Field Survey from
Mt. Wilson and Mt. Harvard

43.7 and 100
Megacycles

Reprinted March 30, 1945

SITE SURVEY FOR 43.7 MC and 100 MC FM and TELEVISION TRANSMITTERS

INTRODUCTION

The purpose of this survey conducted during the months of August, September and October of 1944 by the Engineering Dept. of the radio division of Earle C. Anthony, Inc., was to determine a location for both FM and television transmitters to adequately serve the Southern portion of Southern California and in particular, the Metropolitan Los Angeles area.

A complete survey was not attempted. Due to circumstances beyond our control, it was necessary to determine a desirable location in the quickest possible time. This did not permit the testing of all points along all radials, however the preliminary information which was gathered indicated that the field strength from the Mt. Wilson site was higher in most of the localities. It is definitely thought that a more complete survey is in order.

A study of the topography of the area to be served indicated that line-of-sight transmission would not be possible to all of it from any available location. This is due to the nature of the terrain over which extends the Metropolitan Los Angeles District whose population lives in canyons and hills as well as the more level areas. However, from this study it was possible to choose two sites which offered line-of-sight coverage to the greater portion of the area and to much of the inhabited region within 130 miles. (See maps.)

These two sites had the additional advantages of being accessible by existing roads and within range of power facilities.

One of the locations is Mt. Wilson, a well known peak of the San Gabriel Mountains whose elevation, at the chosen site, is 5728 feet. It is so located on the front or southerly side of the range that there is an open and sheer drop to the southeasterly, southerly and southwesterly directions thus presenting a clear view to the Metropolitan district. At night the lights of some sixty cities and towns may be seen from this mountain, indicating that line-of-sight transmission is to be expected.

The other location is Mt. Harvard, a peak whose elevation is 5440 feet. Although somewhat lower than Mt. Wilson, Mt. Harvard has some advantages as it is about one mile south of the former and extends out in front of the range. It offers better line-of-sight in the easterly and westerly directions.

Both of the above sites are about sixteen air line miles from the center of Los Angeles, one hundred and fifteen miles from San Diego and ninety-three miles from Santa Barbara. Within the thirty-five mile circle is included not only all of the Metropolitan area, but also such other cities as Santa Ana, Pomona and the beach towns.

For the purpose of this survey, tests were conducted on 43.7 megacycles and on 100 megacycles. Two identical transmitters, antennas, etc., were used for each frequeny, one being set up on Mt. Wilson and the other on Mt. Harvard. The transmitters were adjusted to give the same power input to the final amplifier, and were maintained constant at this power. The frequencies of both were checked and kept the same throughout the tests. The antenna patterns were made as nearly equal as possible.

Two test cars were used in order to take as many readings as possible in the limited time. These cars were equipped with model 58 Television Noise and Field Strength Meters manufactured by the Measurements Corporation. The meters were checked and the difference in calibration was found to be negligible. According to the instruction book for these meters, the sensitivity range is from about one to thirty thousand micro-volts per meter at fifteen megacycles and about three to one hundred thousand micro-volts per meter at one hundred and fifty megacycles.

The antennas used on the meters were half wave dipoles mounted on wooden poles twelve feet above the ground. In each measurement an attempt was made to orient the antenna properly, i.e. broadside toward the transmitter.

To conduct the tests, the Mt. Wilson transmitter was operated for thirteen minutes followed by a two minute silent interval. Then the Mt. Harvard transmitter was operated for a similar period. This operation continued throughout the tests thus allowing measurement from one site and then from the other. During the silent periods, noise measurements were made. This procedure was followed first for 43.7 megacycles and then repeated at a later date with two other transmitters for 100 megacycles.

TRANSMITTERS

For the survey on the frequency of 43.7 megacycles, two Motorola type FMT 50 B frequency modulated transmitters with a pair of two type 807 tubes in each of the final amplifiers were used. The power input to the final amplifier was 94.5 watts and throughout the test was held closely to this value. The frequencies of the transmitters were checked by means of a heat controlled 100 KC crystal oscillator and multivibrator, the 100 KC crystal oscillator frequency being checked against WWV.

The transmitters used on the 100 megacycle survey were two composite units each consisting of a 6F6 crystal oscillator, one 6L6 as a fourth harmonic amplifier, one 807 as a fourth harmonic amplifier and one 815 final amplifier. In order to use the transmitter for communication purposes, amplitude modulation was provided, and for this, one type 6L6 tube was sufficient. Power input to the final amplifier was kept at 60 watts.

Various methods of coupling the coax transmission line to the final amplifier were tried. The most satisfactory results were obtained by direct coupling to the plate tank of the type 815 tube. A balanced type of open wire line would probably have given better results, but time did not permit experimentation. Power for the Mt. Wilson transmitter was obtained from the Southern California Edison Company service; that at Mt. Harvard was obtained from a 300 watt gasoline driven alternator. A General Radio Variac was placed in the 110 volt line enabling the operator to adjust the power input to very close limits.

ANTENNAS

The four antennas, two for each frequency, consisted of the single bay turnstile type for horizontal polarization. In each antenna the elements were four dural tubes and rods so arranged that their length could be adjusted for frequency. To obtain a circular radiation pattern, one dipole was fed directly by the coax line from the transmitter, and the other dipole was fed by a quarter wave phasing section. (See Figure E.) Not knowing the propagation characteristics of the coax line, it was necessary to experiment with the length of the phasing section until a satisfactory pattern was obtained. This was done by setting up a field strength meter several miles away and measuring the field as the antenna was rotated. The readings were then plotted on polar co-ordinate paper with the results as shown in Figures A through D. Each antenna was mounted upon a thirty foot rope-guyed wooden pole and fed by forty feet of coax line. In the case of each frequency, both antennas were as nearly identical as it was possible to make them. There was a possibility of an impedance missmatch at the antenna due to our inability to obtain a coax line of the proper impedance, but from the pattern obtained, this did not appear to be serious.

Because equipment for direct measurement of power into the antenna was not available, power input to the final amplifier stage was kept constant. Determination of power by means of the field strength meter was not thought advisable due to the mountainous terrain surrounding the transmitter site. Except for the length of the dipoles and phasing section, identical antennas were used for each frequency.

The non circular pattern at 100 megacycles was probably caused by standing waves being present on the transmission line. Time did not permit of further corrective measures. However, this was not a serious defect as the antenna was oriented so as to bring the flattened portion of the pattern to the north. No measurements were taken in this uninhabited mountainous region.

PROCEDURE

Representative radials were laid out, each beginning at the Mt. Wilson transmitter site. Starting from the north and swinging around the compass in a clockwise direction, the first radial which intersects any inhabited area is 101°. This radial runs along the most northerly area to be served east of the transmitter site and runs through the city of San Bernardino. Similarly the 278° radial running through Santa Barbara bounds the most northerly area to be served west of the transmitter site. In between these two is included all of the thickly inhabited area of the southern section of Southern California.

Swinging slightly clockwise from San Bernardino to 114°, we have another easterly radial passing through Riverside. This radial "clears" the mountains more quickly than does the San Bernardino radial and includes many of the foothill cities and communities.

The longest radial which was run, passes through San Diego and is 153°. This radial skirts the coast from San Juan Capistrano to San Diego, covering many beach cities.

The Manhattan Beach radial is representative of the city of Los Angeles and most of the Metropolitan area. This radial of 220° runs through the heart of the city, almost no part of which is in rural territory.

The Beverly Hills radial runs along the southeasterly side of the Santa Monica Mountains at 243°. These mountains extend somewhat on a line from Mt. Wilson to Santa Monica and bound the northwesterly edge of the city. Also, there are many residences within the canyons of these mountains. Beginning on the north side of these mountains is the suburban area of the San Fernando Valley, which extends to the 278° Santa Barbara radial.

An attempt was made to take field strength measurements on the above radials. This was not always possible due to terrain, traffic conditions, power lines, etc. However, since the primary purpose of the survey was the comparison between the Mt. Wilson and the Mt. Harvard sites, it was not necessary to be on the radial. In the case of Los Angeles, readings were taken in all sections of the city. Since the Manhattan Beach radial is representative of all the area, the results were plotted along this radial.

ANALYSIS

Referring to Figures 1 through 12, these give the complete information for each radial for both frequencies. Along the abscissa is plotted the horizontal distance in miles from the Mt. Wilson transmitter site. The ordinate is used for three different functions. The lower portion is divided into feet and shows elevation above sea level. Field strength is shown in the upper portion in DB above 1 micro-volt per meter. A second DB scale shows gain or loss of Mt. Harvard with respect to Mt. Wilson based on using the 0 DB line as the Mt. Wilson reference level.

Profile graphs were made using the U. S. Geological survey topographical maps. The desired radial was computed and then laid out on the maps. In changing from map to map care was exercised to accurately transfer the last point on a previous map to the new point on the next map. All transfers were checked by contours and other identifiable points.

The radial line was divided into miles and fractions. In the rapidly-changing elevation portions readings were taken of elevation every tenth of a mile, while in the more level portions readings were taken at greater intervals. All of these readings were plotted against the level distance from the transmitter site to obtain the profile graph.

The curves labeled "F" in all graphs are the theoretical field strength curves as obtained from the Federal Communications Commission publication "Standards of Good Engineering Practice." They were taken from the charts for 46 and 105 megacycles. These were plotted for a radiated power of 40 watts for the lower frequency and 20 watts for the higher frequency.

In order to determine what coverage would be had for a transmitter output of three kilowatts, it was desirable to have a reference level for this power. Rather than complicate the graphs with duplicate sets of curves at a higher level, two relative reference lines were drawn in, one for 1000 micro-volts per meter, and one for fifty micro-volts per meter, both for three kilowatts. The difference in power between 40 watts and 3 kilowatts is 18.7 DB. Therefore, the 1000 micro-volts per meter line (60 DB) and the 50 micro-volts per meter line (34 DB) were moved down by this amount. This is equivalent to moving the field strength curve up to the 3 kilowatt level. Similarly the 100 megacycle lines were moved the difference between 20 watts and 3 kilowatts, or 21.7 DB. Both of these lines are for visual inspection only and can be used to observe what portions of the field strength curves would fall above the 1000 and the 50 micro-volt per meter levels for the urban and rural coverage.

The circles and solid circles are the actual field strength readings taken along the radials, the latter being those known to be line-of-sight. Curves labeled "W" represent the field strength curves taken of the Mt. Wilson site. Since the profiles only apply to the Mt. Wilson radials and therefore are incorrect for Mt. Harvard, the Mt. Harvard readings are plotted relative to those of Mt. Wilson. Wherever the Mt. Harvard "H" curve is above the reference line "R", it is an indication that the field strength is stronger than that of Mt. Wilson by the number of DB above the reference line.

An attempt was made to choose locations for measurement in which neither the signal nor the orientation of the antenna varied to a great extent with movement of the measuring equipment. It was found that on the frequency of 43.7 megacycles the effect of standing waves or multipath reception was not as severe as on 100 megacycles. It will be noted that in some cases the signal varies from the theoretical value. This might be caused by in-phase or out of phase multipath reception. We regret that time did not permit further study of these conditions.

This survey was conducted under the supervision of H. L. Blatterman and C. W. Mason, Chief Engineers. Mr. S. F. Johnson co-ordinated the survey information. Mr. R. M. Moore was in charge of the field crew.

SAN BERNARDINO RADIAL - 43.7 MC
Figure 1

As previously mentioned, the San Bernardino radial partially skirts the Sierra Nevada mountains. Along the radial from the Mt. Wilson site the terrain is entirely mountainous for the first 25 miles. Although there are roads in some of the canyons and on some of the mountains, time did not permit the taking of readings in this section. San Bernardino is not in line-of-sight from Mt. Wilson and possibly not from Mt. Harvard. It will be noted that all readings from Mt. Harvard are from five to eighteen DB above those of Mt. Wilson. At San Bernardino the Mt. Wilson reading is 23 DB and the Mt. Harvard is 14.5 DB greater than Mt. Wilson, making it 37.5 DB above 1 micro-volt per meter and only slightly below the 1000 micro-volt per meter line for three kilowatts.

RIVERSIDE RADIAL - 43.7 MC
Figure 2

In swinging from the 101° San Bernardino radial to the 114° Riverside radial, we clear the mountainous region at about 12.5 miles. From this point on to Riverside the radial traverses much rural area and close to many towns. Pomona, for example, is only a few miles off of the radial. Only four readings are available along this radial. The curve between the third and fourth readings is estimated. However, since it is all line-of-sight up to a point near Riverside, it was obtained from examination of other line-of-sight readings at similar distances. Again it will be noted that Mt. Harvard has a greater signal strength varying from 11 to 25 DB higher.

Mt. Rubidoux, just west of Riverside shadows a portion of the town. The radial runs through the highest portion of this hill and represents the worst condition for Riverside.

