CANADIAN MARCONI COMPANY

ENGINEERING SERVICES

FINAL

PROOF OF PERFORMANCE IN

RESPECT TO THE OPERATION OF A

STANDARD BAND BROADCAST STATION.

STATION OR COMPANY:	Toronto Broadcasting Company Limited
CALL LETTERS:	CKEY
CLASS:	III-B
LOCATION:	Toronto, Ontario
CLIENT:	
POWER:	5000 Watts - Days; 1000 Watts - Nights
FREQUENCY:	580 Kilocycles

DESIGNING ENGINEERS:

E.W. Farmer
L.S. Payne
F.A.A. Baily
R.R. Desaulniers
J.M. Toye

FIELD ENGINEERS:

E.O. Swan

TEMPORARY PROOF SUBMITTED:	January 13, 1949
DATE OF FINALIZATION:	August 26, 1949
DATE OF SUBMITTAL:	

E. W. FARMER
LICENSED BY THE
ASSOCIATION of PROFESSIONAL
ENGINEERS - ONTARIO
FOR THE YEAR
1949

ENGINEERING QUALIFICATIONS

E.W. Farmer:- P. Eng., B.Sc., M. Eng. (McGill)
Canadian Marconi Company,
2440 Trenton Road,
Town of Mount Royal, Quebec.
Residence:- Ste. Therese, Quebec.

Fifteen years experience in design and installation of radio transmitting equipment. Presently Chief Factory Engineer, Canadian Marconi Company, member Engineering Institute of Canada, also member Institute of Radio Engineers.

R.J. Rowe:- B.Sc. (Alberta),
Canadian Marconi Company,
2440 Trenton Road,
Town of Mount Royal, Quebec.
Residence:- 28 Cohier Ave., Ville St. Laurent, Que.

Two years instructor in electricity and radio in naval training school at University of Alberta. Engaged since 1943 in design and adjustment of broadcast antenna systems as a member of the Concultant Services' Group of the Canadian Marconi Company.

G.J. McLeod:- B.Sc., Electrical Engineering,
(University of New Brunswick)
Canadian Marconi Company,
2440 Trenton Road,
Town of Mount Royal, Quebec.
Residence:- 1550 McKay Street, Montreal, Que.

Engaged for eight years in the Engineering Department of the Canadian Marconi Company, and at present a member of the Consultant Services' Group in design of broadcast antenna systems, also Instructor for the Evening Radio Classes at the Montreal Technical Institute, for the past four years.

STATEMENT OF PURPOSE

The following report constitutes a detailed statement of Field Intensity and other measurements carried out at Station CKEY, Toronto, Ontario, in conformity with the requirements of the Department of Transport's "Broadcast Specification Number Two", concerning Proofs of Performance for Directional Antenna.

Field data was obtained by the personnel of Station CKEY during the month of May, 1949 and has been formulated in this document by the Consultant Services Group of the Canadian Marconi Company.

Measured results have been interpreted and processed to show the relationship between the actual performance of the antenna array and that predicted and approved for this station.

E.W. Farmer

R.J. Rowe

CANADIAN MARCONI COMPANY,

September 28, 1949.

Discussion of Method And Results Obtained

Because of the special nature of the broadcasting conditions at CKEY, where two patterns at different powers are used to provide a 24 hour daily broadcasting service, it was necessary to devise a plan whereby the station's broadcasting service would not be unduly interrupted while performing the survey required by Government Specification Number 2. Accordingly, it was decided to carry out the work during the daytime in two phases: first, a ratio check of 'Night Pattern' to 'Day Pattern' intensities at a large number of locations surrounding the antenna and chosen for the purpose of delineating the 'Night Pattern': second, a formal proof of performance of the 'Day Pattern', results of which could be applied to the ratio run to establish the shape and size of the 'Night Pattern'.

For the ratio measurements, thirty-one carefully selected points were decided upon where measurements could be made with a minimum of error due to location or field strength disturbances from nearby objects. With a known radiated power of 4,130 watts, field strength measurements were taken on 'Night Pattern' at each of the chosen points. Then, with the station operating at rated power on 'Day Pattern', a second set of measurements were taken at precisely the same points. The ratios obtained were subsequently multiplied by the measured unattenuated 'Day Pattern' intensities in the appropriate directions, and further adjusted by a factor of 0.506, to produce the 'Night Pattern'. This factor (0.506) is obtained from power relationships and yields the actual pattern which exists when the station operates with a normal night power of 1,060 watts.

For the conventional proof of performance of the Day Pattern, field intensity measurements were taken on ten radials in directions chosen to give the best possible delineation of the pattern, consistent with suitability and reasonable accessibility of measuring points. The radials were run on the following bearings:-

Radial No.	Reference Bearing Degrees East of True North.
1	56
2	71.2
3	170
4	197.5
5	236
6	301
7	334
8	357.3

It will be noted that these directions coincide with the important features of the pattern. Thus the intensities over the main area of the large lobe are shown by radials #1, #2, #5, #6, #7 and #8. Radials #3 and #4 determine the radiations in the direction of the small lobe and minima respectively.

Due to the difficulty which would be experienced in obtaining suitable and accessible measuring points, all in exactly the specified directions, and at appropriate distances from the array, a method was employed in which measurements were taken, where necessary, at bearings which differed slightly from the "Reference" or nominal bearing of the radial. (The Reference Bearing is approximately the average of the bearings of all the measuring points on the radial.) These readings were then multiplied by a "Pattern Factor" to give the value which would have been obtained had the measurement been taken exactly on the Reference Bearing.

"Pattern Factors" are determined from the calculated Horizontal Pattern for the array as given in the Brief submitted in support of the Station's Application For License.

As an illustration of the operation of the method, attention is drawn to point #IF on radial #1. This point is at a Bearing of 55° East of True North. The reference Bearing for the radial is 56°. The Calculated Horizontal Pattern of the array indicates that the Unattenuated Field Intensity at 1 Mile at Bearing 55° is 444 mv/m, while that at 56° is 438 mv/m. The Pattern Factor for this point of measurement is therefore 438/444 or 0.988. The Field Intensity Value of 83 mv/m measured at point #IF when multiplied by this factor gives 81.9 mv/m, which to a very close degree of approximation is the Field Intensity which would have been measured at the same distance i.e., 4.1 miles at a bearing of 56°, and the values of 81.9 mv/m and 4.1 miles are therefore, used in plotting the Field Intensity Versus Distance Curve for the radial.

The ground conductivities and the Unattenuated 1 Mile Intensities established for their respective directions by the measurements along each of the radials are as follows:-

Radial Number	Bearing Degrees E of True North	Conductivity E.M.U. x 10^{14}	Unattenuated 1 Mile Field Intensity, mv/m
1	56	5 falling to 3	400
2	71.2	6	300
3	170	8	200
4	197.5	12	125
5	236	8	280
6	301	8 falling to 3	500
7	334	8 falling to 3	485
8	357.3	6 falling to 2	505

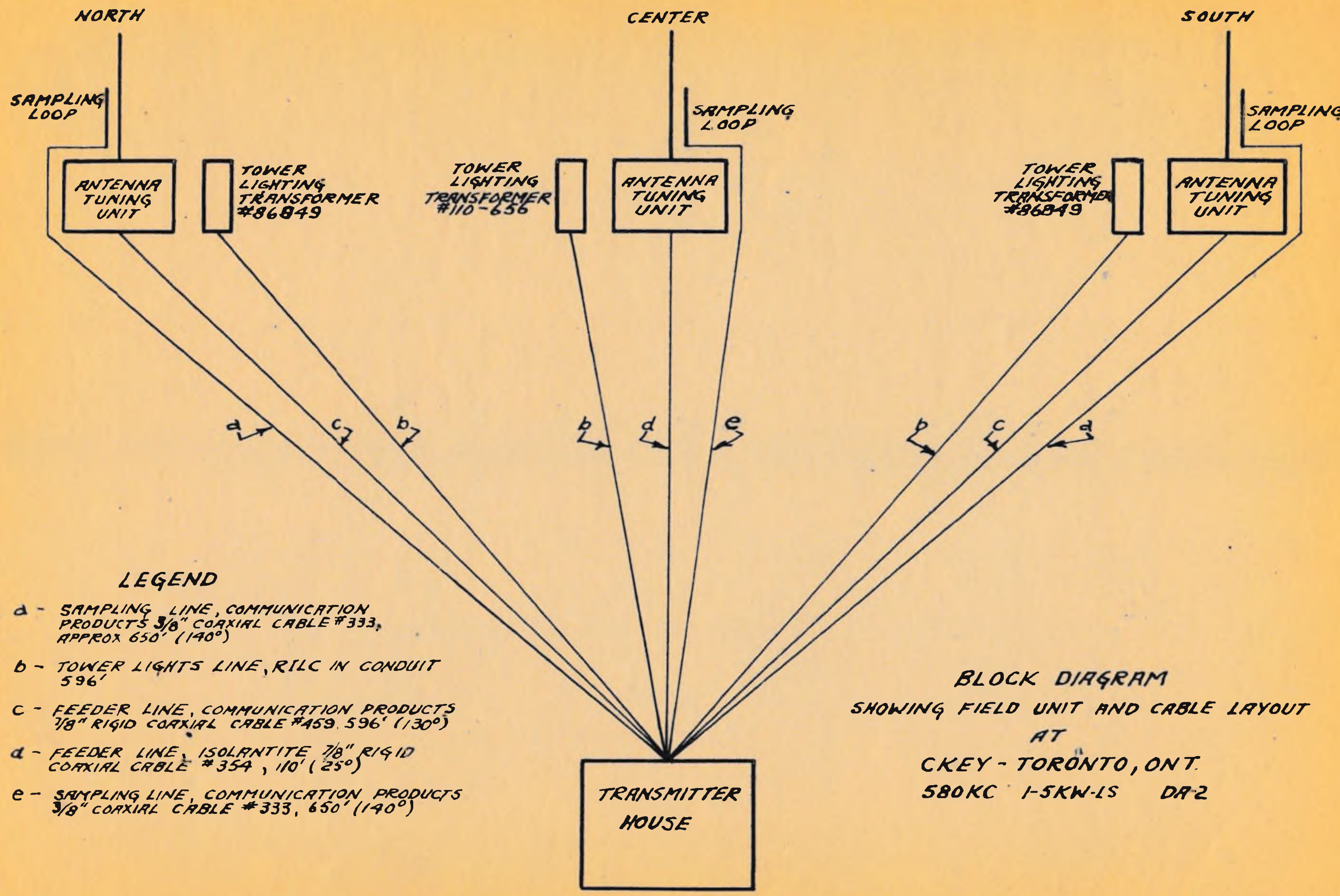
It will be noted on examining the Intensity versus Distance curves that, in many cases, the conductivity is not uniform throughout the total length of the radial. This is to be expected since relatively large distances were covered for all radials with the result that several types of terrain were traversed. The effects referred to above are particularly well illustrated on radials #4 and #6. Referring to radial #4, for example, a distinct change in conductivity is evident between 11 and 40 miles from the antennas where the signal travels for many miles over a large body of water. Radial #6 shows quite the opposite effect. Throughout the first 30 miles from the station the terrain is comparatively uniform with the result that measured intensities fall reasonably near the theoretical curve. During the interval between 30 and 100 miles, however, the signal becomes attenuated more rapidly due to shadow effects and the much rugged nature of the terrain.

No attempt has been made to account for individual discrepancies in measurement except in the remarks appearing against each point of measurement on the tabulation sheets. It is noted however that, where-ever practicable, precautions were taken to secure measurements undisturbed by large metal objects, power lines, telephone lines, etc. In two instances, while field strengths were being taken on radials #1 and #2, difficulties at the transmitter necessitated a reduction in power. The readings have been corrected for the different power, this being possible since the time for each reading was logged and compared with the record of the operation of the transmitter.

The plot of the Unattenuated One Mile Horizontal Patterns taken from the Field Intensity Versus Distance Curves and the Ratio measurements indicate R.M.S. values of 348 mv/m, for the Day Pattern and 148.5 mv/m for the Night Pattern. These values are considered reasonable for the antennas and ground system in use at CKEY, since the antennas are comparatively short with the result that operating resistances are low and loss resistances may be expected to form a relatively high fraction of these values.

The location of service contours shown on the Contour Map Sheets was determined directly from the conductivity curves in the two directions in which measurements were made. In other directions contour signal levels were estimated from these curves, due consideration being given to obvious changes in conductivity because of the particular nature of the terrain or the presence of large bodies of water.

All field strength measurements were made using R.C.A. Field Strength Meters, Type 308-A, Serial CM-101 and Type MI-22452, Serial 029. Impedances shown are those measured during Preliminary Proof of Performance for CKEY's Day Pattern and since, at that time, no measurements were taken on the North Tower, it has been assumed, for the purpose of this document, that North and South tower impedances are essentially the same.



LEGEND

a - SAMPLING LINE, COMMUNICATION PRODUCTS 3/8" COAXIAL CABLE #333, APPROX 650' (140°)

b - TOWER LIGHTS LINE, RILC IN CONDUIT 596'

c - FEEDER LINE, COMMUNICATION PRODUCTS 7/8" RIGID COAXIAL CABLE #459. 596' (130°)

d - FEEDER LINE, ISOLANTITE 7/8" RIGID COAXIAL CABLE #354, 110' (25°)

e - SAMPLING LINE, COMMUNICATION PRODUCTS 3/8" COAXIAL CABLE #333, 650' (140°)

BLOCK DIAGRAM
SHOWING FIELD UNIT AND CABLE LAYOUT
AT
CKEY - TORONTO, ONT.
580KC 1-5KW-LS DA-2

Sheet No. 54

DESCRIPTION OF ARRAY

STATION: CKEY MAIN STUDIO: TORONTO, ONTARIO.

POWER: 1 KW: 5KW-LS FREQUENCY: 580 KC CLASS: 111-B

LOCATION: TORONTO, ONTARIO.

NORTH LATITUDE: 43° 44' 23"

WEST LONGITUDE: 79° 15' 30"

ANTENNA: AUTHORIZED FOR DAY AND NIGHT OPERATION. (DA-2)

THREE ELEMENTS; TWO ELEMENTS DAY; TWO ELEMENTS NIGHT; SOUTH TOWER COMMON TO BOTH NIGHT AND DAY ARRAYS; UNIFORM CROSS-SECTION, GUYED, VERTICAL STEEL TOWERS. 217 = 45°

TOWER:		2 NORTH	3 CENTRE	1 SOUTH
HEIGHT ABOVE INSULATORS:		200'	200'	200' (45°)
OVERALL HEIGHT ABOVE GROUND LEVEL:		$204\frac{1}{2}$'	$204\frac{1}{2}$'	$204\frac{1}{2}$' 43°
OVERALL HEIGHT ABOVE MEAN SEA LEVEL:		$734\frac{1}{4}$'	$734\frac{1}{2}$'	$734\frac{1}{2}$'
SPACING:		530' OR $112\frac{1}{2}$° BETWEEN TOWERS.		
NIGHT PHASING:		0°	-	10° LEAD
NIGHT FIELD RATIO:		1.0	-	1.0
DAY PHASING:		-	0°	97° LEAD
DAY FIELD RATIO:		-	1.0	1.5
ELEMENT CURRENTS AT METERED POINT:	Night	10 amps	0 amps	10.2 amps
	Day	0 amps	14.7 amps	22.1 amps

GROUND SYSTEM: 120 RADIALS PER MAST EACH 424' LONG EXCEPT BETWEEN TOWERS WHERE RADIALS FROM ADJACENT TOWERS ARE BONDED TO A BUS RUN MIDWAY BETWEEN TOWERS AND AT RIGHT ANGLES TO LINE OF TOWERS.

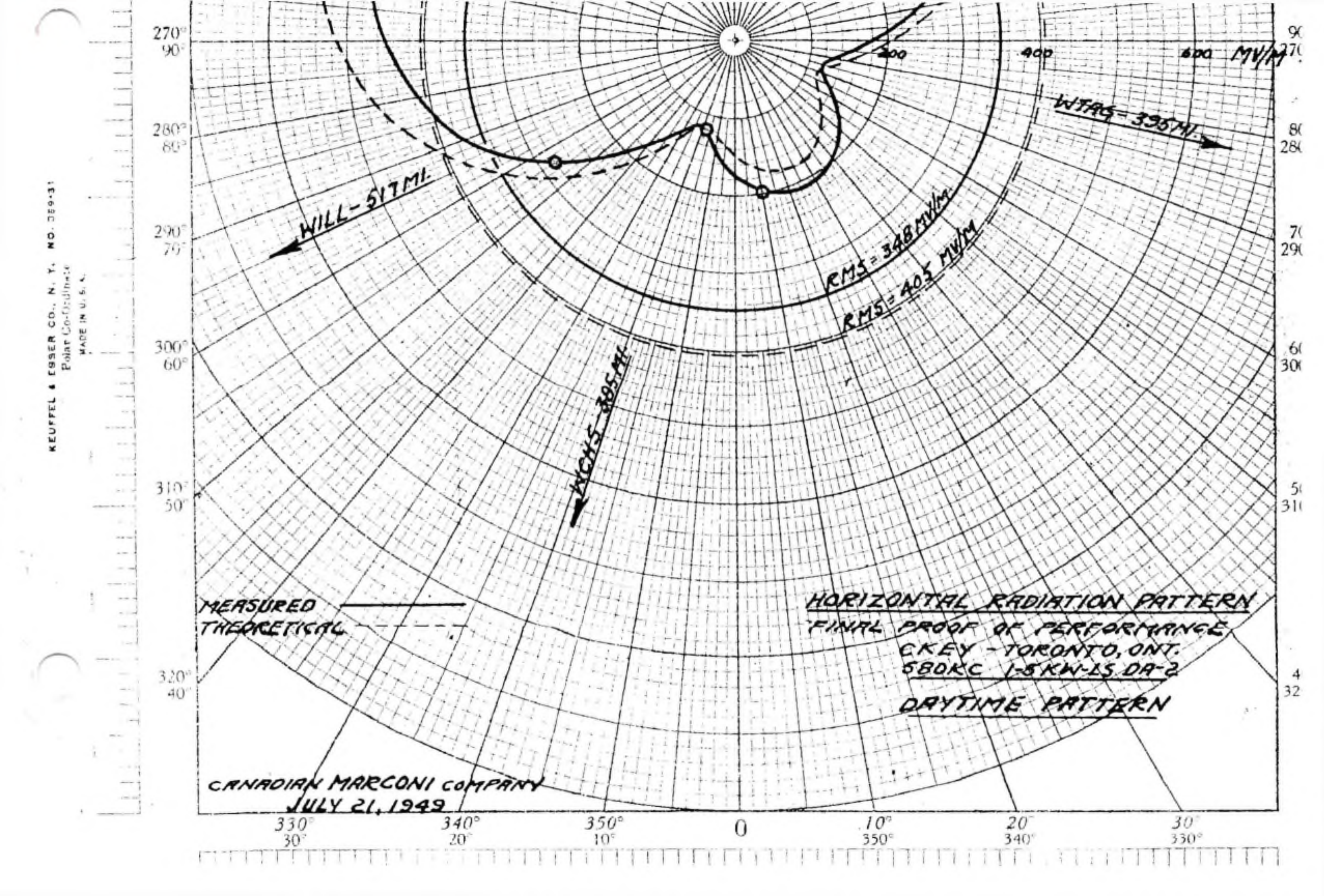
PREDICTED EFFECTIVE FIELD: 405 MV/M (181 MV/M FOR 1 KW)

ORIENTATION: NORTH AND SOUTH TOWERS ON A LINE BEARING 30° WEST OF NORTH. CENTRE AND SOUTH TOWERS ON A LINE BEARING 25° WEST OF NORTH.

CURRENT AT COMMON INPUT TO ANTENNA: NIGHTS - 4.5 AMPS; DAYS - 9.3 AMPS.

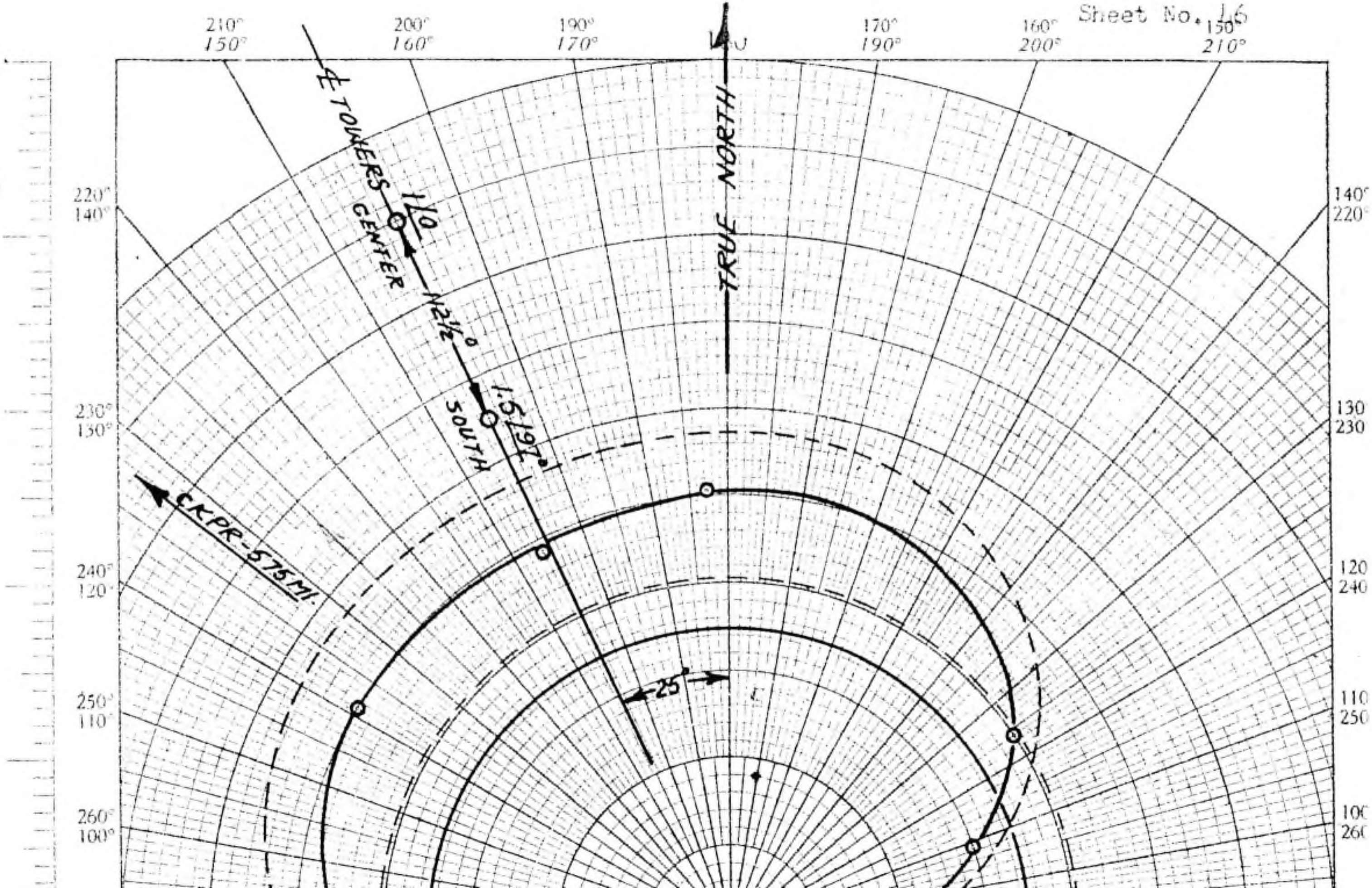
43° - 176 mV/m
60° - 181 mV/m + 2.8%

120



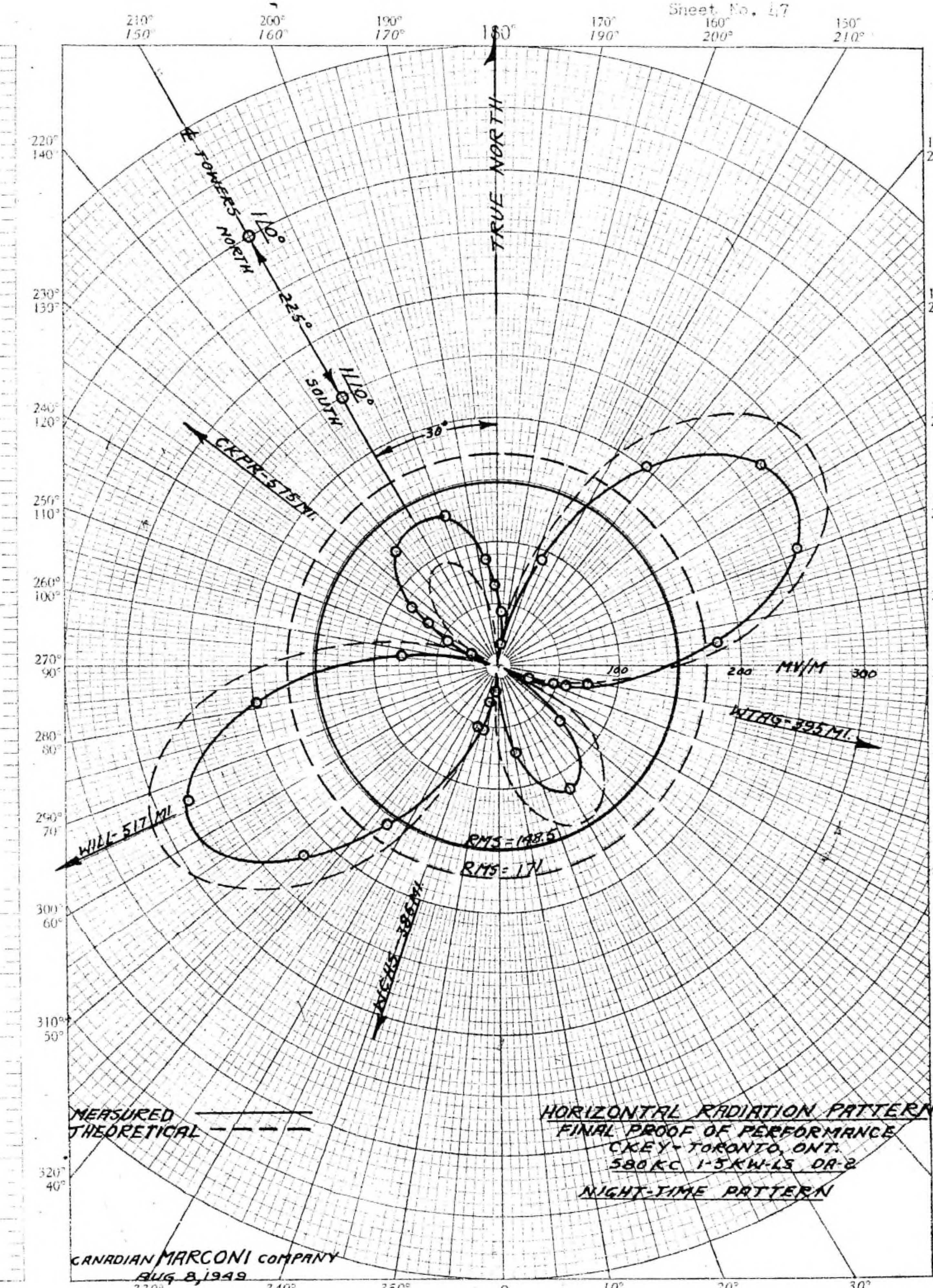
KEUFFEL & ESSER CO., N. Y. NO. 359-31
Polar Co-Ordinate
MADE IN U. S. A.
WILL-517MI.
WCHS-385MI.
WTAG-395MI.
RMS=348 MV/M
RMS=405 MV/M
200
400
600 MV/M
MEASURED
THEORETICAL
HORIZONTAL RADIATION PATTERN
FINAL PROOF OF PERFORMANCE
CKEY - TORONTO, ONT.
580KC 1-5KW-LS DA-2
DAYTIME PATTERN
CANADIAN MARCONI COMPANY
JULY 21, 1949

Sheet No. 16



℄ TOWERS
CENTER
1/0
1/2½°
1.5/197°
SOUTH
TRUE NORTH
CKPR-575 MI.
25°
210° 150°
200° 160°
190° 170°
170° 190°
160° 200°
150° 210°
220° 140°
230° 130°
240° 120°
250° 110°
260° 100°
140° 220°
130 230
120 240
110 250
100 260

Sheet No. 47



TRUE NORTH
TOWERS NORTH
SOUTH
225°
110°
30°
CKPR-575 MI.
WTAG-395 MI.
WILL-517 MI
WCHS-386 MI.
RMS = 148.5
RMS = 171
100
200
MV/M
300
MEASURED
THEORETICAL
HORIZONTAL RADIATION PATTERN
FINAL PROOF OF PERFORMANCE
CKEY - TORONTO, ONT.
580 KC 1-5 KW-LS DA-2
NIGHT-TIME PATTERN
CANADIAN MARCONI COMPANY
AUG 8, 1949

FOR RELEASE WEDNESDAY, MARCH 18th, 1959
Upon start of its presentation to the Board

CKEY STATEMENT TO BOARD OF BROADCAST GOVERNORS

By
Jack Kent Cooke

Brief Reference

Mr Chairman, Members of the Board of Broadcast Governors.

