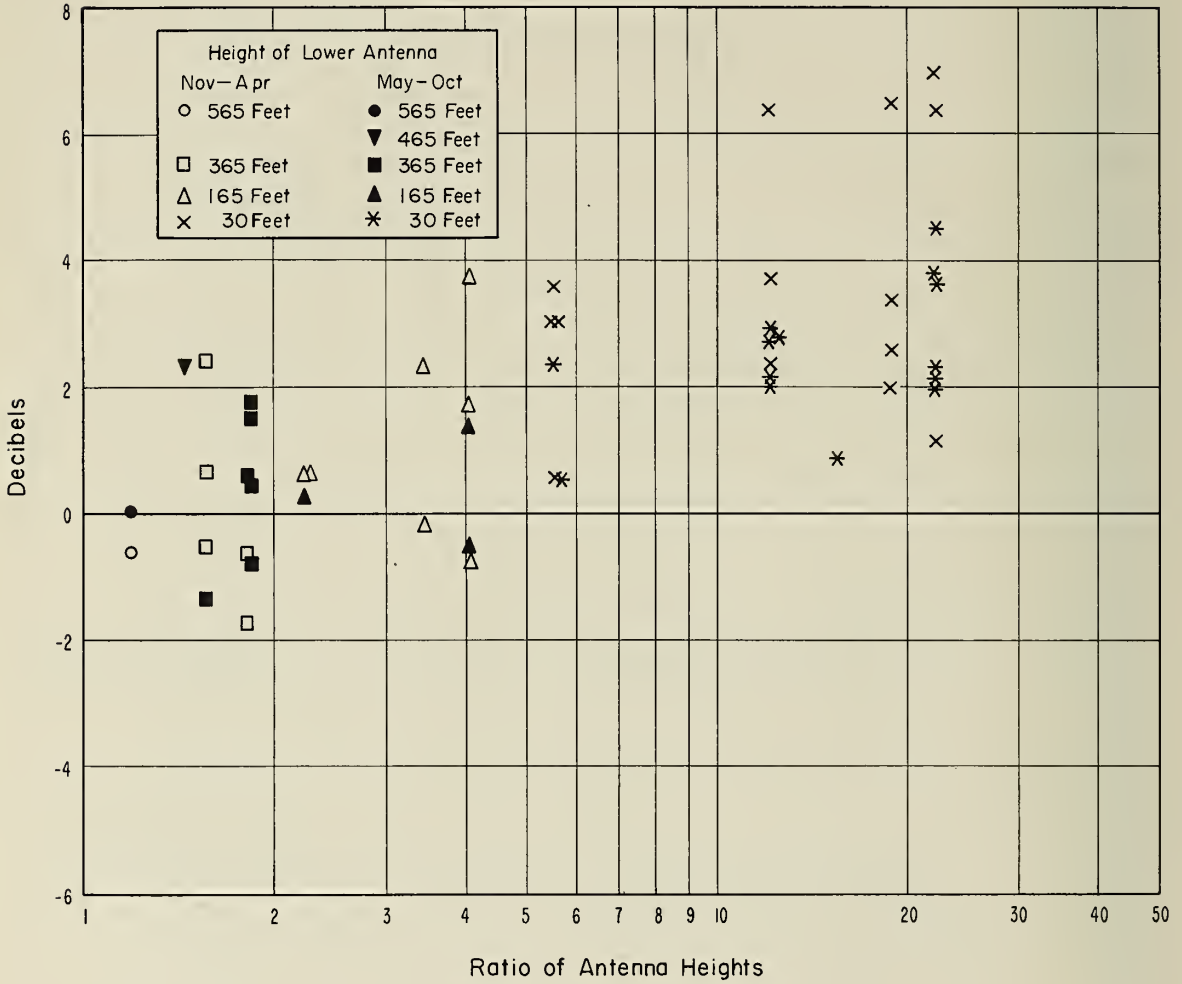


Figure 19

MEDIAN BASIC TRANSMISSION LOSS VERSUS TIME OF YEAR
418 Mc Cedar Rapids - Quincy Path

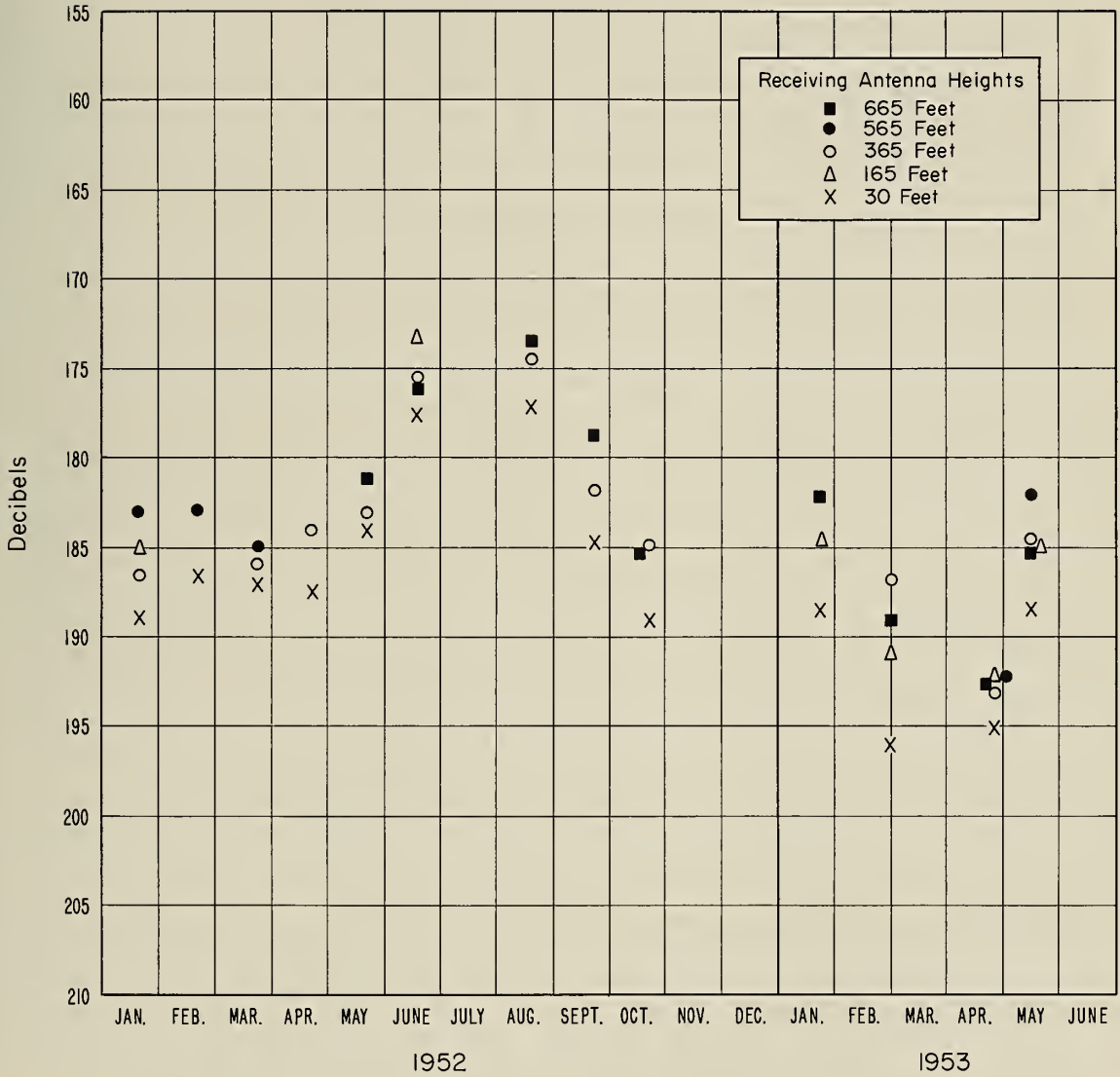


Figure 20

MEDIAN FADING RANGE VS TIME OF YEAR
418 Mc Cedar Rapids - Quincy Path

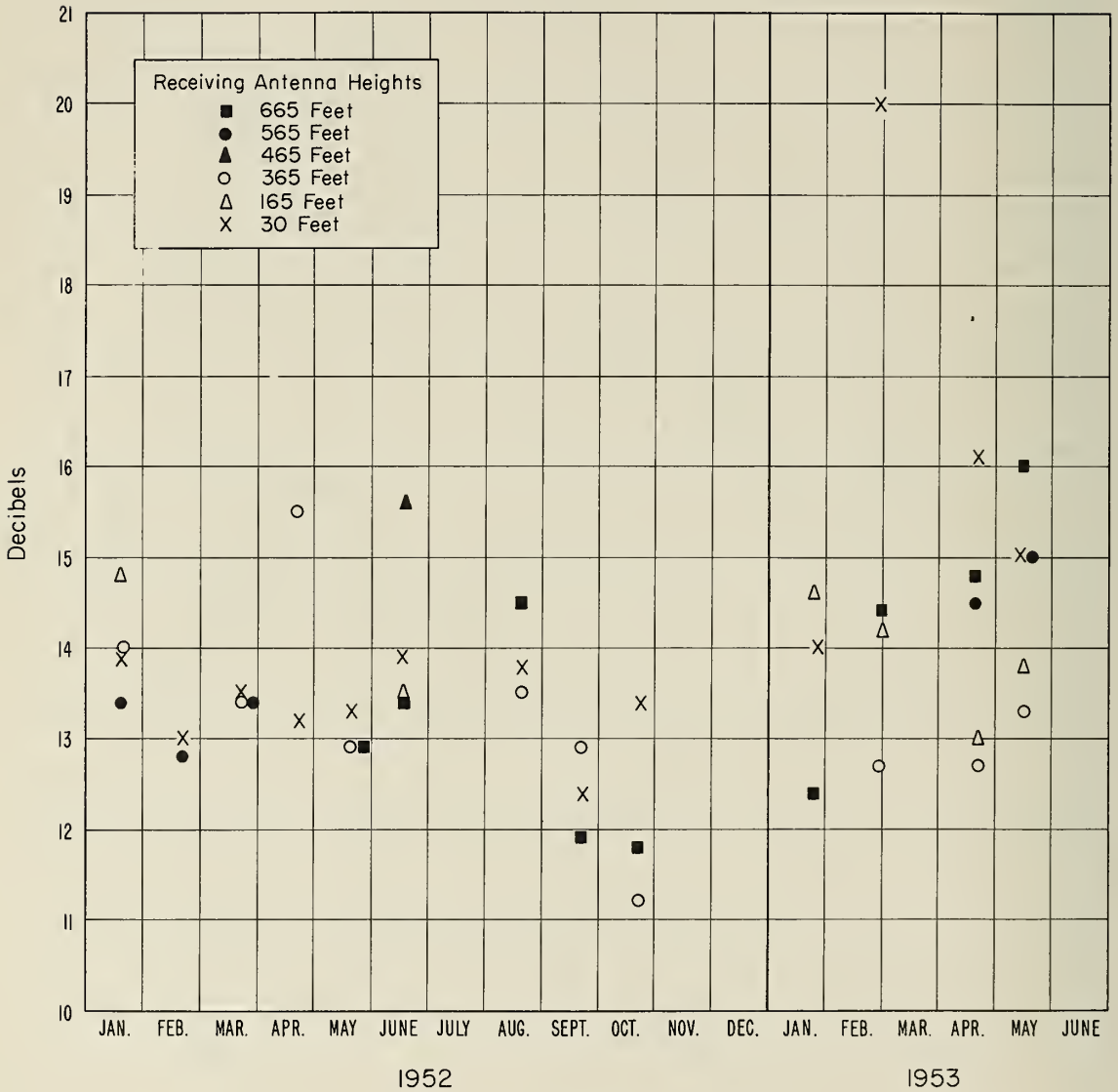


Figure 21

MEDIAN HEIGHT - GAIN RATIO VS TIME OF YEAR
(Ordinate is Median of Hourly Differences of
 L_{bm} at Indicated Height and L_{bm} at 30 Feet)
418 Mc Cedar Rapids - Quincy Path