SAN DIEGO RADIAL - 43.7 MC
Figure 3

Following along the San Diego radial, line-of-sight conditions are reached within ten miles. The mountains drop off abruptly within five miles and the radial runs over the hilly area just east of the towns of El Monte, Whittier, Fullerton, Anaheim, Orange, Santa Ana and Laguna Beach. A profile graph through these towns would be similar to that of Manhattan Beach radial. At about 67 miles the radial passes out over the ocean to return to land near La Jolla. Readings taken along the beach in this sector are not far off of the radial. San Diego covers the region from 113 to 117 miles. The radial ends at the Mexican border at 130 miles.

The actual field strength as plotted varies above and below the theoretical curve. An average curve "A" drawn through the line-of-sight readings nearly coincides with the theoretical. Mt. Harvard is in general weaker than Mt. Wilson, being only considerably higher, close in where its geographical location makes it line-of-sight while Mt. Wilson is not.

MANHATTAN BEACH RADIAL - 43.7 MC
Figure 4

It was pointed out in the introduction that the Metropolitan area of Los Angeles was represented by the Manhattan Beach radial. The area covers an angle of from about 160° to 243°. However, the profile of all radials which might be drawn within this sector would not vary greatly, and the Manhattan Beach radial was chosen since it passes through the center of Downtown Los Angeles and all of it passes over urban area.

In Figure 4 an average field strength line "A" was drawn which closely follows the theoretical curve. For three kilowatt operation none of this area is less than 1000 micro-volts per meter; even the lowest reading is eight DB above this level. Mt. Harvard has lower readings, except close in.

BEVERLY HILLS RADIAL - 43.7 MC
Figure 5

The Beverly Hills radial is a second Metropolitan Los Angeles radial running along the Santa Monica mountains. Other than the canyons and the San Fernando Valley section, this radial represents the worst condition to be encountered for Los Angeles City. This radial clear of the mountains at Altadena passes through four miles of hilly territory north of Glendale and thence through Glendale. The section between fifteen and eighteen miles is just north of Hollywood. This area contains many homes located both on the hills and in the canyons. The radial continues on through Beverly Hills, Westgate and ends just west of Santa Monica, all of the area being principally residential.

The "W" curve again represents the actual value of field strength and the "A" curve the average value of the line-of-sight readings. Practically all of the readings are well above the 1000 micro-volt per meter level. Mt. Harvard only shows stronger field strength close in where it has line-of-sight advantage over Mt. Wilson.

SANTA BARBARA RADIAL - 43.7 MC
Figure 6

The Santa Barbara radial passes almost entirely through mountainous regions. The first town through which the radial passes is Tujunga situated at the foot of the mountains and about twelve miles distant. The radial leaves the mountainous areas temporarily to pass through the San Fernando Valley in which are located many residences, small ranches and several towns. Beyond San Fernando the radial again passes through mountains encountering only very sparsely settled regions. Santa Paula and Carpenteria are the only towns between San Fernando and Santa Barbara. Santa Paula is about 58 miles distant and situated on the floor of the Santa Clara River Valley. Carpenteria is located on the ocean and about 82 miles from Mt. Wilson. Beyond Carpenteria and until Santa Barbara is reached, the radial passes over the Pacific Ocean.

It is easily observed how the actual field strength represented by the "W" curve is affected by the terrain. The reading taken at Santa Paula is not truly representative of the town as it was made on a hill somewhat above the town level. This is also true of the Santa Barbara reading as a good location in town was not found.

The average line-of-sight "A" curve fairly well follows the theoretical although considerably below it until some distance away from the transmitter. The reason for the average being so far below the theoretical has not been determined. It is not due to unequal radiation pattern as this is uniform.

The Mt. Harvard readings are almost all higher than the Mt. Wilson readings. The reason for this is due to the fact that Mt. Harvard extends about a mile "in front of" Mt. Wilson to the south and therefore has a clearer "view" to the east and the west.

SAN BERNARDINO RADIAL - 100 MC
Figure 7

In Figures 7 through 12 the course of the radials will not be discussed since it would be a repetition of what has already been described. These figures are all for 100 MC and comparisons will be made between them and the similar curves for 43.7 MC.

On the San Bernardino radial no signals were picked up from 40 miles to the limit of the tests at about 51.5 miles. This probably is due to being not line-of-sight. The readings at 30.5 miles and 36.5 miles would also appear to be not line-of-sight, although they are within one degree of being on the radial. At this frequency very little gain is realized from Mt. Harvard. It too dropped off to zero at 40 miles.

RIVERSIDE RADIAL - 100 MC
Figure 8

At 100 MC the field strength appears to be much more consistant than at 43.7 MC. No reading was taken in Riverside, behind Mt. Rubidoux, so it is not known what shadow effect takes place. Mt. Harvard is higher in field strength throughout the radial.

SAN DIEGO RADIAL - 100 MC
Figure 9

There is little difference between the two frequencies along this radial as both seem fairly consistant. However, the drop at 105 miles on the 100 MC curve is much more pronounced. The relation of Mt. Harvard to Mt. Wilson differs somewhat from the 43.7 MC curve. At 100 MC, Mt. Harvard shows general improvement up to about 100 miles. Beyond this it drops below the lower frequency curve.

MANHATTAN BEACH RADIAL - 100 MC
Figure 10

Along the Manhattan Beach radial the general shape of the field strength curve is the same as at 43.7 MC, but it is somewhat further below the theoretical. All points however are above the 1000 micro-volt per meter level for three kilowatts. The Mt. Harvard readings show an improvement all of which are equal to or higher than the Mt. Wilson readings.

BEVERLY HILLS RADIAL - 100 MC
Figure 11

The Beverly Hills radial at 100 MC is somewhat similar in shape to the 43.7 MC curve, but it too is also somewhat further below the theoretical curve. Mt. Harvard has dropped off some five DB below that at the lower frequency, most likely due to the readings being not in line-of-sight.

SANTA BARBARA RADIAL - 100 MC
Figure 12

In the Santa Barbara radial, like the San Bernardino radial, the terrain is much more rugged and a greater difference is noted between the two frequencies. All readings between 30,5 miles and 95 miles were zero, with the exception of one. The effect of shadow at 100 MC is very noticeable. Where, on the 100 MC curves zero field strength was measured, fairly good readings were obtained at 43.7 MC.

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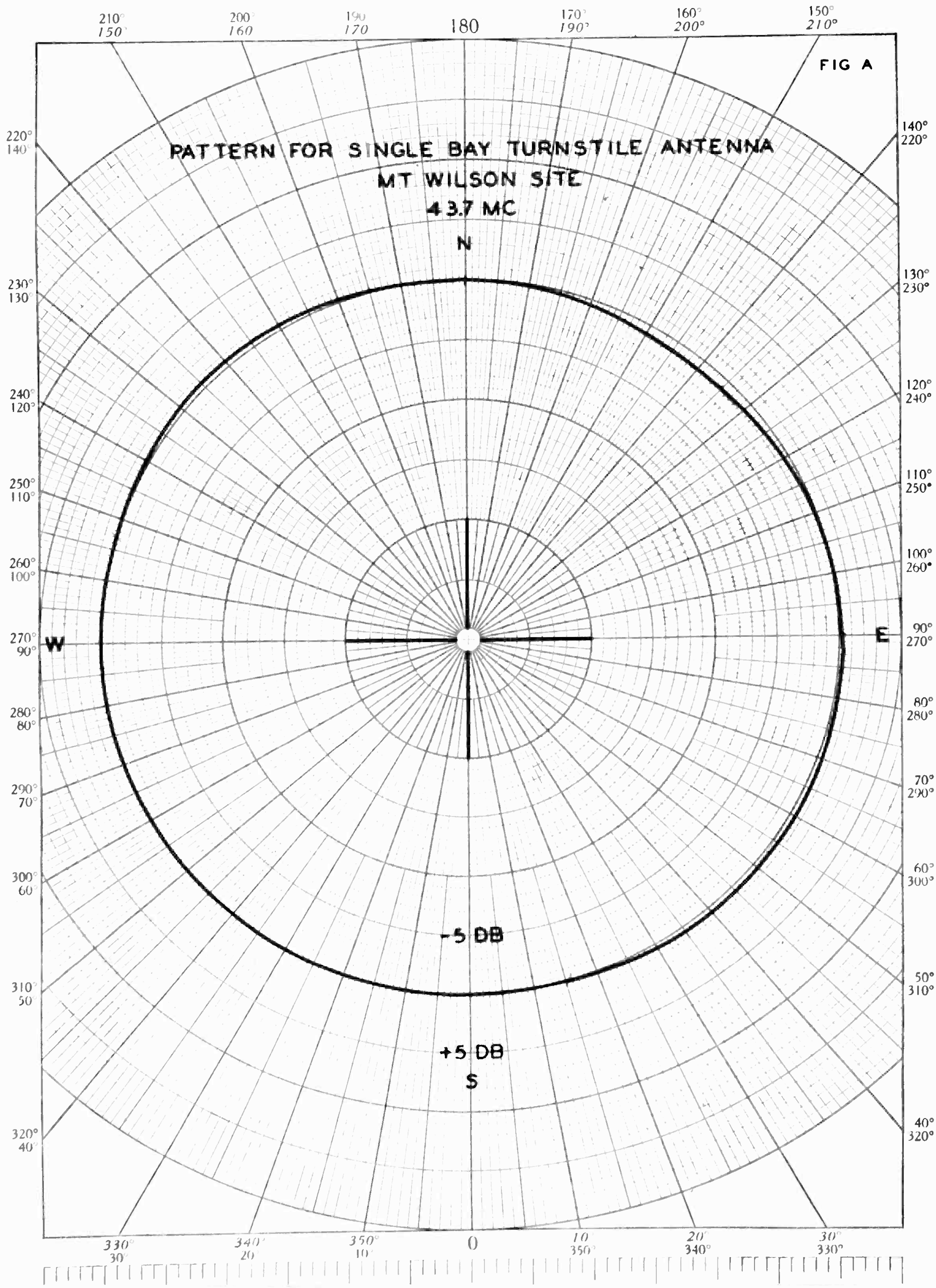


FIG A
PATTERN FOR SINGLE BAY TURNSTILE ANTENNA
MT WILSON SITE
43.7 MC
N
W
E
S
-5 DB
+5 DB
180
0

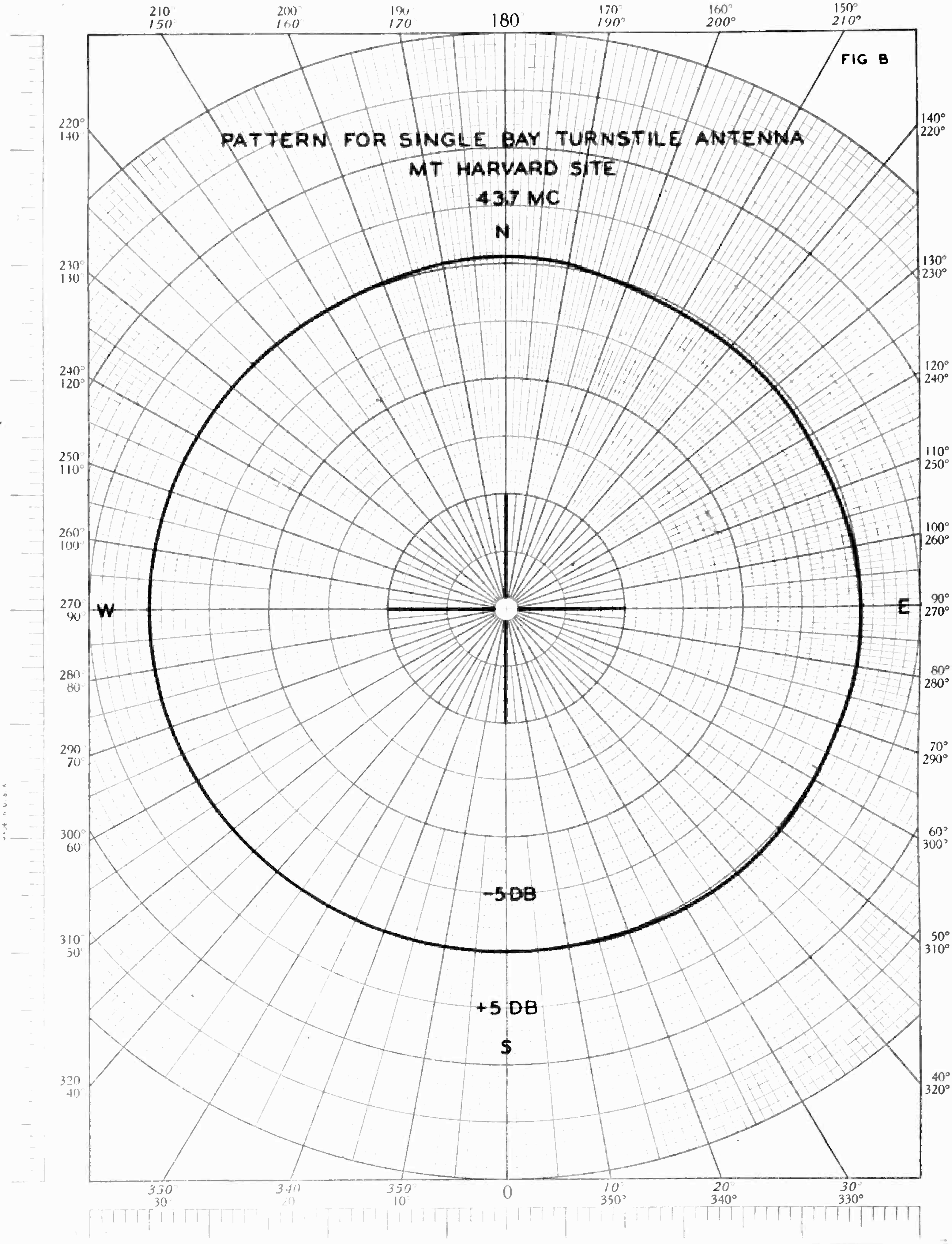


FIG B
PATTERN FOR SINGLE BAY TURNSTILE ANTENNA
MT HARVARD SITE
43.7 MC
N
S
E
W
-5 DB
+5 DB
180
0
KEUFFEL & ESSER CO. N.Y. NO. 358-31