I thank you for this opportunity to outline CKEY's role in the broadcasting industry and the way in which this station has discharged its responsibility to its listeners.

But first, I should like to tell you why I decided to prepare this voluminous brief.

When I arrived in New York from California on February 17th I accepted a phone call from a Toronto newspaper reporter. He asked me to comment on a news story in which it was alleged that CKEY and six other Canadian stations were on the carpet before the BBG, were in danger of losing their licenses because they played too many recordings and too much rock and roll music. The BBG, he said, was adopting a "get tough" policy.

I conveyed to the reporter my skepticism. I was convinced, even then, that my skepticism was justified; and, I am even more convinced now that to prejudge this situation would be the last action imaginable by this Board. In short, I now know that the newspaper stories were not an accurate reflection of the Board's views.

A few days later I flew to Toronto. On my desk at Consolidated Press were letters and telegrams from citizens volunteering to testify personally or by letter to the importance of CKEY's contribution to the community. There were almost two score telephone messages, of a similar nature.

Most of these people expressed incredulity, some were shocked, and some even angered by what they felt was an unjustifiable prejudgment of CKEY. These good people pledged their support and evinced a sincere desire to help CKEY - the station which had helped them so many times in the past.

I then convened a meeting of the executive staff of CKEY, which resolved to prepare and write a comprehensive brief, with a two-fold objective:

Number one, and of the greatest importance: to defend CKEY's reputation and correct what we believed to be a grievous misconception of our broadcast policy. You will realize that the charges attributed to the BBG by the press did considerable harm to CKEY - if not to the entire broadcast industry. The reverberations of these charges must be apparent:

a) The listener doubted the continuity of CKEY's existence.

b) The CKEY staff doubted the permanency of their employment.

c) The advertiser doubted the value of CKEY as a continuing medium of advertising.

d) Many Canadians doubted that the so-called broadcast industry had stability.

Objective number two: the brief should establish a firm foundation for CKEY's future transactions with the BBG:

a) CKEY's imminent application for an increase in power to 50,000 watts.

b) CKEY's long-standing application for a TV license in Toronto.

In the beginning, as we were exhuming files, cross-checking information, scanning ledgers, analyzing program schedules, collecting, writing, drafting, redrafting, consulting our printing department, I knew many moments of irritation, and a few of resentment, that a station with CKEY's reputation for public service should be forced to its knees, as it were, to defend itself.

Frankly, I am not unhappy now that out of the need to defend the station came this comprehensive study of CKEY. This is the first such brief ever submitted to a regulatory body by CKEY.

iefReference

Page 2 The brief traces the history of my acquisition of Radio Station CKEY and the reasoning which led to the development of a system of block programming first introduced by CKEY to Canada fifteen years ago. I have touched on

Page 4 the subject of Masters of Ceremony; the decision to schedule news every hour on the hour prepared and read by experts; the scheduling of sports-

Page 5 casts. I have noted the number of policy decisions, now widely copied, first taken by CKEY in Canada, including the banning of soap operas, rejection of children's serials and a retention by management of complete control of the station's programs. Any program which was not compatible with the overall theory of the program schedule was refused.

ge 8 In 1944, CKEY was to be the first and only music, news and sports station in Canada and one of the first in the world. Complete freedom of choice of program to the listener was assured by the number of radio stations serving the public in the Toronto area. The Toronto listener, today, may hear 22 radio stations and 5 television stations. There is entertainment and information for every taste.

As recently as last Saturday, March 14th, Leslie Bell, music critic, wrote in the Toronto Daily Star; "Nor do I agree with those who say that there is a dearth of serious music on the air. Certainly there is not in the Toronto area. People in these parts have available to them anywhere from 75 to 100 hours of good music a week." Here, I believe, Mr Bell has underestimated the amount of what he calls "good music" available to Toronto listeners. It is much in excess of his figures.

Mr Bell also says; "There is not much point in trying to compel rock and roll stations to play good music. People who listen to these stations just don't want Beethoven and would promptly turn off the dial." To which I say, Amen. I couldn't disagree with him less. I suppose there is room in Toronto for what Mr Bell calls a rock and roll station. I don't know. I don't operate one.

Page 9
Exhibit 1 Through the years, more Torontonians have tuned to CKEY than to any other single station. The reasons would seem to be:

ief
Reference

1) CKEY offers its listeners a professionally planned and executed program of a wide range of popular music.

2) Fast, enterprising coverage of local and world news.

3) The most complete sports coverage ever attempted by a Toronto stations.

4) A devotion to public service which inspires in the listener the belief that CKEY is a force in community affairs.

5) The programming of local artists and performers of promise in the field of music and drama.

Page 11 CKEY presents a broad selection of popular music, in a professional manner. We call it, we feel with justice, the folk music of the American continent. In this we have the support of many important interpreters of music culture. Mr Leonard Bernstein, conductor of the New York Phil-Harmonic orchestra, supports the contention - Mr Robert Fowler, to the contrary, notwithstanding. Mr Bernstein's remarks brighten the CKEY brief.

I have referred to the criticism ascribed to the BBG by the press of the amount of rock and roll music allegedly played by CKEY. A careful study of the CKEY program schedule, even a casual "listen" to the station, would demolish the opinion that CKEY features an excessive amount of rock and roll music.

An analysis of the music scheduled for the week beginning Monday, March 9th, shows that so-called rock and roll music comprised less than 20% of the total of the selections broadcast. Of the 20% loosely called rock and roll, a part could easily be classified simply as popular music. Of the remaining 80%, the music is composed of standards, music comedy hits, show tunes, jazz and so on.

Brief
Reference

Exhibit 1 Next; who listens to CKEY's programs? Elliott-Haynes Limited conducted a comprehensive study of radio audience listening in Metropolitan Toronto in July, 1958, in which the composition of the audience was measured:

13.8% of CKEY listeners are in the 16 to 20 year bracket

18.1% are between the ages of 21 and 30

31.4% from 31 to 40 years

29.0% from 41 to 60 years of age

7.7% are over 60

51.4% of CKEY listeners are male

48.6% are female

These characteristics of CKEY's audience closely parallel the characteristics of the population of Metropolitan Toronto. That CKEY delivers a cross-section of the population is perhaps even more compellingly proved by the advertisers' assessment of the station's audience. Their consistent choice of CKEY has made it the most successful commercial broadcasting station in Canada - and one of the most important ones on the continent.

Page 17 Much of CKEY's popularity stems from its vigorous news policy. From its first days, CKEY has employed specialists in news broadcasting. They are assisted by news writers and aided by special equipment such as CKEY's police radio listening system, tape recorders, telephone recording devices and a portable network of short wave receiving and sending stations. Our news emphasis is on local happenings, but there is no part of the world to which CKEY listeners may not range with our newscasters.

CKEY has a working arrangement with one of Canada's great newspapers, the Toronto Telegram, by which local news is pooled. The station leases the world-wide news services of United Press-International, Canadian Press, Associated Press and a special New York wire service provided by Canadian Press.

Brief
Reference

Page 18 Our newsmen have displayed unusual enterprise on many occasions. Conspicuous examples include the great Toronto snowstorm of 1944, the burning of the Noronic at its pier in Toronto harbour, the Winnipeg floods, Hurricane Hazel, the Marilyn Bell swim, the Hungarian revolution, the Springhill mine disaster and CKEY's regular intensive coverage of Federal, Provincial and Municipal elections.

Page 23 In the same aggresive spirit, CKEY covers the specialized sports news. Since 1944, CKEY has employed two sports specialists, Joe Crysdale and Hal Kelly, who present a thorough and colourful coverage of major sports.

Page 24 CKEY has done excellent work in the field of play-by-play broadcasts. No list is complete without reference to:

a) Broadcasts by CKEY of the home and away games of the Toronto Maple Leafs of the International Baseball League.

b) The first dramatized reconstructions of NHL hockey games played outside Toronto on Sunday evenings.

c) Play-by-play broadcasts of amateur hockey, and the world's championships in Germany in 1955.

d) High school, University and CRFU football games, play-by-play.

e) Almost every major Canadian golf tournament since 1945, providing the most extensive coverage attempted by any single radio station.

f) Our sportscasters range far afield from Florida to Vancouver to Germany to cover news of interest to CKEY listeners.

Brief Reference	
Page 28	From its inception CKEY has concerned itself with development of local live talent and in providing a stage for established live talent. A few of the significant live talent programs which have been broadcast by CKEY are:
Page 28	1) "Invitation to Music" - which featured many of the great Canadian soloists and small groups renowned in the world of classical music.
Page 29	2) "Canadian Playhouse" - since 1945 (507 half hour dramas to the end of 1958) has provided opportunities for some one thousand newcomers to Canadian radio drama. Twenty-three graduates are now successful performers in radio, television and movies in Canada, the U S and England.
Page 32	3) "The Children's Theatre" - since 1947 (429 broadcasts to the end of 1958) has provided professional instruction without charge to children of pre-school and public school age. Under the guidance of Miss Marjorie Purvey, original plays have been performed by more than eight hundred youngsters. The CKEY brief lists more than 60 graduates who have attained success in radio, TV or allied arts.
Page 36	4) "Canadian Talent Showcase" - was the vehicle on which CKEY recently presented gifted professional and amateur musicians and singers to the public. Theprogram provided professional direction, professional musical accompaniment and incentives in the form of cash awards valued at eight hundred and fifty dollars to assist the leading artists in their careers.
	More than 45 artists were presented to the public in the 1958 season.

Brief
Reference

Page 38 All of CKEY's live talent shows, in 1958, were fed to networks of private stations. CKEY paid all costs of this operation, with the exception of network line charges. CKEY received a series of live talent network shows from CKCY, Ottawa, on the same basis.

Pages 41-2 I have singled out certain shows for special mention. They are examples of CKEY's activity in the field of live talent since 1944. Some idea of the expense involved is the amount spent by CKEY on live talent since 1945:- $382,553.00.

Page 43 In addition, there is the extremely important field of staff live talent. CKEY has paid to its air staff since 1945 a total of $1,383,925. In 1958, staff live talent costs were $154,948. Audience acceptance of CKEY's program efforts has necessitated a total staff increase of 40 since 1944. From 38 persons in 1944 to 78 staff members today - 1958.

Page 45 In our brief, I refer to CKEY as a force in the community. Since the day it began, CKEY has been dedicated to the service of the community. In 15 years no worthy cause has been refused; more importantly, CKEY has sought out opportunities to be of service, to point up the needs of the community, and play its part in filling them. I believe that the performance of CKEY through these years has led inevitably to its being considered by the public as a force for good in the community.

Page 45 Random examples of CKEY's public service performance during the last year include such campaigns as:

1) Put Christ back into Christmas
2) A massive campaign to appeal for jobs for AVRC workers laid off in Toronto
3) Drive to Kill safety campaign
4) Walk to Die safety campaign
5) Radar warnings in co-operation with Toronto police
6) Highway congestion reports, particularly on Sunday evenings in summer.

Brief
Reference

Page 51 CKEY has been alert to opportunities for providing public service on a formal basis. Its average contribution in program time alone (not including announcements) to organizations such as the Department of Labour, Salvation Army, Order of St John, the State of Israel and the Roman Catholic Church amount to more than $30,000. each year.

Page 51 The station, however, feels that a more effective contribution has been in the field of spot and flash announcements which "sell" the public service idea as forcefully as a commercial client sells his product on the air. In this area, CKEY between 1944 and 1958 has contributed over $2,300,000. of station time.

Page 50 CKEY has provided a medium through which the public may express its opinions. Each year more than 4,000 listeners air their views on news of topical interest over CKEY's "Sound Off".

Page 48 The station, itself, has adopted an editorial position, clearly divorced from its newscasts. During the last civic election, it published its own slate of candidates for the offices of Mayor and Board of Control, a step which may wisely be followed by all private stations, to the benefit of the public, particularly in those communities where a newspaper monopoly exists.

Follows page 52 The sum of its activities has created for CKEY a favourable image in public mind. The brief contains a few of the many letters received from distinguished citizens since the publication by the press of the charges directed at CKEY. I have already commented on these letters.

Page 53 The station, through the years, has received its share of awards for notable contributions to the program field. They include recognition from Variety magazine, Billboard magazine, the Ontario Safety League, the United Appeal organization in Toronto, the Transport Association and the Institute for Education by Radio-Television of Ohio State University.

The Board has asked for an expression of opinion from CKEY concerning matters which come under the general heading of Philosophy of Broadcasting.

Brief
Reference

Page 55 CKEY considers the amount of advertising permitted under the present regulations to be reasonable and need not be changed. CKEY's advertising content in a typical twelve day period in June, 1958 (chosen because it appears to be an average month) amounted to 18.5% of all material broadcast. It may be of interest to note that in the same period the advertising content of the three Toronto daily newspapers was 64.4% of all material printed.

Page 56 CKEY has taken a strong position in defense of recorded music versus live. We feel it is the sound, economic policy for a single station operating without network affiliation. It is our opinion that CKEY uses less recorded material than many other Canadian radio stations, excluding network feeds or originations. We have cited examples which support this belief. This position has been bolstered by the changes of emphasis in broadcasting dictated by the phenomenal growth of television competition which, for a time, threatened to wipe out broadcasting. The history of the past ten years indicates that the present and future financial success of the radio industry depends upon a professional presentation of music, news and sports.

Page 56 It must be emphasized that it is not enough for a station like CKEY to present a simple selection of records. Such records must be skilfully chosen by a professional library staff. They must be presented to the public by skilled Masters of Ceremony whose direction of the show commends them to the listeners to the point where they become household names.

Page 58 On the subject of giveaways, such as the giving of large sums of money or prizes in contests which have the basic purpose of buying audience, CKEY is opposed to such practices. We did not broadcast schemes of this kind until recently, when we were forced to retaliate against a competitor who employed these tactics.

Page 58 The Board has asked for an opinion on what we shall call "freak shows" - announcer marathons, dance marathons and the like. CKEY deplores them. We have never become involved in such performances, nor do we intend to.

Brief
Reference

Page 60 I have endeavoured to reply to the question of CKEY's philosophy of broadcasting, in the brief before you now. At CKEY we feel that we have Page 61 a two-fold responsibility. First, toward the Government regulatory body which granted the station license. Though I have not always agreed with all of the regulations governing radio, I have endeavoured to obey them. Second, and perhaps greater, is our responsibility to the listeners of Toronto. The license was granted to CKEY in the public interest, to satisfy the needs and the desires of the community. I have tried, with every tool at my command, to fulfill that charge.

Pages 66-8
The surveys referred to in our brief indicate that over 80% of Toronto families are in the lower-middle income class, or less. Obviously, the likes and dislikes of the total available audience in Toronto must be swayed in favour of this mass audience. From a programming point of view, their preferences should outweigh those who may form the more articulate and influential minority.

Page 69 Another survey indicates that 69.7% of the people choose a variety of music as their favourite entertainment. 32.7% voted for news coverage. In the same study, CKEY is chosen by listeners as the Toronto station with the best news coverage.

Once the potential audience for a station is known, the question is how shall you program to satisfy that audience?

W S Gilbert, famous lyricist and playwright, pondered the question in terms of theatre. He said:

> "A man who sets to work to cater for the entertainment of theatrical audiences is in the position of a refreshment contractor who has engaged to supply a meal of one dish at which all classes of the community are to sit down. What should that dish be? It must not be Supreme de Caille, or it will be regarded as insipid by the butcher boy in the gallery. It must not be Baked Sheep's Head, or it will disgust the epicure in the stalls.

Brief
Reference

> It must, I suppose, be some dish that will fit the gastronomic mean of the audience, and I take it that that gastronomic mean will be somewhere in the neighbourhood of rump steak and oyster sauce. If I am right in this conjecture, it seems to follow that a dramatist who intends that his profession shall furnish him with an ample income, should confine himself to writing plays of the "rump steak and oyster sauce" description."

So said the first half of the famous Gilbert and Sullivan partnership.

Page 71 We at CKEY are not content to rest on the record of the past. We have just built, at a cost of $750,000. new studio and technical facilities. It is the most modern and efficient broadcasting plant on the North American continent. Full provision has been made for television broadcasting from these studios.

We have recently added two station wagons, fully-equipped with short wave sending and receiving stations, to expand our coverage of news in the Metropolitan Toronto area. We have on order a complete auxiliary FM transmitter which will allow us to broadcast for long periods of time with full broadcast quality from locations outside of our regular studios.

Soon to be delivered is an elaborate broadcasting studio on wheels, completely equipped to handle every broadcasting function. This mobile studio, 30 feet in length and weighing close to 7 tons, will be used to take our services to the public. It will be set up on highways, in shopping centres, at county fairs and wherever else CKEY may better serve the public interest.

Page 71 We hope, in the near future, to expand the range of our service by applying for an increase to 50,000 watts power, and to have the sympathetic assistance of the Department of Transport and the Board of Broadcast Governors to attain this latest objective of CKEY.

Brief
Reference

Page 71 Fourteen years ago, in 1945, CKEY first asked for the necessary information on which to base an application for a TV license in Toronto. Since then, we have spent much time and considerable money training staff, studying the medium and generally preparing for what we regularly hoped would be the imminent grant of a TV license to this company.

I wish to emphasize that the basic program format of CKEY, embarked upon in 1944, has continued without major change to this very day. My policies were known to the members of the Board of Governors of the CBC when they approved the transfer of license from CKCL to CKEY in 1944. They have never been questioned by any member of the licensing authority or its committee of recommendation from that day to this - or perhaps I should say, until now.

No enterprising station can broadcast without making mistakes, but it is my firm belief that the past 15 years of operation of CKEY has given our listeners program service, information and entertainment of an appealingly professional standard.

I am proud, and I believe, most Torontonians are, of CKEY and of CKEY's public service record.

Following is a list of some of the individuals who have recently written letters of commendation to CKEY, praising its programs, news and public service. Photostatic copies of these and other letters are included in CKEY's BRIEF to the Board of Broadcast Governors:

Leslie M. Frost Prime Minister of Ontario

James Cardinal McGuigan Archbishop of Toronto

Frederick G. Gardiner QC Chairman Municipality of Metropolitan Toronto

Nathan Phillips QC Mayor of Toronto

Controller William R. Allen Toronto

Controller Donald D. Summerville Toronto

Charles Burns Royal Agricultural Winter Fair and President United Appeal

Theodore Heinrich Director Royal Ontario Museum

Mark Napier The Art Gallery of Toronto

T.S.Johnston Toronto Symphony Orchestra Assoc.

Norman Harris Toronto Musicians Assoc.

L.M.McKenzie Ontario Athletics Commissioner

CKEY/CKTB

DOUBLE ADJACENT CHANNEL

MEMORANDA

CKEY/CKTB

DOUBLE ADJACENT CHANNEL
MEMORANDA

Statement of Problem

I a. CKEY proposes to operate on 590 kc - 5 kw DA-1 with transmitter located off south shore of Toronto Island.

b. Directional pattern from four tower end fire with beam centered in northern direction along a bearing 348° true.

c. Maximum field at one mile 750 mv on bearing between 340° and 360° true - 6 db down beam width 113°, centered between bearing of 292° and 45° true.

II a. CKTB operates on 610 kc - 10 kw day, 5 kw night, from location south of St. Catharines.

b. Directional pattern from five tower in line end fire array beamed in a northernly direction on a true bearing of 350° (approximately at Toronto metropolitan area).

c. Maximum field at one mile, day 1300 mv, night 900 mv/m, 6 db down beam width 100°, centered between 40° and 300° true.

III a. Distance from CKTB to Toronto shoreline approximately 45 miles.

b. Estimated day field 20 mv - measured field 18 mv at Toronto shoreline.

c. Calculated field from known conductivities

12.5 mv - 5 miles north of Toronto Shoreline
10.0 mv - 10 miles north of Toronto Shoreline
7.5 mv - 20 miles north of Toronto Shoreline

IV **CKEY/CKTB Estimated Field Ratio (Day)**

CKEY	CKTB	RATIO	Location North of Toronto Shoreline
250 mv/m	15 mv/m	17	1 mile
100 mv/m	12.5 mv/m	8	5 mile
50 mv/m	10.0 mv/m	5	10 mile
25 mv/m	7.5 mv/m	3.5	20 mile

V NARBA Rule (Double adjacent channel)

Undesired to desired signal ratio shall not exceed 30/1 at the 1/2 mv contour of the desired station.

VI Degree of degradation

a. An area encompassing 52 homes on Toronto Island will have signal ratios in excess of 30/1.

b. At night, CKTB nighttime interference contour (co-channel) is in excess of any signal available to the metropolitan Toronto area.

VII CKEY has offered to take any necessary steps and expense to remove interference from all receivers within CKEY's 250 mv/m contour which are unable to receive CKTB because of interference from CKEY.

(A) **Discussion of Receiver Problems**

There are two basic problems arising when a strong undesired signal, two channels removed from the desired channel, is presented to a receiver tuned to the weaker desired station (expected ratio from 17/1 to 3.5/1 within metropolitan Toronto area).

a. The first is the ability of the receiver when tuned to the desired signal 610 kc (7.5 to 15 mv) to avoid blocking by the stronger undesired signal at 590 kc (25 to 250 mv). This is determined almost entirely by the receiver's overall R. F. and I. F. selectivity.

b. The second problem, in which the receiver's selectivity has only a secondary effect, is the interference caused by out of band spurious side frequencies of the interfering carrier (590 kc) when harmonics of its side frequencies come into the pass band of the receiver tuned to the desired channel (610 kc), i. e., 3rd harmonic of 6 kc modulation on 590 kc will be at 608 kc and will be detected as a 2 kc audio interference on the desired signal at 610 kc.

EXPERIMENTAL MEASUREMENTS

There is a very voluminous record of AM broadcast receiver characteristics in various technical reports. However, most of these are (while valid in most respects) ten or more years old.

It was thus desirable to measure receivers of a more recent manufacture, particularly those of a cheaper nature which could be expected to have broader selectivity and poorer performance in other characteristics, specifically against adjacent channel interference.

Two types of low priced receivers were measured; the first a Westinghouse AC/DC, 5 tube, table model which can be considered representative of the bulk of this type of set now in service. (It is perhaps typical of 75% of the AM receivers now in use.)

The second, a cheap version of a small portable transistor receiver which probably represents the characteristics of the cheaper half of such sets. The other half, more expensive, are quite similar in performance to the 5 tube AC/DC receivers.

These receiver measurements were made in the laboratories of the Westinghouse Home Receiver Division at Metuchen, New Jersey. The two receivers measured were typical of current production and were measured in accordance with 48 IRE 17s Standards on Measurements of Radio Receivers.

Selectivity measurements on the receivers were made by adjusting the receiver to the desired frequency - either 1000 kc or 610 kc, and with a fixed mv/m input into the receiver with 30% modulation at 400 cycles, the receiver audio gain was adjusted for rated audio output.

The signal generator's frequency was then changed in successive five kilocycle steps above and below the 1000 kc or 610 kc frequency to which the receiver was tuned. The signal generator's input was increased until at each new off resonant frequency the receiver's output was normal. (Note: the receiver's A. G. C. and audio gain was left operating normally and untouched.)

The results of these measurements are shown on Figure 1 and 2. While not shown at inputs other than 1/2 mv/m, measurements by receiver engineers on receivers of this and other types indicate very little change in selectivity with higher inputs up to levels approaching overload. Since the desired signal at 610 kc will not be in excess of 20 mv/m the measured selectivities can be relied on.
Note: (The apparent broad tuning of receivers subject to strong signals is a result of the A. G. C. taking control at frequencies somewhat off the desired carrier. This is not an indication of change of receiver selectivity against an adjacent channel signal.)

Figure 3 is the plot of (RCA) measurements of a typical transistor car radio and Figure 4 is a plot of the Philco transistor portable data given by Mr. Boland.

The G. E. data by Mr. Boland is plotted on Figure 4 but it does not appear to be complete, although it may have been misinterpreted.

Other receiver selectivity data given by others seems to indicate the above data is on the low side of selectivity rather than the high side, i. e., E. K. Sanderson, Radio Engineer, Volume 2 - 1953 - "Characteristics of Commercial Receivers" shows that for typical AC/DC receivers the

20 db down response is $\pm$ 7. 25 kc
40 db down response is $\pm$ 10. 5 kc
60 db down response is $\pm$ 14 kc

and the second channel response away from 1000 kc is 73 db down.

(B) RECEIVER IMMUNITY TO BLOCKING BY STRONG DOUBLE ADJACENT CHANNEL SIGNAL

A second set of measurements were made on the 830-T-5 and the 737 to test their immunity to blocking (reduction of desired output by A. G. C. action from interfering signal) caused by strong adjacent channel signals.

These measurements were made using the two signal generator set up as described by 48 IRE 17s as follows: The receiver was tuned to 610 kc and the first signal generator was adjusted to have its output signal at 610 kcs with levels ranging from 1/2 mv to 20 mv/m. With a given mv/m at 610 kc, say 10 mv/m, and with the 610 kc output 30% modulated by 400 cycles the receiver's audio gain was adjusted to give rated output. Modulation was then turned off of the desired signal at 610 kc; otherwise it remained at 10 mv/m output. (The receiver's A. G. C. and audio gain are left operating normally and untouched.)

A second signal generator modulated 30% at 400 cycles was coupled to the receiver which was tuned to 610 kcs. The output of the second signal generator was set at various output levels (fixed for each run) and its frequency varied in 5 kc steps from 605 kc down to 590 kc. At each frequency the receiver output was measured. The results of these tests, on both receivers, are shown on Table I and II.

An examination of this data shows that neither receiver will be subject to blocking by 590 kcs signals which are as much as 30 times stronger than the desired signal at 610 kcs. This is with the desired signal having strengths varying from as low as 1/2 mv/m to as high as 20 mv/m.

It should be noted that this immunity to blocking and therefore also cross talk from the 590 kc signal is considerably greater than indicated by the overall selectivity curve of the receivers.

Table I and II show as much as 20 to 30 db more immunity than the overall selectivity curves indicate. The additional immunity comes from the fact that - so long as the interfering signal as seen at the input to the second detector is small compared to the desired 610 kc signal, then the interfering signal is detected as though it was sidebands of the desired signal with carrier at 610 kc.

For example, assuming the interfering signal is at 590 kc with 100% modulation at 1000 cycles, these three signals - lower sideband at 589 kc, carrier at 590 kc, and upper sideband at 591 kc, will appear at the second detectro output (receiver tuned to 610 kc) as audio having frequencies of 21 kc, 20 kc, and 19 kc.