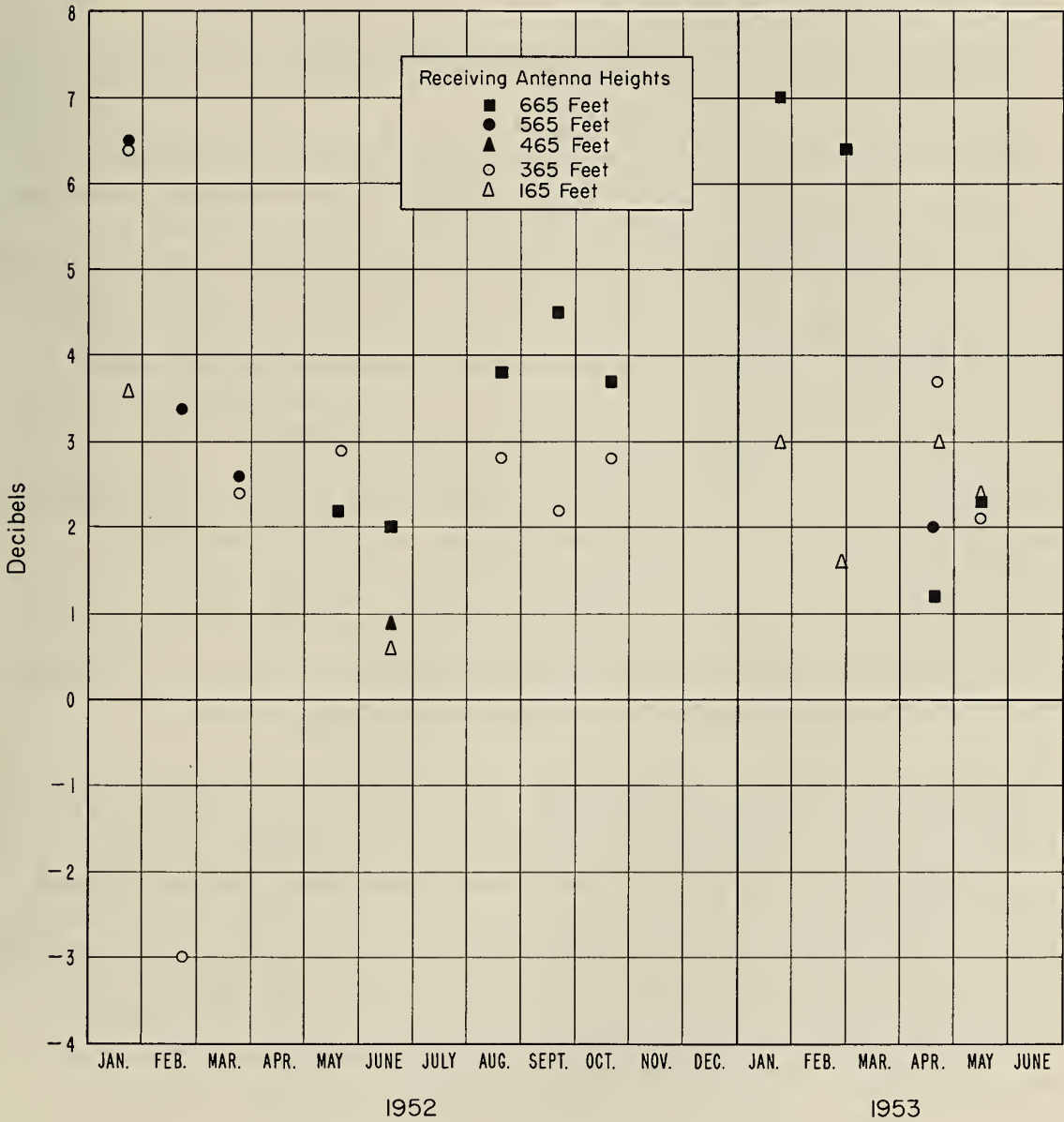


Figure 22

indicated. The usual reduction in median transmission loss during the summer is clearly evident in Figure 20. This graph also demonstrates the danger of concluding that data collected in subsequent years would follow this pattern. In particular, it should be noted that the levels measured in the spring of 1953 are quite different from those obtained in the spring of 1952. Figure 22 shows a tendency toward maximum height-gain during the winter months, while Figure 21 gives little or no indication of any variation in fading range with time of year.

Comparison of Observed and Predicted Basic Transmission Loss

Rice, Longley and Norton^{2/} have developed a method of predicting the cumulative distribution of basic transmission loss at frequencies above 10 megacycles per second for wide ranges of path lengths, antenna heights, terrain configurations and atmospheric refractive index gradients (the latter as deduced from observed surface values of refractivity). Using this method, the predicted cumulative distributions of basic transmission loss were determined for the 30, 165, 365, 565 and 665-foot receiving antenna heights for time block two (November through April, from noon to 6 PM) and for the 30, 365 and 665-foot antenna heights for time block five (May through October from noon to 6 PM). These antenna heights were chosen because of the relatively large amount of observed data available for comparison. The surface refractivity data used in this determination were the average of values for these time blocks during 1952 and 1953 obtained at the U. S. Weather Bureau stations at Des Moines, Iowa, and Joliet, Illinois. These stations lie west and east of the propagation path, respectively. However, the data obtained at these two points are so well correlated that we may reasonably assume that they closely approximate conditions on the path.

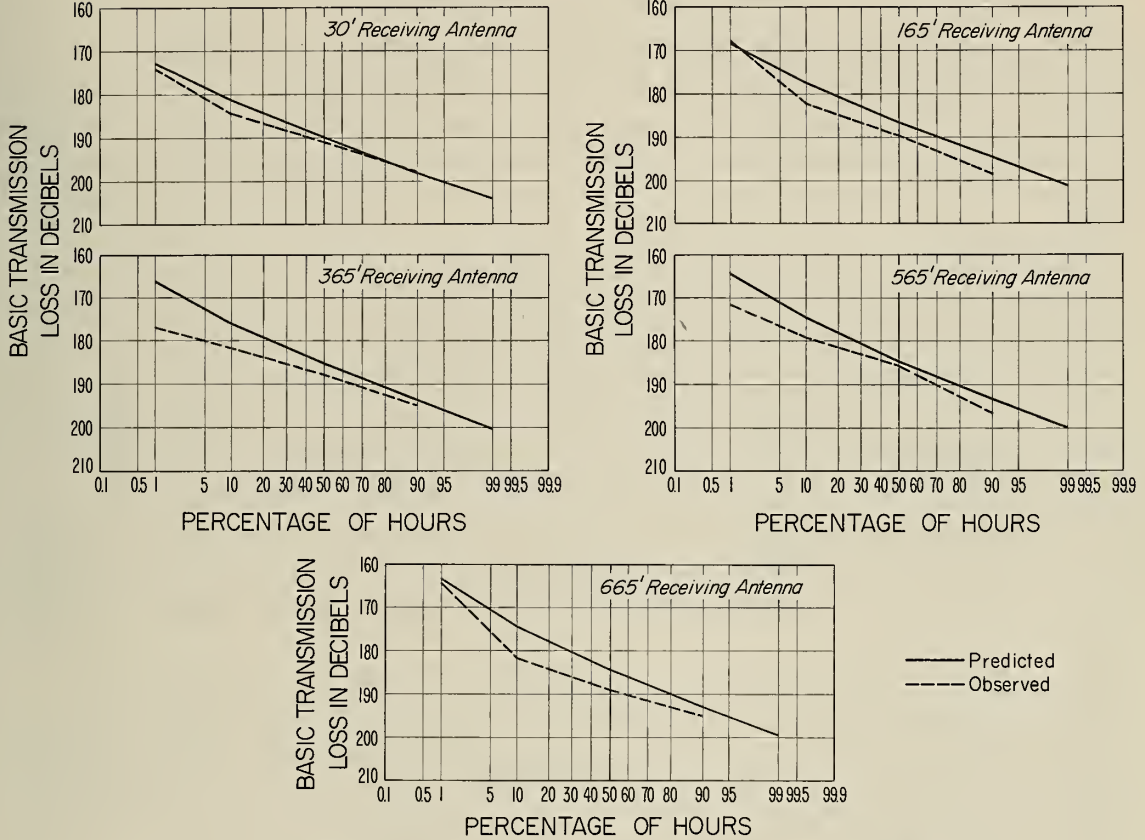
The predicted distributions are shown in Figure 23 along with the corresponding distributions of observed values. The latter include all hourly medians observed during the time block in both 1952 and 1953. Figure 24 provides a comparison of the observed height-gain data shown in Figure 19 with the corresponding predicted values. A predicted value is shown at each ratio of antenna heights; the observed value for each ratio is simply the mean of the values shown in Figure 19. On the assumption that the observed decibel values of height-gain are normally distributed, there is a 68% probability that the true mean lies within the "wings" on the observed points. The fact that the predicted values are all above

OBSERVED AND PREDICTED CUMULATIVE DISTRIBUTIONS OF HOURLY MEDIAN BASIC TRANSMISSION LOSS

418 Mc

Cedar Rapids-Quincy Path

TIME BLOCK 2, NOV. - APR., NOON - 6 P.M.



TIME BLOCK 5, MAY-OCT., NOON - 6 P.M.