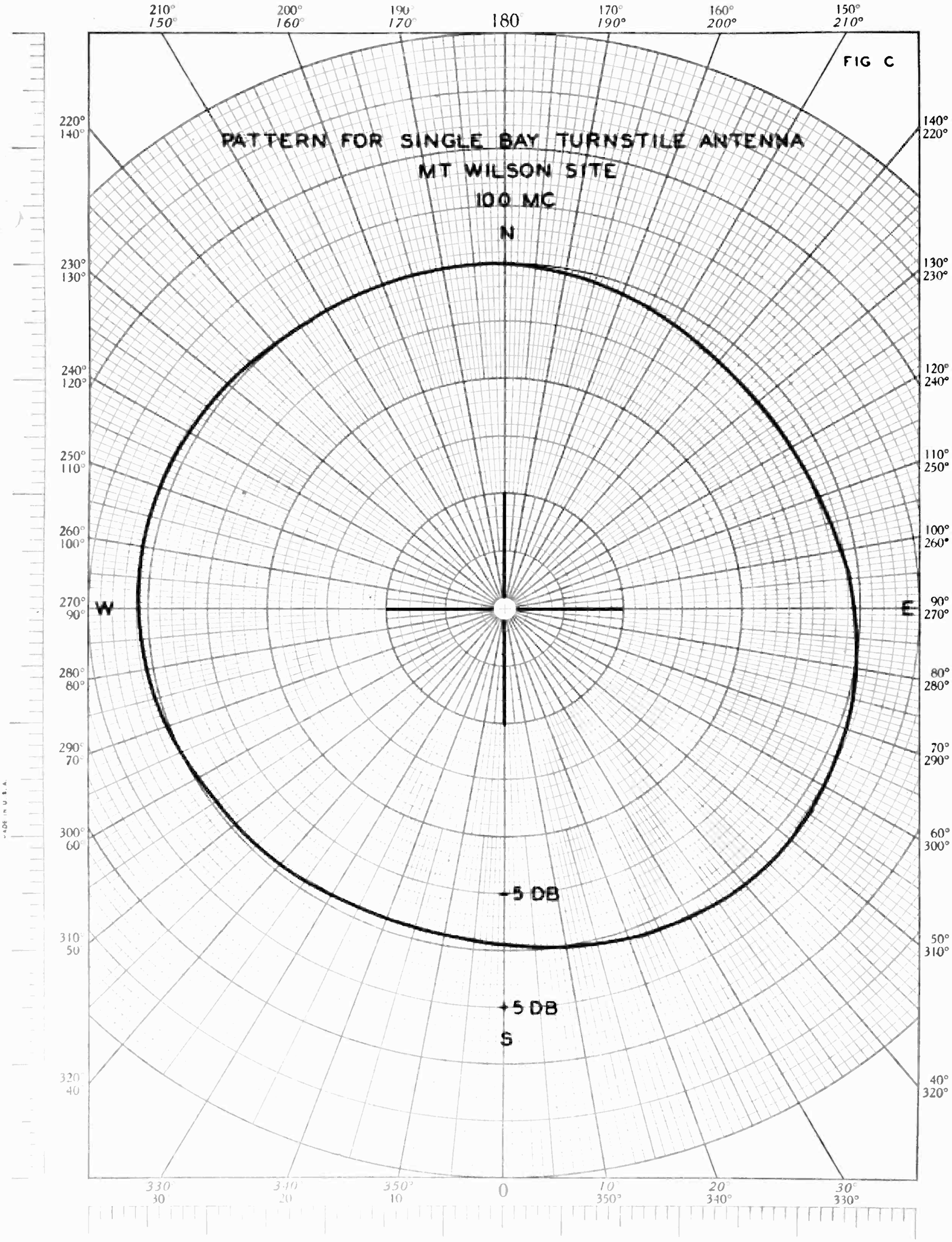


FIG C
PATTERN FOR SINGLE BAY TURNSTILE ANTENNA
MT WILSON SITE
100 MC
N
S
E
W
-5 DB
+5 DB
KEUFFEL & ESSER CO. N. Y. NO. 358-31
Polar Co-ordinate

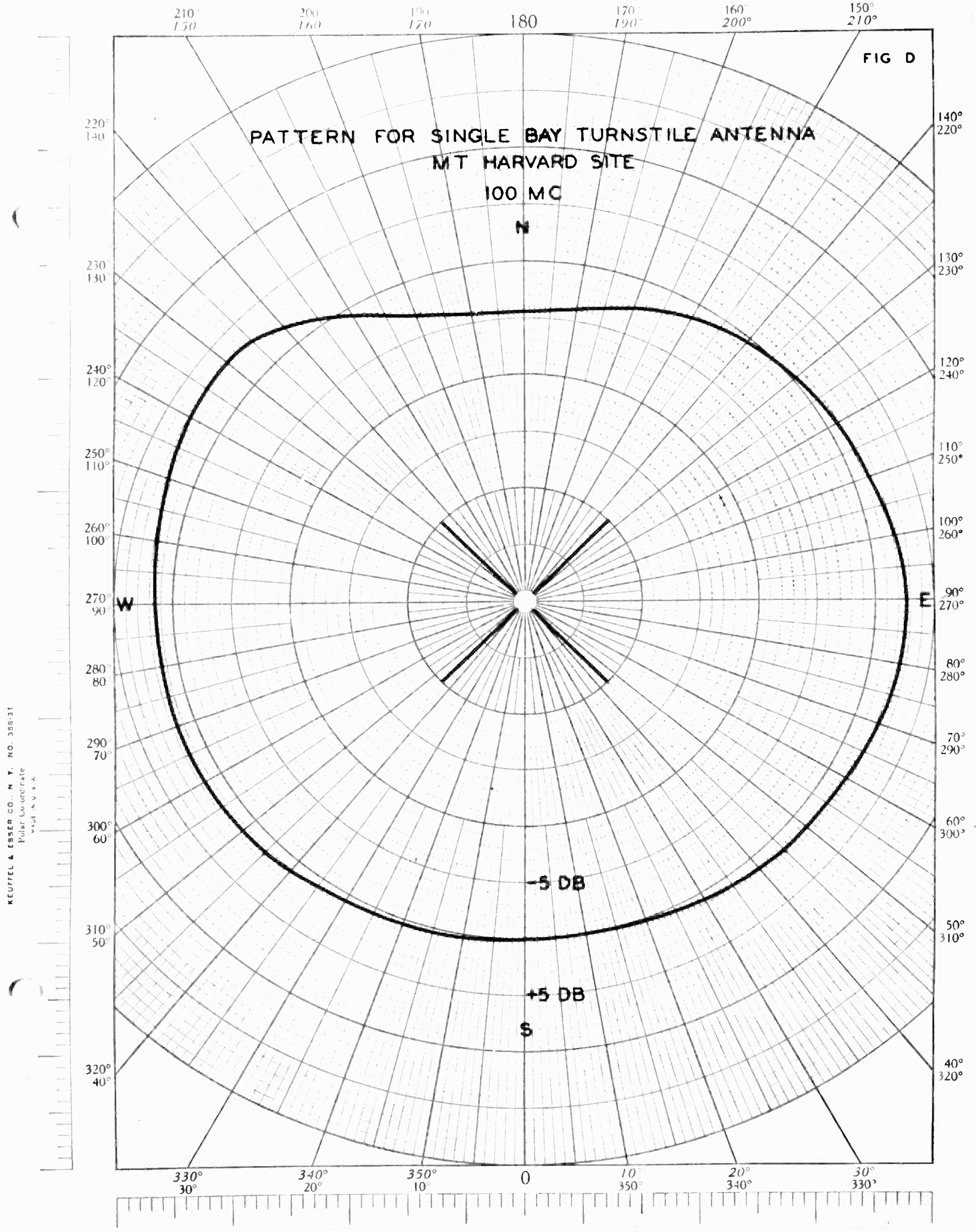
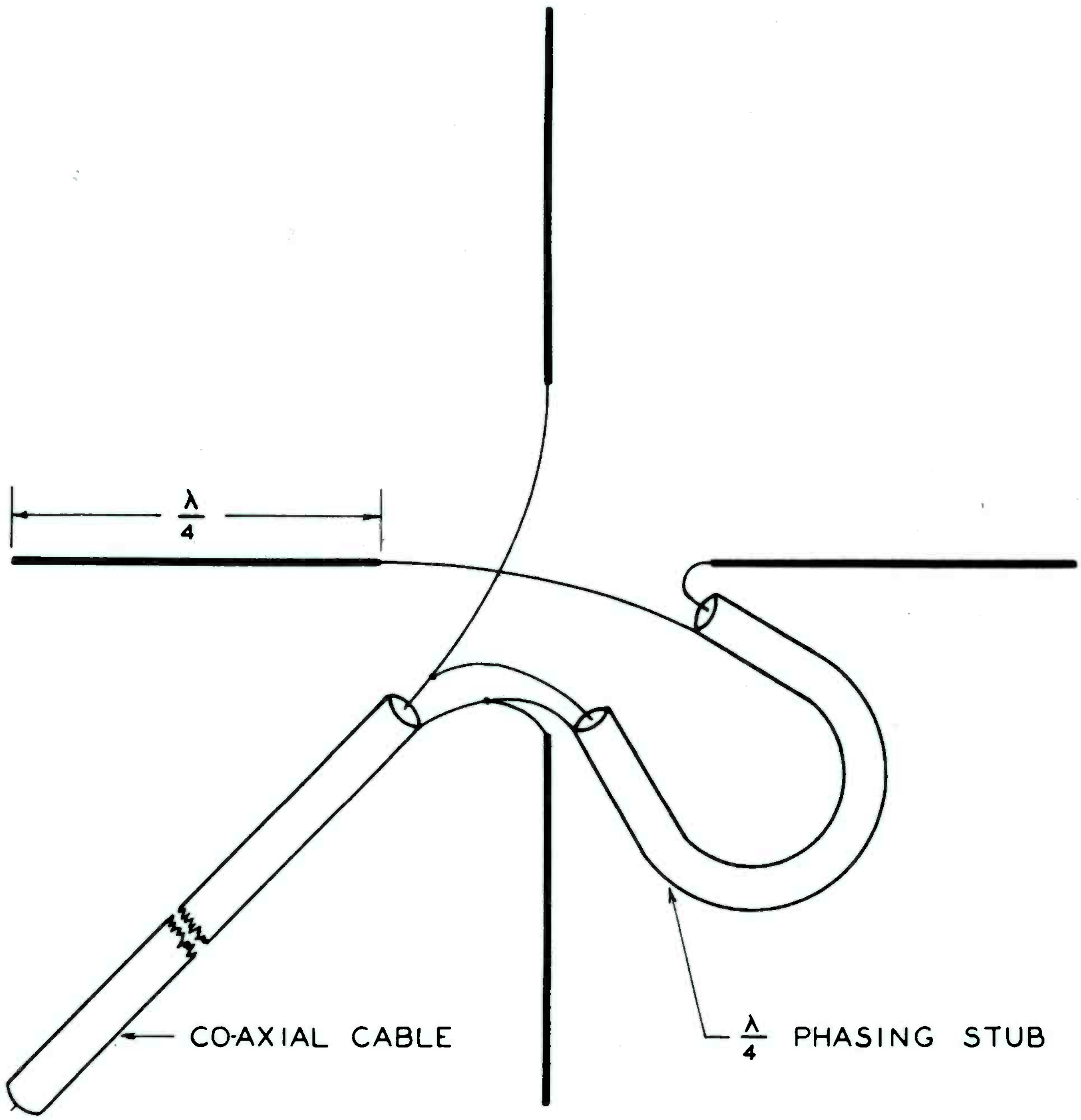
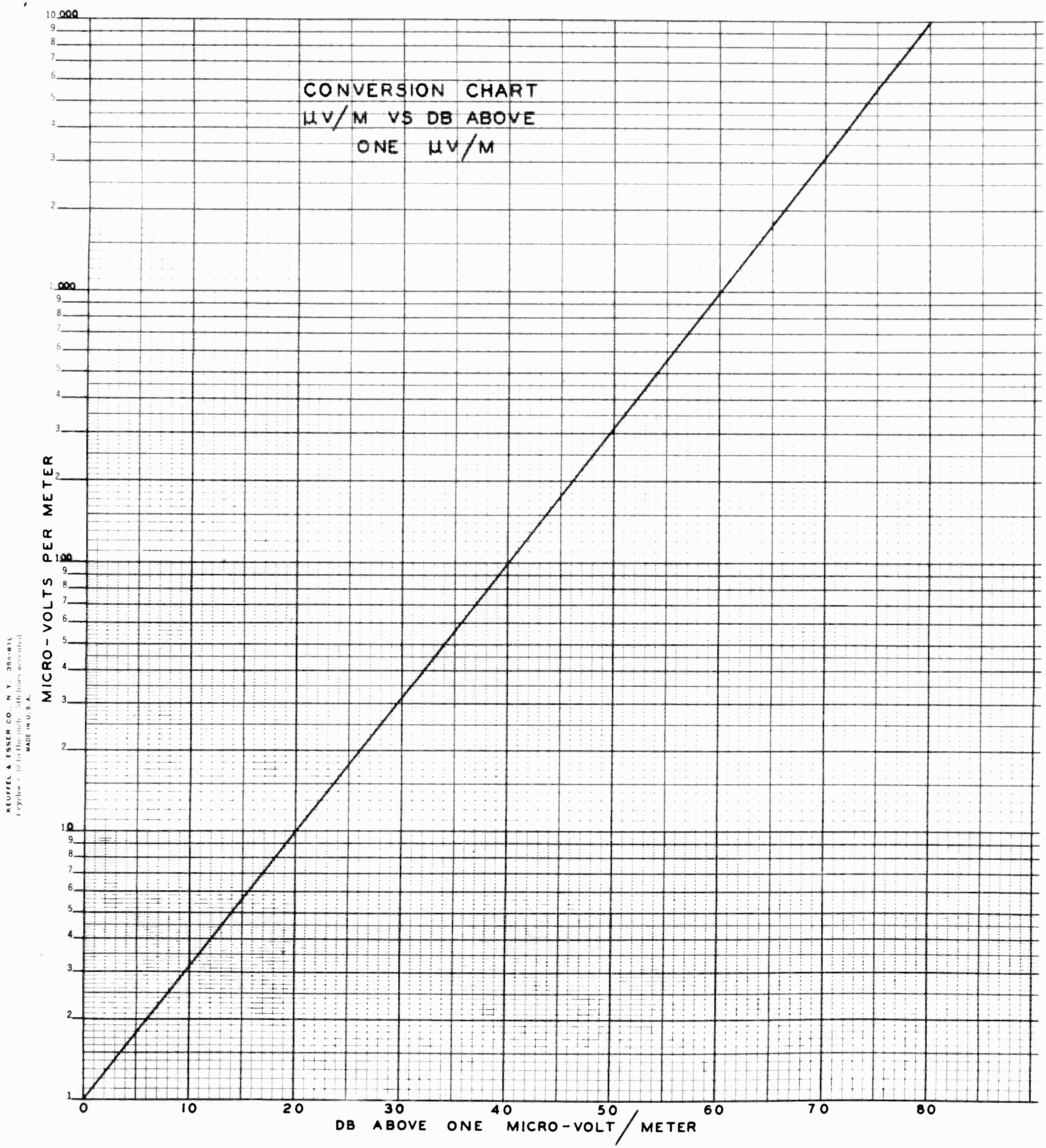