If, for this example, the low selectivity 737 transistor set tuned to 610 kc is considered, it is seen from the selectivity curve (Figure 2) that for 590 kc carrier (and approximately also for $\pm$ 1 kc sidebands) that the receiver will attenuate these signals by 45 db more than the 610 kc signal it is tuned to. Now assume that the 590 kc signal is 30 db stronger than the 610 kc signal. Since the receiver is tuned to 610 kc its response to the 590 kc signal is 45 db less than it is to the 610 kc signal. Therefore the 590 kc signal, as seen at the input to the 2nd detector, will be 30 db -45 db = -15 db below the desired 610 kc signal. This sets the condition for demodulating the 590 kc signals as sidebands (19 kc, 20 kc, 21 kc) of the 610 kc desired signal. Since the audio response of the detector and audio amplifier is quite poor at these frequencies it is certain that the interference of the 590 kc signal at the loudspeaker terminals will be very low indeed. This is confirmed in Tables I and II. This effect can properly be called <u>audio selectivity</u> against adjacent channel interference.

<u>Caution</u> - This effect will only prevail so long as the second detector input at the <u>desired carrier is larger than the interference</u>. Also, the A. G. C. action of the receiver will not be affected by the interfering signal so long as the desired signal at the second detector is larger than the interfering one, i. e., 5 to 10 times larger.

From the above measurements and discussion it is believed that so far as the <u>subject matter discussed</u> is concerned there will be:

1. No trouble from receiver blocking for ratios of as high as 30/1 between 590 kc and 610 kc signals.

2. No crosstalk in the output of the receivers of sufficient amplitude to be objectionable at the loudspeaker.

(C) CROSSTALK FROM OUT OF BAND HARMONICS OF INTERFERING CARRIERS SIDEBANDS (SPURIOUS)

This is a subject which, curiously, there is very little written data on even though back in 1941 it was discussed in detail in a comprehensive article entitled "Broadcast Receivers: A review by Rust, Keall, Ramsey & Sturley in the Journal of IEE, June 1941."

In some respects this type of interference can be considered similar to co-channel interference in the sense that(the spurious frequencies) - harmonics of the side frequencies of the interfering double adjacent channel signal will lie in the pass band of the receiver tuned to the desired channel.

For this situation it is clear that the receiver selectivity will give no immunity against those undesired sideband harmonics which lie within the pass band of the receiver tuned to the desired channel. For example, assume the interfering signal at 590 kc with 30 times the field strength of the desired signal at 610 kc. Assume further that the 590 kc carrier is 100% modulated by a 4 kc sine wave. Further assume that the total distortion at 100% modulation at 4 kc is 5% and that the fourth harmonic distortion of this 4 kc, i. e., 16 kc, is 1%. (This is a highly improbable condition for normal music modulation but is suitable as an example.) Now a 16 kc side frequency on the 590 kc carrier will be at 606 kc and 574 kc. The 606 kc harmonic side frequency will be within the pass band of the receiver tuned to 610 kc and will be demodulated as a 4 kc signal.

The amplitude of this side frequency harmonic as seen in the output of the receiver tuned to 610 kc will, in this example be +30 db, -6 db, -40 db, -5.5 db = -21.5db as strong as the(carrier at 610 kc) i. e., the equivalent of about 9% modulation.

The only way to overcome this type of interference is in some manner to reduce the interfering transmitter's output to the antenna of the harmonics of its higher frequency side bands (spurious out of band radiation). This can be done in several ways.

1. Compatible single side band with radiated side bands below the carrier (590 kc).

2. Bandpass R. F. filter between the transmitter output and input to antenna system.

3. Limit interfering transmitter's modulating frequencies. (Filter on program input)

4. Limit negative going over modulation.

The first method - compatible single side band is discussed in a recent article on this subject by Kahn in the October 1961 Proceedings IRE. This system has been field tested to a limited degree and as far as adjacent channel interference reduction is concerned it has proven itself to be effective. (It is reported by Kahn that CBC has purchased one of his CSSB units for its Montreal station CBM).

An earlier version of CSSB was field tested at KDKA (1020 kc) with good results as far as removing adjacent channel sky wave interference from WBZ (1030 kc). There was no audience reaction, either positive or negative - they were unaware of when D. S. B. or CSSB was in use.

The use of R. F. band pass filters on the output of the transmitter is practical although not normally practiced at present. (Rules requiring out of band radiation to be reduced to 60 db below the carrier's level are generally not met) Figure 5 shows the circuit of a typical, practical R. F. filter designed to be connected between the output of the transmitter and the antenna. Figure 6 shows its electrical characteristics. A more sophisticated design could improve the shoulders on this filter if it appeared desirable. However, audio equalization of the program input to the transmitter probably could more easily flatten the higher audio frequency output delivered to the antenna. This filter gives 26 db attenuation to harmonics of side frequencies 15 kc above and below 590 kc.

Assuming, in a manner similar to the previous example, that the 590 kc carrier is 30 times the 610 kc desired signal and that the modulation frequency is 4 kc at 100% on the 590 kc carrier, and that the fourth harmonic distortion is 1%, then using the R. F. filter, the level of the interfering 16 kc side frequency harmonic (4 kc as seen by receiver tuned to 610 kc) will be with respect to the 610 kc carrier level =
+ 30 db, -6db, -40 db, -5. 5 db, -27 db = -49. 5 db.

This is more than ample protection, and is, for many receivers, below the receiver noise level. The same procedure can be followed for other modulating frequencies and out of band harmonics which will indicate that an R. F. filter with the response indicated in Figure 6 will more than meet -26 db down standards. (i. e., co-channel 20/1)

There are however other factors which should be discussed which will indicate that with normal music programming the modulating side frequencies (harmonics of 3 to 6 kc) will be lower than predicted above. Also, because of receiver cutoff at audio frequencies slightly above 5 kc, their effect will be reduced even further to a point where in the majority of receivers the R. F. filter on the output of the transmitter appears to be needed only as an extra safe guard against heavy over modulation of the interfering carrier. This is particularly true if the interfering carrier to desired carrier is between 10/1 and 5/1 (approximately 2000 homes in Toronto will have interfering carrier levels of 15/1.) All others will be lower and the majority of population in the Toronto metropolitan area will have ratios between 5/1 and 8/1.)

(D) TYPICAL MODULATION MUSIC - PROGRAMMING

The largest segment of time allotted to a specific type of program is to music. Figure 7 shows the frequencies and amplitudes of typical recorded music as discussed by Voil-IRE March 1950 - Some Problems of Disc Recording.

Using this data,as plotted in Figure 7, and the selectivity curve for the low selectivity Model 737 transistor receiver permits an estimate to be made of the level of the expected side bands as seen by the 2nd detector of this receiver when receiving music program in accordance with Voil's music curve. This estimate, (a calculation) is shown on Figure 8. It represents the peak level at any given modulating frequency up to 7 kc that one would expect on the average to occur with a music program. It is seen that for modulating frequencies between 4 and 7 kc modulating levels are between 11% to 3 %.

It should also be noted that for these frequencies the desired signal is only 22 db above noise for 4 kc and 9 db for 7 kc. It is clear that interference at these frequencies need be only as low as noise, i. e., -40 db below the desired carrier, (not 26 db below the desired side band if it is not 26 db above noise.)

Since the interfering carrier can be assumed to be modulated in the same manner as the desired carrier, i. e., with music, it is quite improbable that for the interfering carrier modulation at 4 kc and above to be higher than 15%. The music curve indicates on the average at 4 kc it will be about 15% and at 8 kc 10%.

These lower levels of modulation will quite possibly lower the harmonic distortion of the interfering transmitter and therefore the out of band harmonics of side frequencies generated by modulating frequencies between 4 kc and 8 kc.

Finally, the curves of the audio response of home type receivers indicate serious deficiencies above 5 kc.

Kahn (Oct. 1961 IRE) shows measurements on an RCA table model receiver, model 9-C-7EE, to be 30 db down at 8 kc.

However, because of current practices of broadcasters to modulate heavily with the possibility of over modulating in the negative direction which will cause spurious out of band radiation, it is probably prudent to install the transmitter output R. F. filter as a precautionary measure.

The fourth item, limit negative going modulation to slightly less than 100% will reduce spurious very substantially as over modulation in the negative direction can result in considerable magnitude of high frequency out of band frequencies. This is currently practiced at CKEY using what is called a negative compressor. With this device it is almost impossible to over modulate in the negative direction and out of band spurious is minimal.

SOLUTION OF PROBLEM

While it appears that there will be minimal need for other than normal operating practices at the 590 kc transmitter, the following additional protective procedures will be used to reduce any remaining minimal interference to CKTB by CKEY's operation on 590 kc.

1. If permitted by DOT, CKEY will install the latest version of Kahn CSSB equipment and operate with all modulation on the lower side of 590 kcs. (A study of the increased sideband level on the lower side of 590 kcs (+ 6 db) shows no interference to any 580 kc station, Canadian or American.)

2. If operation with CSSB is not authorized, CKEY will install the following equipment at its transmitter plant:

   a. R. F. bandpass filter on output of transmitter attenuating out of band spurious by at least 20 db.

   b. Install and use a negative modulation compressor to assure no negative modulation beyond 95%.

   c. Install and use low pass audio filter on transmitter input with cutoff at 8 kc.

TABLE I

830-T-5 Receiver

5 Tube AC/DC

Desired signal 500 uv (610 kc)
Undesired signal 5000 uv (590-605 kc)

Interfering signal frequency	Receiver output db
605 kc	+ 6
600 kc	- 24
595 kc	<- 40
590 kc	<- 40

Desired signal 500 uv (610 kc)
Undesired signal 20,000 uv (590 to 605 kc)

Interfering signal frequency	Receiver output db
605 kc	+ 13.5
600 kc	+ 4.5
595 kc	- 19.0
590 kc	- 38.0

Desired signal 500 uv (610 kc)
Undesired signal 100,000 uv (590-605 kc)

Interfering signal frequency	Receiver output db
605 kc	+ 14
600 kc	+ 10.8
595 kc	- 4.8
590 kc	- 25.0

TABLE I

Westinghouse
830-T-5

5 Tube AC/DC Receiver

Desired signal 5000 uv (610 kc)
Undesired signal 100,000 uv (590-605 kc)

Interfering signal frequency	Receiver output db
605 kcs	+ 6
600 kcs	- 11
595 kcs	- 46
590 kcs	<- 50

Desired signal 10,000 uv (610 kcs)
Undesired signal 100,000 uv (590-605 kc)

Interfering signal frequency	Receiver output db
605 kc	+ 2
600 kc	- 25
595 kc	< - 50
590 kc	< 50

Desired signal 20,000 uv (610 kc)
Undesired signal 100,000 uv (590-605 kc)

Interfering signal frequency	Receiver output db
605 kc	- 2.2
600 kc	- 38.2
595 kc	<- 50
590 kc	<- 50

TABLE II

Westinghouse
737 Transistor Receivers

500 uv desired (610 kc)
5000 uv undesired (590 kc - 605 kc)

Interfering signal frequency	Receiver output db
605 kc	+ 6.5
600 kc	- 15
595 kc	- 36
590 kc	- 38

Desired signal (500 uv) 610 kc
Undesired signal 20,000 uv (605 to 590 kc)

Interfering signal frequency	Receiver output db
605 kc	+ 6
600 kc	+ 6
595 kc	- 7.5
590 kc	- 32

Desired signal (500 uv) 610 kc
Undesired signal 100,000 uv (605 to 590 kc)

Interfering signal frequency	Receiver output db
605 kcs	+ 5
600 kcs	+ 5
595 kcs	+ 5
590 kcs	+ 2
585 kcs	- 8
580 kcs	- 23

TABLE II

737 - TRANSISTOR

Desired 5000 uv (610 kcs)
Undesired 100,000 uv (590 to 605 kcs)

Interfering signal frequency	Receiver Output db
605 kc	+ 2.1
600 kc	- 3.8
595 kc	- 38
590 kc	< - 50

Desired 10,000 uv (610 kcs)
Undesired 100,000 uv (590 to 605 kc)

Interfering signal frequency	Receiver output db
605 kcs	+ 0.8
600 kcs	- 26.5
595 kcs	- 51.0
590 kcs	< 50

Desired 20,000 uv (610 kcs)
Undesired 100,000 uv (590 to 605 kc)

Interfering signal frequency	Receiver output db
605 kcs	- 3.5
600 kcs	- 43
595 kcs	< - 50
590 kcs	< - 50

FINAL PROOF OF PERFORMANCE

FOR

RADIO STATION CKEY

TORONTO, ONTARIO

5000/1000 WATTS DA/2

Prepared By:

D.B. Williamson, P. Eng.,
Consulting Engineer.

March 15, 1960.

PROFESSIONAL
D. B. WILLIAMSON

1. STATEMENT OF INTENT

This engineering report constitutes the Final Proof of Performance for Radio Station CKEY, Toronto, Ontario. This Proof of Performance is supplied as evidence that replacement of steel towers, portions of antenna phasor and phase sampling loops have restored the international requirements of the antenna array. Complete data is supplied to show that the antenna system is operating as authorized.

2. ENGINEER RESPONSIBLE FOR THE BRIEF

D.B. Williamson, P. Eng. is the engineer responsible for the antenna set-up and adjustment of the array. All field strength measurements were made by A.C. Gardiner and A. Taylor.

3. DISCUSSION OF MEASUREMENT METHODS

a). Efficiency and Shape of Pattern

The efficiency of the antenna was measured by running eight radials at 45° intervals approximately. The pattern shape was determined by measuring the ratio of directional to non-directional field intensities at convenient distances from the transmitter. All results were recorded in the tables.

b). Radial Measurements

All measurements were taken with a direct reading RCA WX-2D Field Intensity Meter Serial 1332 calibrated September, 1959 by Nems Clarke Inc. Care was taken to select measurement points in open country away from fences and overhead wire lines, etc. A number of points were selected at each location to lessen the possibility of local errors. The readings were plotted on standard F.C.C. log-log paper. Each radial was run to the 0.5 mv/m contour in all directions.

c). Conductivity and Contours

Conductivity values were determined from plots of field intesity measurements using standard F.C.C. conductivity sheets. Field intensity contours were determined from the plotted curves of field intensity, the distance to the various contours being scaled directly from the curves.

d). Antenna Impedance

Impedance values in the system were measured directly with a General Radio R.F. Bridge Serial 897. Impedances of the antenna towers were measured at 10 kc. intervals from 530 to 630 kcs. The measured values of impedance were plotted in linear form and an average curve was drawn through the plotted points.

8. CONCLUSIONS

This Final Proof of Performance shows the antenna system at CKEY to be operating within the requirements of the technical assignment.

Some conductivity changes have occurred since 1947, the date of the original Proof of Performance, notably in the Lake Ontario area where a substantial increase is noted. There appears to be some discrepancy between the power output as calculated at the common point and that calculated at the tower bases. Due to the extremely low self impedances at the tower bases it is impossible to obtain accurate measurements of these values. One figure accuracy is all that can be expected under these conditions. The power feed to the system is the more accurate measurement of the two.

DESCRIPTION OF ARRAY

Station Call: CKEY   Main Studio: Toronto, Ontario

Frequency: 580 kcs. Power: 5000/1000 watts Time: Unlimited

Class: III DA/2

Geographical Location: North Latitude: 43° 44' 23"

West Longitude: 79° 15' 30"

Antenna Characteristics: Authorized for Day & Night Operation DA/2

3 elements, guyed, uniform cross-section, insulated for series feed, South tower common to night and day arrays.

Tower:	South (1)	Center (2)	North (3)
Height above insulators:	200' (45°)	200' (45°)	200' (45°)
Overall height above ground:	204.5'	204.5'	204.5'
Spacing:	530' (112.5°)	530' (112.5°)	
Night Phasing:	0	not used	∠ 10
Night Field Ratio:	1.0	not used	1.0
Day Phasing:	0	-97	not used
Day Field Ratio:	1.0	0.66	not used

Ground System: 120 radials per mast each 424' long except for common chords between towers.

Effective Field: Theoretical: 405 mv/m @ 1 mi. for 5 KW.

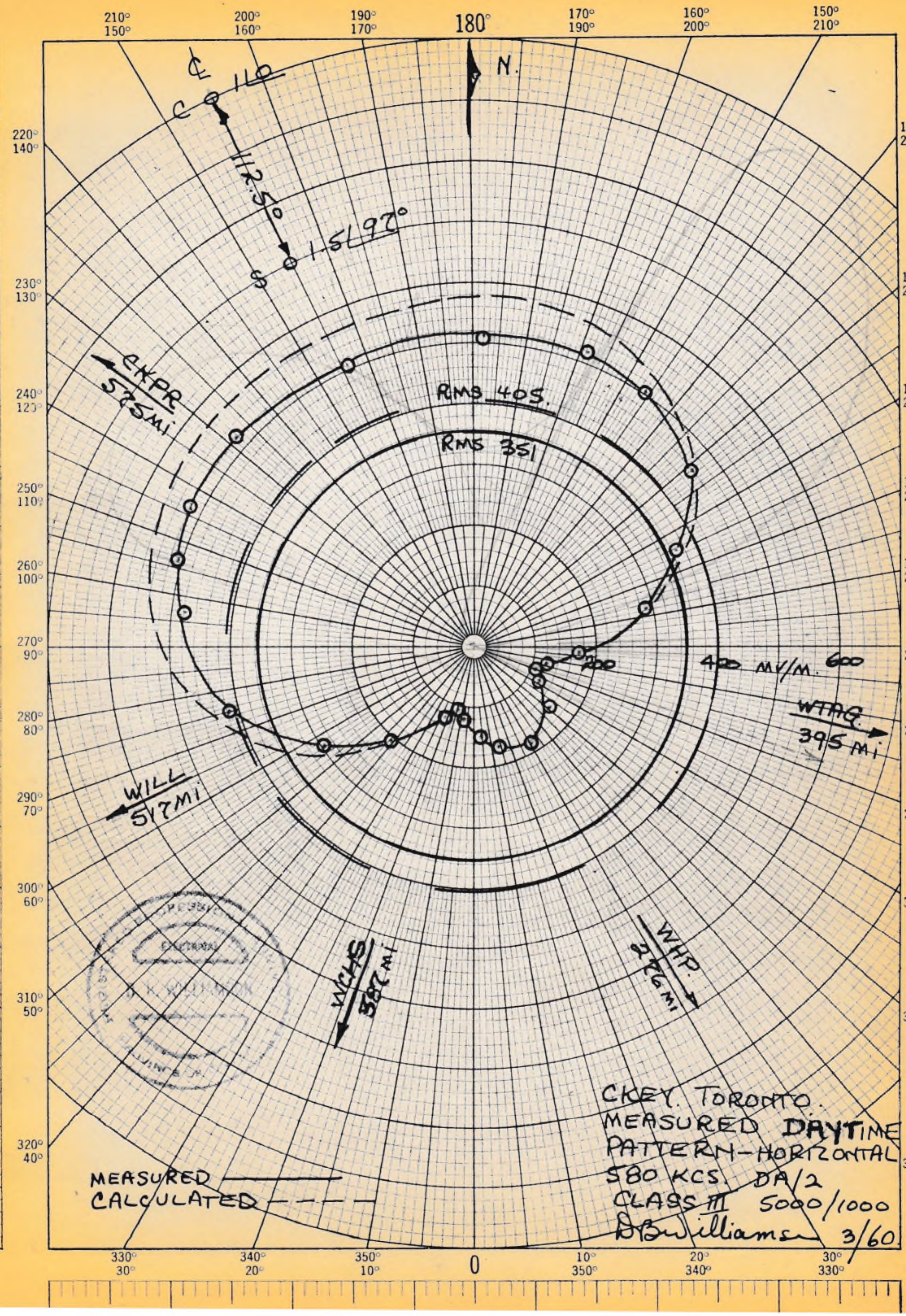
(181 mv/m @ 1 mi. for 1 KW.)

Measured: 351 mv/m @ 1 mi. for 5 KW.

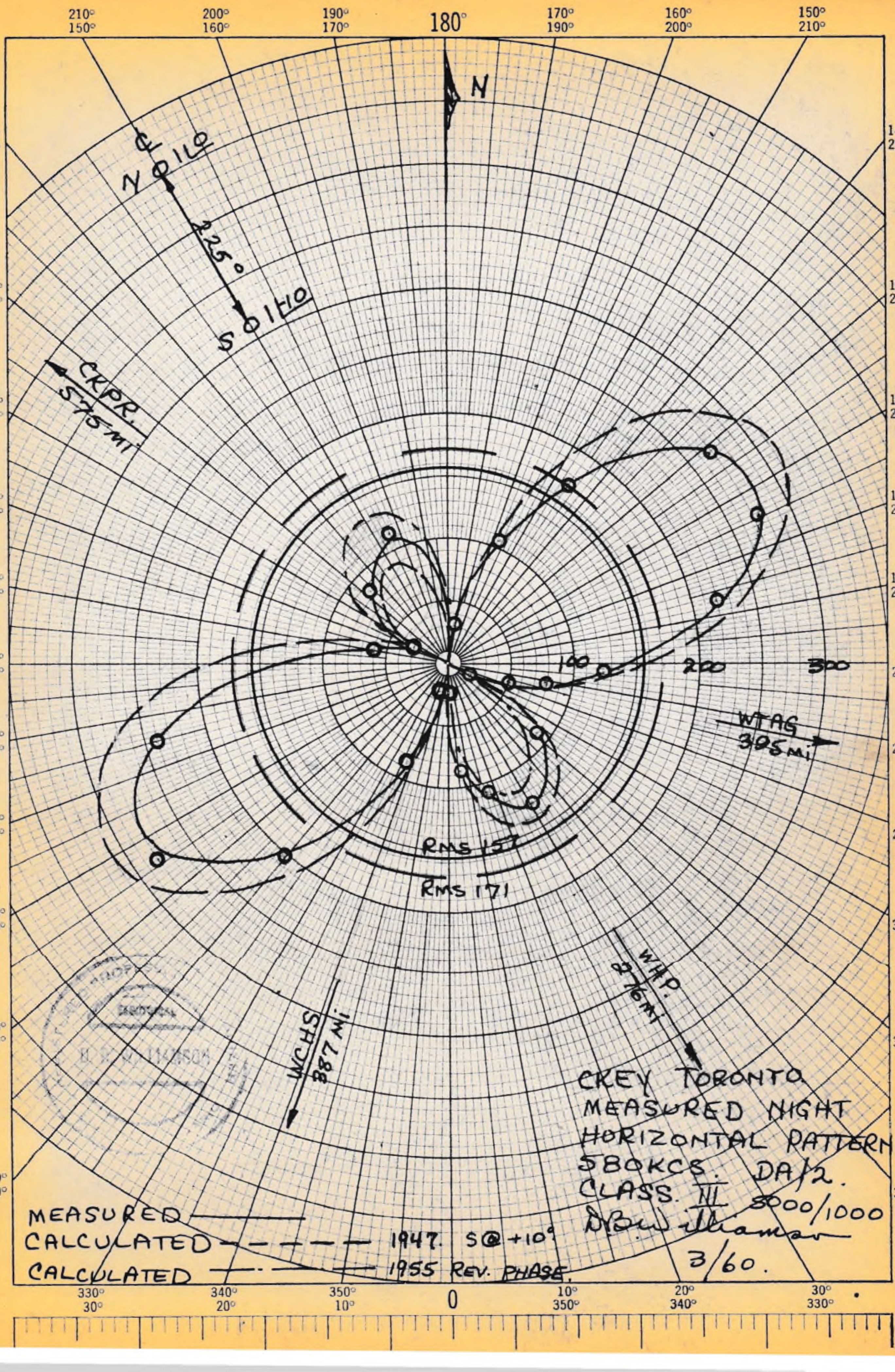
(157 mv/m @ 1 mi. for 1 KW.)

Orientation: North and South towers 30° W. of N.

Center and South towers 25° W. of N.



CKEY. TORONTO.
MEASURED DAYTIME
PATTERN-HORIZONTAL
580 KCS. DA/2
CLASS III 5000/1000
D.B. Williams 3/60
MEASURED
CALCULATED
RMS 405.
RMS 351
200
400 MV/M. 600
N.
℄ 110
C
S
112.5°
1.5∠92°
CKPR 525 Mi
WILL 517 Mi
WTAG 395 Mi
WCHS 387 mi
WHP. 276 mi



G9-31
POLAR CO-ORDINATE
CANADIAN CHARTS AND SUPPLIES LTD.
OAKVILLE, ONT.

See [illegible] of 19-9-60
See B[illegible] 13-12-60 – Replace

(CORRECTED DESCRIPTION SHEET)

STATION:	CKEY	MAIN STUDIO:	Toronto, Ontario		
POWER:	1 Kw. 5Kw-[illegible]	FREQUENCY:	580 Kc.	CLASS:	III-B

LOCATION: Toronto, Ontario

North Latitude: 43° 44' 23"

West Longitude: 79° 15' 30"

ANTENNA: Authorized for Day and Night Operation (DA-2)

Three elements; two elements day; two elements night; south tower common to both night and day arrays; uniform cross-section, guyed, vertical steel towers.

TOWER:	NORTH	CENTRE	SOUTH
Height above Insulators:	200'	200'	200' (45°)
Spacing:	530' or $112\frac{1}{2}°$ between towers.		
Night Phasing:	10° Lead	-	0°
Night Field Ratio:	1.0	-	1.0
Day Phasing:	-	0°	97° Lead
Day Field Ratio:	-	1.0	1.5

Ground System: 120 radials per mast each 424' long except between towers where radials from adjacent towers are bonded to a bus run midway between towers and at right angles to line of towers. Each radial, #10 AWG Bare Copper Wire, buried 8 inches.

Predicted Effective Field: 405 mv/m (181 mv/m for 1 kw.)