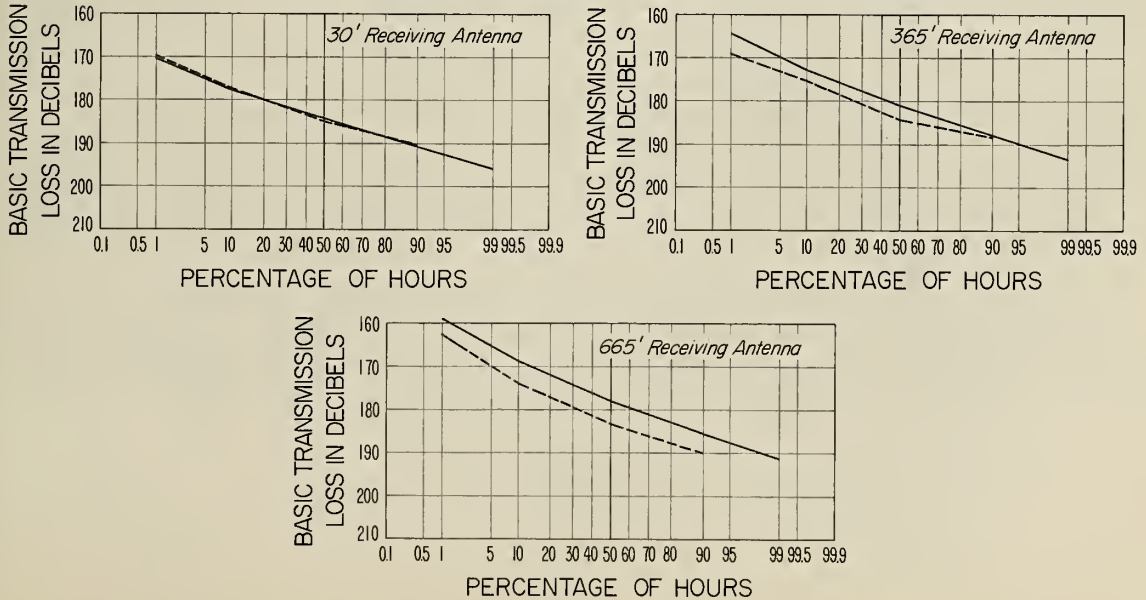


Figure 23

PREDICTED AND OBSERVED HEIGHT-GAIN VERSUS
RATIO OF ANTENNA HEIGHTS FOR ALL HOURS 1952 AND 1953

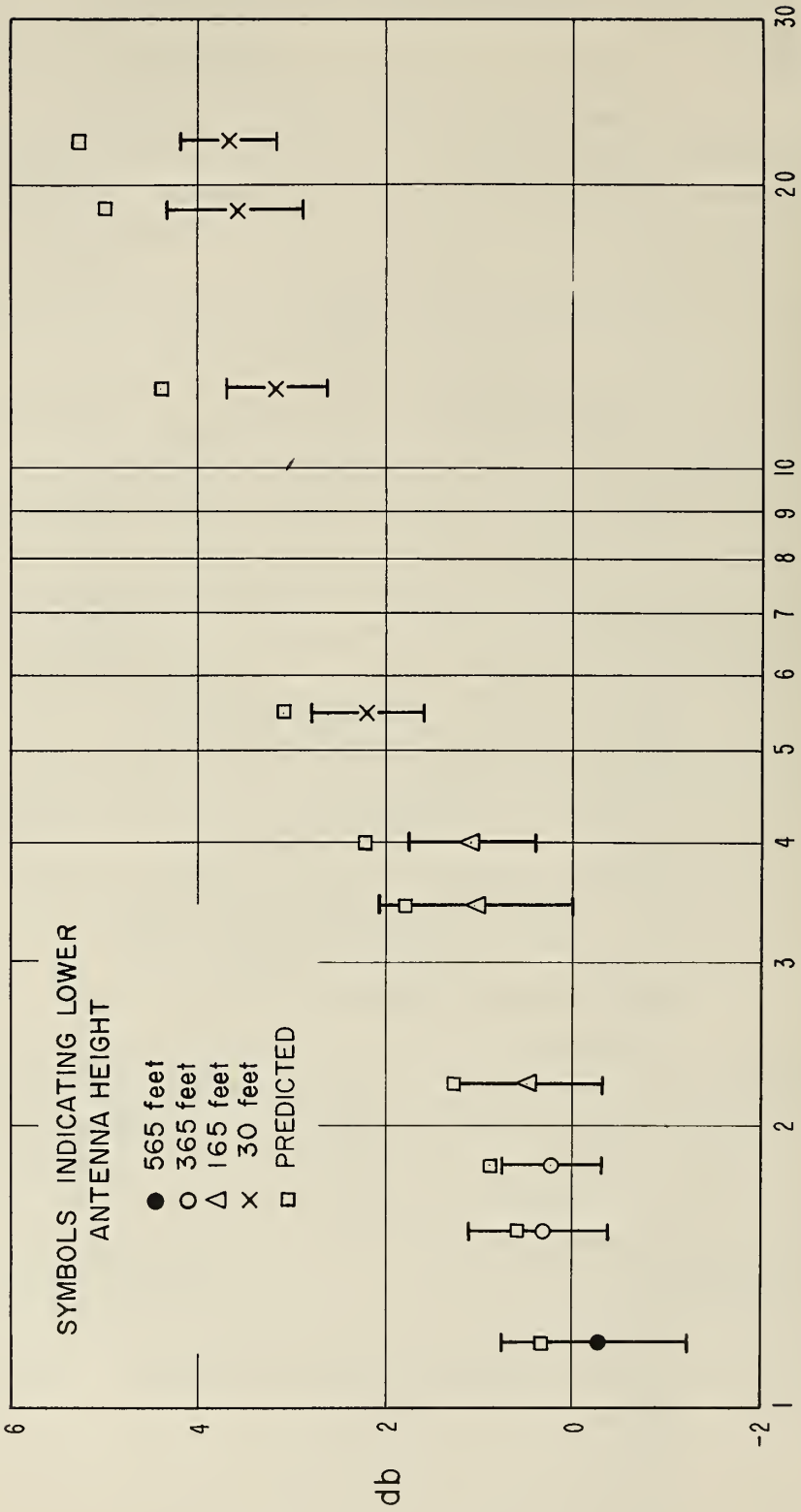


Figure 24

the measured values (and, indeed, lie outside the wings in most cases) indicates a consistent bias in the prediction which is larger at the higher ratios, i. e., those involving the 30-foot antennas.

Space Correlation

In addition to the long-term recordings of basic transmission loss, several special recordings were made to study the correlation of short-term variations in signal level occurring simultaneously on spaced antennas. These recordings were made at chart speeds ranging from 3 to 12 inches per minute.

On May 21, 1953, recordings were made of the signal levels received on a fixed antenna located 31 feet above ground and those received on a movable antenna. The latter was located in the vertical plane containing both the fixed antenna and the transmitting antenna. Its height could be varied from 33 to 69 feet above ground. The recordings were made for approximately 2 minutes at each of 16 spacings, ranging from 0.85 to 16 wavelengths. The period covered by the vertical correlation run was from 1:43 to 3:19 PM, and was made as short as possible in order to minimize the probability that the propagation medium would undergo a long-term change during that period.

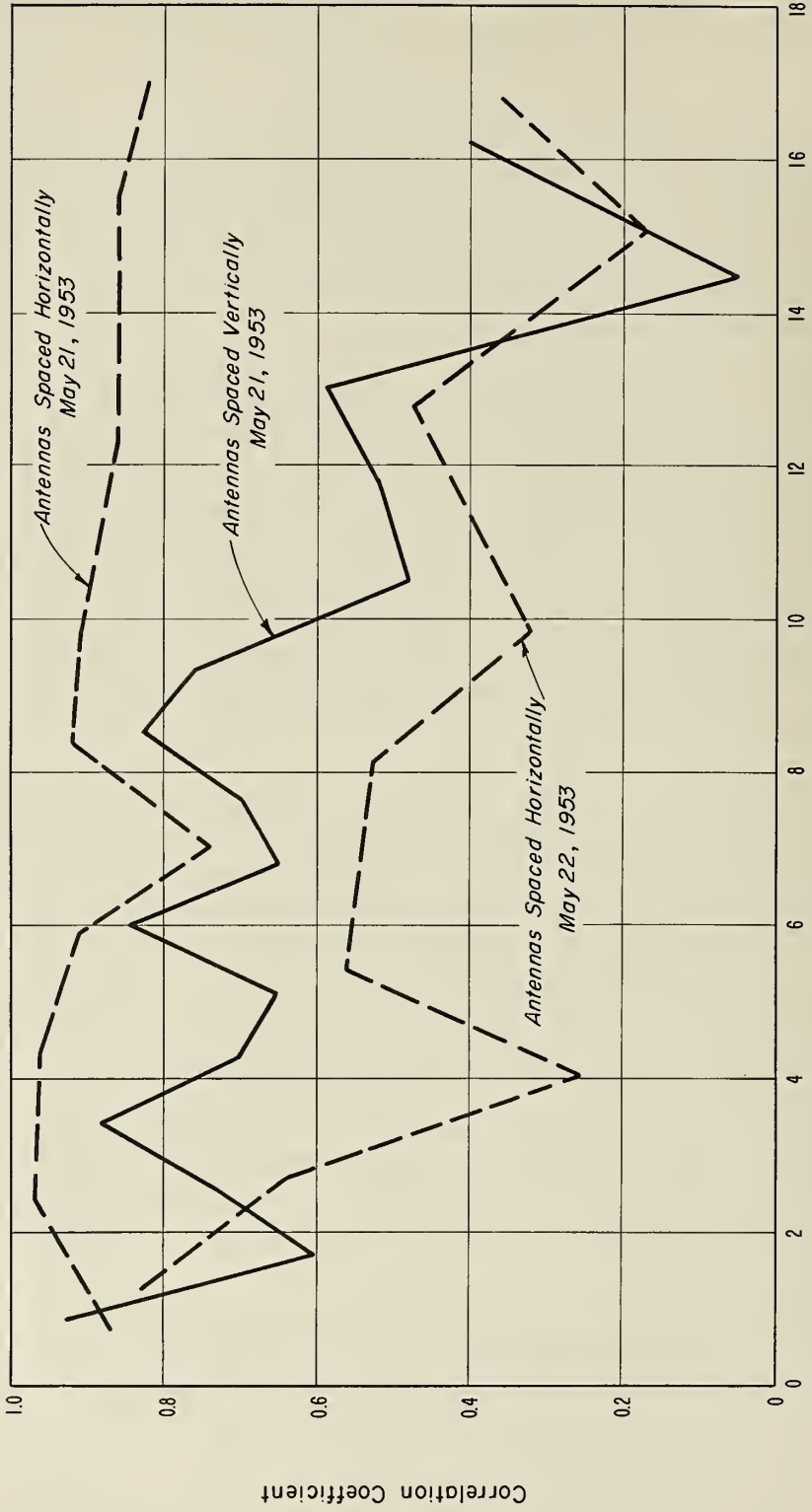
Later in the afternoon of May 21 a similar run was made, this time varying the horizontal separations of the two antennas in a line normal to the propagation path. Both antennas were 30 feet above ground. Recordings were made for from 2 to 4 minutes at each of 10 spacings ranging from 0.7 to 17 wavelengths. The period covered by this run was from 4:33 to 6:22 PM. On the next afternoon, the horizontal run was repeated from 2:05 to 3:25 PM, this time with 2 to 5 minute recordings at each of 9 spacings from 1.2 to 17 wavelengths.

In analyzing the data from both the horizontal and vertical runs, instantaneous values of the recorded voltages were read at 2-second intervals and a coefficient of correlation computed for each spacing. These are shown plotted as a function of antenna spacing in Figure 25.

It should be noted that the curves for the horizontal runs differ widely even though they were made on successive afternoons. The signal fading rate was much lower on the 21st and the correlation distance

CORRELATION OF INSTANTANEOUS SIGNAL LEVELS
VERSUS ANTENNA SPACING
Cedar Rapids - Quincy Path

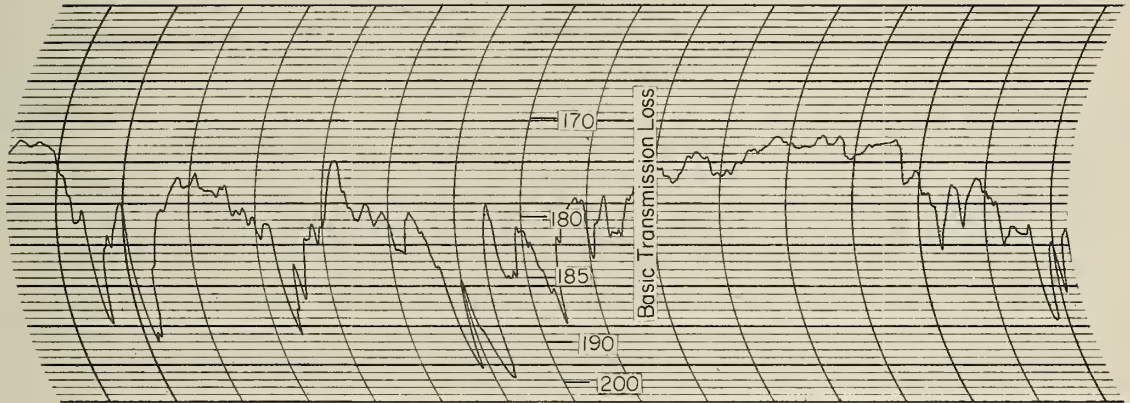
418Mc



Spacing in Wavelengths

Figure 25

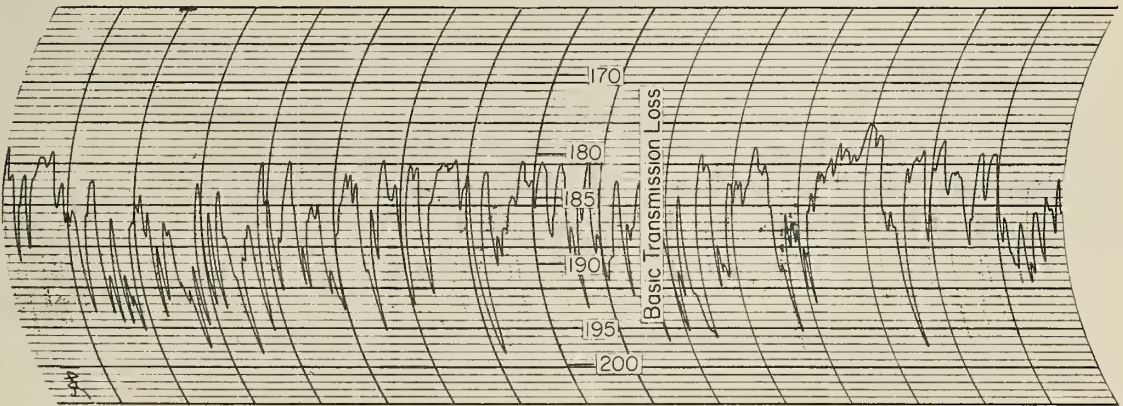
SAMPLE OF RECORDINGS MADE FOR CORRELATION STUDY
418 Mc Cedar Rapids - Quincy Path
Chart Speed: 12 in./min.



1818

1819

May 21, 1953



1405

1406

May 22, 1953

Figure 26

correspondingly greater, as evidenced by the fact that even at 17 wavelengths, the correlation remained greater than 0.8. The recording samples shown in Figure 26 illustrate the difference in fading characteristics observed on the two days. The correlation on vertically spaced antennas dropped to something less than 0.4 at 16 wavelengths. This is in good agreement with similar measurements made at 1046 Mc over the 226-mile path from Cheyenne Mountain, Colorado, to Garden City, Kansas. ³/

Several times during the course of the regular transmission loss recordings, the chart speeds were increased for short periods so that the short-term fading characteristics could be examined. This was done simultaneously on all the antenna heights being used at the time, so that the recordings could be checked for correlations. A large number of correlation coefficients were computed for samples ranging in length from one to three minutes, and for all spacings from 100 feet to 635 feet. (42 to 270 wavelengths) Although these correlations ranged from + 0.6 to - 0.7, they showed no dependence on spacing, time of day, or time of year. The mean of all the coefficients was + 0.04 and the median, + 0.06. Consequently, we may conclude that, as expected, the variations in instantaneous signal levels observed at two antennas separated vertically by about 40 wavelengths were independent.

Acknowledgments

The authors wish to acknowledge the work of J. W. Herbstreit who performed the spaced-antenna correlation experiments, assisted by L. J. Maloney. The surface refractivity data were supplied by B. R. Bean. Much of the reduction of the radio data was done by F. L. Anderson. P. L. Rice offered many helpful suggestions concerning the analysis.