FIG D
PATTERN FOR SINGLE BAY TURNSTILE ANTENNA
MT HARVARD SITE
100 MC
N
S
E
W
-5 DB
+5 DB
180
0
KEUFFEL & ESSER CO. N. Y. NO. 358-31
Polar Co-ordinate

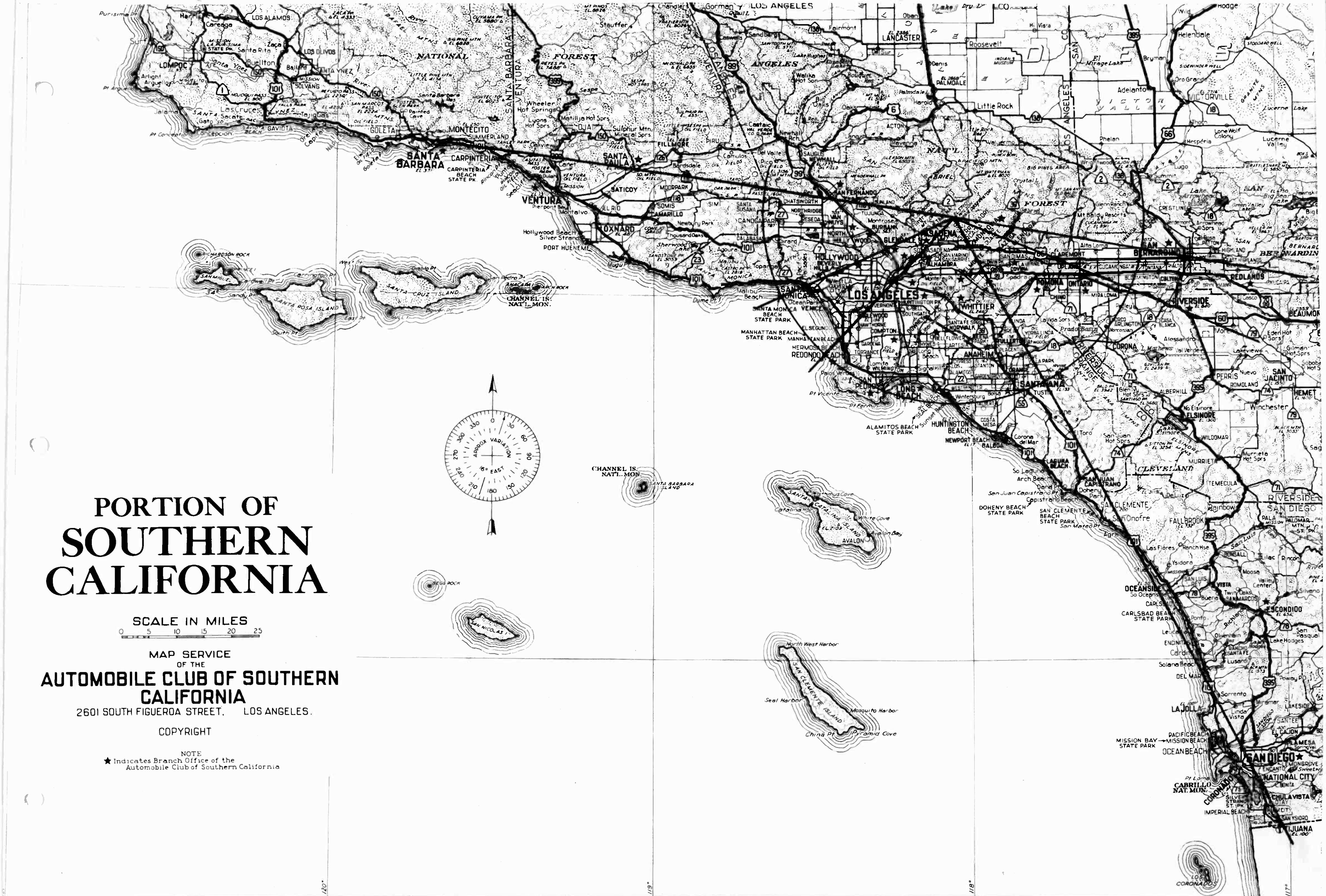
TURNSTILE ANTENNA

USED ON MT WILSON & MT HARVARD ON 43.7 MC & 100 MC




CONVERSION CHART
µV/M VS DB ABOVE
ONE µV/M
MICRO-VOLTS PER METER
DB ABOVE ONE MICRO-VOLT/METER
0
10
20
30
40
50
60
70
80
1
10
100
1,000
10,000
KEUFFEL & ESSER CO., N. Y.
MADE IN U. S. A.