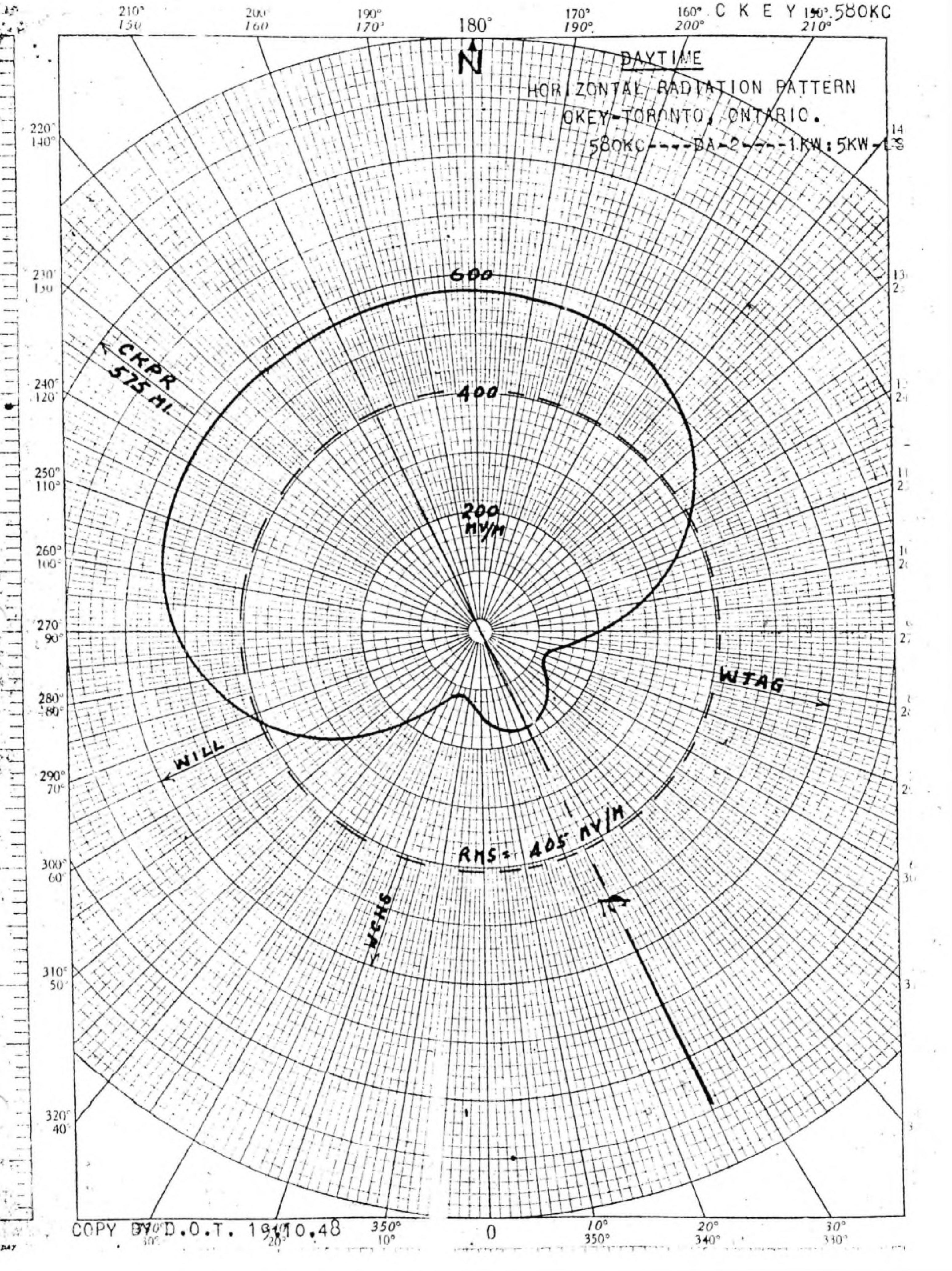
Orientation: North and south towers on a line bearing 30° East of North
Centre and south towers on a line bearing 25° West of North

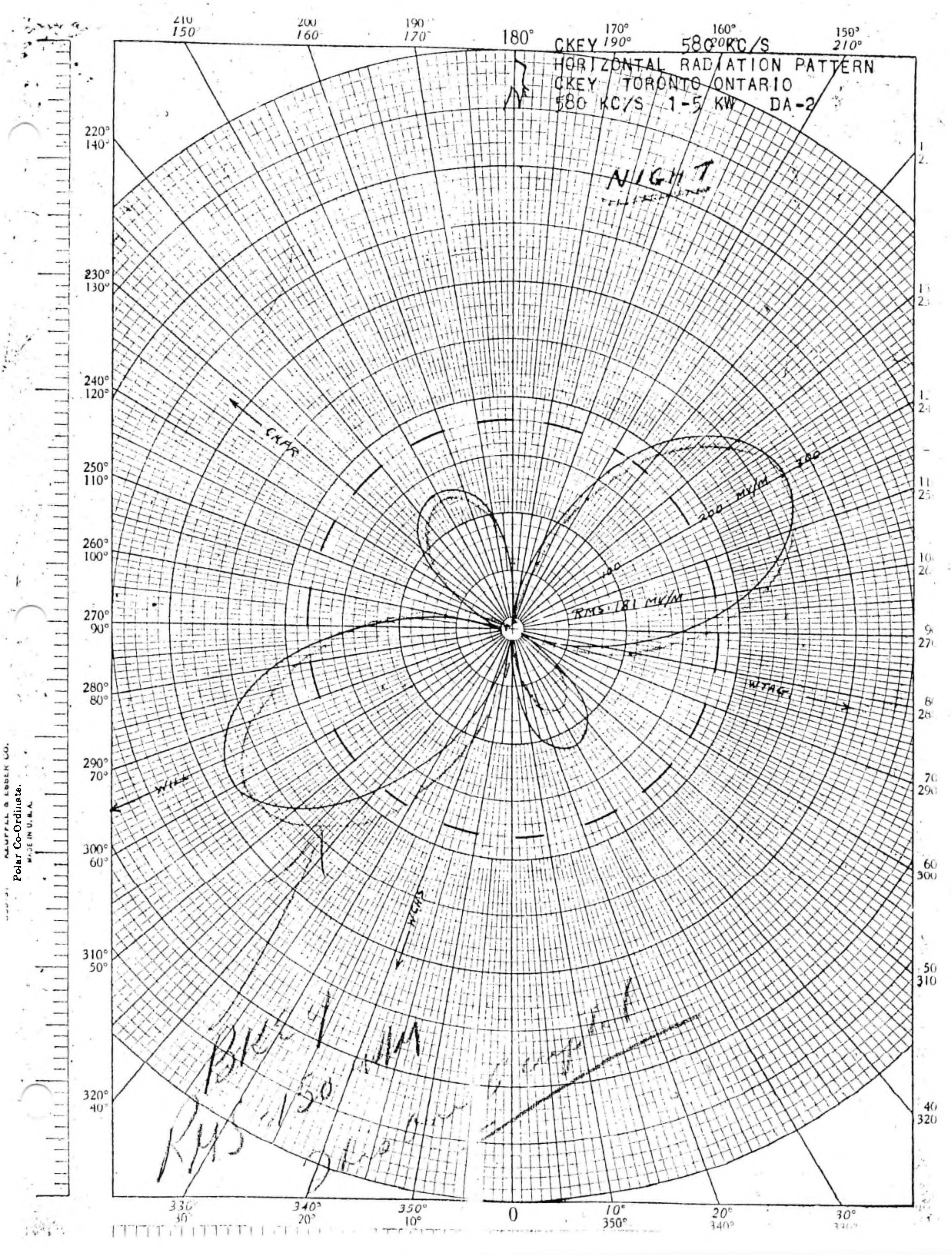
NOTE: This involves only the correction of a typographical error with regard to the night phasing of the station.

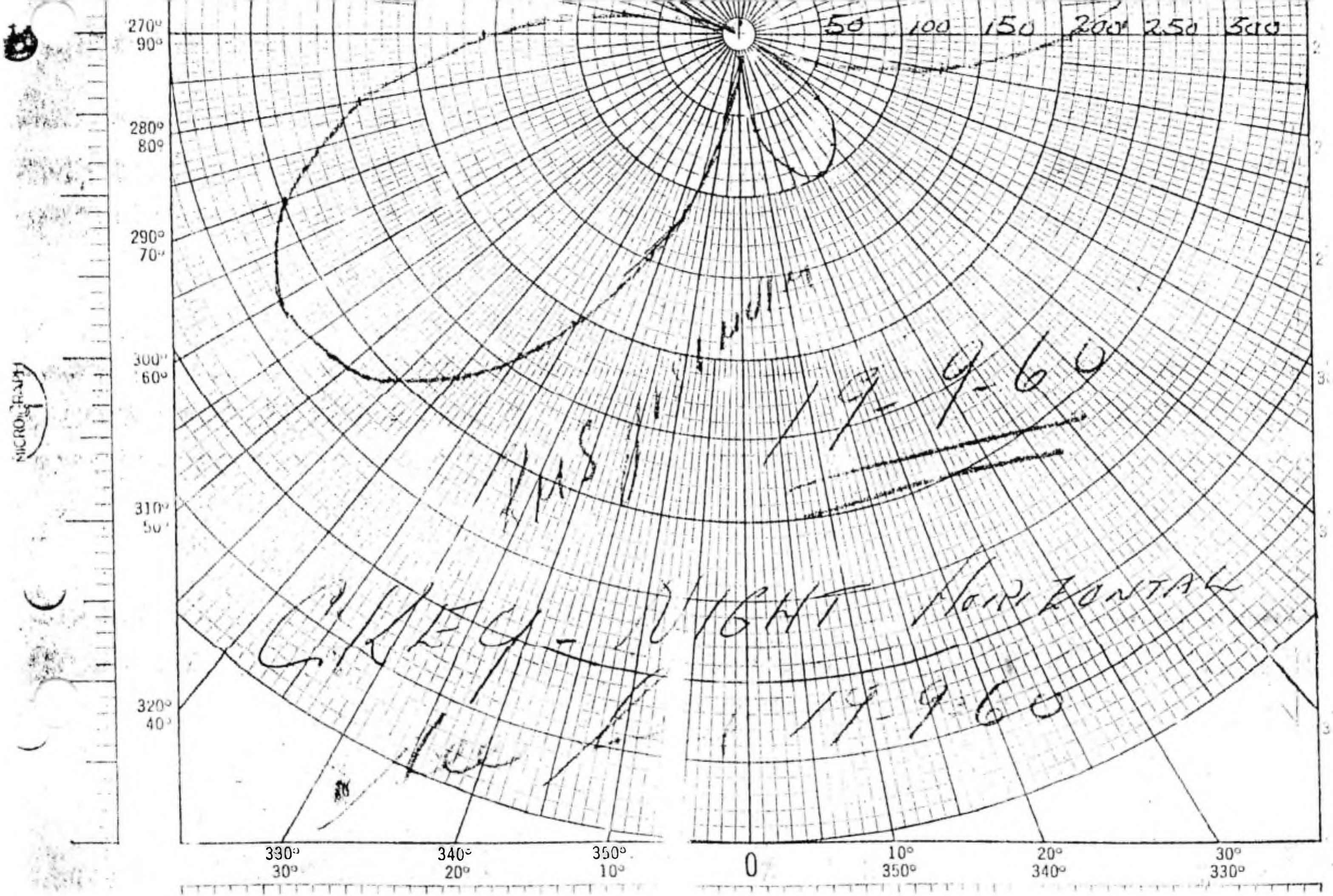
DATE: February 25, 1955.

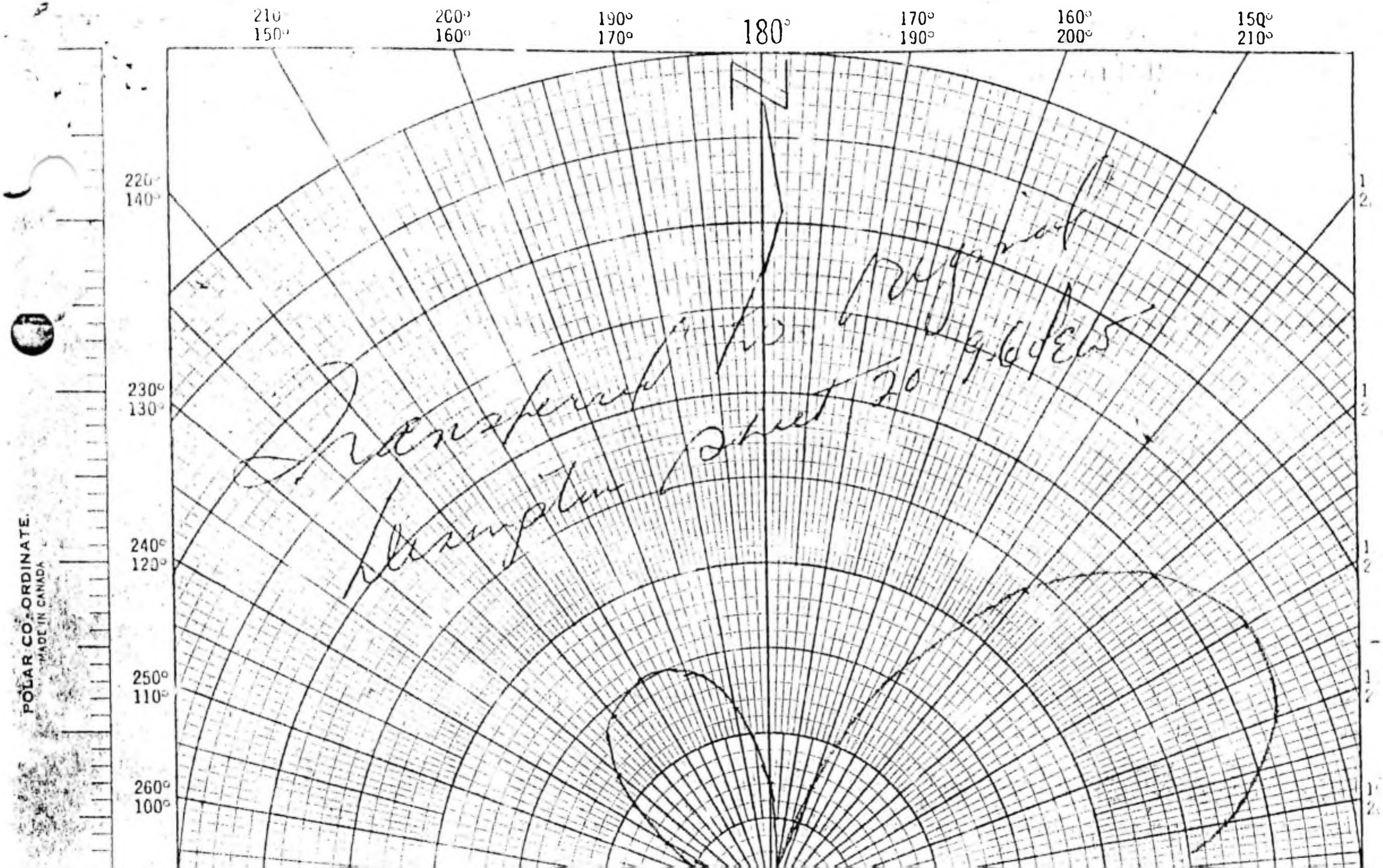
APPROVED

JUL 22 1978


CKEY 580KC
DAYTIME
HORIZONTAL RADIATION PATTERN
CKEY-TORONTO, ONTARIO.
580KC----DA-2----1KW:5KW-LS
600
400
200 MV/M
CKPR 575 MI
WTAG
WILL
RMS= 405 MV/M
WCHS
COPY BY D.O.T. 19/10.48


CKEY 580 KC/S
HORIZONTAL RADIATION PATTERN
CKEY TORONTO ONTARIO
580 KC/S 1-5 KW DA-2
NIGHT
CKFR
200 MV/M
300
100
RMS 181 MV/M
WTAG
WCHS
Polar Co-Ordinate.


MICROGRAPH
270° 90°
280° 80°
290° 70°
300° 60°
310° 50°
320° 40°
330° 30°
340° 20°
350° 10°
0
10° 350°
20° 340°
30° 330°
50 100 150 200 250 300
17-9-60
GREG-NIGHT HORIZONTAL
17-9-60


POLAR CO-ORDINATE.
MADE IN CANADA
180°
Transferred to Original
Template Sheet 20

ENGINEERING BRIEF

FOR A POWER INCREASE,

FREQUENCY CHANGE AND SITE CHANGE

STATION: CKEY - Toronto, Canada

APPLICANT: Shoreacres Broadcasting Co., Ltd.

CONSULTANT: J. Gordon Elder

PROPOSED ASSIGNMENT:

Power:	5KW day and night
Frequency:	590 kc/s
Mode:	DA-1
Class:	111

Date of Submission: July 13, 1961
(revised August 29, 1961)
& Dec., 13, 1961

DESCRIPTION SHEET - DIRECTIONAL ANTENNA

STATION CALL: CKEY

MAIN STUDIO: Toronto, Ontario

FREQUENCY: 590 kc/s

POWER: 5 KW

CLASS: III

TIME: Day and Night

NOTIFICATION LIST NO. DATE:

GEOGRAPHICAL LOCATION OF THE ANTENNA SYSTEM: NORTH LATITUDE: 43° 36' 33"

WEST LONGITUDE: 79° 23' 20"

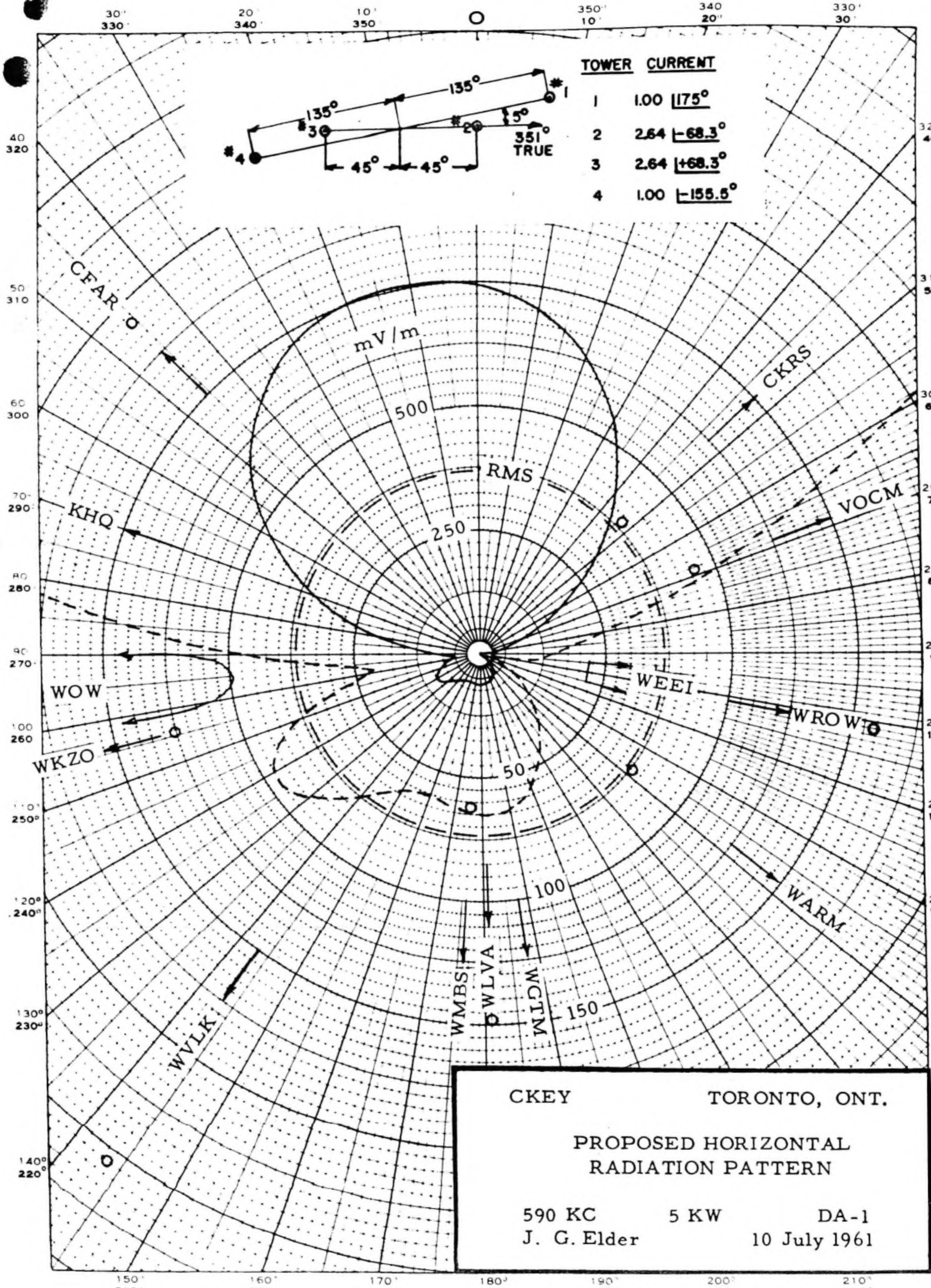
ANTENNA CHARACTERISTICS: Four 1" dia. vertical copper elements, base-insulated, series fed; mounted and insulated within self-supporting, sectionalized steel towers; each top-loaded by a series inductance and hat of 50 ft. dia. Vertical radiation characteristic approx. same as for 45° non-loaded antenna.

ELEMENT	1	2	3	4
HEIGHT	150' (32°.4)	150'	150'	150'
SPACING (from array center)	625' (135°)	208.3' (45°)	208.3' (45°)	625' (135°)
BEARING (from array center)	346°	351°	171°	166°
CURRENT RATIO	1	2.64	2.64	1
PHASING	175°	-68.3°	68.3°	-155.5°

GROUND SYSTEM: Ground screen at base of each tower, 120 radials per tower sunk in lake bottom, radials joined along common chord. #10 AWG bare copper wire. Average length of radials 0.4 wave length.

EXPECTED EFFICIENCY: 165 mV/m for 1 KW
369 mV/m for 5 KW

Figure 1



CKEY TORONTO, ONT.

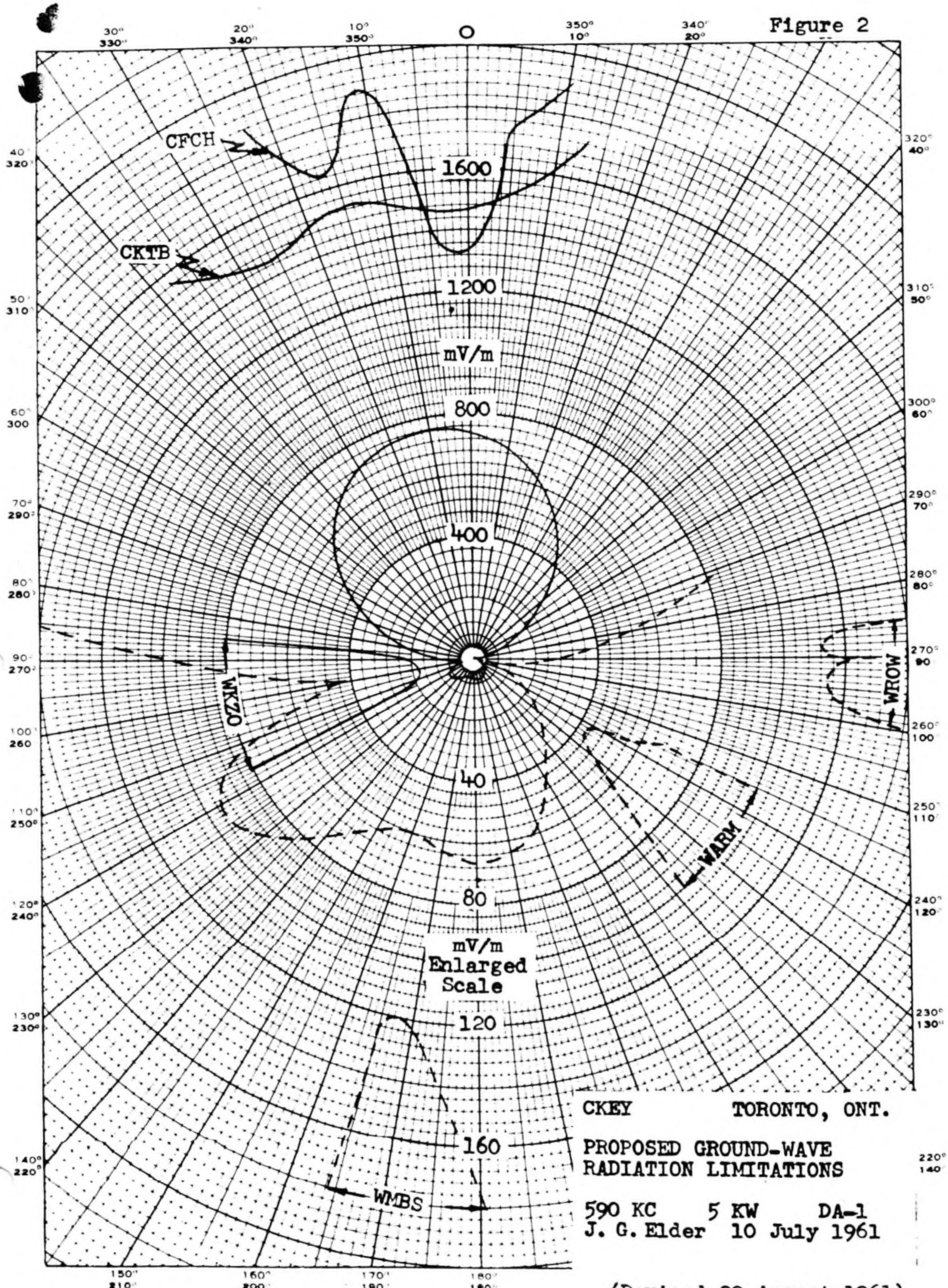
PROPOSED HORIZONTAL RADIATION PATTERN

590 KC 5 KW DA-1

J. G. Elder 10 July 1961

(Revised 29 August 1961)

Figure 2



CKEY TORONTO, ONT.

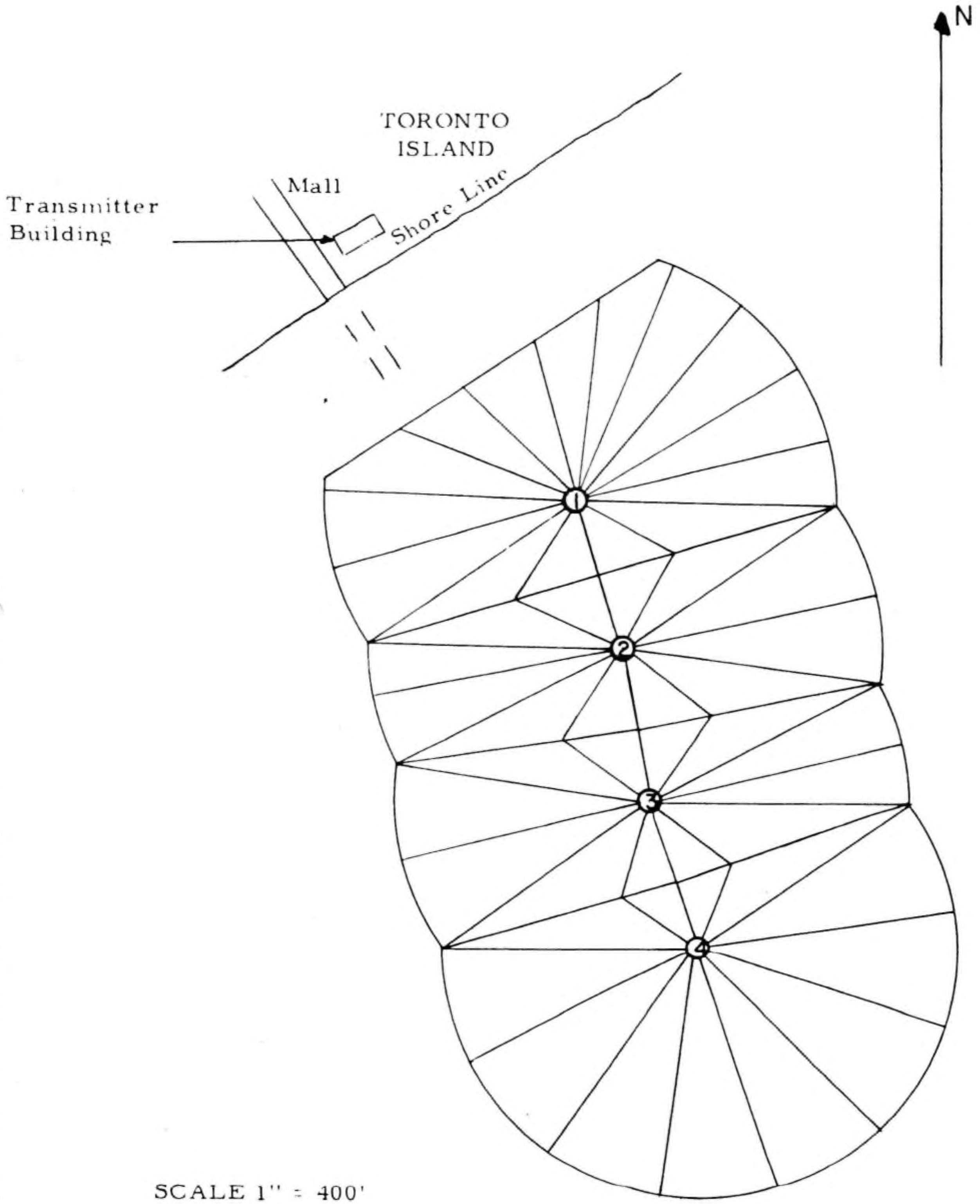
PROPOSED GROUND-WAVE
RADIATION LIMITATIONS

590 KC 5 KW DA-1
J. G. Elder 10 July 1961

(Revised 29 August 1961)