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TABLE II

Recording Period	30	165	365	Antenna Height	465	565	665
1952							
Jan. 14 to Feb. 2	1/18-2/2 (273 hrs)	1/25-2/2 (147 hrs)	1/14-1/25 (223 hrs)			1/14-2/2 (374 hrs)	
Feb. 18 to Mar. 2	2/18-3/2 (221 hrs)		2/18-2/21 (48 hrs)			2/18-3/2 (196 hrs)	
Mar. 17 to Mar. 29	3/17-3/29 (225 hrs)		3/17-3/29 (199 hrs)			3/17-3/29 (206 hrs)	
Apr. 15 to Apr. 26	4/15-4/26 (237 hrs)		4/21-4/25 (73 hrs)				
May 12 to May 24	5/12-5/24 (258 hrs)		5/12-5/21 (85 hrs)				5/12-5/24 (266 hrs)
June 9 to June 30	6/9-6/30 (382 hrs)	6/14-6/25 (71 hrs)			6/9-6/28 (191 hrs)		6/9-6/30 (350 hrs)
Aug. 12 to Aug. 23	8/12-8/23 (239 hrs)		8/12-8/23 (223 hrs)				8/12-8/23 (224 hrs)
Sept. 15 to Sept. 27	9/15-9/27 (270 hrs)		9/15-9/27 (185 hrs)				9/15-9/27 (261 hrs)
Oct. 20 to Nov. 2	10/21-11/2 (252 hrs)		10/21-11/2 (206 hrs)				10/20-11/2 (252 hrs)

TABLE II
(Continued)

Recording Period	30	165	365	465	565	665
	Antenna Height					
1953						
Jan. 20 to Jan. 31	1/20-1/31 (236 hrs)	1/20-1/31 (240 hrs)				1/20-1/31 (230 hrs)
Feb. 23 to Mar. 7	2/23-3/2 (139 hrs)	2/23-3/7 (277 hrs)	2/28-3/7 (141 hrs)			2/23-3/7 (272 hrs)
Apr. 13 to Apr. 25	4/16-4/25 (218 hrs)	4/13-4/25 (264 hrs)	4/13-4/25 (276 hrs)		4/17-4/25 (173 hrs)	4/16-4/25 (220 hrs)
May 11 to May 23	5/11-5/19 (151 hrs)	5/11-5/20 (165 hrs)	5/11-5/22 (205 hrs)		5/11-5/23 (107 hrs)	5/11-5/23 (247 hrs)
Total Hours	3101	1164	1864	191	1056	2322

TABLE III -- I
TABLATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
 CEDAR RAPIDS-QUINCY PATH
 RECEIVING ANTENNA HEIGHT: 30 Feet

418 MC
 RECORDING PERIOD: January 14 to February 2, 1952

MONTH: DAY:	J A N U A R Y														F E B R U A R Y																		
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2													
Mn-1A	193.5	196.7*	188.0	192.5	205.1*	194.4*	191.1	185.8	188.3	191.0	190.4	184.2	185.6	188.3	178.0																		
1A-2A	13.3*	195.6*	188.4	192.5	203.8*	190.9	190.8	191.1	190.3	192.9	188.5	183.7	186.1	189.0	180.0																		
2A-3A	14.5*	12.8*	193.8	188.8	192.6	202.8*	190.3	191.7	192.2	189.9	188.1	189.2	181.3	185.7	178.5																		
3A-4A	15.8*	11.0*	193.7	188.6	193.3	200.3*	189.6	193.3	193.1	190.1	188.7	188.7	186.2	189.8	173.0																		
4A-5A	14.4*	12.2*	193.6	192.7	193.3	200.3*	189.6	193.3	193.1	190.1	188.7	188.7	186.2	189.8	173.0																		
5A-6A	192.0	193.8	187.5*	194.1*	200.7*	186.8	204.7*	194.4	192.0	189.8	187.8	186.0	184.7	189.7	170.9																		
6A-7A	15.3*	11.8*	193.8	193.7	195.6*	187.3	195.6*	198.4	189.9	188.2	188.8	186.3	186.8	189.0	158.5*																		
7A-8A	16.3*	11.1*	15.6*	191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
8A-9A				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
9A-10A				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
10A-11A				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
11A-NOON				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
NOON-1P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
1P-2P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
2P-3P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
3P-4P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
4P-5P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
5P-6P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
6P-7P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
7P-8P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
8P-9P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
9P-10P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
10P-11P				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		
11P-Mn				191.2	193.2	187.3	195.6*	191.1	191.1	191.1	187.3	188.8	185.3	185.5	186.9																		

* Extrapolated Values

TABLE III -2

TABULATION OF HOURLY VALUES OF L_{dm} AND FADING RANGE

418 MC

RECORDING PERIOD: January 14 to February 2, 1952

CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 165 Feet

MONTH:	J A N U A R Y												F E B R U A R Y											
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2				
DAY:																								
Mn-1A													180.8	182.3	185.4	188.9	178.6		188.1	175.0				
1A-2A												17.1	12.3	12.4	13.8	16.5			18.5	9.2				
2A-3A												182.7	183.2	185.8	186.0	181.3			185.5	173.5				
3A-4A												16.9	15.0	13.8	13.7	15.1			17.0	14.2				
4A-5A												185.4	183.3	182.5	185.4	177.0			182.8	166.3				
5A-6A												14.9	14.5	12.5	14.6	18.0			16.3	9.7				
6A-7A												187.0	185.3	184.9	186.9	174.9			188.7	164.4				
7A-8A												16.3	13.4	13.2	14.5	17.2			17.0	16.1				
8A-9A												191.1	185.7	184.8	186.1	180.9			188.2	162.4				
9A-10A												16.9	13.7	13.7	15.9	17.0			17.3	16.0				
10A-11A												197.5	184.5	185.3	185.5	181.9			188.4	153.5				
11A-NOON												18.8	13.6	13.7	15.8	14.8			17.7	15.4				
NOON-1P												200.0*	187.6	185.0	183.4	182.8			182.3	149.0				
1P-2P												19.1	12.2	15.3	15.5				17.3	9.0				
2P-3P												188.3	185.8	186.3	184.9	180.7			176.3	147.8				
3P-4P												13.8	17.4	13.3	15.9	14.6			16.7	13.9				
4P-5P												186.7	187.4	184.4	178.1				177.0	145.0				
5P-6P												16.2	12.7	14.4	15.6				20.4	13.5				
6P-7P												188.0	188.0	184.7					176.8	147.8				
7P-8P												16.3	199.2*	13.9					17.1	13.9				
8P-9P												194.0												
9P-10P												16.1	197.8	183.0										
10P-11P												192.6	189.0	199.3*	187.8	182.1	181.3							
11P-Mn												16.5	16.2	13.5	13.7	14.4	14.6							
												189.8	196.8	189.0	181.4	183.0								
												15.3	14.5	13.0	15.2	15.5								
												183.5	193.0	187.8	180.8	186.2								
												15.4	16.1	12.7	15.5	16.8								
												186.5	185.4	189.1	187.3	180.8	189.5	186.7						
												15.4	12.9	13.6	12.7	13.7	17.8	14.8						
												187.6	185.7	188.4	184.4	185.1	190.7	182.3						
												13.4	12.9	13.1	15.0	18.2								
												190.6	185.4	186.9	187.4	186.2								
												15.5	14.2	13.8	14.8	14.7								
												187.8	181.8	185.4	185.0	186.6								
												14.6	12.2	14.9	15.0	12.9								
												186.5	181.7	182.4	186.3	183.9								
												15.3	13.7	14.6	14.9	14.1								
												185.0	181.9	183.7	187.6	182.5								
												16.5	13.9	14.7	18.6	14.6								
												181.6	182.4	185.0	190.8	183.0								
												16.7	12.8	13.9	15.7	13.2								
												180.1	181.4	186.3	192.1	181.0								
												14.4	14.5	14.3	17.5	15.4								

TABLE III-5

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE

CEDAR RAPIDS-QUINCY PATH
RECEIVING ANTENNA HEIGHT: 30 Feet

418 MC

RECORDING PERIOD: February 18 to March 2, 1952

MONTH:	F E B R U A R Y												M A R C H			
	18	19	20	21	22	23	24	25	26	27	28	29	1	2		
Mn-1A	191.3	188.1	196.8	188.4		184.0	178.1		179.8	182.8	186.6	185.0	185.8			
1A-2A	11.7	13.8	11.1	12.8		15.2	13.6		13.0*	13.7	16.2	12.9	13.3			
2A-3A	189.7	190.0	195.4	186.9		182.7	179.6		180.7	182.3	185.7	184.5	189.5			
3A-4A	12.2	13.6*	11.7*	13.7		13.9	14.3*		7.5	14.0	14.7	12.2	16.9*			
4A-5A	190.1		196.7	186.5		183.6	182.4		184.3	181.9	184.3	185.1				
5A-6A	189.7		195.4	187.3		183.7	181.7		180.9	185.4*	185.9	183.8				
6A-7A	191.6		194.2	189.4		183.9	181.3		8.8	15.2*	14.1	13.8				
7A-8A	190.9		194.7	191.2		185.7	181.7		179.7			186.2				
8A-9A	10.3		11.6*	12.1		12.7	11.3		7.9			12.9				
9A-10A	190.7		194.7*	193.4		184.7	178.9		174.8			186.1				
10A-11A	10.2		10.5*	11.6		12.9	12.2		13.4*			12.3				
11A-NOON	190.8		192.8	193.2			175.3		177.0	185.6		187.1				
NOON-1P	191.4		193.3*	191.3			12.7		13.7	13.6		11.9				
1P-2P	10.6		11.8	12.5			176.1		178.9	183.8		186.1				
2P-3P	186.9		194.6	187.4			11.3*		13.0	13.8		13.0				
3P-4P	12.7		11.4*	12.3			175.5		186.3	183.8		188.3				
4P-5P	190.9		195.8	191.3			11.9		13.1	12.8		14.1				
5P-6P	12.9		14.3*	12.8			187.3		186.0	185.5		186.8				
6P-7P	190.6		197.5	193.0			10.4		13.2*	13.8		13.3				
7P-8P	13.4		12.6	11.1*			182.8		185.7	183.7		186.6				
8P-9P	190.9		195.3	192.0			186.0		186.0	183.5		185.0				
9P-10P	14.0*		14.9*	12.1			14.9		13.7	13.8		13.2				
10P-11P	189.8		194.8	191.0			187.4		186.9	181.9		185.0				
11P-Mn	12.6		11.8*	13.3			13.3		13.0	13.4		13.2				
	189.4		194.3	194.9			188.6		189.9	180.2		184.4				
	12.5		11.6*	12.5*			11.7*		14.2	14.8		12.8				
	188.9		192.3	195.8			190.1		186.3	180.5		184.2				
	14.7		13.8*	12.3*			11.8*		13.2	13.0		13.4				
	191.7		190.0	199.4			184.8		183.0	187.5		185.9				
	12.2*		12.7	12.3			13.0		14.5	13.5		14.4				
	192.5		189.0	197.8			183.9		182.7	182.0		187.3				
	13.2*		13.1	12.6*			13.4		12.8	16.3		13.9				
	191.4		187.9	196.0			180.8		182.5	183.3		197.4				
	12.4		13.1	12.0*			14.3*		13.3	13.8		13.2*				
	191.2		185.2	198.8			177.6		181.4	184.1		189.0				
	11.4		14.3	12.6*			12.7		13.4	13.6		14.2				
	191.1		184.1	196.9			184.4		176.7	179.6		190.9				
	12.0		13.6	12.4*			11.5		16.4	13.1		13.7				
	190.7		186.8	196.9			185.0		182.4	187.3		185.0				
	12.3		13.1	12.4*			12.5		14.2	13.9		14.6				
	192.0		186.1	196.5			188.0		181.3	181.4		185.4				
	10.6		12.9	11.0*			16.9		13.6	13.1		13.0				
				12.8								13.8*				