Road Map of
LOS ANGELES
AND
VICINITY
CALIFORNIA
SCALE IN MILES
COPYRIGHT BY
AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA
2601 SOUTH FIGUEROA STREET LOS ANGELES
LEGEND
MAJOR HIGHWAYS
MAIN HIGHWAYS
MAIN CONNECTING ROADS
OTHER ROADS
TRAILS
U.S. FEDERAL HIGHWAY NUMBERS
CALIFORNIA STATE HIGHWAY NUMBERS
COUNTY BOUNDARIES
INCORPORATED CITY BOUNDARIES
NATIONAL FOREST BOUNDARIES
IMPROVED CAMP GROUNDS
RANGER STATIONS
OIL WELLS
OIL REFINERY OR TANK FARM
RAILROADS
ELECTRIC RAILWAYS
MOUNTAIN PEAKS
AQUEDUCTS
OFFICES, AUTO CLUB SO. CAL.
MILEAGE BETWEEN TRIANGLES
KNX KMTR
190TH. STREET
and
HAWTHORNE BLVD.
35 MILE CIRCLE
278°
243°
220°
101°
114°
153°
P A C I F I C
O C E A N
SANTA MONICA
LOS ANGELES
HOLLYWOOD
BEVERLY HILLS
GLENDALE
PASADENA
BURBANK
VAN NUYS
SAN FERNANDO
INGLEWOOD
VENICE
REDONDO BEACH
HERMOSA BEACH
MANHATTAN BEACH
EL SEGUNDO
TORRANCE
COMPTON
LONG BEACH
SAN PEDRO
WILMINGTON
WHITTIER
FULLERTON
ANAHEIM
ORANGE
SANTA ANA
POMONA
ONTARIO
SAN BERNARDINO
RIVERSIDE
REDLANDS
COLTON
CORONA
MONROVIA
AZUSA
ALHAMBRA
SAN GABRIEL
HUNTINGTON PARK
HUNTINGTON BEACH
NEWPORT BEACH
LAGUNA BEACH
SAN JUAN CAPISTRANO
ELSINORE
SAN CLEMENTE ISLAND
SANTA CATALINA
AVALON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NOTE
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LOS ANGELES
SANTA BARBARA
VENTURA
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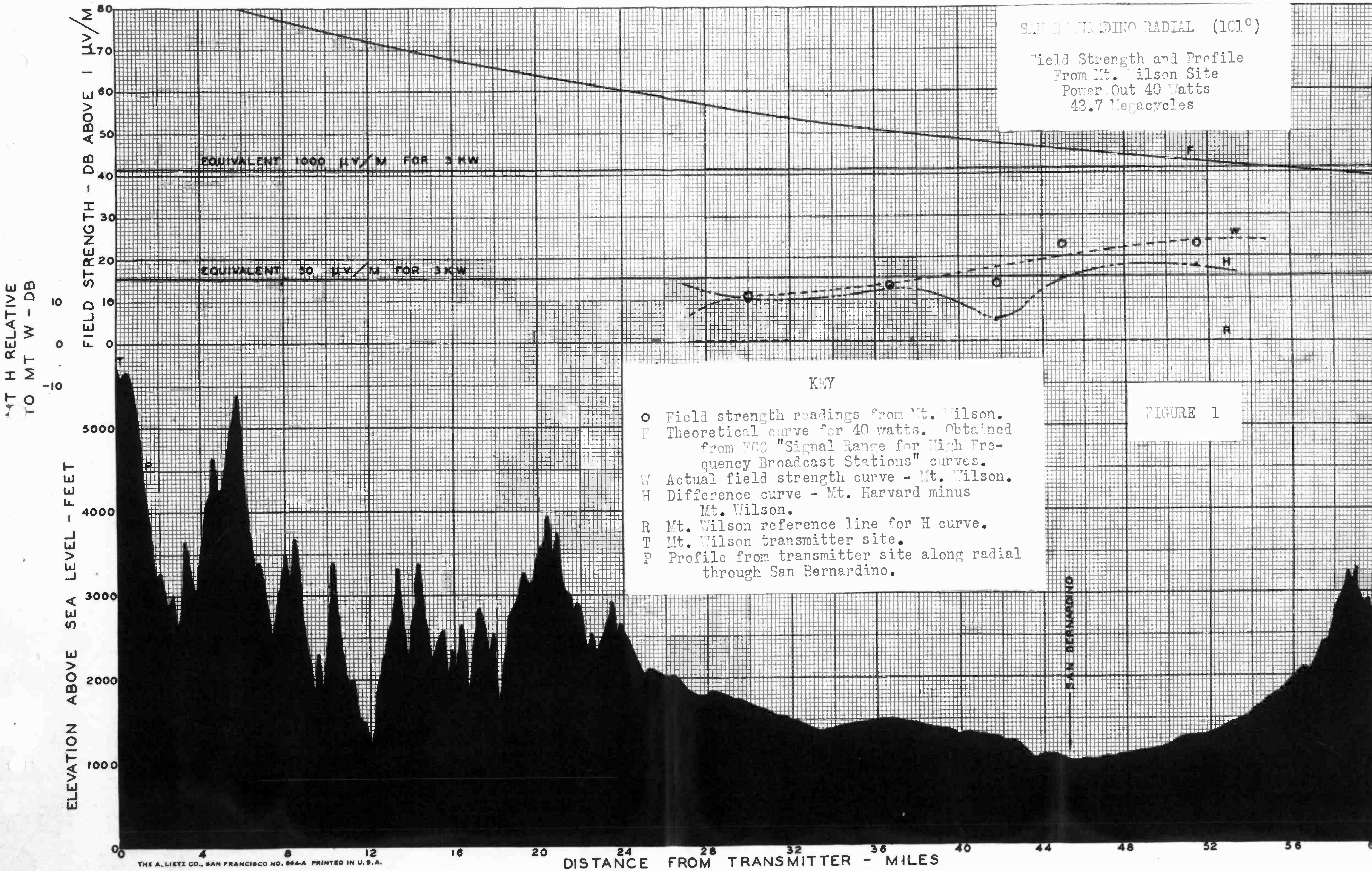
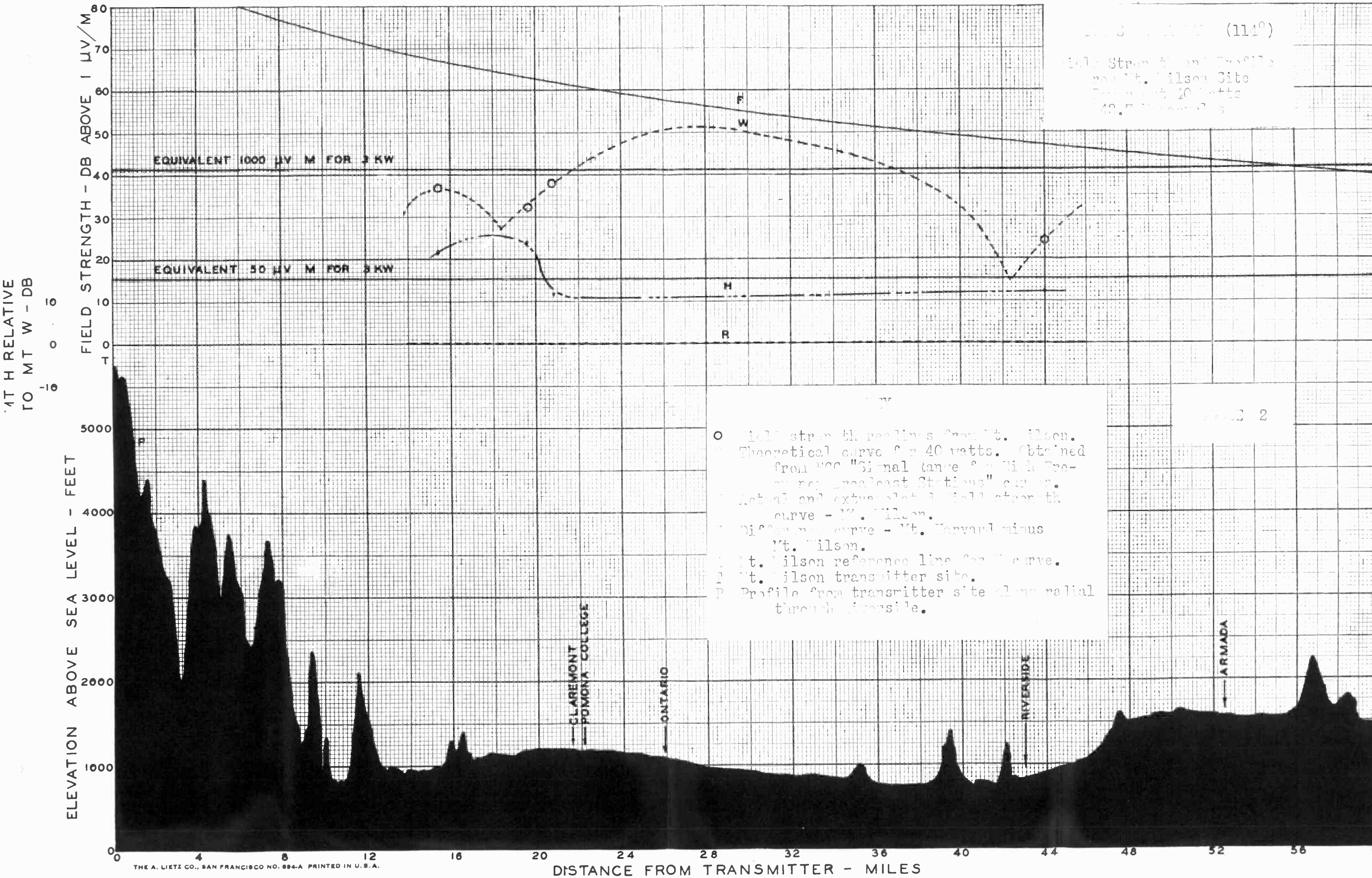
HOLLYWOOD
LONG BEACH
WHITTIER
ANAHEIM
SANTA ANA
POMONA
ONTARIO
SAN BERNARDINO
RIVERSIDE
REDLANDS
CORONA
ELSINORE
PERRIS
HEMET
LANCASTER
PALMDALE
VICTORVILLE
LOMPOC
GOLETA
MONTECITO
CARPINTERIA
OCEANSIDE
ESCONDIDO
LA JOLLA
SAN DIEGO
NATIONAL CITY
CHULA VISTA
TIJUANA
SANTA ROSA ISLAND
SANTA CRUZ ISLAND
SANTA CATALINA ISLAND
SAN CLEMENTE ISLAND
SAN NICOLAS
CHANNEL IS. NAT'L. MON.
APPROX VARIATION 16° EAST
120°
119°
118°
117°

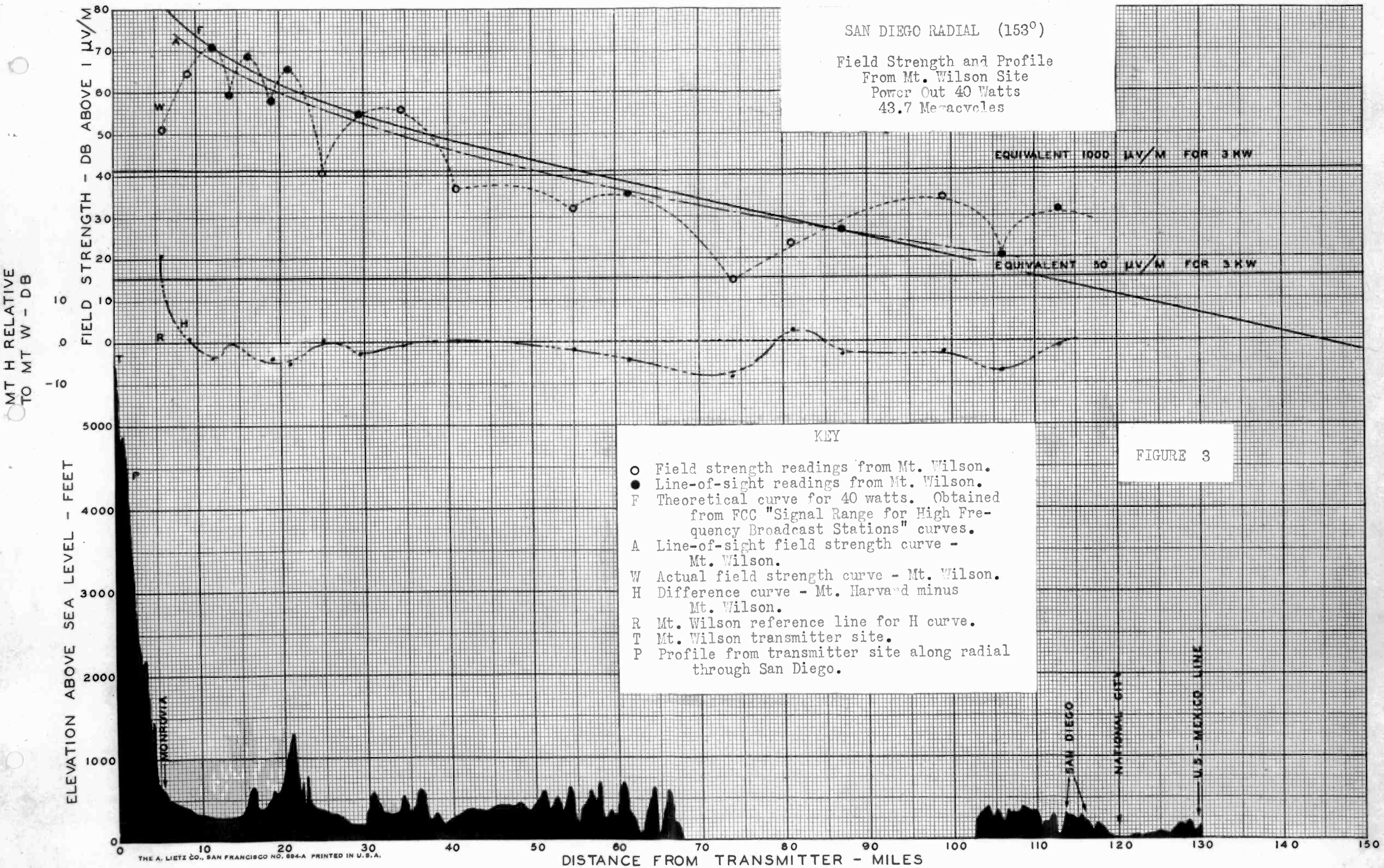


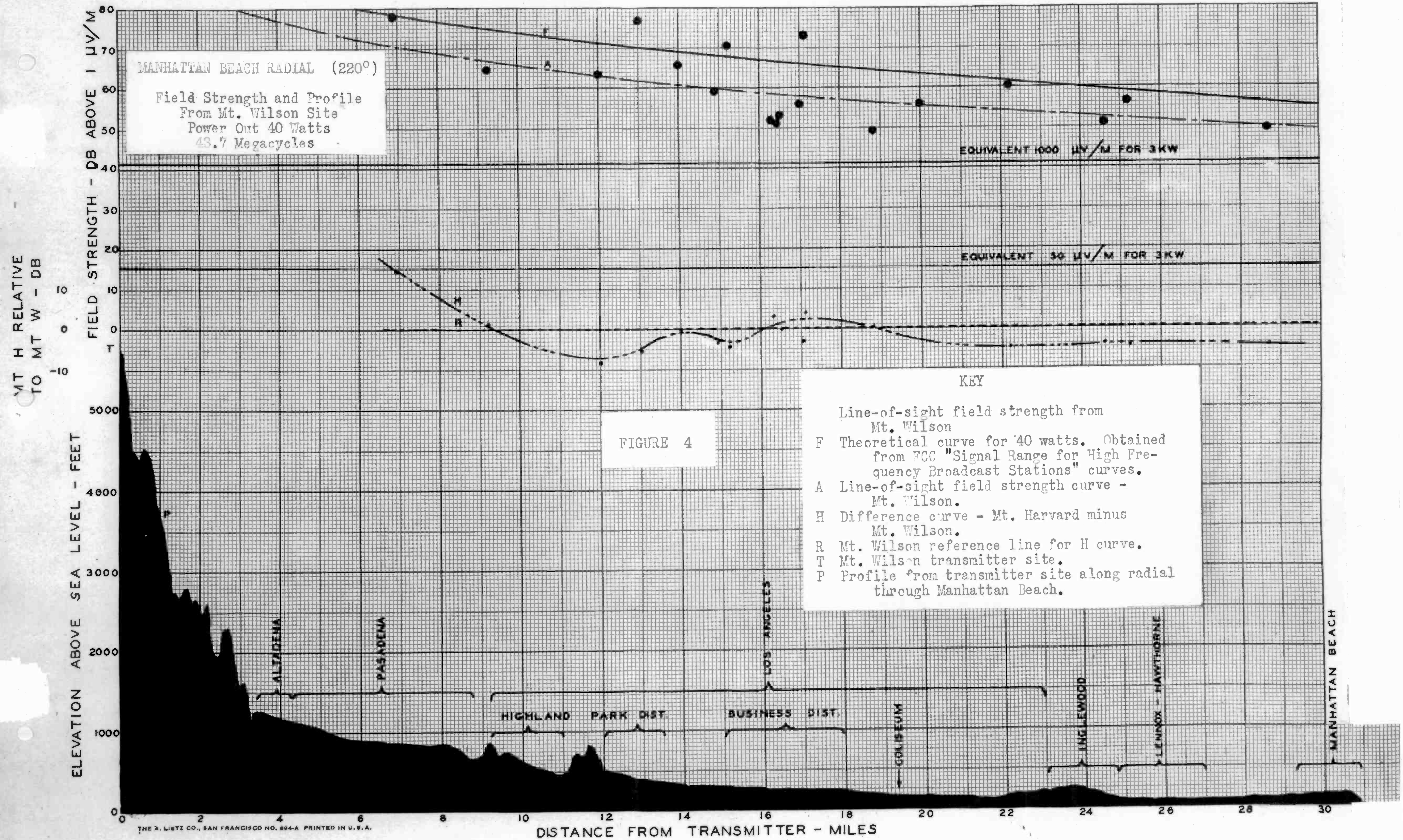
SAN BERNARDINO RADIAL (101°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 40 Watts
43.7 Megacycles
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
F
W
H
R
T
P
SAN BERNARDINO
KEY
O Field strength readings from Mt. Wilson.
F Theoretical curve for 40 watts. Obtained from FCC "Signal Range for High Frequency Broadcast Stations" curves.
W Actual field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through San Bernardino.
FIELD STRENGTH - DB ABOVE 1 µV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
80
70
60
50
40
30
20
10
0
10
0
-10
5000
4000
3000
2000
1000
0
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.