ARRAY AND GROUND SYSTEM

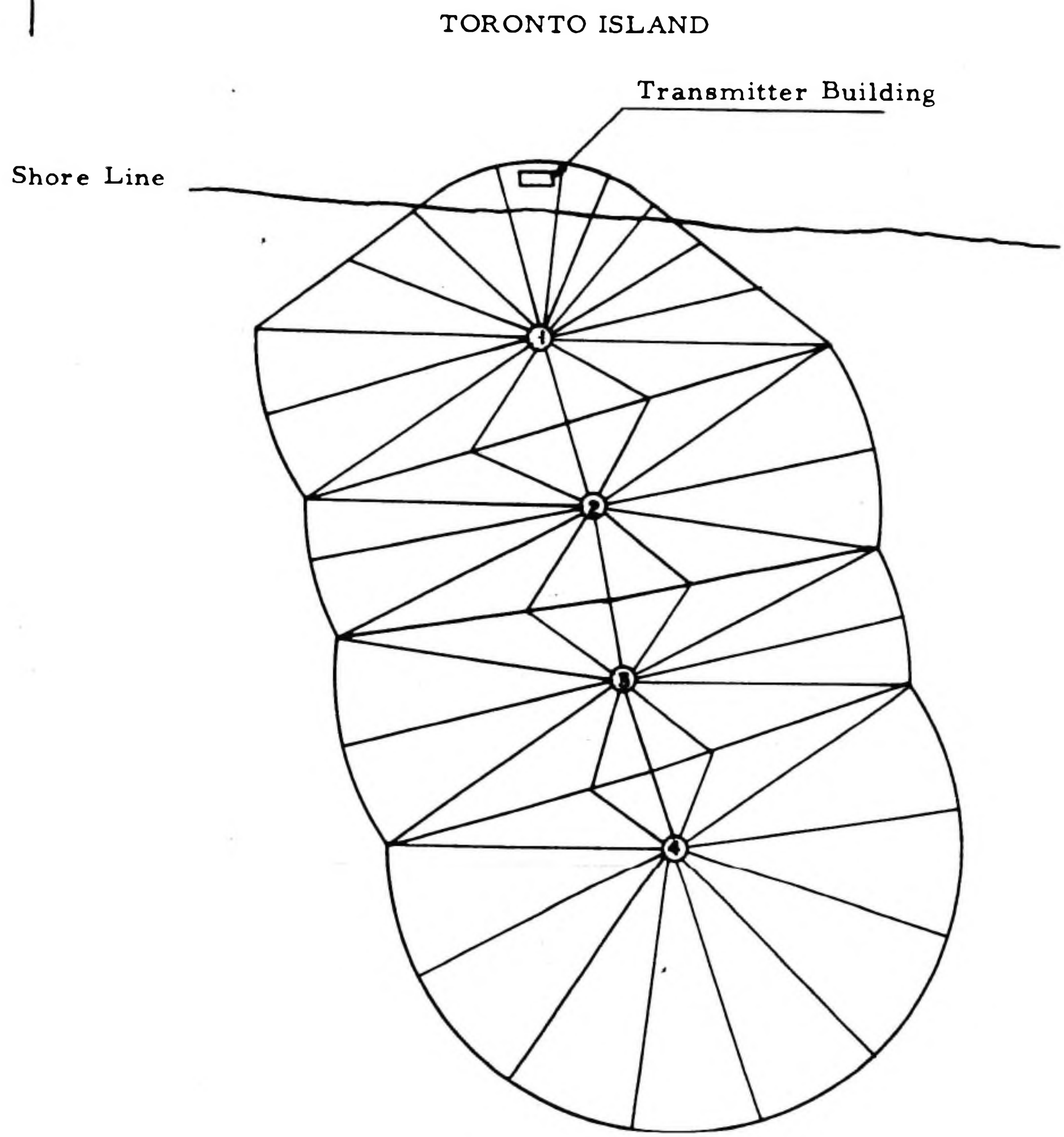
Figure 4



SCALE 1" = 400'

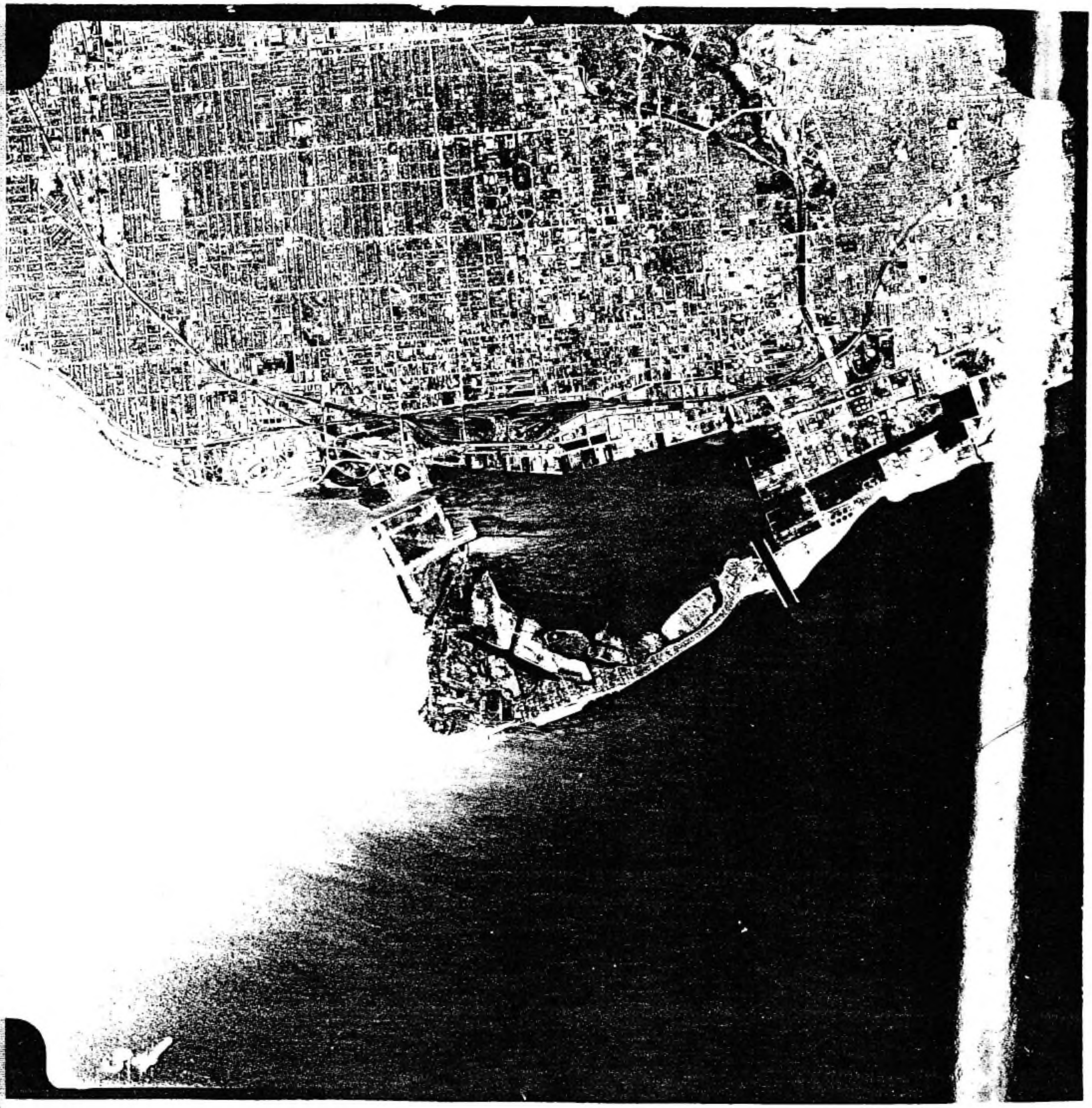
Figure 4A

ARRAY AND GROUND SYSTEM



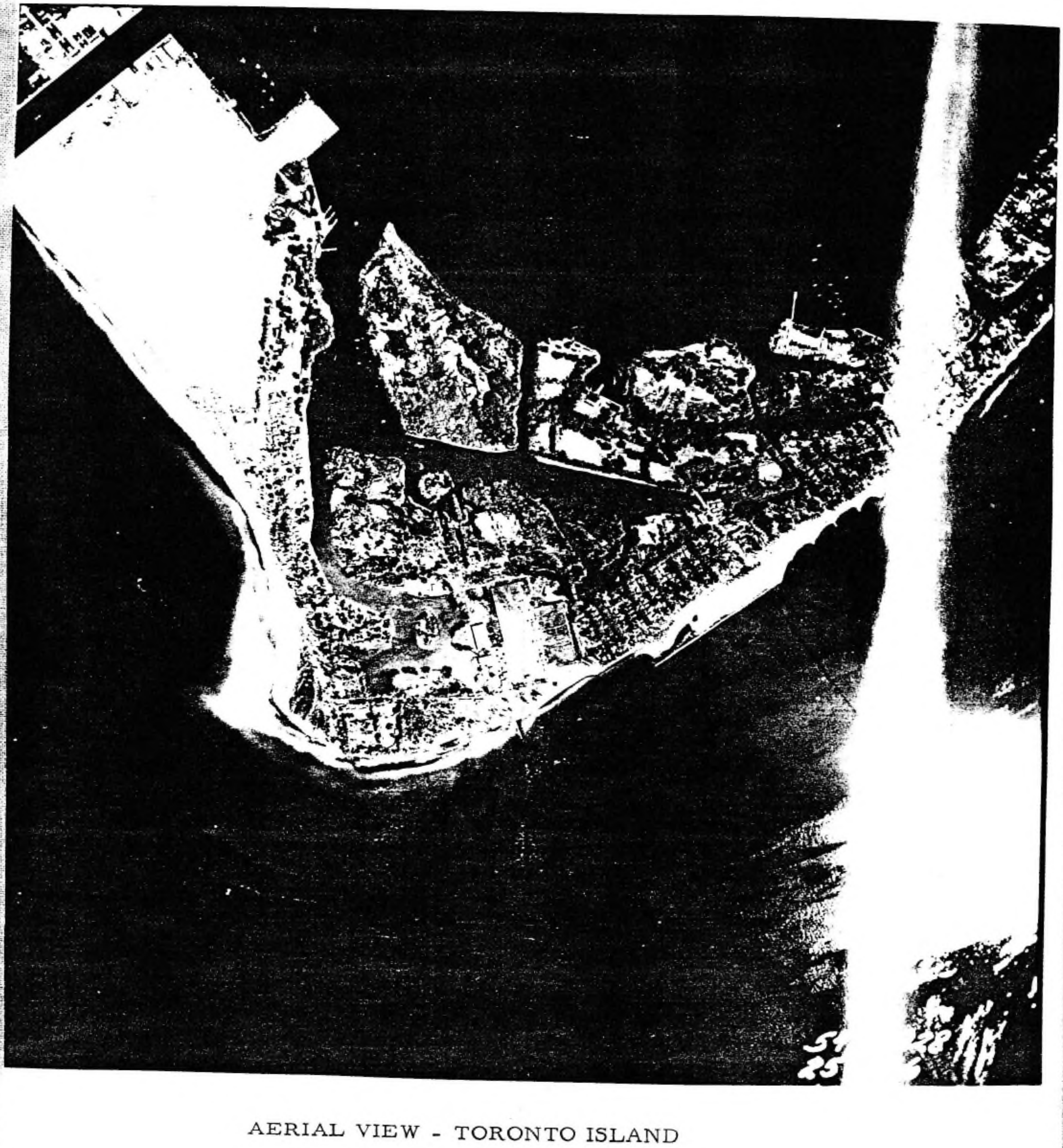
SCALE 1' = 400'

Figure 5-1



AERIAL VIEW - TORONTO ISLAND

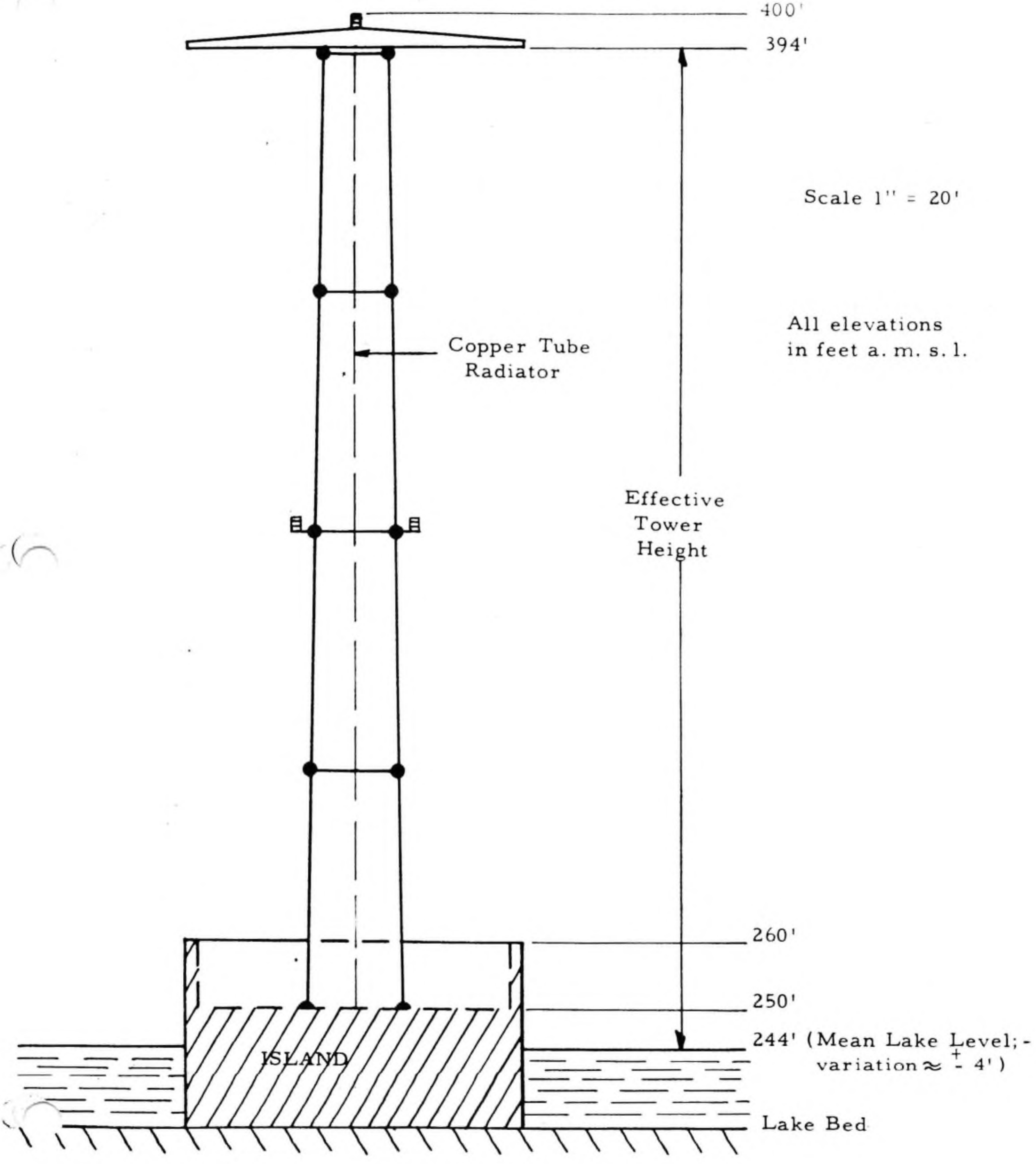
Figure 5-2



AERIAL VIEW - TORONTO ISLAND

Figure 6

TYPICAL ARRAY ELEVATIONS



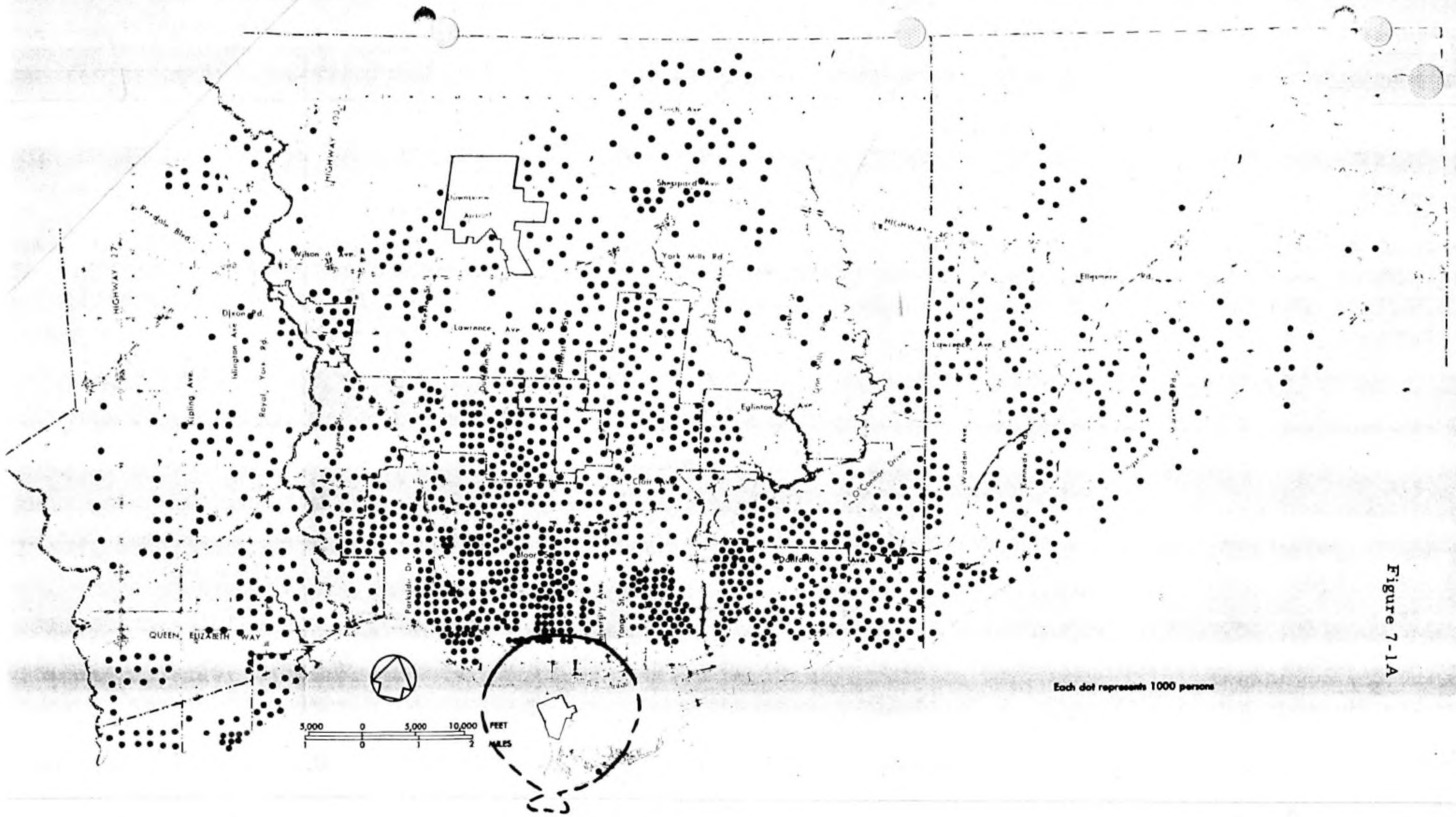
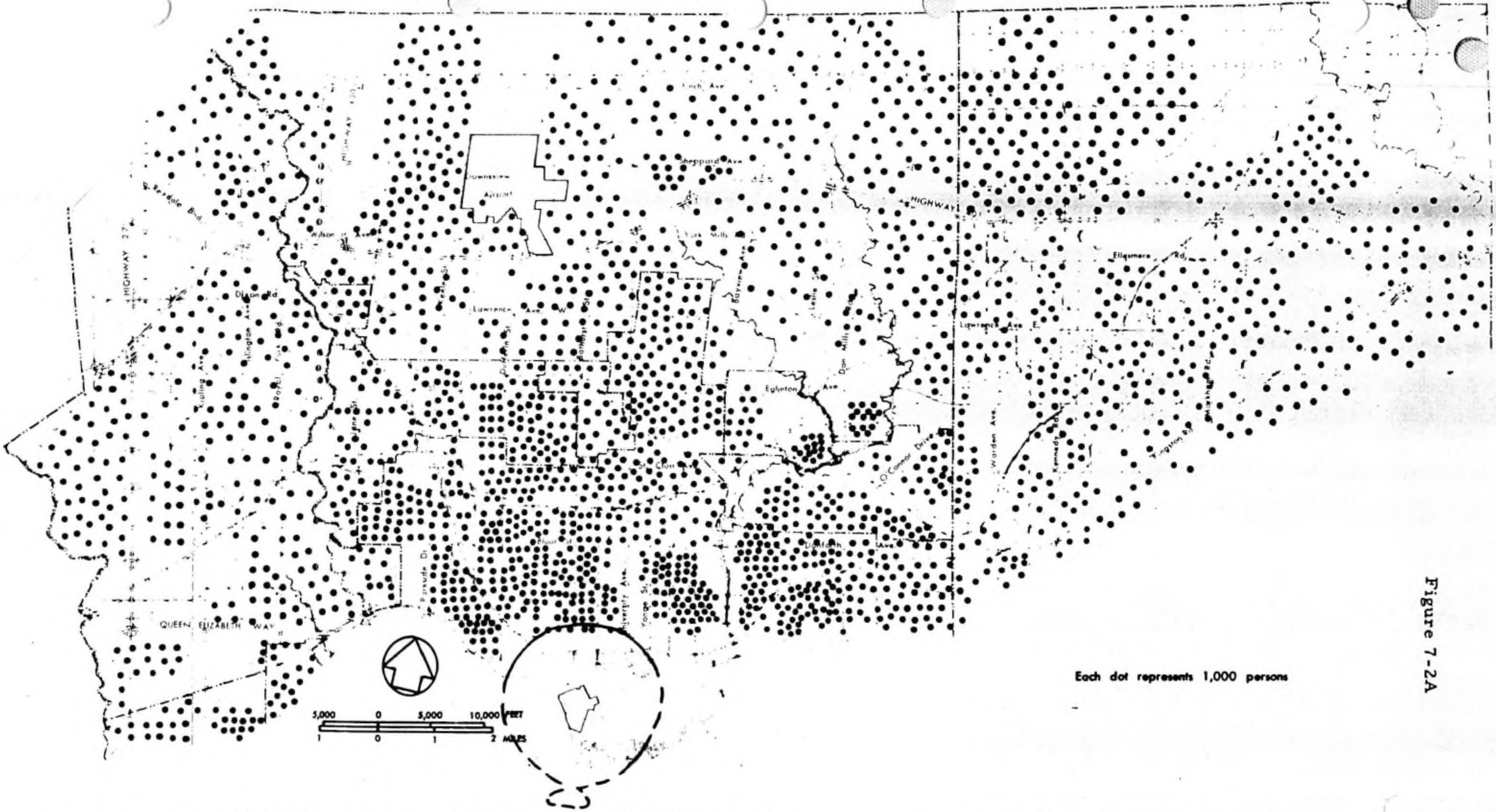


Figure 7-1A

OFFICIAL PLAN OF THE METROPOLITAN TORONTO PLANNING AREA
METROPOLITAN TORONTO PLANNING BOARD SEPTEMBER, 1959

DISTRIBUTION OF POPULATION —1958 PLATE 11



OFFICIAL PLAN OF THE METROPOLITAN TORONTO PLANNING AREA
METROPOLITAN TORONTO PLANNING BOARD SEPTEMBER, 1959

DISTRIBUTION OF POPULATION – 1980 PLATE 12

Figure 7-2A

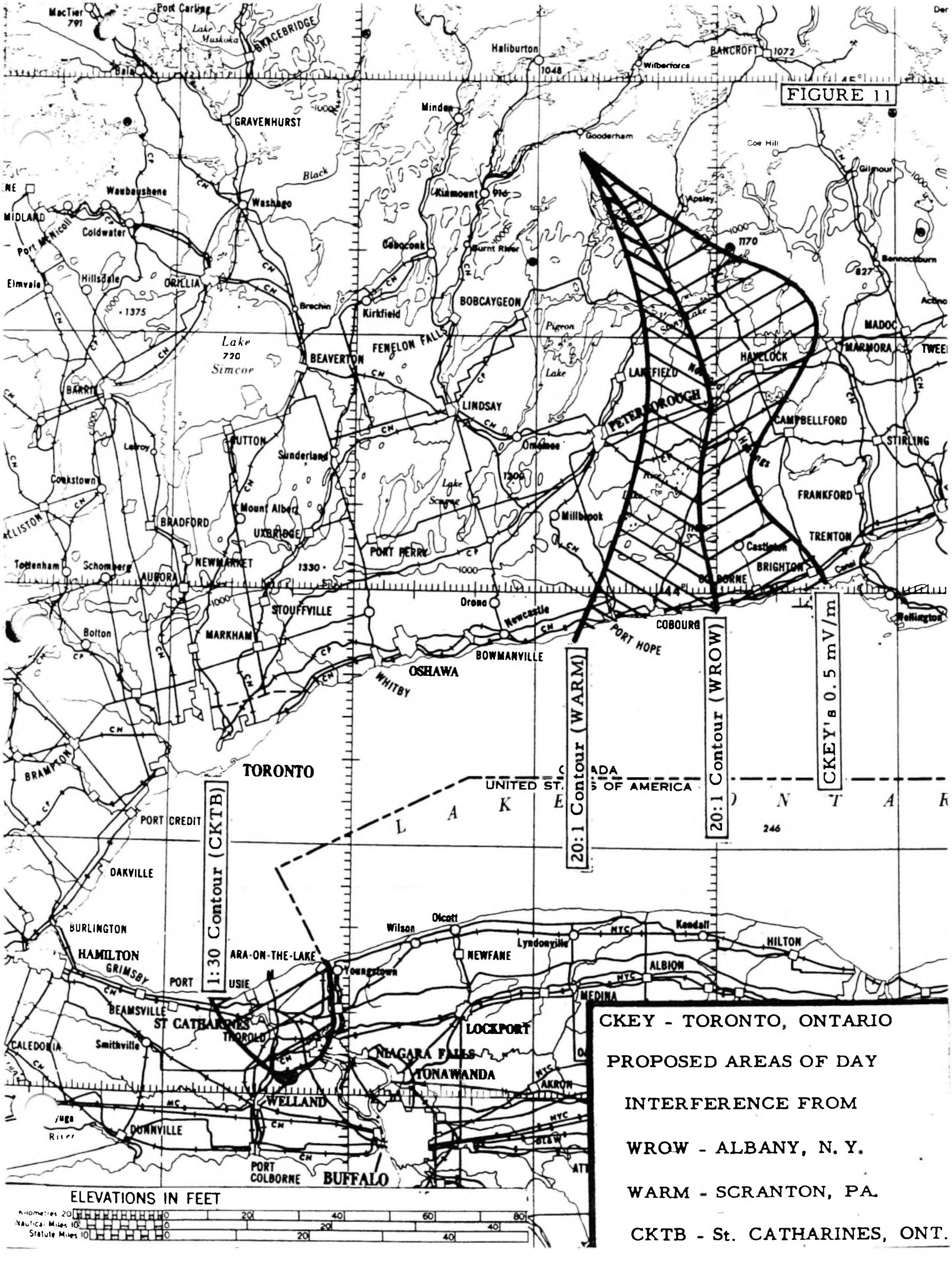


FIGURE 11
20:1 Contour (WARM)
20:1 Contour (WROW)
CKEY's 0.5 mV/m
1:30 Contour (CKTB)
TORONTO
PETERBOROUGH
OSHAWA
BUFFALO
CANADA
UNITED STATES OF AMERICA
ELEVATIONS IN FEET
CKEY - TORONTO, ONTARIO
PROPOSED AREAS OF DAY
INTERFERENCE FROM
WROW - ALBANY, N. Y.
WARM - SCRANTON, PA.
CKTB - St. CATHARINES, ONT.