TABLE III - 7

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT : 565 Feet

418 MC

RECORDING PERIOD: February 18 to March 2, 1952

MONTH:	F E B R U A R Y												M A R C H				
	18	19	20	21	22	23	24	25	26	27	28	29	1	2			
Mn-1A	188.2	185.2	194.2	173.7						164.2	177.4	183.6	184.7	176.9			
IA-2A	7.5	14.6	13.1*	14.5*						11.7*	9.4*	13.7	13.5	13.8			
2A-3A	187.0		193.1	175.6						161.7	172.7	182.3	183.0	176.4			
3A-4A	8.5		12.6*	12.2*						10.1*	16.5*	13.2	12.9	13.8			
4A-5A	185.7		192.8	177.0				178.3		159.2*	174.5	181.7	181.8	188.8			
5A-6A	9.3		12.6*	11.2			12.7			11.2*	13.1	13.1	13.1	21.2			
6A-7A	183.9		190.3	175.0						157.3	177.8	183.1	179.7				
7A-8A	10.2		13.0*	13.5						19.4*	12.9*	13.2	12.2				
8A-9A	185.3		189.4	179.1				174.8		161.4*	186.6	183.3					
9A-10A	9.4		12.8*	14.6				14.0		8.5*	13.6	12.7					
10A-11A	187.8		191.3	181.4				173.2		164.7	176.7	178.4					
11A-NOON	5.9		12.1*	11.7				13.9		10.7*	13.6*	13.6					
NOON-1P	188.8		191.6	182.5				172.7		172.0	178.8	182.7					
1P-2P	12.7*		12.3*	13.8				11.7		16.5*	12.9	11.6					
2P-3P	179.7		192.3	177.7	180.2			173.2		176.0	182.0						
3P-4P	14.5		12.0*	15.2	13.2			11.5		13.3	12.9*						
4P-5P	181.8	189.3	192.9	175.5				174.7	180.6	183.3			184.6				
5P-6P	14.0	11.8*	12.7*	11.6				11.5	12.9	12.4			12.0				
6P-7P	182.2	187.8	193.2	178.1	180.5			177.7	182.3	181.8			185.4				
7P-8P	12.2	12.6*	12.9*	12.6	13.6			14.0	14.0	12.5			11.8				
8P-9P	187.1	184.3	193.7	182.9	178.0			179.0	183.3	181.7			184.3				
9P-10P	14.9	13.3	12.5*	12.7	13.6			13.1	13.5	12.2			11.8				
10P-11P	186.7	185.6	196.3*	192.7	178.8	179.3		181.3	183.8	181.2	185.4		184.4				
11P-Mn	12.9	12.6	12.7*	14.0	13.5			12.3	13.4*	12.8	12.6		12.1				
	12.6	11.8	13.5*	12.2				182.7	179.3	185.3			184.8				
	190.1	186.2	198.3*	180.2				182.3	180.2	183.8	193.3*		183.8				
	18.9*	11.6	13.2*	14.2				12.3	12.5	12.7	10.1	12.6					
	190.2	186.5	201.7*	188.8	186.8			181.5	180.8	182.3	191.9	184.8					
	8.9*	12.9	13.7*	16.9*				12.5	13.0	12.6	11.1*	12.9					
	12.0*	14.4*	12.9	195.3*				178.2	180.8	177.8	192.9*	183.8					
	189.7*	185.5	200.1*	184.6	197.3*			15.5	13.3	14.6	10.4*	12.3					
	11.2*	14.6	14.4					173.3	178.3	179.2	192.3	183.3					
	189.3	183.3	200.6*	182.8	194.2			12.6*	13.4	13.3	9.8*	13.8					
	11.1*	14.0	13.5	13.5*				172.1	179.2	180.8	192.3	183.5					
	190.0	179.2	198.3*	180.3				177.2	170.2	179.8	190.6	179.3					
	9.6*	15.0	17.0					11.4	15.0*	14.3*	14.0	11.2*	12.9				
	189.5	181.7	196.0*	175.2				181.2	170.3	177.0	186.9	178.2					
	8.9	14.4	14.5*	11.9*				14.0	14.3*	11.5*	14.2*	12.6	13.6*				
	190.7*	181.3	194.5	175.7				179.0	179.0	185.4	176.8						
	12.5	13.1*	11.7*					12.6	12.6	12.7	14.0*						

TABLE III-8
 TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
 CEDAR RAPIDS-QUINCY PATH
 RECEIVING ANTENNA HEIGHT:

418 MC
 RECORDING PERIOD: March 1 to 29, 1952

30 Feet

MONTH: DAY:	M	R	C	H	21	22	23	24	25	26	27	28	29
	Mn-1A	196.5	190.4	184.4	184.9	190.0	184.7	200.0*	189.3	193.8	189.4		
1A-2A	14.9*	10.9	12.3	13.3	14.4	187.4	200.0*	11.2	14.4	13.7			
2A-3A	194.8	188.4	183.4	180.8	187.5	187.4	200.0*	186.3	191.9	186.7			
3A-4A	14.4*	9.6	14.5	13.3*	13.4	183.2	202.2*	12.4	13.3	13.5			
4A-5A	200.4*	187.9	183.4	180.2	188.8	183.5	201.1*	184.0	191.7	185.5			
5A-6A	10.7*	13.8	15.0*	13.8	14.1	182.3	202.0*	12.5	13.3	13.1			
6A-7A	184.6	181.4	182.9	186.8	182.3	182.3	202.0*	181.9	191.8	174.6*			
7A-8A	12.5	13.8	13.3	13.4	13.5	183.5	201.0*	13.6	13.3	13.3			
8A-9A	183.3	180.7	184.1	191.8	203.4*	181.3	200.3*	180.4	195.1	175.5			
9A-10A	10.8	16.1	12.5	12.8*	14.1	180.1	198.0	12.5	13.9	8.9			
10A-11A	181.9	180.8	184.2	191.3	201.0*	178.4	198.0	180.1	197.2	174.3			
11A-NOON	16.1	13.0*	13.6	15.9*	13.6	180.9	198.0	11.6	13.9	7.2			
NOON-1P	185.9	183.0	182.9	197.6	180.9	180.9	198.0	174.6	197.5	173.7			
1P-2P	13.9	13.9*	15.3	13.6*	15.3	183.4	198.2	12.9	13.6	10.9			
2P-3P	183.4	185.6	183.9	198.2	180.0	180.0	198.4	183.6	196.4	174.8			
3P-4P	13.7	14.2*	13.0	13.8*	13.5*	182.6	202.0*	17.5	12.7	10.3			
4P-5P	181.3	185.8	184.6	196.0	182.6	182.6	202.0*	195.8	189.5	189.5			
5P-6P	14.7*	13.6	13.8	12.2*	13.7	185.0		12.1	14.7	14.7			
6P-7P	185.0					185.2		185.8	195.9	191.9			
7P-8P	13.6	189.4		184.6	194.2	185.2		15.3	13.0	12.8			
8P-9P	185.4	189.4		13.0	13.7	13.7		187.3	196.0	190.3			
9P-10P	13.5	11.3*		186.3	185.1	186.5		14.1	13.4	13.7			
10P-11P	183.0	186.7	185.0	183.7	13.7	187.8		186.5	195.0	188.7			
11P-Mn	14.1	10.6*	16.7	14.3	13.7	183.1		12.9	14.6	12.7			
	13.8	9.9	15.2*	13.5	13.7	189.0		186.4	194.5	188.6			
	182.4	186.1	180.9	189.3	190.2	195.6		13.7	15.2	13.4			
	13.6	10.4	15.5*	13.7	14.4	12.3		188.9	192.4	190.9			
	15.2	12.2	14.7	10.6	13.4	13.6		11.8	12.0	12.4			
	183.4	183.3	185.9	186.9	181.8	192.4		190.4	191.1	192.4			
	14.0	13.5	17.1	13.0	13.8	13.9*		12.5	11.8	12.1			
	184.0	185.9	185.1	186.7	183.0	194.6		191.6	193.0	193.8			
	13.7	9.6*	19.6*	14.5	13.5	14.6*		12.3	11.6	11.6			
	185.4	188.2	182.1	186.7	184.8	197.6*		182.3	192.2	194.1			
	13.2	9.3*	16.3*	12.2	12.8	10.1*		13.0	11.8	11.6			
	181.2	188.7	180.4	186.6	183.3	200.0*		191.3	192.5	195.3			
	12.0	11.6*	16.1*	13.3	13.6	13.0		12.7	11.9	11.9			
		188.2	181.5	183.7	182.4	200.1*		188.3	191.2	196.9			
		13.5	15.3*	13.4	13.5	16.1*		14.3	12.4	11.9			
		187.4	176.7	182.7	185.0	200.1*		192.9	189.7	193.1			
		13.7	13.0	14.1	14.1	13.0		17.0	13.4	12.3			
		187.6	175.2	180.9	192.6	181.4		193.5	185.3	181.2			
		13.1	15.6	14.2*	12.9*	13.6		188.9	191.7	187.2			
		188.1	180.4	182.6	192.2	183.1		11.2	13.5	12.2			
		10.7	10.3	13.5	12.6*	13.8		189.5	194.4	189.8			
		189.8	184.7	191.8	183.3	197.1		13.0	14.8	13.0			
		19.7		13.1	14.0*	13.7							

TABLE III-10
 TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
 CEDAR RAPIDS - QUINCY PATH
 RECEIVING ANTENNA HEIGHT: 565 Feet

418 MC
 RECORDING PERIOD: March 17 to 29, 1952

MONTH:	M	A	R	C	H																		
DAY:	17	18	19	20	21	22	23	24	25	26	27	28	29										
Mn-1A	192.0	174.3	175.5	174.3	189.6	185.0	191.1	186.0	188.7	179.1													
1A-2A	10.8	11.7	14.2	11.7	188.0	186.0	188.8	184.4	183.3	177.0													
2A-3A	192.4	12.1	12.1	5.6	15.1	182.5	188.4	181.5	182.9	173.1													
3A-4A	194.6	12.7	12.9	14.6	188.6	182.5	188.4	181.5	182.9	173.1													
4A-5A	194.7	193.0	173.2	177.0	187.4	179.9	187.8	181.3	182.4														
5A-6A	14.2	21.5	14.8	14.8	12.2	13.3	12.5	14.0	14.3														
6A-7A	193.5	190.8	172.5	178.8	190.4	179.5	187.2	181.5	182.9														
7A-8A	10.0	19.7	13.1	14.3	11.9	11.6	11.5	13.8	14.3														
8A-9A	193.6	189.8	167.7	178.8	189.5	177.8	188.1	181.1	190.4														
9A-10A	11.5	20.9	12.4	12.6	14.1	13.6	12.3	14.7	13.3														
10A-11A	11.6	19.5	14.2	15.6	14.1	180.2	185.0	176.6	191.7														
11A-NOON	195.3*	185.0	170.9	175.2	195.5*	178.6	180.4	183.8	187.7														
NOON-1P	194.6	180.7	173.0	175.8	180.9	182.4	185.5	185.1	179.7														
1P-2P	14.1	16.5	14.1	13.4	13.8	15.1	17.7	14.2	16.6														
2P-3P	175.3	14.4																					
3P-4P	175.3	198.2	181.7	179.0	189.3	184.3	184.4	193.5	187.3														
4P-5P	13.1	16.4	14.1	13.5	13.4	13.6	14.8	12.2	12.5														
5P-6P	178.4	194.5	180.4	185.5	179.6	185.6	185.5	192.5	187.9														
6P-7P	12.3	14.5	14.8	11.2	13.0	11.8	13.9	11.2	11.6														
7P-8P	177.8		174.9	188.4	180.5	186.0	184.5	189.9	187.3														
8P-9P	12.9		13.5	14.7	14.4	12.2	13.9	13.1	12.0														
9P-10P	178.3		186.0	182.3	189.6	192.7	184.8	185.3	191.6	186.5													
10P-11P	12.7		15.0	14.1	12.7	10.0	12.4	13.9	12.0	11.6													
11P-Mn	182.5	195.6	184.2	182.5	191.7	193.6	185.0	188.6	192.4	187.9													
	13.1	22.2	13.7	13.2	12.5	10.1	13.0	12.7	11.2	10.7													
	180.7	193.4	184.1	178.9	192.3	192.7	184.4	189.8	192.3	191.0													
	12.3	23.3	14.1	13.6	13.4	11.8	12.9	12.7	9.6	10.2													
	181.8	196.4	168.0	184.4	179.2	192.5	185.1	191.1	193.6	192.4													
	11.7	23.6	18.6	13.7	13.6	13.5	7.4	12.3	8.7	9.2													
	182.8		171.2	185.0	177.8	192.2	185.4	191.6	192.5	193.4													
	10.4		12.1	14.1	14.5	7.7	12.3	12.6	9.4	9.0													
	12.4		14.0	14.2	14.8	187.7	181.6	191.7	192.6	192.6													
			172.0	181.3	177.6	180.0	180.4	189.0	190.4	188.4													
			13.0	15.0	14.7	11.1	13.3	17.2	9.9	9.8													
			168.5	180.1	182.9	181.9	177.7	192.3	187.9	182.4													
			11.6	14.8	12.1	17.4	26.2	16.3	11.6	16.2													
			166.0	179.6	188.5	183.4	181.8	193.4	186.4	169.3													
			14.1	14.0	10.4	14.4	13.4	13.6	12.3	6.0													
			164.7	175.6	190.3	184.0	185.2	186.4	187.4														
			17.1	13.4	10.6	14.4	13.8	12.8	12.9														
			172.7	174.8	190.9	184.4	188.4	185.4	191.9	182.6													
			20.5	15.9	11.6	14.0	11.7	12.6	13.0	16.9													