FIGURE 1



FIELD STRENGTH - DB ABOVE 1 μV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
EQUIVALENT 1000 μV M FOR 3 KW
EQUIVALENT 50 μV M FOR 3 KW
F
W
H
R
T
P
CLAREMONT
POMONA COLLEGE
ONTARIO
RIVERSIDE
ARMADA
(114°)
THE A. LIETZ CO., SAN FRANCISCO NO. 694-A PRINTED IN U.S.A.


SAN DIEGO RADIAL (153°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 40 Watts
43.7 Megacycles
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
FIELD STRENGTH - DB ABOVE I µV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
MONROVIA
SAN DIEGO
NATIONAL CITY
U.S.-MEXICO LINE
KEY
O Field strength readings from Mt. Wilson.
● Line-of-sight readings from Mt. Wilson.
F Theoretical curve for 40 watts. Obtained from FCC "Signal Range for High Frequency Broadcast Stations" curves.
A Line-of-sight field strength curve - Mt. Wilson.
W Actual field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through San Diego.
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.
FIGURE 3


MANHATTAN BEACH RADIAL (220°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 40 Watts
43.7 Megacycles
EQUIVALENT 1000 µV/M FOR 3KW
EQUIVALENT 50 µV/M FOR 3KW
FIELD STRENGTH - DB ABOVE 1 µV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
FIGURE 4
KEY
Line-of-sight field strength from Mt. Wilson
F Theoretical curve for 40 watts. Obtained from FCC "Signal Range for High Frequency Broadcast Stations" curves.
A Line-of-sight field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Manhattan Beach.
ALTADENA
PASADENA
HIGHLAND PARK DIST.
LOS ANGELES
BUSINESS DIST.
COLISEUM
INGLEWOOD
LENNOX - HAWTHORNE
MANHATTAN BEACH
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.

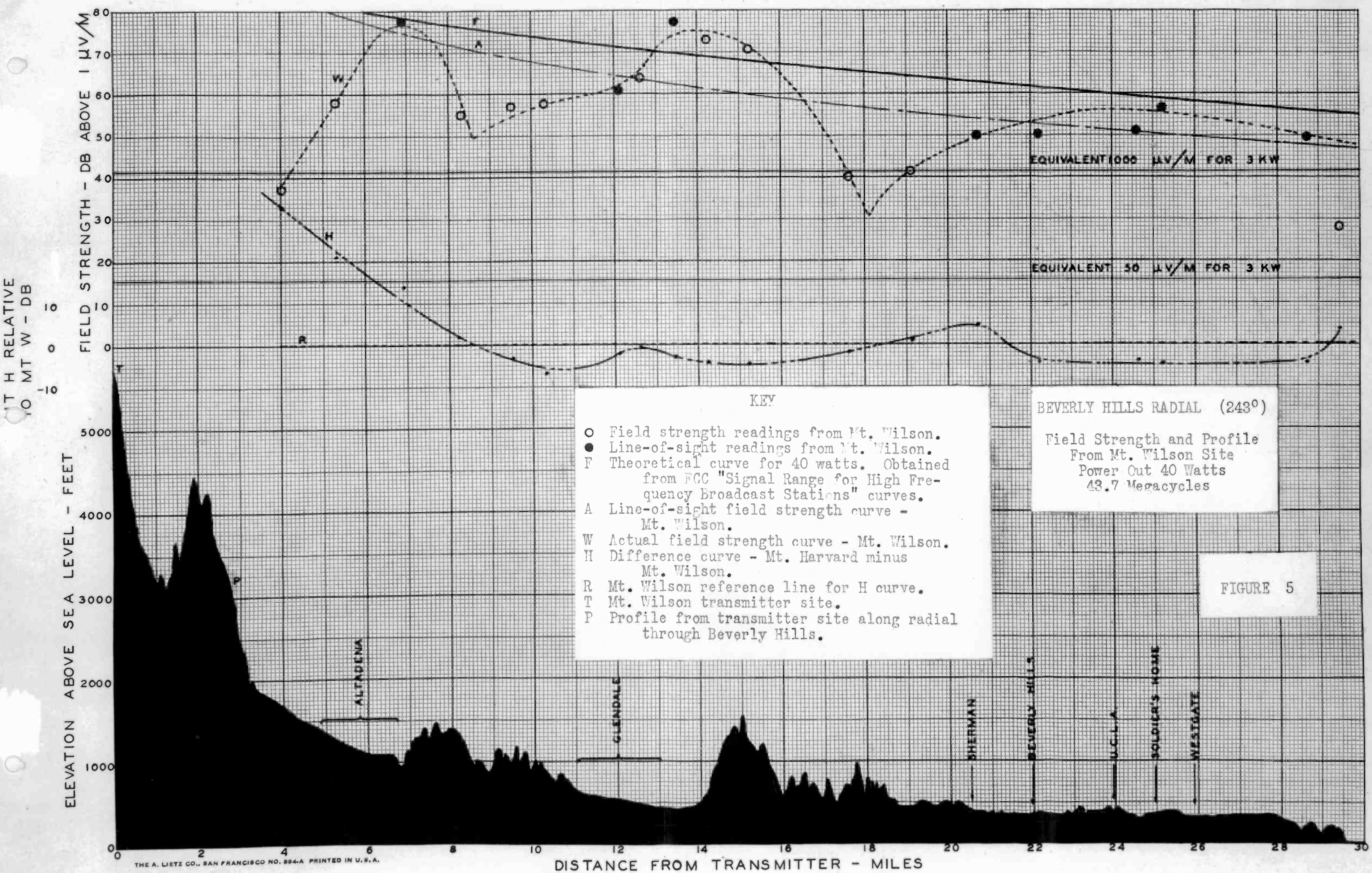
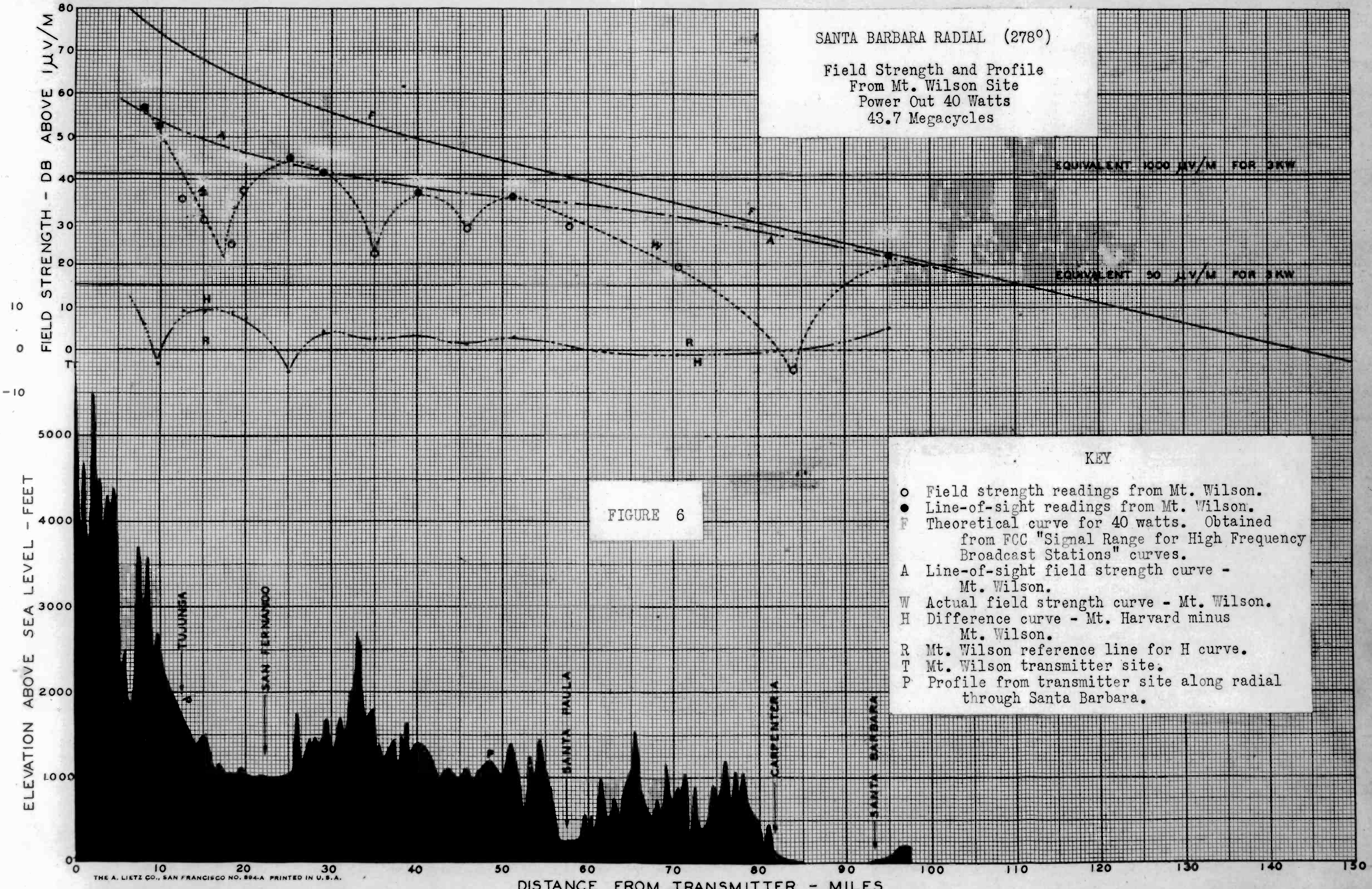
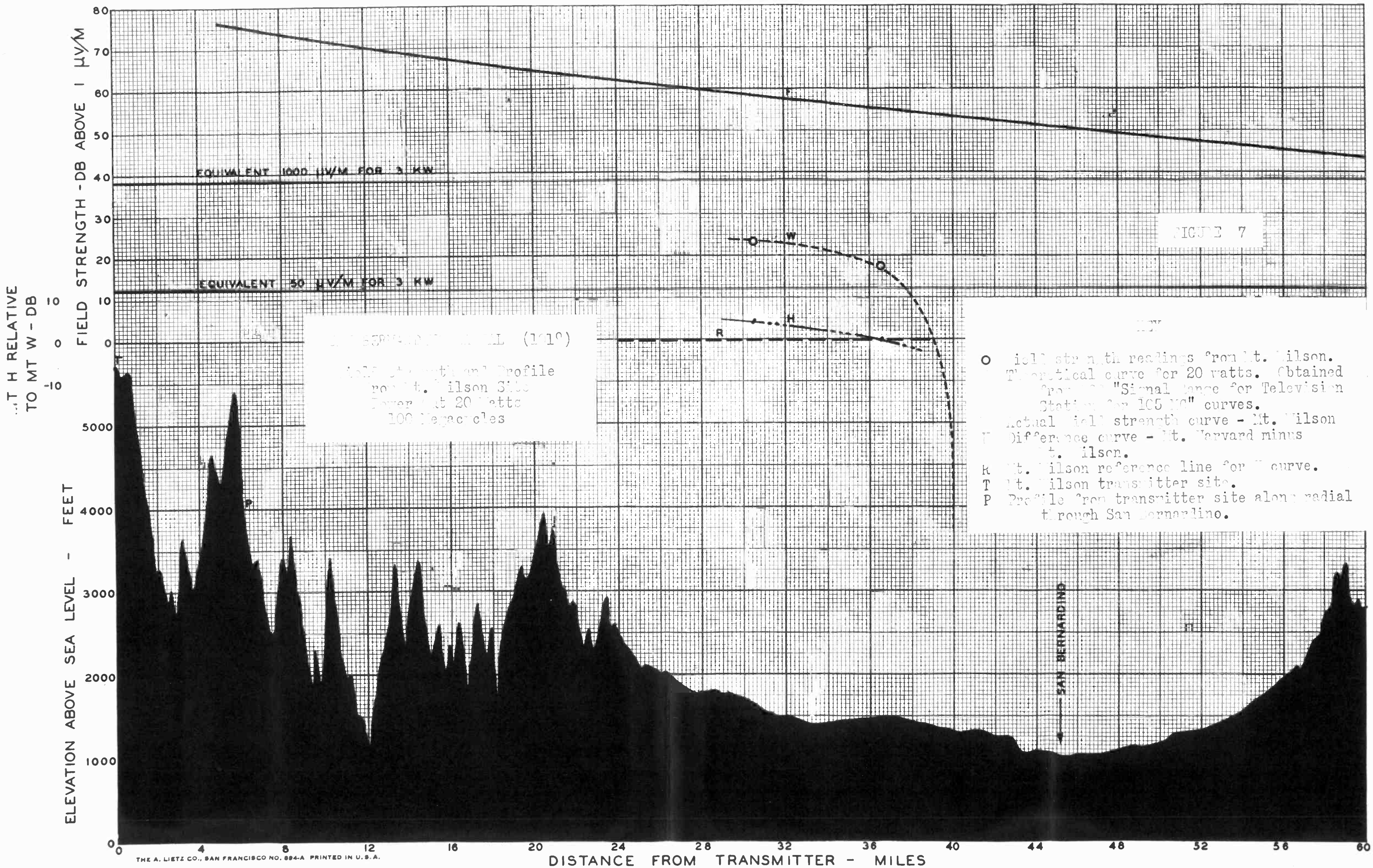