Computed pattern agrees

DESCRIPTION SHEET - DIRECTIONAL ANTENNA

STATION CALL: CKEY

MAIN STUDIO: Toronto, Ontario

FREQUENCY: 590 kc/s

POWER: 5 KW

MODE: DA-1

CLASS: III

TIME: Day and Night

NOTIFICATION LIST NO. **169** DATE: **March 23, 1962.**

GEOGRAPHICAL LOCATION OF THE ANTENNA SYSTEM: NORTH LATITUDE: 43° 36' 33" WEST LONGITUDE: 79° 23' 20"

ANTENNA CHARACTERISTICS: Four 1" dia. vertical copper elements, base-insulated, series fed; mounted and insulated within self-supporting, sectionalized steel towers; each top-loaded by a series inductance and hat of 50 ft. dia. Vertical radiation characteristic approx. same as for 45° non-loaded antenna.

ELEMENT	1	2	3	4
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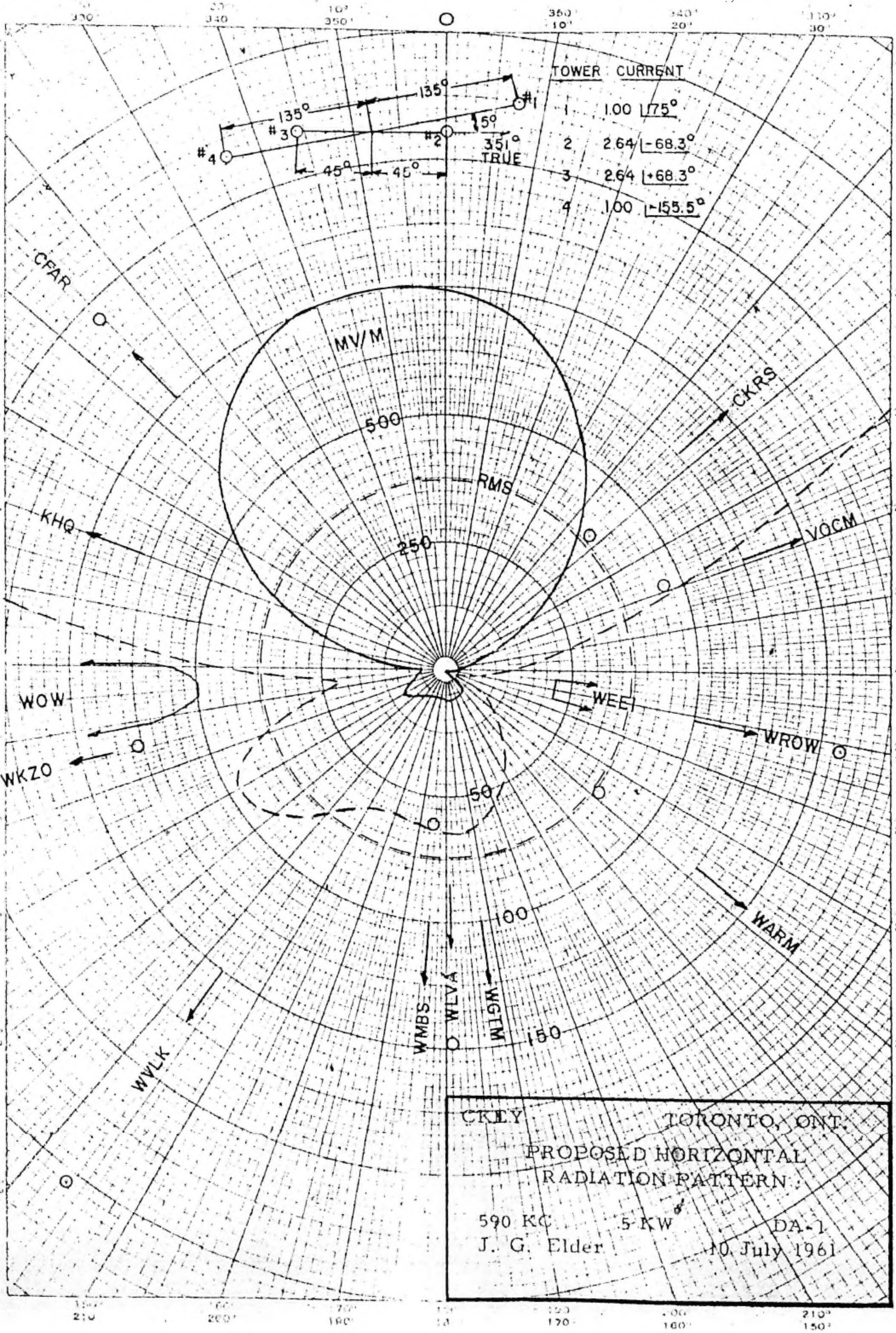
BEARING (from array center)	346°	351°	171°	166°
CURRENT RATIO	1	2.64	2.64	1
PHASING	175°	-68.3°	68.3°	-155.5°

GROUND SYSTEM: Ground screen at base of each tower, 120 radials per tower sunk in lake bottom, radials joined along common chord. #10 AWG bare copper wire. Average length of radials 0.4 wave length.

EXPECTED EFFICIENCY: 1?5 mV/m for 1 KW
3?9 mV/m for 5 KW

Figure 1


TOWER CURRENT
1 1.00 ∠175°
2 2.64 ∠-68.3°
3 2.64 ∠+68.3°
4 1.00 ∠-155.5°
#1
#2
#3
#4
135°
135°
5°
351°
TRUE
45°
45°
MV/M
500
RMS
250
100
150
50
CFAR
CKRS
KHQ
VOCM
WOW
WEEI
WROW
WKZO
WARM
WMBS
WLVA
WGTM
WYLK
CKEY TORONTO, ONT.
PROPOSED HORIZONTAL
RADIATION PATTERN
590 KC 5 KW DA-1
J. G. Elder 10 July 1961
EUGENE DIETZGEN CO.
NO. 340-P DIETZGEN GRAPH PAPER
POLAR COORDINATE

ckey

580

TORONTO

Oral Presentation

to

THE BOARD OF BROADCAST GOVERNORS

by

Douglas C. Trowell
Vice-President & General Manager
Shoreacres Broadcasting Company Limited

Feb. 9, 1962

ckey 580

Mr. Chairman
Dr. Connell
Gentlemen of the Board of
Broadcast Governors

My name is Douglas Trowell and I am Vice-President and General Manager of Shoreacres Broadcasting Company Limited, which owns and operates Radio Station CKEY in Toronto.

With me today representing Shoreacres are:

Mr. Gordon Elder, our Engineering Consultant,

Mr. Ralph N. Harmon, Vice-President Engineering, Westinghouse Broadcasting Company Inc.,

Mr. William R. Onn, Chief Engineer of CKEY.

As a supplement to our application before you requesting a change in frequency, a change in antenna site and an increase in night-time power for CKEY, I would like to go over the events of the past year as they concern Shoreacres and CKEY.

It is now almost a year since Shoreacres appeared before you in an application for transfer of ownership of CKEY. At that time, certain intentions, promises and commitments were undertaken by Shoreacres. Those undertakings by and large have been carried out and in some cases exceeded.

Our last appearance was February 22, 1961 following which the Board of Broadcast Governors approved our application. Final details and arrangements for closing the sale were then commenced between Shoreacres and the previous owner. These were completed and the sale closed two months later on April 17, 1961.

From April 17th, Shoreacres maintained a temporary caretaker operation of the station pending the hiring of a General Manager. Particular emphasis in that two month period was placed on engineering and accounting.

In June of 1961 I joined Shoreacres as General Manager of CKEY. There followed a period of orientation and assessment involving a thorough briefing and study of intentions and broad policies of operations as stated to you by the owners and directors. Rough plans were pencilled in and we embarked on a program of building the new organization.

A complete operational Department Head group consisting of top people in their fields was drawn together during the summer. Most of them were new to the station and the city.

These people in turn underwent orientation and assessment of people and situations just as I had experienced earlier. In their cases much more detail was involved.

Plans were laid.

Many new people - new talent (writers, producers, air talent) - seasoned news personnel, were added to staff. By late August and early September Programming, Engineering, News & Public Affairs, Sales, Promotion, Business & Accounting, Publicity were all starting to take form. We were ready for our first major change on October 1. We met the date filled with zeal and high hopes.

Our news staff tripled. It increased from three people to a staff of nine seasoned newsmen (editors, reporters, air men). Our news time doubled, going from 14 hours of news and sports to close to 30 hours per week! In addition to a regular hourly news schedule, certain half-hourly newscasts were added. Added to this was an ambitious and demanding schedule of extended newscasts and news-in-depth.

At 7 and again at 8 every weekday morning CKEY News delivers 15 minutes of comprehensive news and sports.

At 12:30 noon - 10 minutes

At 5:00 p.m. - 10 minutes again

At 6:00 p.m. - a full half hour! 10 minutes of hard news, followed by 10 minutes of specialized business, labour & agricultural news, and topped off with 10 minutes of sports.

At 7:00 p.m. - 10 minutes.

At 10:00 p.m. - another full half hour news program of hard news, sports and think pieces.

At 11:00 p.m. - the eleventh hour news. 15 minutes wrap-up of news, sports and weather. As I said earlier, this is all on top of a regular 24 hour service of new every hour. Then, on Sundays from 6 to 7 p.m.

a full hour of news, think pieces, and background material such as Cross Canada Reports consisting of taped news and comments from representative radio stations in each province thus providing a weekly exchange of Canadian viewpoint and opinion.

Five major wire services, voice reports from the Ottawa radio bureau, global voice reports via Broadcast News and Radio Press International, some material from the city room of the Globe & Mail - all supplement our own beats on the local scene.

Enlarged facilities in terms of space - new equipment such as beeper phones, pocket tape machines, 2 way mobile news patrols - all in the hands of experienced newsmen under close senior editorial supervision shape up as an effective task force in the Toronto news field.

CKEY News and Public Affairs has planned and executed several specials such as:

On-the-spot reports (48 of them in 2½ days!) from the founding convention of the New Democratic Party.

Complete and continuing coverage of the Progressive Conservative Leadership convention.

Coverage for children of the annual Santa Claus Parade.

Grey Cup festivities live from all over town for an entire evening with CKEY personalities participating in the Grey Cup Parade and sponsoring the Toronto Police Drum & Bugle Corp.

Thorough and speedy coverage of the recent Provincial by-elections with our own reporters and staff on the scene not only in Toronto committee rooms, but in Brant, Kenora and Renfrew as well.

Special arrangements for eye-witness coverage of the U.S. Manned Space Shot were planned and set up.

We have been extremely gratified in all of these areas to have received letters of commendation from interested listeners and participants. Documentary news specials such as these are the beginnings of even more extensive radio journalism at CKEY.

Innovation and experiment have characterized other program periods besides news. Bill Brady's morning show is literally a community forum for free democratic expression of interest and opinion, making use of the telephone for audience participation. It has attracted widespread interest and is developing a growing awareness of radio as a potent and vital force in social communication.

Tempo Toronto, with Brad Crandall, from 9 to midnight each night, includes a kick-off hour of lively radio journalism of ambitious dimension as it ranges and free wheels throughout Toronto, from City Hall to the Twist, to Belly dancers; from sharp and penetrating theatrical reviews to the quick sampling of public opinion on topics of vital and controversial local interest. In 5 months it interviewed or presented 640 people approximately (a list attached) - Tempo then goes to the phone for a couple of hours of always fascinating and often erudite eavesdropping on conversations and debates between Brad Crandall and his grass roots conversationalists.

Another trial run that is growing in interest is the light-hearted satire and humour of our two-man team of Woodman & Rich with their show designed to give variety and a lift to sagging spirits in the drive-home time.

On Sunday mornings, early, CKEY schedules Sunrise Concert - four hours of the world's great music from 5 a.m. to 9. Then from 9 to noon - news and pleasant Sunday morning music consisting of show music blended with currently popular music.

From 7 to 11 each Sunday a venture into a journalistic form again, this time for purposes of providing religious, inspirational and philosophic fare. It is known as Man's Religious Horizons and it offers a church service, history of religion, a lively forum on moral and ethical aspects of current affairs. There's a half hour of great religious music, a warm person-to-person period of devotion and reassurance, religious readings, - - all planned and drawn together under the direction of one man, Kendrick Crossley. Man's Religious Horizons has won us warm encouragement from religious leaders and laymen alike. More important, it has been a source of gratification and inspiration to many listeners.

At other times throughout the day on CKEY listeners find fun, popular music, lively,warm and interested people, quizzes, games, useful service announcements providing a varied and balanced program fare in the context of the demands of today's audience.

Surveys indicate that more and more people are joining our audience and business is sure to develop with our audience growth.

This brings me to our brief. It was first submitted to the Department of Transport in July last year. After many hours of thought, planning and negotiation with the various people and authorities concerned, it has undergone many modifications and alterations. It is our conviction that if we are to serve the people in our community properly, we must do business at a level sufficiently high to maintain and expand that service. To achieve and maintain that level of income in a highly competitive area we need to improve our technical facility just as substantially as it is possible for us to do. Hence our request to change frequency, change transmitter location, and increase night-time power. By these changes CKEY's signal will be available to the entire Metropolitan Toronto area which is our primary licenced area. Our signal would then be more clearly heard and competitively stronger both day and night. Furthermore, we are sure that this can be accomplished without derogating any other service in the area.

We respectfully ask for favorable consideration of our request. Thank you.


NOW!
CLEARLY
NUMBER
ONE
RADIO
59
CKEY

W. R. ONN
Chief Engineer

CKEY MOVES TO 590 ON THE DIAL

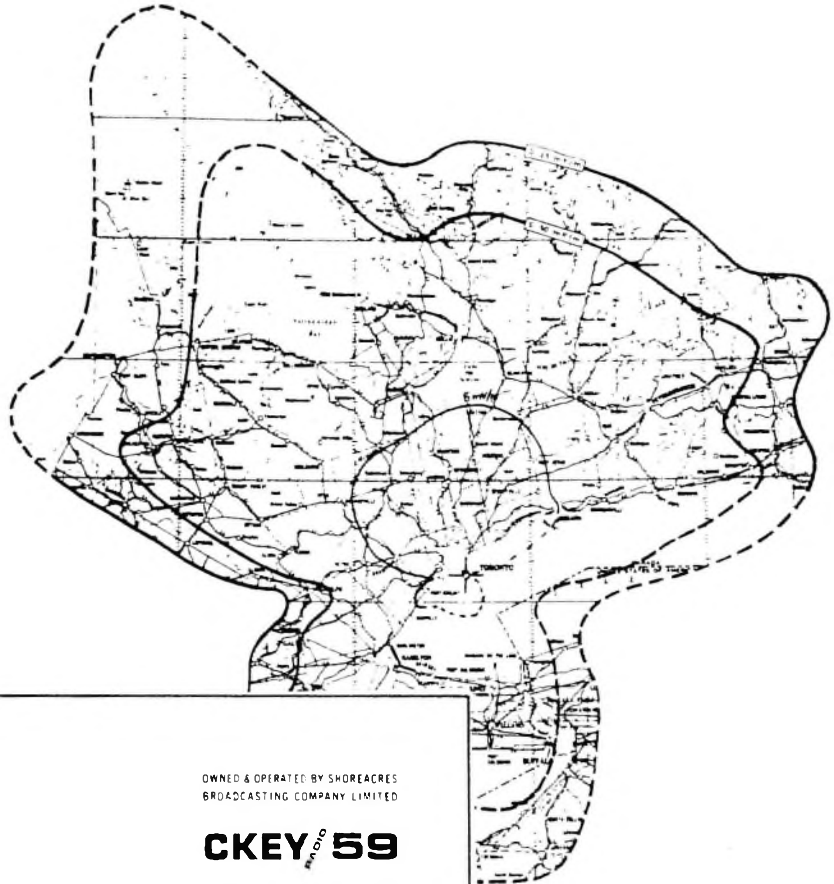
The move from 580 to 590 kilocycles on the AM radio dial, at 8 a.m., Monday, January 6th, culminated over two years of engineering, planning, construction and installation. CKEY, now with 5,000 watts of power, both day and night — a five-fold increase between sunset and sunrise — introduced a number of new concepts and unique developments in AM broadcast engineering.

This move in transmitting frequency, has far-reaching effects on reception for listeners in our primary service area, providing them with such advantages as virtually interference-free day-and-night reception and a superior quality of program transmission.

The move provides a stronger signal strength in all areas north and east of Toronto, as well as the majority of centres to the west. While the degree of daytime improvement will vary according to the signal strength previously provided, substantial change should be quite noticeable in all areas during the sunset-to-sunrise hours.

By virtue of the low frequency, the new location and equipment, the signal will be better than a 50,000 watt station in the middle or upper portions of the broadcast band.

Signal improvements were made possible by a change of transmitter site from Scarborough to Gibraltar Point at the Toronto Islands. With four "Texas tower" type antennas, over 1600 feet out into Lake Ontario, this unique installation, making use of water as the ground conductor, provides the finest basis on which to transmit the signal, much superior to a similar installation on land. The unusual "top hat" design makes the four towers electrically equivalent to twice their actual height, Mr. Onn indicated.



OWNED & OPERATED BY SHOREACRES
BROADCASTING COMPANY LIMITED

CKEY RADIO 59

247 DAVENPORT ROAD, TORONTO 5,
ONTARIO, TELEPHONE WALNUT 5-3111

JANUARY 1964

CLEARLY, to an advertiser, our technical advances mean little unless people are listening. People are listening .. listening as never before to Canada's Number One popular music and news station, and all surveys indicate our popularity is steadily rising.

At CKEY, we create a climate for your advertising that commands attention ... commands action. People like and listen to our lively Good Guys, our pace-setting news, our pleasantly popular music, our penetrating public service.

You can buy CKEY's 1964 audience at 1961 rates. In fact, we offer you the most efficient rate structure in Toronto radio. Imagine! Breakfast rotation starting at thirty-five dollars and going down from there!!!

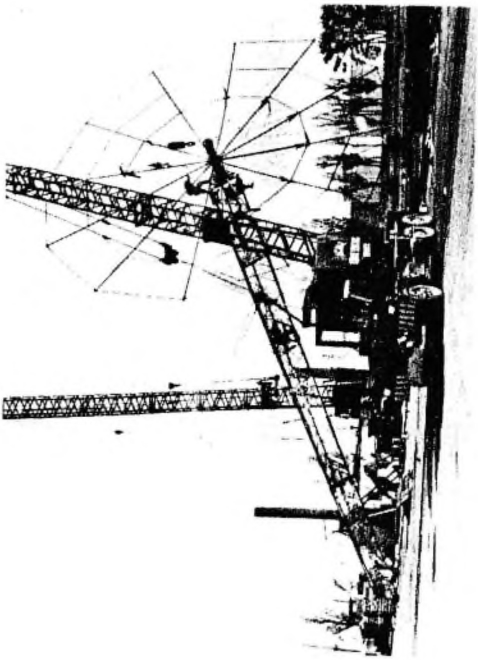
Your CKEY Salesman offers you a range of promotional and merchandising services too ... all designed to assist the alert marketer ... the alert retailer ... to move more merchandise ... create more traffic ... make more money.

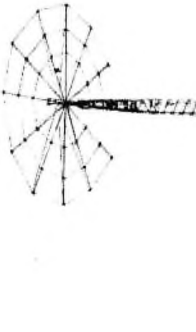
Call CKEY today ... we'll come a-running with the full story ... of Canada's Number One popular music and news station ... Radio 59 ... CKEY.

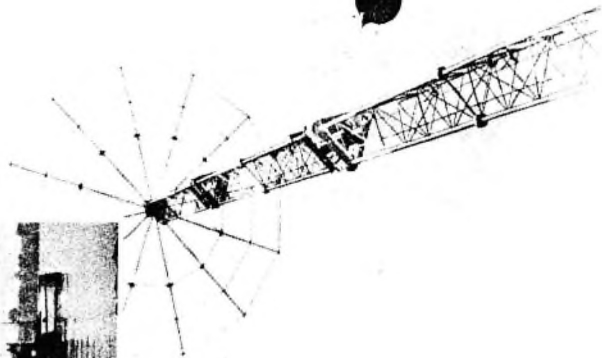
Sincerely,

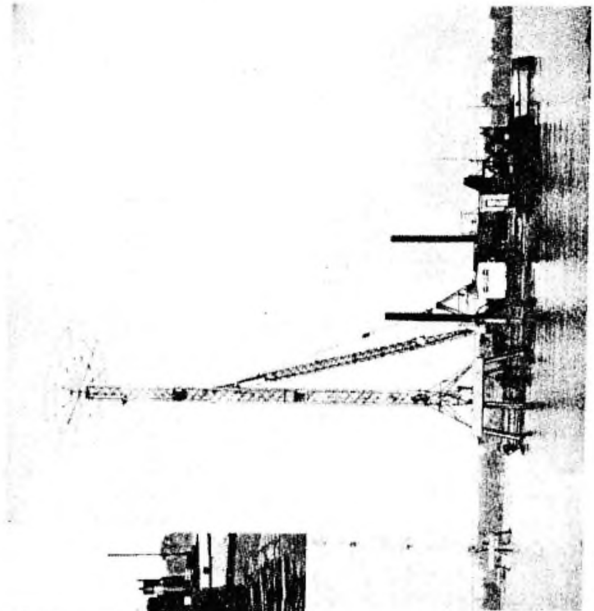
Stuart C. Brandy

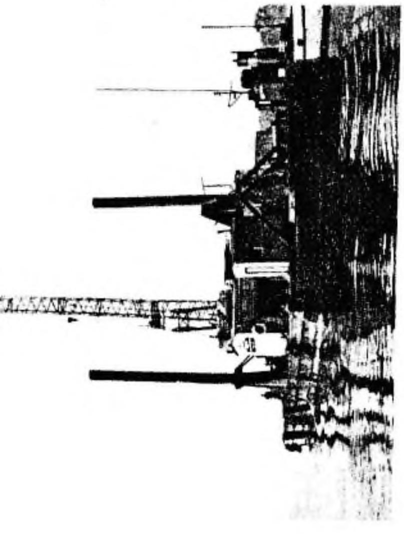
Stuart C. Brandy,
General Sales Manager.

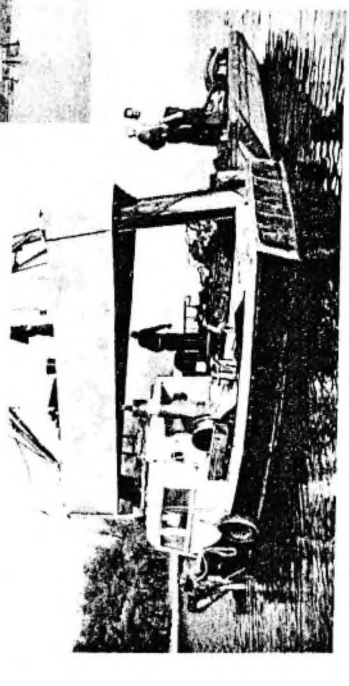












6206-88

STATION: CKEY

LOCATION: TORONTO, ONTARIO

SUBMISSION DATE: JULY 1963

APPLICATION: DAYTIME
POWER INCREASE

APPLICANT: Shoreacres Broadcasting Company Ltd.

PARAMETER	PRESENT	APPROVED	PROPOSED
Frequency	580 kc/s	590 kc/s	590 kc/s
Power	1N/5D kW	5 kW	5N/10D kW
Class	III	III	III
Mode	DA-2	DA-1	DA-1

DESCRIPTION SHEET - DIRECTIONAL ANTENNA

STATION CALL:	CKEY
MAIN STUDIO:	Toronto, Ontario
FREQUENCY:	590 kc/s
POWER:	5 kW night; 10 kW day
MODE:	DA-1
CLASS:	III
TIME:	Unlimited

NOTIFICATION LIST NO.: DATE:

GEOGRAPHICAL LOCATION OF THE ANTENNA SYSTEM: North Latitude: 43° 36' 33"
West Longitude: 79° 23' 20"

ANTENNA CHARACTERISTICS: Four 1" diameter vertical copper elements, base insulated, series fed; mounted and insulated within self-supporting, sectionalized steel towers; each top-loaded by a series inductance and hat of 50 ft. diameter. Vertical radiation characteristic approx. same as for 45° non-loaded antenna.

ELEMENT:	#1 NORTH	#2 N. CENTRE	#3 S. CENTRE	#4 SOUTH
HEIGHT:	150'(32.4°)	150'	150'	150'
SPACING:	reference	417.9'(90.2°)	832.7'(179.9°)	1,250'(270°)
TRUE BEARING:	reference	163.5°	167.2°	166°
CURRENT RATIO:	1.00	2.64	2.64	1.00
PHASING:	175°	-68.3°	68.3°	-155.5°

GROUND SYSTEM: Ground screen at base of each tower, 120 radials per tower sunk in lake bottom, radials joined along common chord. # 10 A.W.G. bare copper wire. Average length of radials 0.4 λ.