TABLE III-11
TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 30 Feet

418 MC
RECORDING PERIOD: April 15 to 26, 1952

MONTH:	A P R I L												
	15	16	17	18	19	20	21	22	23	24	25	26	
DAY:													
Mn-1A	185.3	187.9	199.3*	188.0	185.5	175.6	187.1	187.9	189.7	184.6	196.2		
	12.8	13.7		13.2	15.0	13.5	13.0	13.3	13.0	12.3	16.2*		
1A -2A	182.7	186.2		188.6	187.2	176.8	186.8	190.3	186.4	184.7	195.1		
	13.0	15.0		13.1	14.5	14.9	13.3	11.9	14.8	13.5	15.5*		
2A-3A	184.3	183.7		188.0	185.9	177.9	188.1	194.0	178.3	184.0	195.8		
	14.7	14.2		13.0	11.7	12.7	12.4	11.9*	13.7	12.7	15.3*		
3A-4A	184.5	182.3	200.2*	188.4	183.3	177.5	188.3	197.3	177.2	184.0	193.9		
	13.2	13.5		14.0*	12.6	14.4	13.2	12.5*	14.3	13.1	15.8*		
4A-5A	183.2	182.4	201.5*	187.5	183.6	180.9	190.0	198.0	178.1	178.3	192.7		
	13.2	13.2		14.1*	12.6	15.1	12.9	12.9*	13.5	15.8	21.4*		
5A-6A	182.6	183.1	200.5*	188.7	184.4	186.3	189.2	196.2	175.8	171.3	190.8		
	11.6	13.8		13.2	11.9	12.9	12.5	11.9*	13.1	4.3	14.9*		
6A-7A	183.9	182.4	190.0	184.0	185.0	187.3	189.1	192.3	177.0	163.5*	188.4		
	13.2	14.3	15.9*	13.3	13.2	12.8	13.1	11.8*	12.9	12.8	13.8		
7A-8A	179.8	176.4	172.2	182.0	186.2	189.2	186.3	191.8	181.8	157.8*	182.3		
	15.5	15.9*	11.1*	12.5	13.0	12.3	13.0	12.1*	14.4*	13.8	4.5*		
8A-9A	178.8	185.4	197.3	181.3	186.4	191.2	185.4	189.7	185.1	183.8	192.0		
	11.9*	13.5	32.5*	14.2	11.0	12.7	13.6	12.4	14.1	17.6	14.2*		
9A-10A													
10A-11A	187.2	185.1	198.5	182.4	187.7	191.0	187.7	195.1	182.7	187.5	194.2		
	13.8	14.2	14.6*	12.5	13.5	13.2*	14.3*	11.6*	13.3	13.6	13.5*		
11A-NOON	189.8	181.3	194.7	183.6	187.5	189.1	186.8	192.8	182.0	187.0	191.7		
	13.0	13.5	11.3*	12.6	12.6	14.2	13.5*	12.9*	13.8	12.9	13.9*		
NOON-1P	188.5	179.8	194.1	185.0	187.8	187.5	187.7	193.5	182.0	187.2	191.9		
	14.2	13.4*	11.3*	13.4	13.2	12.7	13.4	11.8*	13.5	12.6	13.3*		
1P-2P	187.8	180.3	193.7	187.3	187.0	186.6	188.6	195.5	182.9	187.6	191.6		
	12.9	13.2	13.3*	13.9	12.7	13.0	13.6	10.9*	12.8	12.8	13.6*		
2P-3P	187.8	182.2	192.6		186.2	184.3	189.2	195.3	184.0	188.0	191.0		
	13.0	13.0	12.6*		12.6	12.5	14.3	11.0*	13.3	12.5	13.2*		
3P-4P	188.3	182.5	193.5		187.2	185.1	186.3	195.2	185.3	191.2	191.2		
	13.8	13.4	12.5*		14.3	12.1	13.3	11.3*	13.5	13.3*	12.5		
4P-5P	187.8	182.7	193.7		186.6	184.3	185.3	194.5	186.7	198.8	191.8		
	14.6	13.0	12.1*		12.9	12.2	13.1	11.1*	13.4	13.1*			
5P-6P	188.1	183.9	193.9		184.1	184.4	186.2	194.2	188.5	203.0*			
	14.0	13.5	13.0*		13.4	12.2	13.2	11.2*	12.8				
6P-7P	187.8	191.0	194.5		183.8	188.8	187.8	194.0	190.6	202.8*			
	14.9	12.8	13.2*		13.5	12.3	14.0	11.7*	12.0				
7P-8P	185.5	193.6	194.4		183.8	188.7	186.5	193.7	191.2	199.7*			
	14.4	16.0*	14.2*		13.0	12.5	13.5	11.8*	11.5				
8P-9P	185.7	189.2	192.3		182.1	187.2	186.8	191.8	191.0	199.6*			
	12.8	16.5*	11.0*		13.3	13.3	10.8	12.3	12.3				
9P-10P	184.8	189.3	191.3		179.5	185.3	187.6	192.3	188.4	199.1*			
	13.6	15.3*	14.1*		13.2	13.2	14.0	12.6*	13.3				
10P-11P	186.8	186.4	192.8	189.9	187.2	186.5	187.2	191.1	186.7	197.8			
	13.2	14.0	15.4*	13.2	14.1	13.0	13.8	13.8*	13.0	17.2*			
11P-Mn	186.5	187.3	195.3	188.8	181.1	175.8	186.0	187.8	189.8	185.8	196.8		
	13.1	14.0	16.1*	13.1	7.9	14.7*	13.3	13.5	13.9*	12.8	16.9*		

TABLE III-12
TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE

418 MC
RECORDING PERIOD: April 15 to 26, 1952
CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 365 Feet

MONTH: DAY:	A P R I L												
	15	16	17	18	19	20	21	22	23	24	25	26	
Mn-1A								174.7	186.3	182.9	184.3		
1A-2A								8.4	18.3	14.0	12.4		
2A-3A								181.5	188.7	179.7	183.9		
3A-4A								16.0	16.0	13.6	12.9		
4A-5A								183.7	193.0	173.5	182.8		
5A-6A								16.7	16.6	14.3*	12.9		
6A-7A								182.2	196.6	171.0	178.0		
7A-8A								16.3	16.6	14.4	14.2*		
8A-9A								182.6	191.4	170.9	173.3		
9A-10A								15.7	18.0	14.9	6.1*		
10A-11A								182.2	185.5	169.4	168.7		
11A-NOON								16.1	18.3	14.0	3.9*		
NOON-1P								182.8	185.9	171.6	159.7		
1P-2P								16.0	19.4	15.1*	12.5		
2P-3P								183.2	188.2	177.1	145.5		
3P-4P								15.6	17.9	15.3	5.5		
4P-5P								182.5	196.8	180.6	170.7		
5P-6P								15.6	17.9	16.7*	35.9*		
6P-7P								183.8	189.2		190.2		
7P-8P								16.8	15.5		12.3		
8P-9P								189.5					
9P-10P								16.1					
10P-11P								186.7					
11P-Mn								16.5					
								186.9	183.5	181.8			
								17.1	16.4	15.5			
								190.7	183.0				
								17.2	15.2				
								191.2	184.3				
								18.0	14.8				
								190.0	186.0				
								18.4	13.5				
								190.4	187.9				
								17.3	13.1				
								184.9	189.8				
								15.7	12.6				
								187.3	186.2	191.1			
								16.2	15.7	10.7			
								186.9	187.7	190.8			
								17.7	15.5	10.7			
								187.7		190.2			
								17.6		12.8			
								187.7	183.2	189.0			
								17.1	14.1	11.7			
								188.9	182.7	186.5			
								16.9	14.4	12.4			
								168.7	182.2	185.2			
								7.3*	14.6	11.5			

TABLE III-15

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
 CEDAR RAPIDS-QUINCY PATH
 RECEIVING ANTENNA HEIGHT: 665 Feet

418 MC
 RECORDING PERIOD: May 12 to 24, 1952

MONTH:	M A Y												
	12	13	14	15	16	17	18	19	20	21	22	23	24
DAY:													
Mn-1A		<160.0	<160.0	172.9	14.0			173.1	178.7				
1A-2A	<166.0	<160.0	158.1	171.6	171.7	177.5	176.5	183.2	178.0	188.4	184.0	178.7	
2A-3A	<166.0	<160.0	160.6	8.6*	9.0	13.5	14.4	13.4*	13.8	11.4	14.6	12.6*	13.4*
3A-4A	<166.0	<160.0	166.8	180.6	174.7	158.0*	174.4	182.5	174.8	194.6*	179.9	176.7	16.8
4A-5A	<166.0	159.3	167.1	182.1	177.2	165.1	171.0	181.7	166.7	190.4*	181.3	174.8	
5A-6A	<166.0	163.7	172.3	186.0	176.4	161.3	168.8	181.5	<166.0	189.8	172.3	173.9	
6A-7A	<166.0	137.2*	177.5	183.7	178.0	163.7	<160.0	169.1	163.2	189.2	166.2	169.9	
7A-8A	175.7	174.6	178.9	185.6	176.6	<160.0	164.8	23.9*	13.7	12.7*	13.4*	15.0*	
8A-9A	188.6	181.1	178.7	186.3	176.5	174.8	169.7	174.5	<166.0	187.8	161.2	167.7	
9A-10A	21.1*	13.3*	13.7	9.4	11.8*	8.0	25.7*	31.0*	161.4	11.8*	3.2	13.2*	
10A-11A	185.3	187.0	191.1	180.1	187.4	180.5	177.5	177.8	181.6	186.7	177.3	175.8	
11A-NOON	16.3*	13.0*	13.0*	13.4	13.0*	14.0	13.1	13.1	12.3	15.6*	13.2*	14.0	
NOON-1P	186.9	187.5	191.9	182.1	188.9	182.0	184.7	182.8	186.8	183.8	182.6	179.4	177.6
1P-2P	12.3	12.9*	14.9*	12.9	12.7*	12.6	14.4	11.8	11.6	13.3	12.5	13.2	13.2
2P-3P	188.1	190.5	184.8	182.0	188.1	184.3	184.0	186.1	187.3	181.7	183.8	181.7	180.4
3P-4P	11.5*	13.4*	11.6	13.5	12.3*	12.5	14.0	10.8	10.1	13.2	11.3	12.9	13.2
4P-5P	190.0	186.9	184.9	187.1	184.2	183.2	186.0	187.7	178.2	186.7	182.1	179.4	
5P-6P	189.2	187.5	187.5	183.5	182.6	186.1	186.1	188.4	183.0	186.9	184.4	180.9	
6P-7P	188.9	187.0	186.3	178.8	186.3	178.8	186.5	186.5	185.6	188.1	185.7	181.6	
7P-8P	190.5	185.9	181.2	175.3	182.7	182.8	186.4	191.3	182.7	188.0	186.2	183.7	
8P-9P	11.4*	13.1	12.8*	13.0	12.7	12.7	10.1	8.8*	12.8	11.2*	14.1*	13.0*	
9P-10P	191.5	184.4	181.1	172.6	181.8	182.4	186.4	191.1	183.5	188.2	184.2	182.8	
10P-11P	188.8	181.8	179.0	173.6	182.2	181.0	187.0	189.1	183.5	188.1	174.4	182.5	
11P-Mn	12.1*	13.9	17.0*	13.1	14.4	14.4	12.9*	10.6*	10.7*	12.7	17.1*	9.2*	13.0*
	175.8	170.2	173.4	175.5	170.8	177.5	180.0	176.6	188.7	188.2	185.2	183.2	
	8.1	11.2*	13.3*	16.6*	13.5*	11.5	12.2	20.7*	10.7*	13.5*	17.5*	12.7*	
	174.1	159.6*	161.8	169.5	172.8	177.6	178.9	167.8	188.2	191.2	185.1		
	6.9*	11.1	15.0*	12.5	13.4	12.4	9.2*	11.4	14.0*	12.3*			
	<166.0	161.3	155.8*	171.0	171.7	179.3	178.4	183.8	189.8				
		11.8*	15.5*	12.4	13.6	13.0		11.1	14.6*				