FIELD STRENGTH - DB ABOVE 1 µV/M
H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
F
A
W
H
R
T
P
ALTADENA
GLENDALE
SHERMAN
BEVERLY HILLS
U.C.L.A.
SOLDIER'S HOME
WESTGATE
KEY
○ Field strength readings from Mt. Wilson.
● Line-of-sight readings from Mt. Wilson.
F Theoretical curve for 40 watts. Obtained from FCC "Signal Range for High Frequency Broadcast Stations" curves.
A Line-of-sight field strength curve - Mt. Wilson.
W Actual field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Beverly Hills.
BEVERLY HILLS RADIAL (243°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 40 Watts
43.7 Megacycles
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.

FIGURE 5


SANTA BARBARA RADIAL (278°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 40 Watts
43.7 Megacycles
EQUIVALENT 1000 μV/M FOR 3KW
EQUIVALENT 50 μV/M FOR 3KW
FIGURE 6
KEY
o Field strength readings from Mt. Wilson.
● Line-of-sight readings from Mt. Wilson.
F Theoretical curve for 40 watts. Obtained from FCC "Signal Range for High Frequency Broadcast Stations" curves.
A Line-of-sight field strength curve - Mt. Wilson.
W Actual field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Santa Barbara.
FIELD STRENGTH - DB ABOVE 1μV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
TUJUNGA
SAN FERNANDO
SANTA PAULA
CARPENTERIA
SANTA BARBARA
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.


FIELD STRENGTH - DB ABOVE 1 µV/M
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
W
H
R
T
P
Profile
Power at 20
100
curves.
SAN BERNARDINO
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
THE A. LIETZ CO., SAN FRANCISCO NO. 884-A PRINTED IN U.S.A.

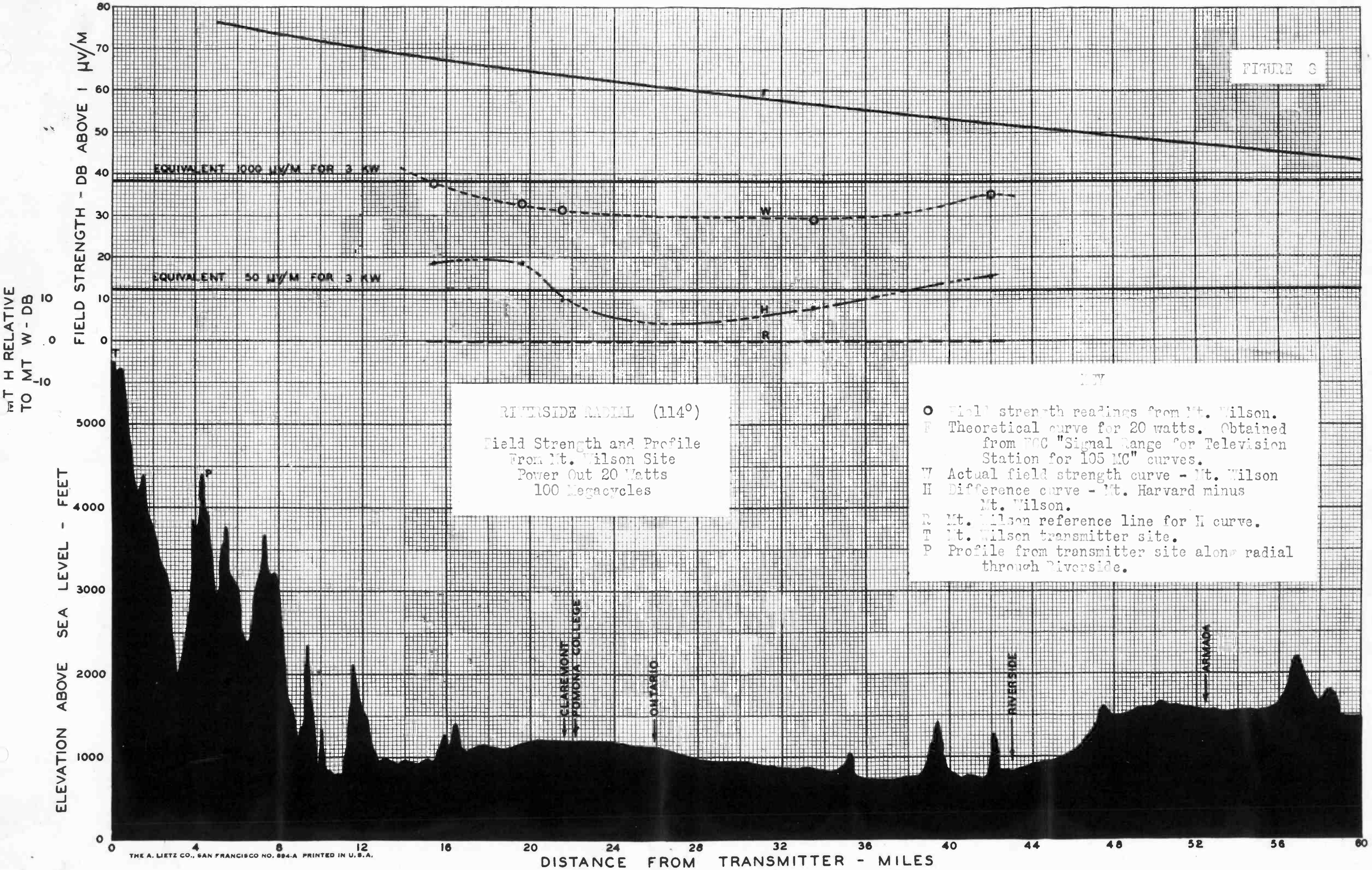
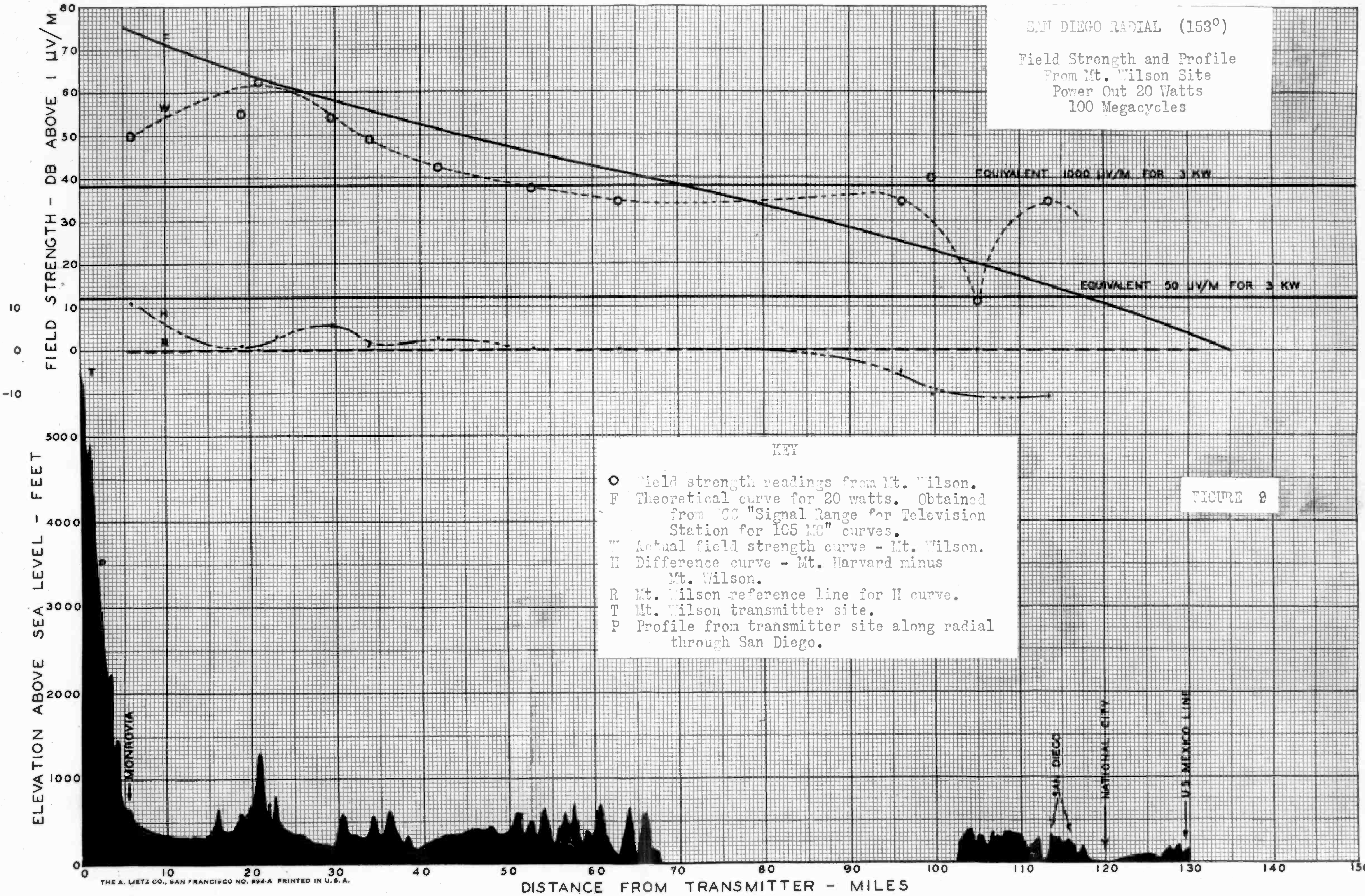
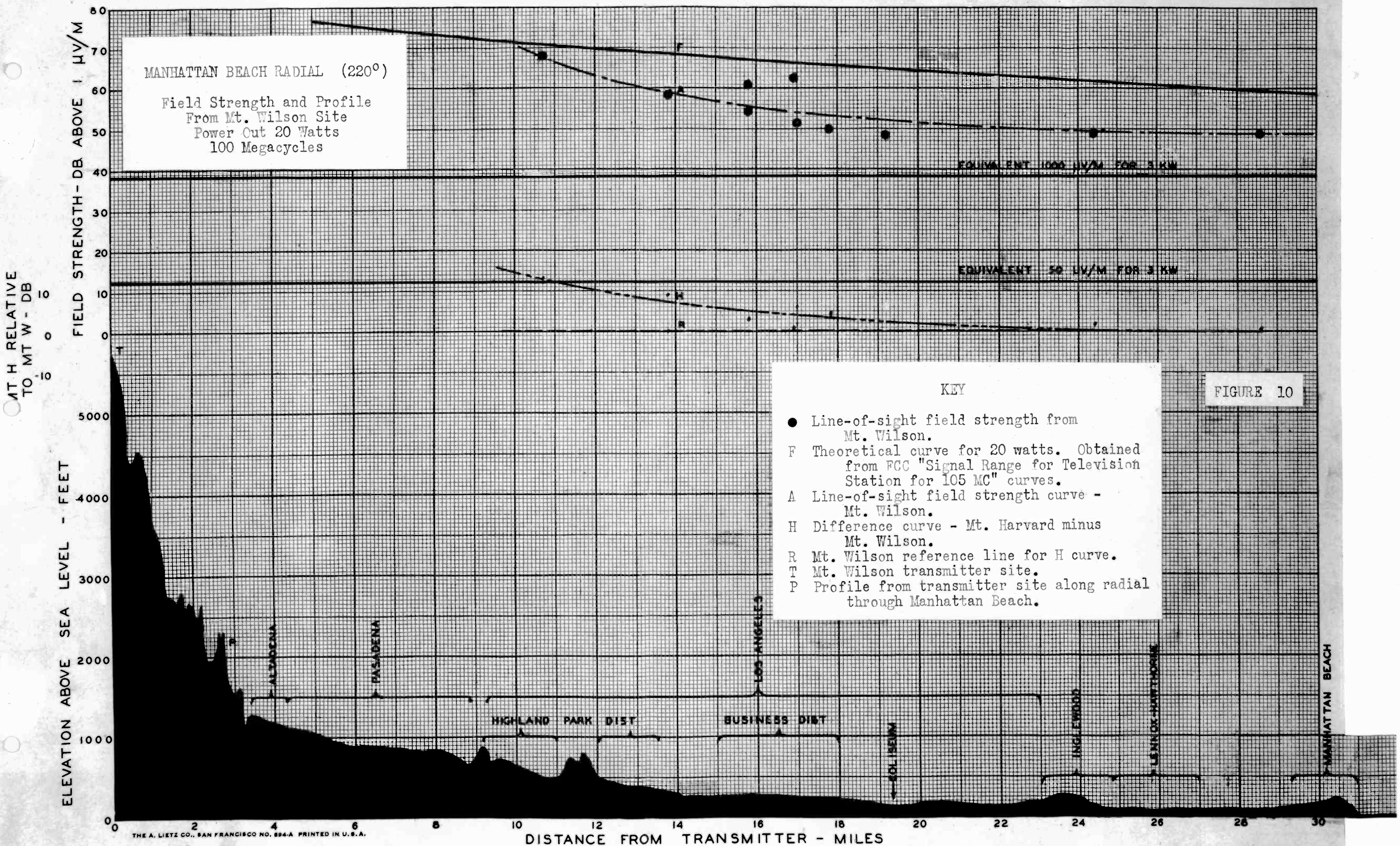