EXPECTED EFFICIENCY: 165 mV/m for 1 kW
369 mV/m for 5 kW
521.5 mV/m for 10 kW

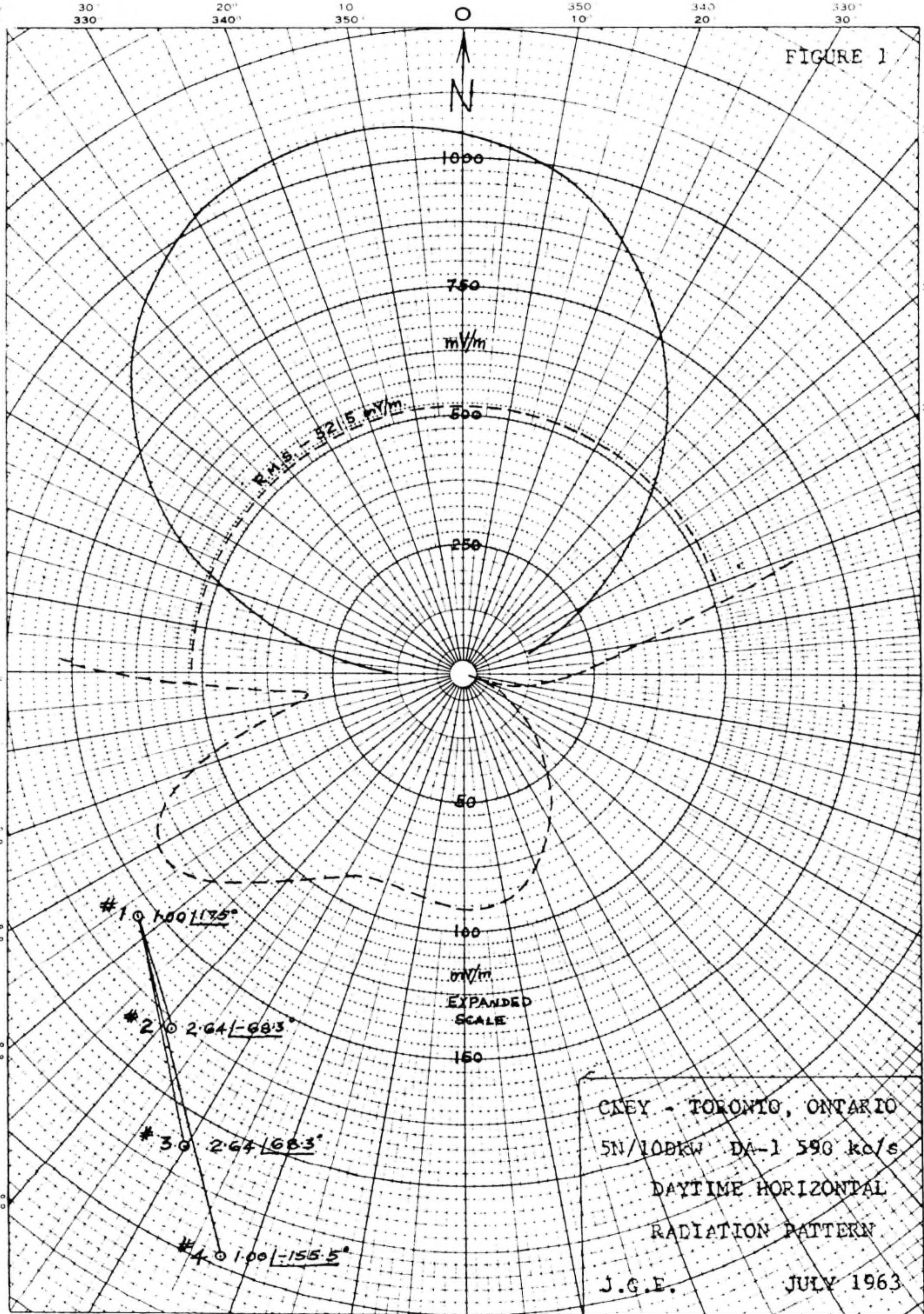


FIGURE 1
N
1000
750
mV/m
R.M.S. – 521.5 mV/m
500
250
50
100
mV/m
EXPANDED
SCALE
150
#1 1.00 ∠175°
#2 2.64 ∠-68.3°
#3 2.64 ∠68.3°
#4 1.00 ∠-155.5°
CKEY - TORONTO, ONTARIO
5N/10DKW DA-1 590 kc/s
DAYTIME HORIZONTAL
RADIATION PATTERN
J.G.E.
JULY 1963

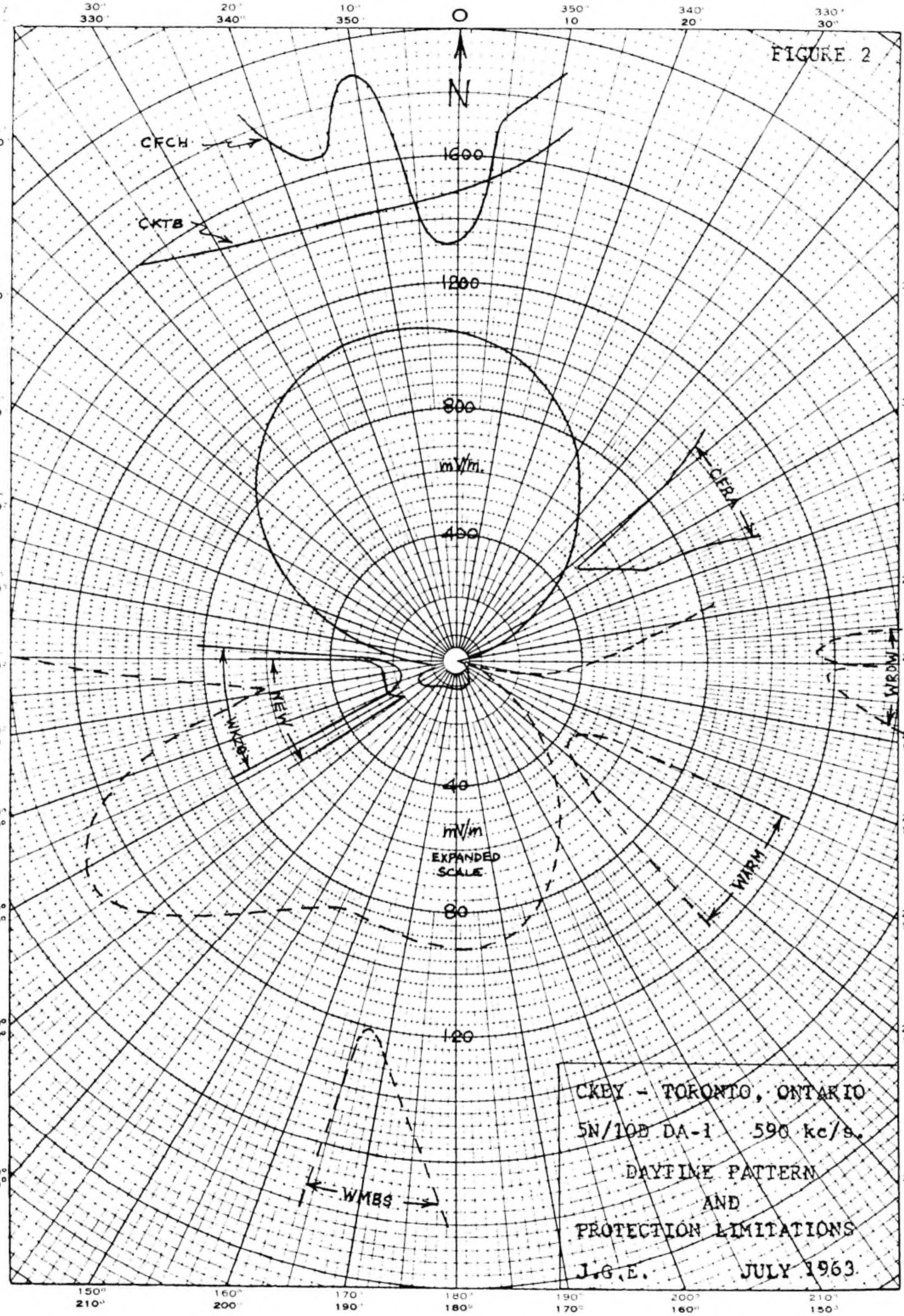


FIGURE 2
N
CFCH
CKTB
CFRA
NEW
WKTO
WRDW
WARM
WMBS
1600
1200
800
mV/m.
400
40
mV/m
EXPANDED SCALE
80
120
CKEY - TORONTO, ONTARIO
5N/10D DA-1 590 kc/s.
DAYTIME PATTERN
AND
PROTECTION LIMITATIONS
J.G.E. JULY 1963

Computed to pattern agrees
See [illegible] for NN

DESCRIPTION SHEET - DIRECTIONAL ANTENNA

STATION CALL:	CKEY
MAIN STUDIO:	Toronto, Ontario
FREQUENCY:	590 kc/s
POWER:	5 kW night; 10 kW day
MODE:	DA-1
CLASS:	III
TIME:	Unlimited

NOTIFICATION LIST NO.: 185 DATE: March 20, 1964

GEOGRAPHICAL LOCATION OF THE ANTENNA SYSTEM: North Latitude: 43° 36' 33"
West Longitude: 79° 23' 20"

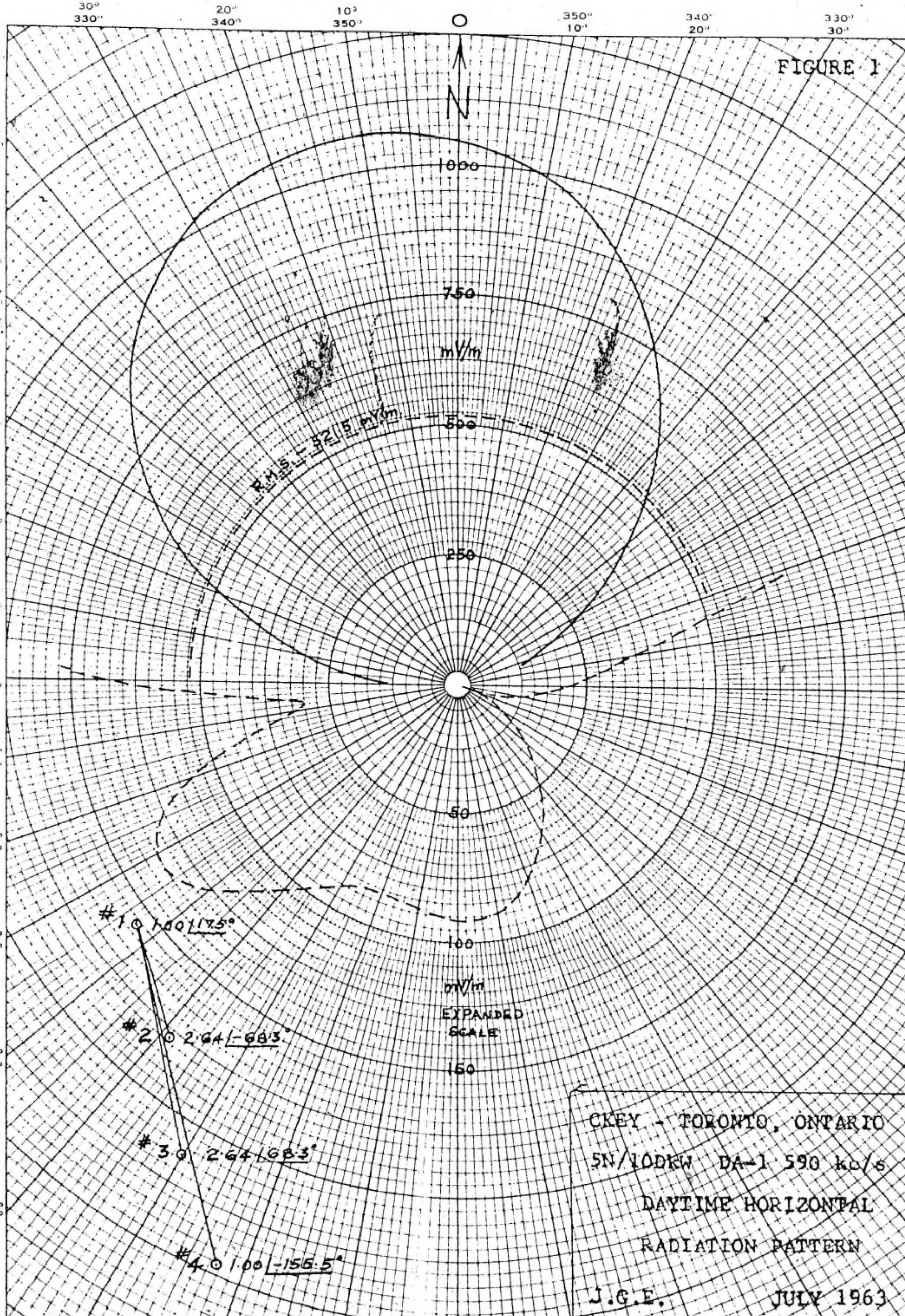
ANTENNA CHARACTERISTICS: Four 1" diameter vertical copper elements, base insulated, series fed; mounted and insulated within self-supporting, sectionalized steel towers; each top-loaded by a series inductance and hat of 50 ft. diameter. Vertical radiation characteristic approx. same as for 45° non-loaded antenna.

ELEMENT:	#1 NORTH	#2 N. CENTRE	#3 S. CENTRE	#4 SOUTH
HEIGHT:	150'(32.4°)	150'	150'	150'
SPACING:	reference	417.9'(90.2°)	832.7'(179.9°)	1,250'(270°)
TRUE BEARING:	reference	163.5°	167.2°	166°
CURRENT RATIO:	1.00	2.64	2.64	1.00
PHASING:	175°	-68.3°	68.3°	-155.5°

GROUND SYSTEM: Ground screen at base of each tower, 120 radials per tower sunk in lake bottom, radials joined along common chord. # 10 A.W.G. bare copper wire. Average length of radials 0.4 λ.

EXPECTED EFFICIENCY:
165 mV/m for 1 kW
369 mV/m for 5 kW
521.5 mV/m for 10 kW

NOTE: Please retain radiation patterns notified for CKEY in Canadian Change List No. 169, dated March 23, 1962 and attach to this revised description sheet and Daytime pattern. This only concerns an increase in daytime power, with Nighttime operation continuing as previously notified.



CKEY - TORONTO, ONTARIO

5N/10DKW DA-1 590 kc/s

DAYTIME HORIZONTAL

RADIATION PATTERN

J.G.E. JULY 1963

EUGENE DIETZGEN CO. PRINTED IN U.S.A.

NO. 340-P DIETZGEN GRAPH PAPER POLAR CO-ORDINATE

SUPPLEMENTARY BRIEF

In support of Technical brief

Board of Broadcast Governors Hearing
April 28, 1964
OTTAWA Ontario

Submitted by

SHOREACRES BROADCASTING COMPANY LIMITED

Our current application is for an increase in the power of CKEY from 5,000 watts to 10,000 watts in the daytime only. Our night power would still be 5,000 watts.

Our frequency (590) and signal pattern would remain unchanged.

Our transmitter site is likewise unchanged.

Our transmitter would require only a slight modification to make the daytime power increase. This modification is relatively inexpensive.

Our technical brief has been approved by the Department of Transport and is now before the Board of Broadcast Governors for recommendation to the Minister of Transport.

This application is not really a recent decision on our part. Rather, as we have stated in our two previous appearances before the Board, it is part of our continuing and ongoing intent to improve our technical service in every way acceptable. However, we do feel it is important that everyone who may be asked to apply judgment to this application have as complete a picture of our position in relation to this requested increase as we can provide.

As stated, it is not something new, but rather the present culmination of the efforts of our company to improve this particular and important aspect of our operation.

In the original application for ownership transfer of licence at the BBG Hearings of February, 1961, the principals of our company specifically referred to their intention to return to the Board for an increase in power and improvement of facility as quickly as possible. Our engineering consultants were already aware of the great need for improvement and were hard at work looking for ways to achieve it. Subsequently, we appeared before the Board the following year, February, 1962, to apply for a 5 kw day and night signal at the new 590 frequency and with an improved pattern. The Board recommended this application for approval.

If it hadn't been for the technical problems involving the Department of Transport 1% blanketing rule in force at that time, our application would have been for 10,000 watts daytime and in fact was originally submitted to Department of Transport with that power requested. In short, if it had been technically acceptable at that time to apply for the increase to 10,000 watts it could, and hopefully would have been granted then.

When in April 1963, the Department of Transport revised the blanketing rule from 1% to 3% we were then in a position to re-apply for our originally intended 10,000 watt daytime power referred to above.

However, even though the Department of Transport blanketing rule was altered from 1% to 3% the Department of Transport first required us to complete and technically prove out our pattern on 590 before we could apply for the 10 kw improvement. This was because of concern on the part of the Department of Transport that there might have been nighttime double-adjacent-channel signal-ratio problems between CKEY (590 kc) and CKTB (610 kc). We know now based on measurements of actual signal that, in fact, the signal ratios between the two stations are technically acceptable. Therefore no problem exists. In effect, our present daytime application would produce approximately the same signal ratios to the double adjacent channel in the daytime hours as we have already established as acceptable in actual practice at night. In short the same freedom from signal problems would obtain. The Department of Transport had this established to their satisfaction before they approved the technical brief before you at this time.

There were other complications. One was an unavoidable time lag between the Board of Broadcast Governors recommendation and the final Ministerial approval of that February, 1962 application. This time-lag had an additionally serious effect on our progress because of our unique transmitter site out in Lake Ontario waters. Obviously, working out in the lake, we were limited to construction during good weather months and we didn't receive the required final letter from the Minister until late summer. This meant that instead of being able to have our new facility in operation and hence of direct benefit to us competitively by fall of 1962 we had to get extensions of our construction permit ending up with an early 1964 date.

Two years elapsed between the time of our application and the time we were actually operating on our new facility.

To make a long story shorter, while the company had indicated its desire for an vastly improved technical facility in its original application in February of 1961 and it was necessary to apply for a somewhat reduced improvement in February of 1962, we were still unable to gain any benefit from our efforts until we finally had approval of our first changes put into effect in January 6th, 1964.

At this point, permit us to clarify the major reasons behind our desires to improve our signal. As we stated at the February, 1962 Hearing, we are interested in contributing toward the conservation of a dwindling public resource, namely the Canadian allocations of the AM spectrum. We refer to foreign encroachment on the one hand and increasing man-made interference on the other. Also, from our own business standpoint it is pragmatic that we obtain for ourselves the best available competitive signal. We would like to emphasize the intensity of our need in that direction, for in CKEY's case, practically speaking, it has been three years of outgo and a reduced opportunity for improved income which might have been ours, due in a substantial measure to a more adequate and certainly more competitive signal. Over that period hundreds of thousands of dollars went out, on programming costs as well as in our effort to improve our facility. For months we still had a poor signal particularly in Metro Toronto, the area which we're primarily licenced to serve, and difficulty in competing on an equal footing for audience and revenue.

During this period, other Toronto and area stations applied for and got improvements stiffening the competitive position even further. We would like to emphasize that we did not oppose any of those applications, feeling strongly that an improvement in any Canadian station facility acceptable under Department of Transport criteria is consistent with our own stated policy of spectrum conservation. This is our view irrespective of competitive problems or questions of self interest.

Now, with a favorable recommendation by the Board of Governors to the Minister of our Department of Transport-approved brief, and an additional investment on our part of about $5,000.00 to $6,000.00 (depending consultant costs), we could move to 10,000 watts daytime, serve better an additional 150,000 people, develop our earning capability and begin recouping on our substantial investment over the past three years.

Assuming a BBG recommendation for approval we feel that this $6,000.00 spent to make this change could return to us $50,000.00 in added revenue in the first year of its operation.

Of course, it is in the long term that the major financial advantage lies through our maintainance and improvement of a competitive signal.

We would like to state at this point that we hope to continue in our ongoing intent to keep searching for further acceptable means of additional improvement.

It is our hope that during our Hearing we may enlarge on certain points dealt with briefly in this brief. We look forward to that opportunity as well as to trying to answer any questions which the Board may wish to ask.

Respectfully submitted

D. C. Trowell
Vice-President & General Manager
SHOREACRES BROADCASTING COMPANY LIMITED

April 15, 1964

APPENDIX C   Directors & Executive Officers

Mr. D. F. Hunter, 251 Warren Road, Toronto 7, Ontario.	DIRECTOR	Canadian
Mr. D. G. Campbell 11 Ravensbourne Crescent, ISLINGTON Ontario.	President, Shoreacres Proadcasting Company Limited, also DIRECTOR	Canadian
Mr. F. S. Chalmers, 1 Benvenuto Place, TORONTO 7, Ontario	DIRECTOR	Canadian
Mr. R. A. McEachern 100 Elm Avenue, TORONTO 5, Ontario.	DIRECTOR	Canadian
Mr. D. C. Trowell, 186 Sheldrake Blvd., TORONTO 12, Ontario.	Vice-President & General Manager Shoreacres Broadcasting Company Limitec also, DIRECTOR	Canadian

STATION CALL: CKEY

STUDIO LOCATION: TORONTO, ONTARIO

APPLICATION: CHANGE OF AM FACILITIES

SUBMISSION DATE: 31 MARCH 1966

APPLICANT: SHOREACRES BROADCASTING COMPANY LIMITED

CONSULTANT: J. G. ELDER, P. ENG.

ALLOCATION	PRESENT	PROPOSED
Frequency	590 kc/s	590 kc/s
Power	5N/10D kW	10 kW
Class	III	III
Mode	DA-1	DA-2

TECHNICAL BRIEF

1-INTRODUCTION

Elder Engineering Limited was retained by Shoreacres Broadcasting Company Limited, to prepare this technical brief. It contains proposals for a change of transmitting facilities at Station CKEY, Toronto. It was prepared in accordance with Broadcast Procedures One and Two.

2-PURPOSE

CKEY presently operates at ten kilowatts day and five kilowatts night on 590 kc/s, using one directional pattern (DA-1). It is proposed to increase night time power to ten kilowatts and to employ different patterns (DA-2). Night time service will be improved and extended substantially over the arc from north west to north east. In both patterns the westerly null will be filled as much as possible. This involves minor modifications to the daytime pattern and an additional fifth tower at night.

3-DAYTIME PRIMARY SERVICE (reference: Figure 7-2)

No change is proposed except west to south west from the site where some improvement will result. The maximum increase in the horizontal radiated field intensity will occur towards Long Branch and Cooksville. The signal there will be raised by eighty to ninety per cent. In the same direction, the 5 mV/m contour will extend an additional five miles and will enclose Streetsville. The signal in Oakville will be increased slightly.

4-DAYTIME SECONDARY SERVICE (reference: Figure 7-3)

No noticeable change will occur except west to south west from Toronto Island. Over this arc the 0.5 mV/m contour will extend up to ten miles further than at present. It will now enclose Simcoe, Kitchener and Waterloo. It will provide satisfactory service to smaller communities and rural areas, free from objectionable cochannel or adjacent channel interferece.

5-NIGHT TIME SERVICE (reference: Figure 7-2)

By raising power to ten kilowatts at night, the primary service area will become approximately the same as the daytime one. The signal levels throughout Metropolitan Toronto will be increased, by up to fifty per cent. The theoretical ten per cent night limitation on 590 kc/s has a value of 18 - 19 mV/m within the proposed service area. This level of field intensity provides recognized service, free from objectionable skywave interference. The 19 mV/m contour will extend an additional six or seven miles north-north-west. Satisfactory intermittent service will frequently be rendered within the 5 mV/m contour.

6-MAXIMUM FIELD STRENGTHS (reference: Figure 7-1)

Virtually no change is proposed in the location of the daytime 25 and 250 mV/m contours, except over water. The proposed day and night 25 mV/m contours enclose a population of approximately 1,750,000. The day and night 250 mV/m contours enclose approximately 40,000 and 45,000 persons, respectively. The population ratios are therefore 2.3 and 2.6% which meet the requirements of Rule Two in the case of CKEY. The population counts were based upon 1961 Census information provided by the Dominion Bureau of Statistics.

The proposed night time 1000 mV/m contour encloses approximately eight buildings and no residents. CKEY will investigate any reasonable complaints of blanketing interference that may arise. The station will take corrective action bearing all costs, as required by Rule Two.

7-ASSUMPTIONS AND SOURCES OF INFORMATION

Most values of ground conductivity were based upon the Department of Transport's Sheet Two "Southern Ontario" and the Federal Communications Commission's Figure M3, as required by Rule Seven. However, the contours for 100 mV/m and more were predicted using the measured values of 2 - 6 mmhos/m.

Assignments were protected as required by the 1950 NARBA up to and including: Canadian change list # 209 and United States change list # 1151. Relevant information was derived from the antenna description sheets distributed by the Department of Transport.

All maps were current editions obtainable from the Department of Mines and Technical Surveys. The following sheets were used:

Scale	Title	Number
1:50,000	Toronto	30 M/11 W, E
1:250,000	Toronto	30 M
1:250,000	Lake Simcoe	30 D

Scale	Title	Number
1:250,000	Kitchener	40 P
1:250,000	Bruce	41 A
1:1,000,000	Southern Ontario	NW 42/83 1/2

8-LIST OF PROTECTED STATIONS

All the relevant assignments are class III, as follows:

CALL	LOCATION	kc/s	kW	MODE
CKWW	Windsor, Ontario	580	0.5	DA-1
CFRA	Ottawa, Ontario	580	10N/50D	DA-2
WROW	Albany, New York	590	1N/5D	DA-2
WARM	Scranton, Pennsylvania	590	5	DA-2
WMBS	Uniontown, Pennsylvania	590	1	DA-N
WKZO	Kalamazoo, Michigan	590	5	DA-N
WEEI	Boston, Massachusetts	590	5	DA-1
WVLK	Lexington, Kentucky	590	1N/5D	DA-2
WOW	Omaha, Nebraska	590	5	ND-U
CKRS	Jonquiere, Quebec	590	1	DA-1
VOCM	St. John's, Newfoundland	590	10	DA-N
CFAR	Flin Flon, Manitoba	590	1N/10D	DA-D
CFCH	North Bay, Ontario	600	5N/10D	DA-2
WFRM	Coudersport, Pennsylvania	600	1	ND-D
WSOM	Salem, Ohio	600	0.5	DA-D
CKTB	St. Catharines, Ontario	610	5N/10D	DA-1

9-DAYTIME INTERFERENCE ANALYSIS (reference: Table 4: Figure 5)

All protection requirements in critical directions were calculated precisely. Adequate clearance distances have been allowed and radiation safety factors generally exceed ten per cent.

10-NIGHT TIME INTERFERENCE ANALYSIS (reference: Table 5)

The 10% night limitation contours of all cochannel stations are protected from objectionable skywave interference in accordance with appendix B and G of NARBA. The 0.5 mV/m contours of all cochannel and adjacent channel stations are protected from groundwave interference in accordance with the customary ratio rules.

The small additional area in which the CKEY:CKTB field intensity ratio would exceed 30:1 is shown in Figure 6. Most of it is over water and the remainder is completely uninhabited commercial waterfront property. Since no people reside in the affected area, CKTB provides no (intermittent) service requiring protection there. However, CKEY agrees to investigate any complaints of interference from CKEY to the reception of CKTB, on receivers located in homes within the proposed 250 mV/m contour and to take corrective action bearing all costs. This undertaking is merely an extension of a current requirement and no interference complaints are expected.

11-OSCILLATOR RADIATION INTERFERENCE

This form of interference might occur to the reception of CHUM on 1050 kc/s. CKEY agrees to investigate any complaints and to take corrective action as required by Rule Eleven.

12-INTERMODULATION WITH OTHER STATIONS

The proposed 100 mV/m contours exclose the antenna site of CKFH on 1430 kc/s. No intermodulation has been experienced, partly due to the highly reactive impedance of CKFH's array at 590 kc/s. In the unlikely event that the problem does arise, CKEY will investigate it and take corrective action as required by Rule Three.

13-HARMONIC INTERFERENCE

There are no assignments in the area on 1180 kc/s, therefore this form of interference will not arise.

14-IMAGE INTERFERENCE

There are two relevant assignments within the proposed 0.5 mV/m daytime contour. These are CHYM Kitchener, on 1490 kc/s and CKOT Tillsonburg, on 1510 kc/s. Within the primary service areas of these stations, interference could be caused to the reception of CKEY on 590 kc/s.

However, since it is proposed to increase CKEY's signal levels in these areas, the risk of interference will be reduced.

15-ARRAY CONSIDERATIONS

A fifth tower will be located a few feet on shore and in line with the end towers. It will be similar to the existing towers, which were fully described in a previous engineering brief for CKEY. Though their design is unconventional, it has proved to be well suited to the application.

A special multi-conductor cable connects the towers to the transmitting building. It is protected within an iron pipe conduit buried several feet below the lake bed.

The most restrictive protection requirements are towards WARM from the daytime pattern and towards WEEI at night. In each case 44 mV/m is the maximum permissible radiation. This represents a side lobe suppression of approximately 28 db. A minimum safety factor of 2 db (25%) has been allowed to compensate for engineering tolerances. Experience has proved that the modified array is practical and implementable.

16-ENGINEER'S SEAL AND SIGNATURE

This brief was prepared by the undersigned, a consultant practicing in the field of broadcast engineering.

J. Gordon Elder

J. Gordon Elder, P. Eng.

31 March 19[illegible]

TABLE 1

ANTENNA DESCRIPTION SHEET

STATION CALL: CKEY

MAIN STUDIO: TORONTO, ONTARIO

FREQUENCY: 590 kc/s

POWER: 10 kW

CLASS: III

MODE: DA-2

TIME: UNLIMITED

NOTIFICATION LIST NO.: .... DATE: ....

GEOGRAPHICAL LOCATION: Latitude: 43° 36' 33" North
Longitude: 79° 23' 20" West

ARRAY CHARACTERISTICS: Five 1" diameter vertical copper elements, base insulated, series fed; mounted and insulated within self-supporting, sectionalized steel towers; each top-loaded by a series inductor and hat of 50 feet diameter. Vertical radiation characteristic approximately same as for 45° non-loaded antenna.

TOWER:	#1 NORTH	#2 N.C.	#3 CENTRE	#4 S.C.	#5 SOUTH
HEIGHT:	150'	150'	150'	150'	150'(32.4°)
SPACING:	416.7' 90°	reference	417.9' 90.2°	832.7' 179.9°	1250' 270°
TRUE BEARING:	346°	reference	163.5°	167.2°	166°
DAY RATIO:	-	1.00	2.90	2.64	1.02
DAY PHASE:	-	175°	-70°	70°	-150°
NIGHT RATIO:	1.00	4.00	6.00	4.00	1.00
NIGHT PHASE:	0°	153°	-64.5°	79°	-153°

GROUND SYSTEM: 120 equally spaced #10 AWG bare copper radial wires per tower buried 6 - 8" deep or sunk in the lake bottom and of average effective length 0.4λ (670').