TABLE III - 18

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 465 Feet

418 MC June 9 to 30, 1952

MONTH:	J	U	N	E																											
DAY:	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30									
Mn-1A	170.0 9.0*	165.1 19.2*	146.0 8.1	155.0 9.5*	186.1 16.7	166.7 183.2	156.1 18.4*	187.2 20.9*	147.5 7.0																						
1A-2A	166.7 10.6	161.8 13.3*	153.0 7.8	155.7 15.7*	182.2 16.1	168.6 23.5*	174.4 17.0*	187.8 21.9*	144.7 7.5																						
2A-3A	154.0 4.2	165.9 15.2*	137.2 10.0	152.3 10.7*	181.8 22.9*	173.1 18.3	188.6 19.7*	143.5 9.7																							
3A-4A	156.7 3.8	161.6 14.8*	133.6 3.7	151.2 8.4*	184.6 21.6	184.5 26.1	190.3 21.1*	149.6 7.5																							
4A-5A	152.8 7.1	159.0 9.7	145.0 11.3	165.8 16.4*	180.8 17.5	187.0 23.0*	160.2 16.5	187.4 18.1	152.2 7.5																						
5A-6A		150.5	146.0	170.2	182.0	185.8	169.3	177.1	154.5																						
6A-7A	151.0 5.2	143.3 6.5	152.0 15.8	170.6 19.5	183.3 20.8	182.3 19.7*	177.4 16.9	171.5 11.6*	153.3 15.2																						
7A-8A	<167.6	138.8 21.8	132.5 11.0	171.6 14.5	199.0 26.4*	184.0 18.0	182.1 16.1*	12.2 17.8	136.6 34.7																						
8A-9A		168.2 13.3	185.1 16.7	176.5 16.7	16.2*	19.3	180.3 17.8	158.3 34.7																							
9A-10A		170.2 12.8	186.1 15.0	178.5 16.4	176.5 16.2		184.3	181.5 13.3																							
10A-11A	174.2	167.0 16.6*	187.7 14.3	181.9 19.3	178.0 15.6	186.4 18.0	183.4 17.3	181.3 13.7																							
NOON-1P	177.1 13.5*	187.8 14.2	187.8 14.2	177.8 15.1	178.7 15.6	187.8 18.0	183.4 16.0	180.4 15.2																							
1P-2P	178.1 13.0*	189.8 15.5	180.3 18.5	180.2 16.1	180.2 16.1	180.2 16.1	184.0 15.0	180.9 15.2																							
2P-3P	179.1 13.4	178.8 13.4	183.7 16.7	178.9 14.0*	183.7 16.7	178.9 14.0*	183.8 14.6	182.1 15.7																							
3P-4P	181.3 13.6	174.3 16.5	187.8 19.0	178.3 15.6	187.8 19.0	178.3 15.6	182.6 14.5	182.2 13.5																							
4P-5P	180.0	174.2 15.6	185.9 22.1	188.0 18.9	177.8 15.6	188.0 15.6	181.7 14.9	182.7 13.7																							
5P-6P	177.9	171.8 15.2*	182.7 15.8*	181.7 15.3	176.2 15.8	175.3 16.6	184.2 14.7	183.3 13.3																							
6P-7P	172.3 14.1*	173.0 14.6	182.7 15.5*	176.2 13.5	175.7 16.3	180.5 18.5	175.4 17.1*	181.9 12.5																							
7P-8P	172.3 13.2*	177.7 16.6	181.7 14.6	175.0 20.3	174.8 16.5	183.6 20.1	179.9	170.3																							
8P-9P	175.2	164.8 23.9*	177.2 11.8*	164.8 19.1*	188.0 22.4	184.5 22.4	156.8 17.6*	182.8 18.9																							
9P-10P	174.0	172.3 12.8	166.3 8.6	165.0 17.8	183.5 16.8	185.9 22.0*	154.9 26.4*	157.4 30.5*																							
10P-11P	173.8 13.7		160.3 15.2	168.3 15.8	183.6 20.3		156.8 17.6*	182.8 18.9																							
11P-Mn	173.2 12.6	147.7 17.4*	165.5 15.2	186.3 15.8	183.6 20.3																										

TABLE III - 20
 TABULATION OF HOURLY VALUES OF L_{dm} AND FADING RANGE
 CEDAR RAPIDS - QUINCY PATH
 RECEIVING ANTENNA HEIGHT: 30 Feet

418 MC
 RECORDING PERIOD: August 12 to 23, 1952

MONTH: DAY:	A U G U S T											
	12	13	14	15	16	17	18	19	20	21	22	23
Mn-1A	177.5	180.5	185.1	179.7	175.7	175.7	160.0	179.4	184.0	176.1*	167.7	
1A-2A	14.0	16.2	11.0	13.3	14.6	16.8	12.8	13.3	15.8			
2A-3A	174.2	166.4	184.6	176.0	176.7	151.1*	177.5	181.6	175.9*	168.9		
3A-4A	14.5	21.0	11.0	14.4	14.6	13.0	12.8	13.0	12.8			
4A-5A	176.1	171.9	185.5	179.2	172.8	154.9*	176.7*	180.7	172.3	171.1		
5A-6A	13.6	19.1	11.6	12.3	14.3	12.7	11.7	15.1				
6A-7A	171.8	186.1	178.2	174.0	170.2	151.5*	175.5*	180.4	172.2	167.0		
7A-8A	14.3	11.3	13.2	14.0	13.1	13.5	12.2	15.5				
8A-9A	169.5	186.6	175.1	171.7	166.7	120.2*	176.2	179.7	166.3	170.5		
9A-10A	15.3	12.5	14.4	16.4	14.5	14.1	14.5	10.4	13.7			
10A-11A	163.7*	187.2	173.8	170.5	158.3	143.6*	175.7*	177.2	163.9	169.9		
11A-NOON	164.6*	189.2	171.3	161.4*	155.7*	145.2*	178.8	175.7	170.7	172.0		
NOON-1P	170.2	190.5	170.7	160.4	161.7	141.2*	180.8	175.3*	170.0	169.7		
1P-2P	15.4	18.3	14.4	14.8	16.0	182.8	174.0					
2P-3P	177.2	188.6	168.2	167.8	163.7*	11.0	12.2					
3P-4P	13.9	13.9	13.6	19.6	165.2	169.6	168.7	174.7	174.3*	172.8		
4P-5P		179.2	187.5	164.8	183.8	14.1	11.5					
5P-6P	179.9	180.2	17.8	20.6	19.5							
6P-7P	13.4	14.4	17.2	13.6	17.1	175.0	182.2	182.9	172.9	184.0	179.1	
7P-8P	179.6	181.7	189.2	18.8	17.2	14.2	14.6	11.5	13.4	13.2	12.4	
8P-9P	13.9	14.7	18.8	18.8	12.6	13.0	12.8	185.7	176.3*	184.6	179.7	
9P-10P	179.6	181.7	184.6	189.5	184.5	173.3	186.9	186.2	179.3	182.5	179.9	
10P-11P	13.3	14.3	12.6	20.0	12.8	12.0	12.9	12.5	13.4	12.5	13.9	
11P-Mn	179.7	183.0	186.0	189.1	184.1	174.7	188.2	186.1	180.9	181.8	180.2	
	13.9	14.0	13.8	21.2	13.1	13.5	12.7	12.2	13.3	13.2	14.0	
	177.7	181.6	186.2	189.6	184.5	176.2	188.0	186.3	178.6	181.2	178.4	
	12.8	14.5	26.4	22.0	13.2	12.6	12.7	13.2	13.6	13.8	13.0	
	178.9	183.9	186.2	188.8	179.3	177.5	188.0	183.1	177.0*	181.1	178.4	
	13.3	16.2	12.5	24.6	14.1	13.7	12.9	11.9				
	181.9	186.2	180.1	185.3	178.7	178.5	176.0	187.7	176.4*	178.6	177.9	
	12.9	15.0	13.4	13.7	16.3	13.4	15.4	12.7				
	181.5	183.9	170.7	183.4	179.9	176.1	166.2	182.2	175.1*	173.6	173.6	
	12.8	15.9	18.6	11.7	15.4	14.9	17.8	17.8				
	178.1	185.2	171.1	184.4	177.8	175.2	167.7	164.2	176.3*	170.2	170.6	
	12.1	15.0	18.2	11.6	15.1	14.5	13.5	18.2				
	178.8	184.9	179.9	183.7	177.9	176.6	158.4	164.2*	175.7*	166.5	170.1	
	14.8	15.6	13.9	11.3	13.8	14.5	14.8	12.4	174.5*	168.2	168.1	
	177.2	184.2	179.9	184.8	176.7	167.0	155.6	166.5	176.3*	170.2	170.6	
	13.5	16.7	17.0	15.1	15.1	19.1	14.6	11.4				
	176.7	183.9	180.4	174.1	177.7	163.7	173.2	173.2	166.8	169.8	159.7	
	13.2	15.4	13.2	12.9	13.2	17.0	12.1	12.1	181.8	172.6*	170.2	
	177.5	181.9	184.2	168.5	177.7	168.0	171.2	176.6*	11.6	11.6	16.1	
	13.5	14.0	10.0	14.8	12.9	17.6	18.0	11.6				

TABLE III-22
 TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
 CEDAR RAPIDS-QUINCY PATH
 RECEIVING ANTENNA HEIGHT: 665 Feet

418 MC
 RECORDING PERIOD: August 12 to 23, 1952

MONTH:	A U G U S T											
	12	13	14	15	16	17	18	19	20	21	22	23
DAY:												
Mn-1A	174.7	169.7	179.8	178.7	173.2	147.2*	176.5	174.6	166.2	166.4		
	18.9	19.5	14.1	15.8	15.1		12.5	11.4	41.1	14.5		
IA -2A	173.2	150.0*	181.3	178.7	171.1	142.6*	174.3	176.1	163.7	163.7		
	19.5	19.5	20.8	14.6	13.6		14.9	13.8	14.3	13.8		
2A-3A	173.2	153.1	181.6	177.6	171.7	151.7	170.6	174.4	173.2	161.9		
	19.3	12.7	12.6	15.6	15.5	20.6	13.2	12.4	16.3	14.4		
3A-4A	168.9	176.9	174.7	170.0	158.8	153.5	168.8	175.3	164.4	161.2		
	20.9	10.0	15.6	13.9	11.7	19.4	13.0	13.6	19.2	12.5		
4A-5A	151.2	178.2	169.9	162.0	154.0	147.2*	172.2	176.7	154.7*	164.7		
	23.2	17.1	14.4	16.8	13.9		12.5	13.5	16.4	16.4		
5A-6A	141.2*	177.9	165.8	152.8	159.2*	153.8*	171.4	176.6	155.6*	161.1		
		14.8	15.7	5.4		22.0	12.9	15.0	14.0			
6A-7A		181.1	165.2			131.7*	174.2	175.7	155.0	161.2		
		14.0	17.1				15.1	12.7	8.3	14.2		
7A-8A	144.2*	180.3	164.0			144.2*	179.8	176.4	159.8*	169.2		
		12.8	15.5			153.7	14.8	13.7				
8A-9A	169.6	176.6	156.9			162.7	187.6	174.3				
	26.7	14.0	14.8			161.7	18.3	12.3				
9A-10A		152.7	17.8			17.3	14.0	17.8	172.7	165.0		
		17.8				168.2		13.3	14.5	12.7		
10A-11A	175.6	180.7							175.7	171.2		
	13.3	14.9							14.7	15.5		
11A-NOON	177.7	180.2							180.1	174.2		
	15.8	14.5							12.5	13.4		
NOON-1P	179.4	180.7							177.7	177.3		
	14.5	15.0							13.3	14.1		
1P-2P	180.7	182.7	181.6	186.2					179.2	177.3		
	13.7	15.5	13.6	18.9					14.3	13.5		
2P-3P	180.9	182.8	183.8	187.7					180.8	177.3		
	13.5	13.8	17.0	15.3					17.3	17.6		
3P-4P	180.0	182.0	175.6	188.4					184.7	179.2		
	14.5	14.7	24.6	15.9					14.5	14.1		
4P-5P	180.1	184.4	165.6	189.3					13.0	15.6		
	13.7	14.3	15.6	18.3					15.6	14.6		
5P-6P	182.3	187.5							189.7	173.6		
	13.8	12.2							34.4	12.9		
6P-7P	180.6	184.8	158.7*	186.5					175.5	172.7		
	13.4	13.5	15.6	13.7					15.3	16.6		
7P-8P	178.0	182.2	168.6	186.9					174.7	168.1		
	14.5	13.2	20.0	17.0					14.7	14.9		
8P-9P	176.6	182.0	175.2	181.8					172.3	163.9		
	16.2	12.0	23.3	16.7					16.0	16.6		
9P-10P	174.0	179.7	165.9	171.2					159.5*	159.0		
	19.6	13.3	14.9	26.0					14.9	15.1		
10P-11P	174.5	179.2	162.2	173.2					164.7	150.5*		
	17.4	13.8	20.7	15.2						17.2		
11P-Mn	172.7	179.7	175.7	172.5					172.1	165.7		
	19.5	13.4	11.0	14.1					16.5	11.7		