FIGURE 8
FIELD STRENGTH - DB ABOVE 1 µV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
F
W
H
R
T
P
CLAREMONT
POMONA COLLEGE
ONTARIO
RIVERSIDE
ARMADA
RIVERSIDE RADIAL (114°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 20 Watts
100 Megacycles
KEY
O Field strength readings from Mt. Wilson.
F Theoretical curve for 20 watts. Obtained from FCC "Signal Range for Television Station for 105 MC" curves.
W Actual field strength curve - Mt. Wilson
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Riverside.
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.



SAN DIEGO RADIAL (153°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 20 Watts
100 Megacycles
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
FIELD STRENGTH - DB ABOVE 1 µV/M
H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
KEY
O Field strength readings from Mt. Wilson.
F Theoretical curve for 20 watts. Obtained from FCC "Signal Range for Television Station for 105 MC" curves.
W Actual field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through San Diego.
FIGURE 9
MONROVIA
SAN DIEGO
NATIONAL CITY
U.S. MEXICO LINE
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.


MANHATTAN BEACH RADIAL (220°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 20 Watts
100 Megacycles
FIELD STRENGTH - DB ABOVE 1 µV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
F
A
H
R
T
P
ALTADENA
PASADENA
HIGHLAND PARK DIST
LOS ANGELES
BUSINESS DIST
COLISEUM
INGLEWOOD
LENNOX-HAWTHORNE
MANHATTAN BEACH
KEY
● Line-of-sight field strength from Mt. Wilson.
F Theoretical curve for 20 watts. Obtained from FCC "Signal Range for Television Station for 105 MC" curves.
A Line-of-sight field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Manhattan Beach.
FIGURE 10
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.

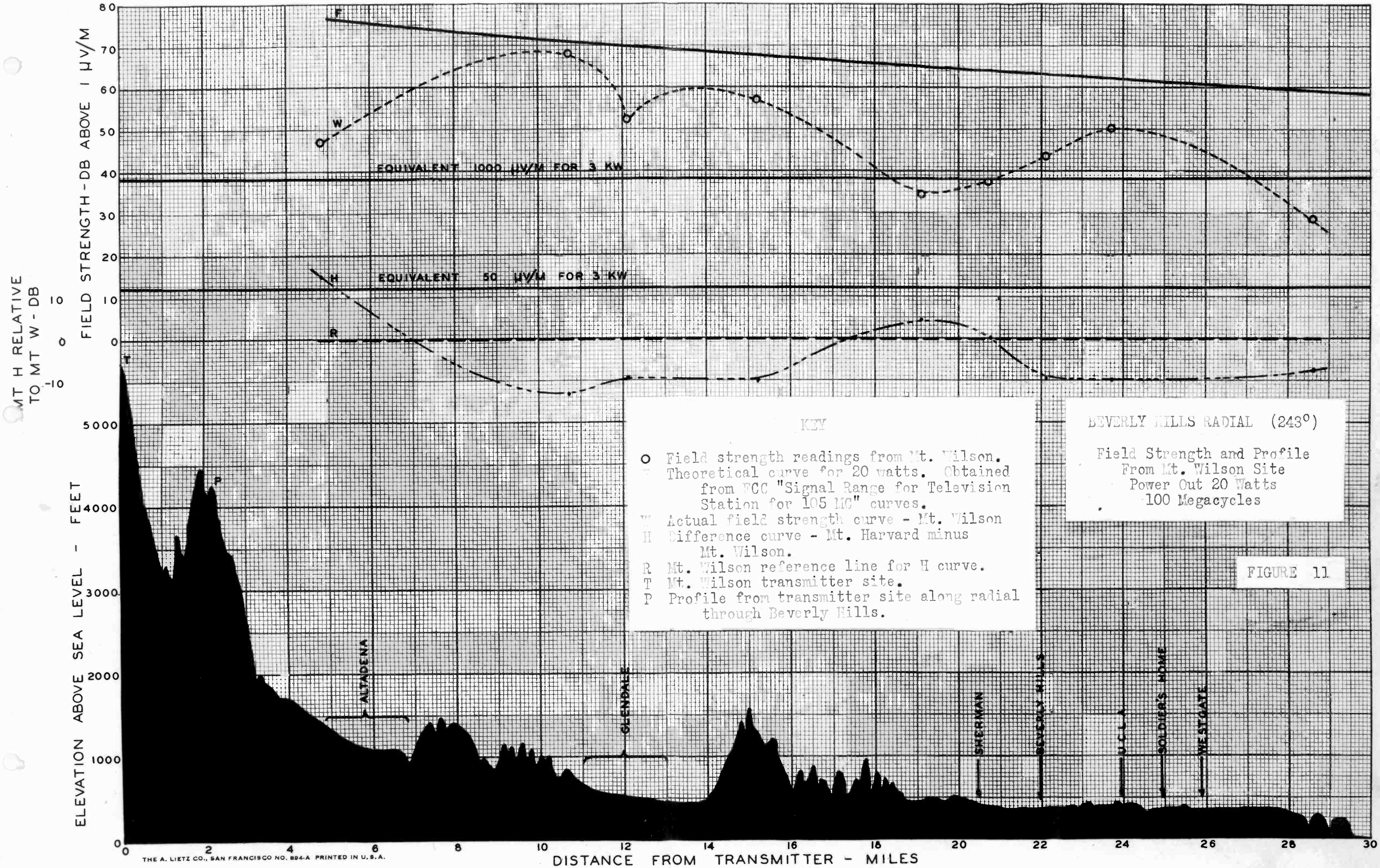
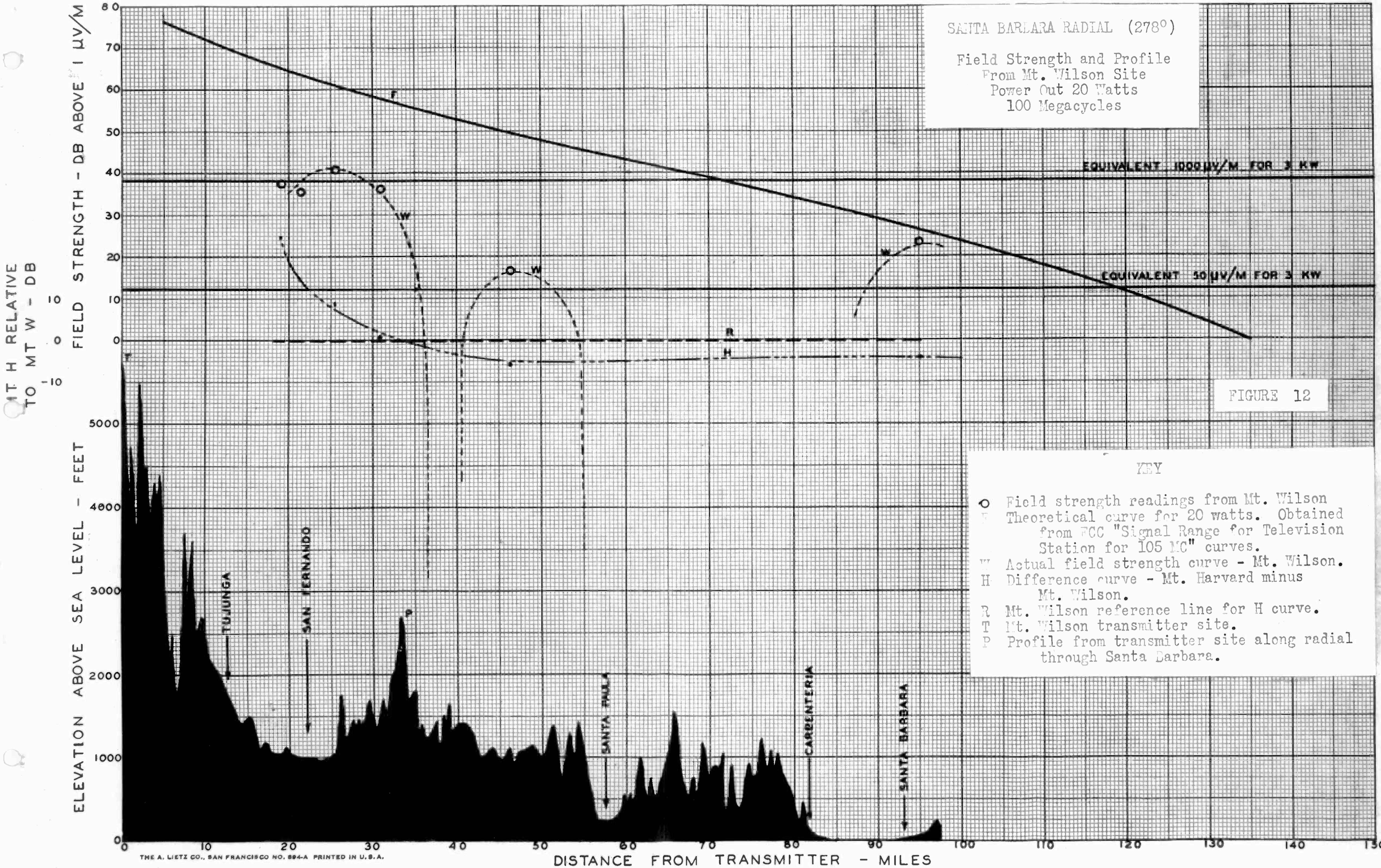

BEVERLY HILLS RADIAL (243°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 20 Watts
100 Megacycles
KEY
O Field strength readings from Mt. Wilson.
F Theoretical curve for 20 watts. Obtained from FCC "Signal Range for Television Station for 105 MC" curves.
W Actual field strength curve - Mt. Wilson
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Beverly Hills.
FIELD STRENGTH - DB ABOVE 1 µV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
EQUIVALENT 1000 µV/M FOR 3 KW
EQUIVALENT 50 µV/M FOR 3 KW
F
W
H
R
T
P
ALTADENA
GLENDALE
SHERMAN
BEVERLY HILLS
U.C.L.A.
SOLDIERS HOME
WESTGATE
80
70
60
50
40
30
20
10
0
-10
5000
4000
3000
2000
1000
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.

FIGURE 11



SANTA BARBARA RADIAL (278°)
Field Strength and Profile
From Mt. Wilson Site
Power Out 20 Watts
100 Megacycles
EQUIVALENT 1000 μV/M FOR 3 KW
EQUIVALENT 50 μV/M FOR 3 KW
FIGURE 12
KEY
O Field strength readings from Mt. Wilson
F Theoretical curve for 20 watts. Obtained from FCC "Signal Range for Television Station for 105 MC" curves.
W Actual field strength curve - Mt. Wilson.
H Difference curve - Mt. Harvard minus Mt. Wilson.
R Mt. Wilson reference line for H curve.
T Mt. Wilson transmitter site.
P Profile from transmitter site along radial through Santa Barbara.
FIELD STRENGTH - DB ABOVE 1 μV/M
MT H RELATIVE TO MT W - DB
ELEVATION ABOVE SEA LEVEL - FEET
DISTANCE FROM TRANSMITTER - MILES
TUJUNGA
SAN FERNANDO
SANTA PAULA
CARPENTERIA
SANTA BARBARA
THE A. LIETZ CO., SAN FRANCISCO NO. 894-A PRINTED IN U.S.A.