TABLE III -28

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 665 Feet

418 MC

RECORDING PERIOD: October 20 to November 2, 1952

MONTH:	O	C	T	O	B	E	R	N	O	V	E	M	B	E	R
DAY:	20	21	22	23	24	25	26	27	28	29	30	31	1	2	
Mn-1A		167.4	176.6	164.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6
1A-2A		164.5	177.9	159.0	175.3	175.3	175.3	175.3	175.3	175.3	175.3	175.3	175.3	175.3	175.3
2A-3A		162.7	179.7	161.5	193.6*	180.8	190.3	178.5	190.2*	198.9*	185.0	186.3	11.4*		
3A-4A		157.8	179.3	171.3*	188.7	181.0	189.3	178.1	193.6*	200.4*	184.5				
4A-5A		157.3	179.3	166.7	186.3	184.6	188.6	175.0	195.4*	193.9*	182.3				
5A-6A		155.5	178.4	153.8	186.7	181.2	188.8	172.8	195.9*	191.0*	182.1				
6A-7A		166.6	178.4	152.0	184.6	184.5	189.9	173.4	191.7*	184.3	182.4				
7A-8A		170.6	178.4	151.0	183.0	174.5	187.4	172.8	192.5*	182.3	181.2				
8A-9A		179.1	178.3	154.9	182.2	183.6	185.4	185.4	195.1*	180.3	170.2				
9A-10A		177.1	177.1	180.1	184.0	182.6	188.9	188.9	>200.0	182.1	181.4				
10A-11A		180.6	180.6	187.4	183.6	186.9	186.2	186.2	196.9*	187.0	183.9				
11A-NOON		183.1	180.3	185.6	186.5	183.8	13.6*	14.8*	6.3*						
NOON-1P		187.4	182.3	183.6	184.9	187.8	185.8	188.5	188.0	188.1	193.1*				
1P-2P		181.8	184.6	185.6	189.9	187.3	186.6	189.0	187.2	188.2	193.8*				
2P-3P		182.7	184.6	185.5	189.3	186.8	186.5	189.2	185.5	192.0*	192.5*	186.1			
3P-4P		183.5	184.6	184.1	187.4	187.3	186.6	186.6	193.6*	183.2	187.8	191.2*	185.4		
4P-5P		183.5	184.4	182.7	188.5	185.4	6.5	6.5	195.0*	181.4	187.4	189.9	182.9		
5P-6P		182.7	184.8	182.0	192.3*	183.8	187.9	187.9	192.4*	181.9	186.9	190.8*	183.3		
6P-7P		181.7	188.3	180.2	194.2*	185.7	189.4	189.4	190.3	188.6	193.0*	191.8*	183.5		
7P-8P		181.1	188.9	179.4	189.5	193.6*	187.0	187.0	188.6	193.0*	191.8*	183.5			
8P-9P		179.1	176.0	184.5	193.3*	183.4	187.9	187.9	192.4*	181.9	186.9	190.8*	183.3		
9P-10P		177.4	176.6	182.1	191.0*	184.5	189.8	189.8	192.4*	181.9	186.9	190.8*	183.3		
10P-11P		172.8	175.8	181.1	182.4	181.1	182.4	182.4	192.4*	181.9	186.9	190.8*	183.3		
11P-Mn		170.3	180.1	173.4	183.5	191.5*	185.6	196.7*	196.7*	201.3*	188.0				
		6.8	11.9	8.3*	10.7	10.7	10.7	15.9*	15.9*	15.9*	12.2*				

TABLE III -33

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE
 CEDAR RAPIDS - QUINCY PATH
 RECEIVING ANTENNA HEIGHT : 165 Feet

418 MC

RECORDING PERIOD: February 23 to March 7, 1953

MONTH:	F	E	B	R	U	A	R	Y	M	A	R	C	H
DAY:	23	24	25	26	27	28	1	2	3	4	5	6	7
Mn-1 A	<174.5	188.8	192.3	194.0	196.4*	188.7	>200.0	179.3	191.5	187.8	190.5	185.1	
IA -2A	<174.5	188.1	189.2	194.8*	185.8	186.3	>200.0	178.9	195.0*	185.6	190.1	182.8	
2A-3A	<174.5	187.9	188.1	192.7*	189.9	184.6	>200.0	180.7	197.0*	187.8	189.0	179.9	
3A-4A	<174.5	187.5	191.7	192.4*	191.5	183.0	196.4*	181.4	188.6	184.9	191.1	177.6	
4A-5A	<174.5	189.8	197.0*	192.0	190.5	183.6	197.4*	176.7	185.5	185.6	191.1	178.3	
5A-6A	175.7	197.0*	192.6	196.0*	192.5	181.1	198.0*	179.3	186.0	182.5	190.5	181.0	
6A-7A	178.8	>200*	195.4	196.5*	193.0	182.2	196.6*	181.7	183.7	180.3	190.6	184.7	
7A-8A	179.2	199.5*	195.4	195.0*	191.4	186.8	192.7	181.3	182.5	180.3	189.3	185.8	
8A-9A	176.7	199.1*	200.0*	192.4	190.0	185.3	190.2	183.3	186.9	180.4	188.6	192.5	
9A-10A	175.2	197.3*	198.0*	193.7	191.5	184.1	188.8	185.6	196.2*	186.0	189.2	195.5	
10A-11A	189.4	198.9*	14.1*	14.1*	15.9*	15.1	188.5	188.3	198.7*	187.7	188.5	>194.4	
11A-NOON	>200*	>200*	198.8*	196.9*	196.0*	187.1	187.6	187.6	187.6	181.1	11.8*	>194.4	
NOON-1P	184.1	>200*	199.5*	195.0*	197.2*	187.5	185.0	195.9*	193.5	187.5	189.9		
1P-2P	186.4	14.0*	195.6*	199.0*	194.3	196.3*	189.1	199.5*	190.2	187.3	186.0		
2P-3P	190.4	>200*	195.3*	199.5*	196.0*	195.3	192.0	>194.4	190.5	187.5	186.9		
3P-4P	191.7	197.3*	195.5*	198.5*	195.3*	200.0*	194.1	>194.4	191.0	189.1	190.3		
4P-5P	192.5	196.7*	197.0*	193.3	199.0*	>200.0	199.9*	>194.4	191.9	188.2	190.4		
5P-6P	193.2	195.9*	>200*	195.1*	199.4*	>200.0	185.2	>200.0	196.3*	190.3	188.0		
6P-7P	193.4	193.7	197.3*	196.7*	197.9*	196.5*	187.9	>194.4	>200.0*	189.8	188.1		
7P-8P	8.6*	20.0*	200*	195.6*	189.7	188.9	14.2*	194.4	188.9	191.0	185.8		
8P-9P	8.0*	15.5*	199.0*	195.1*	199.0*	190.5	13.1*	197.5*	200.0*	192.0	21.6*		
9P-10P	9.7	20.6*	192.8*	196.0*	199.0*	190.5	12.3*	181.7	194.3	190.8	185.5		
10P-11P	6.5	24.3*	15.1*	194.0*	199.0*	>200.0*	14.0*	14.3*	15.3*	11.8*	13.5		
11P-Mn	7.8	23.3*	15.1*	194.0*	200.0*	188.5	14.5*	14.8	15.1*	11.8*	12.5		
	175.2	189.6	194.5*	196.0*	197.8*	188.5	>200.0*	187.3	187.7	193.5	187.2		
	8.1*	17.4*	12.3*	12.3*	19.3*	12.5*	19.3*	20.1*	15.9*	13.4*			

TABLE III -34

TABULATION OF HOURLY VALUES OF L_{bm} AND FADING RANGE

CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 365 Feet

418 MC

RECORDING PERIOD: February 23 to March 7, 1953

MONTH: DAY:	F E B R U A R Y							M A R C H						
	23	24	25	26	27	28	1	2	3	4	5	6	7	
Mn-1A							185.7 8.4	191.6 10.0*	179.1 14.2	191.6 14.2	185.8 13.3	188.6 12.9	185.0 14.7	
1A-2A							185.6 11.5	178.4 14.1	182.4 12.1	192.8* 12.8	182.4 14.6	187.6 14.6	181.1 14.6	
2A-3A							183.8 12.7	180.4 13.0	185.7 14.2	197.7* 14.2	185.7 15.1	188.1 15.2	179.0 15.2	
3A-4A							182.8 12.9	197.5* 12.6	180.6 14.5	190.6 12.8	181.4 13.9	191.1 13.0	176.7 13.0	
4A-5A							184.0 12.0	>200.0 14.3	176.3 15.1	185.8 14.3	182.7 14.3	193.0 13.8	177.9 13.1	
5A-6A							182.4 12.7	>200.0 14.2	179.1 13.8	185.5 13.7	181.1 13.6	192.6 12.5	180.2 12.5	
6A-7A							183.1 14.3	197.5* 13.3	180.2 13.3	183.7 12.1	180.6 13.5	192.5 14.0		
7A-8A							185.4 13.5	193.6 13.3*	180.7 12.5	184.4 11.8	180.7 14.3	191.4 11.2		
8A-9A							184.3 15.1	191.4 15.4*	183.2 15.7	186.7 11.9	179.4 11.5	189.4 13.5		
9A-10A							184.1 12.0	189.4 14.4*	184.4 14.4	193.5* 13.5	181.7 13.4	190.0 13.4		
10A-11A							184.2 13.4	188.9 15.1*	189.1 16.0		184.4 12.0	189.5 12.7		
11A-NOON							186.6 13.3	190.0 15.2*						
NOON-1P							186.1 12.3	185.8 14.0*	197.5* 14.0	192.7 13.5	185.9 13.7	190.5 13.7		
1P-2P							187.6 12.8			190.0 10.6	186.4 12.8	186.5 15.6		
2P-3P							187.9 11.1	179.1 10.6		187.1 11.7	186.7 11.5	187.7 13.3		
3P-4P							187.7 6.8	176.9 7.4	190.3 3.6		187.8 10.3	190.3 12.7		
4P-5P							186.4 5.7	178.2 7.7	189.4 2.3		187.7 11.6	189.5 11.2		
5P-6P							193.6* 6.3	180.7 5.7	191.7 8.8	194.2 10.7	189.2 12.7	187.6 12.7		
6P-7P									185.2 9.3	195.5* 9.0	188.5 12.2	186.1 13.0		
7P-8P							185.4 7.7*	193.8* 7.4	186.3 12.0	190.3 8.0	190.2 12.1	186.8 13.6		
8P-9P							185.8 7.7*	190.7 4.7	187.5 10.8	193.5 11.0	190.4 11.2	185.9 13.8		
9P-10P							185.2 6.9*	187.0 7.4	179.7 12.3	189.7 12.7	191.8 11.1	185.6 13.6		
10P-11P							185.6 7.1*	187.0 9.3	185.0 11.0	184.1 12.4	193.2 11.5	186.5 14.0		
11P-Mn							185.2 7.8	188.6 4.0	183.6 12.7	185.8 11.8	191.0 12.7	186.7 14.1		

TABLE III -44

TABLATION OF HOURLY VALUES OF L_{dm} AND FADING RANGE

CEDAR RAPIDS - QUINCY PATH
RECEIVING ANTENNA HEIGHT: 565 Feet

418 MC
RECORDING PERIOD May 11 to 23, 1953

MONTH: DAY:	M A Y												
	11	12	13	14	15	16	17	18	19	20	21	22	23
Mn-1A	183.7	173.3	187.9	13.7	169.0					179.9			
1A-2A	14.8	180.5	187.9	14.4	7.5					184.8	181.0		
2A-3A	186.4	186.8	185.8	13.1	171.9	179.0	182.8			13.3			
3A-4A	15.9	184.0	185.2	14.8	12.2	13.7				179.0	182.8		
4A-5A		180.7	187.4	14.8	166.0*	171.8	184.6			15.9			
5A-6A		183.2	194.4	15.2	164.8*	181.3				15.9			
6A-7A	182.0	182.0	189.9	21.9	169.0	169.0	181.0			15.8	15.5		
7A-8A	182.9	182.9	191.4	19.0	179.0	169.8	179.4			17.7	14.7		
8A-9A	186.1	186.1	182.3	17.0	172.4	180.4				15.0			
9A-10A	184.3	184.3	183.5	17.0	175.4	178.9				14.4			
10A-11A			187.5	15.9	180.0	178.6				180.0	178.6		
11A-NOON			189.6	14.3	179.1	180.2				12.4			
NOON-1P			189.0	14.3	12.8					179.0	181.4		
1P-2P	191.3	18.4	189.0	14.3	180.0	179.5				12.5			
2P-3P	191.9	14.9	184.3	12.1	180.0	175.0				12.5			
3P-4P	15.5	186.3	191.8	12.5	180.1					180.1	178.1		
4P-5P	13.4	185.0	192.3	12.5	12.7	12.3				12.3	16.0		
5P-6P	193.0	183.9	191.6	12.9	190.7	180.5	179.5			180.5	179.5		
6P-7P	191.3	182.1	191.3	12.1	13.2	11.7				11.7	16.7		
7P-8P	188.9	180.1	189.8	15.8	190.7					180.0	180.0		
8P-9P	15.1	179.1	188.3	15.6	190.7					16.7	16.7		
9P-10P	17.6	178.0	186.6	14.7	12.6					179.5	178.4		
10P-11P	14.8	179.5	186.8	14.7	190.8	177.5				177.5	18.0		
11P-Mn	16.5	175.5	187.1	15.2	182.2	184.3				184.3			
	183.9	175.5	187.1	15.2	179.6	179.3				179.3			
	15.7	175.5	187.1	15.2	172.3	176.9				176.9			
			167.4	4.9	9.7	176.7				176.7			
			180.4			180.4				180.4			