PREDICTED EFFICIENCY: 165 mV/m for 1 kW
521.5 mV/m for 10 kW

TABLE 3

TOWER IMPEDANCES, CURRENTS AND POWER DIVISION

PHYSICAL TOWER HEIGHT = 32.4°(150')

SELF IMPEDANCE (ohms)

$$\left.\begin{array}{l} Z_{11} = 15.5 \pm j0 \end{array}\right. \quad \text{estimated}$$

$$\left.\begin{array}{l} Z_{22} = 15.7 + j5 \\ Z_{33} = 16.0 + j7.5 \\ Z_{44} = 16.5 \pm j0 \\ Z_{55} = 17.9 + j5.6 \end{array}\right\} \text{measured}$$

MUTUAL IMPEDANCE

TOWERS	SPACING	Z
1-2,2-3,3-4,4-5	90° & 90.2°	$9.9\angle -41°$
1-3,2-4,3-5	179.9° & 180°	$5.9\angle -110°$
1-4,2-5	270°	$4.1\angle +167°$
1-5	360°	$3.1\angle +79°$

TOWER #		1	2	3	4	5
	IMP.		7.2+j40	9.5+j18	7.2+j4	-8.9+j8
DAY	AMPS.	-	8.85	26.7	23.4	9.03
	WATTS	-	564	6240	3920	-725
	IMP.	-27.0+j15	3.7+j20	9.0+j4	6.6+j1	-16.4-j22
NIGHT	AMPS.	4.74	18.96	28.44	18.96	4.74
	WATTS	-606	1330	7270	2370	-368

NOTE:

1) Above are approximate base operating values.
2) Resistance components include coil and ground losses.
3) Cable and circuit losses are estimated to be an additional 3% to 5%.
4) If measured values are close to predictions, the self resistance of tower #2 may be increased by adjustment of the top hat coupling coil.

DAY-TIME INTERFERENCE ANALYSIS FOR . CKEY, TORONTO, ONTARIO ...... POWER: 10 kW DA-2 FREQUENCY: 590 kc/s.

(1) PROTECTED STATIONS								(2) PROTECTED POINTS						
CALL SIGN	FREQUENCY	CLASS	POWER	LOCATION	DISTANCE TO INTERFERING STATION	BEARING TO INTERFERING STATION	BEARING FROM INTERFERING STATION	POINT ON PROTECTED CONTOUR	PROTECTED CONTOUR OR BORDER	BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)
	Kc/s		Kw.		MILES	DEG.	DEG.		MV/M	DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES
CFRA	580	III	10N/50D	OTTAWA, ONTARIO	215	240	058	A	0.50	220	115	4	48	170
								B	0.50	235	200	4	61	154
								C	0.50	250	310	4	74	143
								D	0.50	265	500	4/50, 1/20	70	155
								E	0.50	280	900	4/56, 1/32	88	160
CKWW	580	III	0.5	WINDSOR, ONTARIO	212	060.5	243	A	0.50	032	294	20/80, 10/48	128	118
								B	0.50	045	266	20	120	105
								C	0.50	055	224	20	111	102
								D	0.50	066	162	20	96	118

2 FREQUENCY: . 590 kc/s. TABLE 4-1

(2) PROTECTED POINTS				(3) INTERFERENCE CONDITIONS							
BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)	BEARING FROM INTERFERING STATION TO (2)	PATH ANALYSIS BETWEEN INTERFERING STATION AND (2)	PROPOSED RADIATION OF INTERFERING STATION TOWARDS (2)	PROPOSED INTERFERING SIGNAL AT (2)	PERMISSIBLE INTERFERING SIGNAL AT (2)	PERMISSIBLE RADIATION TOWARDS (2)	CLEARANCE DISTANCE BETWEEN PROTECTED AND INTERFERING CONTOURS
DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES	DEG.	10^{-14} emu/miles	MV/M AT 1 MILE	MV/M		MV/M AT 1 MILE	MILES
220	115	4	48	170	064	15/48,6/35,4/87	220	.082	.250	670	50
235	200	4	61	154	060	15/38,6/46,4/70	260	.109	.250	600	35
250	310	4	74	143	052	15/25,6/60,4/58	400	.204	.250	490	7
265	500	4/30, 1/20	70	155	047	6/90,4/25,1/40	480	.113	.250	1,060	20
280	900	4/56, 1/32	88	160	037	6/95,1/64	640	.112	.250	1,425	24
032	294	20/80, 10/48	128	118	271	15/5,6/8,10/15,4/30,6/60	190	.156	.250	305	24
045	266	20	120	105	258	15/9,6/4,10/16,4/36,6/40	125	.133	.250	235	27
055	224	20	111	102	246	15/10,10/20,4/62,20/10	152	.157	.250	242	19
066	162	20	96	118	237	15/12,10/15,20/24,4/42, 20/25	153	.193	.250	198	23

DAY-TIME INTERFERENCE ANALYSIS FOR ..CKEY, TORONTO, ONTARIO ...... POWER: 10 KW .. DA-2 FREQUENCY: .590 kc/s.

(1) PROTECTED STATIONS								(2) PROTECTED POINTS						
CALL SIGN	FREQUENCY	CLASS	POWER	LOCATION	DISTANCE TO INTERFERING STATION	BEARING TO INTERFERING STATION	BEARING FROM INTERFERING STATION	POINT ON PROTECTED CONTOUR	PROTECTED CONTOUR OR BORDER	BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)
	kc/s		kw.		MILES	DEG.	DEG.		MV/M	DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES
WROW	590	III	1N/5D	ALBANY, NEW YORK	295	285.5	102	A	0.5	350	780	4/32, 2/45, 4/11	88	270
								B	0.5	340	760	4/30, 2/32, 4/28	90	254
								C	0.5	330	715	4/32, 2/29, 4/27	88	241
								D	0.5	320	640	4/35, 2/20, 4/34	89	228
								E	0.5	310	545	4/93	93	214
								F	0.5	300	430	4/85	85	214
								G	0.5	290	300	4/73	73	222
WARM	590	III	5	SCRANTON, PENNSYLVANIA	235	311	128.5	A	0.5	350	270	4	69	187
								B	0.5	340	370	4	79	168
								C	0.5	330	490	4	88	154
								D	0.5	320	460	4	86	150
								E	0.5	310	400	4	81	153
								F	0.5	300	300	4	73	163
								G	0.5	290	200	4	61	179

EQUENCY: .590 kc/s. TABLE 4-2

PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	(3) INTERFERENCE CONDITIONS: DISTANCE FROM INTERFERING STATION TO (2)	BEARING FROM INTERFERING STATION TO (2)	PATH ANALYSIS BETWEEN INTERFERING STATION AND (2)	PROPOSED RADIATION OF INTERFERING STATION TOWARDS (2)	PROPOSED INTERFERING SIGNAL AT (2)	PERMISSIBLE INTERFERING SIGNAL AT (2)	PERMISSIBLE RADIATION TOWARDS (2)	CLEARANCE DISTANCE BETWEEN PROTECTED AND INTERFERING CONTOURS
10^{-14} emu/miles	MILES	MILES	DEG.	10^{-14} emu/miles	MV/M AT 1 MILE	MV/M		MV/M AT 1 MILE	MILES
32, 2/45, 4/11	88	270	85.0	15/136, 8/24, 4/110	106	.015	.025	176	30
30, 2/32, 4/26	90	254	85.5	15/136, 8/24, 4/94	105	.020	.025	135	13
32, 2/29, 4/27	88	241	87	15/133, 8/27, 4/80	103	.023	.025	110	3
15, 2/20, 4/34	89	228	90	15/80, 8/80, 4/68	98	.022	.025	110	10±
13	93	214	92	15/40, 8/115, 4/59	94	.023	.025	103	5
15	85	214	96.5	15/26, 8/111, 4/77	86	.018	.025	116	16
3	73	222	100.5	15/22, 8/88, 4/112	76	.012	.025	156	37
4	69	187	115	15/18, 8/84, 4/86	41	.011	.025	93	45
4	79	168	115	15/18, 8/64, 4/66	41	.015	.025	67	29
4	88	154	117.5	15/16, 8/84, 4/50	35	.018	.025	50	18
4	86	150	123	15/16, 8/90, 4/42	31	.018	.025	43	25
4	81	153	128.5	15/16, 8/84, 4/49	33	.018	.025	45	30
4	73	163	134	15/16, 8/64, 4/79	43	.017	.025	64	32
4	61	179	135.5	15/16, 8/60, 4/100	45	.012	.025	93	41

NTS

DAY-TIME INTERFERENCE ANALYSIS FOR .CKEY. TORONTO, ONTARIO....... POWER: 10 KW...DA-2 FREQUENCY: .590 kc/s.

(1) PROTECTED STATIONS								(2) PROTECTED POINTS						
CALL SIGN	FREQUENCY	CLASS	POWER	LOCATION	DISTANCE TO INTERFERING STATION	BEARING TO INTERFERING STATION	BEARING FROM INTERFERING STATION	POINT ON PROTECTED CONTOUR	PROTECTED CONTOUR OR BORDER	BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)
	Kc/s		KW.		MILES	DEG.	DEG.		MV/M	DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES
WMBS	590	III	1	UNIONTOWN, PENNSYLVANIA	265	004	184	A	0.5	040	175	4	57.5	222
								B	0.5	000	175	4	57.5	204
								C	0.5	340	175	4	57.5	214
								D	0.5	320	175	4	57.5	228
								E	0.5	300	175	4	57.5	264
WKZO	590	III	5	KALAMAZOO, MICHIGAN	330	072.5	255	A	0.5	000	409	2/22, 8/80	102	310
								B	0.5	040	409	2/25, 8/75	100	253
								C	0.5	063	409	2/29, 8/61	90	238
								D	0.5	070	409	2/33, 8/52	65	241
								E	0.5	077	409	2/37, 8/42	79	247
								F	0.5	088	409	2/40, 4/29	69	259
								G	0.5	099	409	2/33, 4/30	63	271
								H	0.5	120	409	2/26, 4/40, 8/5	71	282
								J	0.5	160	409	2/31, 4/16, 8/30	77	333

EQUENCY: 590 kc/s.

TABLE 4-3

NTS		(3) INTERFERENCE CONDITIONS							
PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)	BEARING FROM INTERFERING STATION TO (2)	PATH ANALYSIS BETWEEN INTERFERING STATION AND (2)	PROPOSED RADIATION OF INTERFERING STATION TOWARDS (2)	PROPOSED INTERFERING SIGNAL AT (2)	PERMISSIBLE INTERFERING SIGNAL AT (2)	PERMISSIBLE RADIATION TOWARDS (2)	CLEARANCE DISTANCE BETWEEN PROTECTED AND INTERFERING CONTOURS
10^{-14} emu/miles	MILES	MILES	DEG.	10^{-14} emu/miles	MV/M AT 1 MILE	MV/M		MV/M AT 1 MILE	MILES
4	57.5	222	175	15/30,20/22,8/38,4/40,2/90	110	.012	.025	227	38
4	57.5	204	185	4/20 15/30,20/24,8/40,4/30,2/60,	106	.017	.025	152	11
4	57.5	214	190	8/43,4/40 15/30,20/25,10/23,8/17,4/38,	103	.023	.025	111	6
4	57.5	228	194	4/30 15/30,20/28,8/44,4/30,8/64,	100	.020	.025	125	12
4	57.5	264	196	4/58 15/30,20/26,8/50,4/26,8/78,	98	.011	.025	227	25
2/22, 8/80	102	310	273	15/42,8/105 10/28,4/31,6/60,10/44,	200	.012	.025	417	21
2/25, 8/75	100	253	267.5	15/40,8/52 10/27,4/32,6/59,10/43,	142	.018	.025	200	16
2/29, 8/61	90	238	260	10/26,8/10,15/38,8/40 15/8,6/5,10/16,4/35,6/60,	122	.016	.025	185	22
2/33, 8/52	85	241	257.5	20/26,10/18,8/7,15/37,8/43 15/9,6/4,10/16,4/38,6/44,	127	.020	.025	156	15
2/37, 8/42	79	247	255	20/58,15/40,8/49 15/9,6/3,10/17,4/43,6/30,	134	.021	.025	161	14
2/40, 4/29	69	259	252.5	20/68,15/34,8/62 15/9,6/3,10/17,4/50,6/16,	140	.019	.025	187	20
2/33, 4/30	63	271	250	20/73,15/31,8/74 15/10,6/2,10/17,4/57,6/7,	146	.016	.025	227	26
2/26, 4/40, 8/5	71	282	245	8/93 15/10,10/19,4/60,20/100,	154	.016	.025	238	39
2/31, 4/16, 8/30	77	333	242.5	8/118 15/10,10/20,4/60,20/125,	156	.009	.025	431	82

DAY-TIME INTERFERENCE ANALYSIS FOR CKEY, TORONTO, ONTARIO...... POWER: 10 KW. DA-2 FREQUENCY: 590 kc/s.

(1) PROTECTED STATIONS								(2) PROTECTED POINTS						
CALL SIGN	FREQUENCY	CLASS	POWER	LOCATION	DISTANCE TO INTERFERING STATION	BEARING TO INTERFERING STATION	BEARING FROM INTERFERING STATION	POINT ON PROTECTED CONTOUR	PROTECTED CONTOUR OR BORDER	BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)
	kc/s		Kw.		MILES	DEG.	DEG.		MV/M	DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES
CFCH	600	III	5N/10D	NORTH BAY, ONTARIO	180	178.5	358.5	A	0.5	120	225	2/30, 1/8	38	163
								B	0.5	150	90	2/27, 5	27.5	156
								C	0.5	180	155	2/34	34	145
								D	0.5	210	90	2/27, 5	27.5	156
								E	0.5	230	145	2/33, 5	33.5	161
								F	0.5	255	390	2/52	52	174
								G	0.5	270	540	2/59	59	190
WFRM	600	III	1	COUDERSPORT, PENNSYLVANIA	148	332	151	A	0.5	036	175	4	34.5	125
								B	0.5	352	175	4	34.5	96
								C	0.5	334	175	4	34.5	92
								D	0.5	324	175	4	34.5	94
								E	0.5	316	175	4	34.5	97
								F	0.5	304	175	4	34.5	102
								G	0.5	288	175	4	34.5	110
								H	0.5	270	175	4	34.5	129

FREQUENCY: .590 kc/s.

TABLE 4-4

(2)			(3)							
ED POINTS			INTERFERENCE CONDITIONS							
RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)	BEARING FROM INTERFERING STATION TO (2)	PATH ANALYSIS BETWEEN INTERFERING STATION AND (2)	PROPOSED RADIATION OF INTERFERING STATION TOWARDS (2)	PROPOSED INTERFERING SIGNAL AT (2)	PERMISSIBLE INTERFERING SIGNAL AT (2)	PERMISSIBLE RADIATION TOWARDS (2)	CLEARANCE DISTANCE BETWEEN PROTECTED AND INTERFERING CONTOURS
MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES	DEG.	10^{-14} emu/miles	MV/M AT 1 MILE	MV/M		MV/M AT 1 MILE	MILES
225	2/30, 1/8	38	163	010.5	6/80,1/83	984	.128	.250	1,920	25
90	2/27, 5	27.5	156	004.5	6/78,1/78	1015	.153	.250	1,670	24
155	2/34	34	145	359	6/78,1/67	1046	.198	.250	1,320	10
90	2/27, 5	27.5	156	354	6/81,1/60,2/15	1060	.170	.250	1,560	16
145	2/33, 5	33.5	161	347.5	6/35,4/48,1/54,2/24	1068	.140	.250	1,900	21
390	2/52	52	174	342.5	6/29,4/63,10/20,1/22,2/40	1066	.158	.250	1,670	24
540	2/59	59	190	340.5	6/28,4/64,10/36,2/62	1063	.153	.250	1,730	32
175	4	54.5	125	129	15/16,8/86,4/23	32	.032	.250	247	78
175	4	54.5	96	140	15/16,8/54,4/26	57	.094	.250	151.5	30
175	4	54.5	92	150	15/28,20/6,8/38,4/20	82	.174	.250	118	12
175	4	54.5	94	155	15/27,20/27,8/20,4/19	92	.230	.250	100	6
175	4	54.5	97	160	15/27,20/27,10/5,8/18,4/19	100	.232	.250	108	5
175	4	54.5	102	165	15/28,20/25,10/7,8/20,4/22	106	.207	.250	128	6
175	4	54.5	110	170	15/28,20/24,10/10,8/23,4/30	109	.151	.250	161	17
175	4	54.5	129	173	15/28,20/22,10/12,8/23,4/44	109	.102	.250	206	33

DAY-TIME INTERFERENCE ANALYSIS FOR .CKEY,.TORONTO,.ONTARIO....... POWER: 10.kW..DA-2 FREQUENCY: 590. kc/s..

(1) PROTECTED STATIONS								(2) PROTECTED POINTS						
CALL SIGN	FREQUENCY	CLASS	POWER	LOCATION	DISTANCE TO INTERFERING STATION	BEARING TO INTERFERING STATION	BEARING FROM INTERFERING STATION	POINT ON PROTECTED CONTOUR	PROTECTED CONTOUR OR BORDER	BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)
	kc/s		kW.		MILES	DEG.	DEG.		MV/M	DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES
WSOM	600	III	0.5 DA-D	SALEM, OHIO	210	021	203	A	0.5	350	115	8	67	154
								B	0.5	000	177	8	(82)	144
								C	0.5	010	238	8	(93)	132
								D	0.5	020	282	8/78, 4/14	92	118
								E	0.5	030	297	8/80, 4/15	95	117
								F	0.5	040	280	8/87, 4/d	95	122
								G	0.5	050	225	8/74, 2/7	81	134
														(1)
CKTB	610	III	5N/10D	ST. CATHERINES, ONTARIO	42	345	165	A	19.2	349	1280	20/14, 15/30, 6/0.5	44.5	3.8
								B	18.3	346	1260	20/13, 15/29, 6/2.8	44.8	3.0
								C	18.3	345	1260	20/13, 15/29, 6/2.2	44.5	2.7
								D	18.4	344	1260	20/13, 15/29, 6/2.5	44.5	2.6
								E	18.7	340	1245	20/13, 15/32	45	4.6

NOTE: (1) Distances are from the sit

(2) Conductivity values were nc

FREQUENCY: 590. kc/s.. TABLE 4-

INTS		(3) INTERFERENCE CONDITIONS							
PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)	BEARING FROM INTERFERING STATION TO (2)	PATH ANALYSIS BETWEEN INTERFERING STATION AND (2)	PROPOSED RADIATION OF INTERFERING STATION TOWARDS (2)	PROPOSED INTERFERING SIGNAL AT (2)	PERMISSIBLE INTERFERING SIGNAL AT (2)	PERMISSIBLE RADIATION TOWARDS (2)	CLEARANCE DISTANCE BETWEEN PROTECTED AND INTERFERING CONTOURS
10^{-14} emu/miles	MILES	MILES	DEG.	10^{-14} emu/miles	MV/M AT 1 MILE	MV/M		MV/M AT 1 MILE	MILES
8	67	154	216	15/30, 20/40, 10/44, 8/40	110	.121	.250	227	36
8	(82)	144	214	15/30, 20/39, 10/42, 8/34	106	.115	.250	194	23
8	(93)	132	210	15/29, 20/35, 10/39, 8/30	105	.168	.250	156	15
8/78, 4/14	92	118	204	15/28, 20/31, 10/30, 8/29	98	.206	.250	119	6
8/80, 4/15	95	117	196	15/27, 20/27, 10/27, 8/20, 4/16	98	.167	.250	147	12
8/87, 4/8	95	122	189	15/27, 20/26, 10/20, 6/20, 4/30, 2/10	104	.130	.250	200	23
8/74, 2/7	81	134	186	15/27, 20/25, 10/19, 8/22, 4/31	106	.088	.250	300	43
		(1)		(2)					
20/14, 15/30, 6/0.5	44.5	3.8	029	6	760	108	575	2,500	2.4
20/13, 15/29, 6/2.8	44.8	3.0	358	2	1000	238	555	2,330	0.7
20/13, 15/29, 6/2.5	44.5	2.7	345	2	1070	406	550	2,040	0.5
20/13, 15/29, 6/2.5	44.5	2.6	330	2	1015	288	550	1,940	0.5
20/13, 15/32	45	4.6	290	3	500	102	560	3,430	4.0

NOTE: (1) Distances are from the site to the nearest populated areas

(2) Conductivity values were measured during CKEY's proof of performance.

NIGHT
~~DAY~~-TIME INTERFERENCE ANALYSIS FOR ..CKEY, TORONTO, ONTARIO...... POWER: 10 kW DA-2 FREQUENCY: 590 kc/s.

CALL SIGN	FREQUENCY	CLASS	POWER	LOCATION	DISTANCE TO INTERFERING STATION	BEARING TO INTERFERING STATION	BEARING FROM INTERFERING STATION	POINT ON PROTECTED CONTOUR	PROTECTED CONTOUR OR BORDER	BEARING FROM (1) TOWARDS (2)	RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)
	Kc/s		Kw.		MILES	DEG.	DEG.		MV/M	DEG.	MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES
WKZO	590	5	DA-N	KALAMAZOO, MICHIGAN					0.5	051	390	2/24, 8/66	90	246
									0.5	044	500	2/23, 8/86	109	240
									0.5	036	630	2/22, 8/102	124	242
									0.5	026	765	2/21, 8/118	139	256
									0.5	010	910	2/20, 8/130	150	290
WMBS	590	1	DA-N	UNIONTOWN, PENNSYLVANIA					0.5	015		4/65, 2/7	72	194
									0.5	000		4	70	195

NOTE: The ground wave protection requirements of other stations remain the same at night as for daytime or are reduced.

FREQUENCY: .590 kc/s. TABLE 3-1

(2) ... ED POINTS			(3) INTERFERENCE CONDITIONS							
... RADIATION FROM (1) TOWARDS (2)	PATH ANALYSIS BETWEEN (1) and (2)	DISTANCE FROM (1) TO (2)	DISTANCE FROM INTERFERING STATION TO (2)	BEARING FROM INTERFERING STATION TO (2)	PATH ANALYSIS BETWEEN INTERFERING STATION AND (2)	PROPOSED RADIATION OF INTERFERING STATION TOWARDS (2)	PROPOSED INTERFERING SIGNAL AT (2)	PERMISSIBLE INTERFERING SIGNAL AT (2)	PERMISSIBLE RADIATION TOWARDS (2)	CLEARANCE DISTANCE BETWEEN PROTECTED AND INTERFERING CONTOURS
MV/M AT 1 MILE	10^{-14} emu/miles	MILES	MILES	DEG.	10^{-14} emu/miles	MV/M AT 1 MILE	MV/M		MV/M AT 1 MILE	MILES
0	2/24, 8/66	90	246	265	10/25, 8/17, 15/40, 8/46 5/6, 6/7, 10/15, 4/31, 6/58,	68	.010	.025	179	70
0	2/23, 8/86	109	240	270	10/21, 8/23, 15/40, 8/38 15/5, 6/9, 10/15, 4/29, 6/60,	86	.013	.025	162	55
0	2/22, 8/102	124	242	275	10/22, 8/23, 15/42, 8/38 5/15, 6/10, 10/13, 4/28, 6/63,	130	.019	.025	170	30
5	2/21, 8/118	139	256	280	10/24, 8/30, 15/14, 8/68 5/15, 6/10, 10/12, 4/28, 6/64,	200	.023	.025	221	8
0	2/20, 8/130	150	290	284	10/25, 8/145 15/5, 6/11, 10/11, 4/29, 6/64,	270	.019	.025	363	22
	4/65, 2/7	72	194	180	4/30, 2/70 15/28, 20/23, 8/39, 10/15, 8/26,	75	.012	.025	155	32
	4	70	195	186	2/60, 4/10 15/27, 20/25, 10/18, 8/24, 4/31,	70	.015	.025	121	25

NIGHT-TIME INTERFERENCE ANALYSIS FOR STATION ..CKEY., TORONTO, ONTARIO...... POWER 10 KW DA-2 FREQUENCY: ..590..kc/s (of

(1)					(2)					(3)		(4)	(5)
STATIONS RECEIVING INTERFERENCE					STATIONS CAUSING INTERFERENCE					SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)
CALL SIGN	CLASS	POWER	MODE	LOCATION	CALL SIGN	CLASS	POWER	MODE	LOCATION			APPX. F PAGE 36 NARBA	
WROW	III	1N/5D	DA-2	ALBANY, NEW YORK	WOW	III	5	ND-U	OMAHA, NEBRASKA	1200	077	0-2.4	435
					WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	140	280	32-47.5	170
					WARM	III	5	DA-2	SCRANTON, PENNSYLVANIA	130	046	33.8-50	20
					CKEY	III	10	DA-2	TORONTO, ONTARIO	290	100	15.8-26.3	18
WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	VOCM	III	10	DA-N	ST. JOHN'S, NEWFOUNDLAND	970	256	2.0-5.0	170
					CKRS	III	1	DA-1	JONQUIERE, QUEBEC	420	179	10.5-17.8	27
					CMCY	ID	25	DA-1	HAVANA, CUBA	1550	022	0	450
					WOW	III	5	ND-U	OMAHA, NEBRASKA	1320	077	0-1.2	435
					CKEY	III	10	DA-2	TORONTO, ONTARIO	430	098	10.2-17.3	25
WARM	III	5	DA-2	SCRANTON, PENNSYLVANIA	WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	250	256	18.7-30.2	150
					VOCM	III	10	DA-N	ST. JOHN'S, NEWFOUNDLANI	1210	260	0-2.3	170
					CKRS	III	1	DA-1	JONQUIERE, QUEBEC	530	205	7.8-13.4	42
					WKZO	III	5	DA-N	KALAMAZOO, MICHIGAN	530	093	7.7-13.3	85
					WOW	III	5	ND-U	OMAHA, NEBRASKA	1100	082	0.8-3.5	435
					CKEY	III	10	DA-2	TORONTO, ONTARIO	240	127	19.5-31.2	18

FREQUENCY: ..590..kc/s			PRESENT NIGHT LIMI ONS (of all stations possibl affected)					VALUES (LIMITING)		PROPOSED NIGHT LIMITATIONS		
(3)		(4)	(5)	(6A)	(6B)	(6C)	(7)	(8A)	(8B)	(9A)	(9B)	(9C)
SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)	'E' AT (4) FROM (2) TOWARDS (1) FOR 100 MV/M AT 1 MILE RADIATED, DURING 10% OF TIME (MV/M)	UNDESIRED 10% SKYWAVE FIELD EXISTING AT (1) CAUSED BY RADIATION AT (4) FROM (2) (MV/M)	EXISTING CONTOUR LIMITATION TO (1) CAUSED BY (2) (MV/M)	COLUMN (6C) R. S. S. LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE) TO PRODUCE (8A)	PROPOSED RADIATION AT (4) OF (2) TOWARDS (1) (MV/M AT 1 MILE)	UNDESIRED 10% SKYWAVE FIELD AT (1) CAUSED BY PROPOSED RADIATION AT (4) FROM (2) (MV/M)	PROPOSED LIMITATION TO (1) CAUSED BY (2) (MV/M)
		APPX. F PAGE 36 NARBA		APPX. E PAGE 35 NARBA	$\frac{(5) \times (6A)}{100}$	20 x (6B)		APPX. B NOTE 4 NARBA			$\frac{(9A) \times (6A)}{100}$	(9B) x 20 REFER TO (8A)
1200	077	0-2.4	435	.019	.083	1.66						
140	280	32-47.5	170	.390	.663	13.26	*					
130	046	33.8-50	20	.410	.082	1.66						
290	100	15.8-26.3	18	.220	.040	0.80	13.13	6.57	150	18	.040	0.80
970	256	2.0-5.0	170	.036	.061	1.22	*					
420	179	10.5-17.8	27	.156	.042	0.84						
1550	022	0	450	.0095	.043	0.86						
1320	077	0-1.2	435	.014	.061	1.22	*					
430	098	10.2-17.3	25	.150	.0375	0.75	1.73	1.25	42	17	.0255	0.51
250	256	18.7-30.2	150	.250	.375	7.50	*					
1210	260	0-2.3	170	.018	.031	0.62						
530	205	7.8-13.4	42	.120	.050	1.01						
530	093	7.7-13.3	85	.120	.102	2.04						
1100	082	0.8-3.5	435	.0245	.107	2.14						
240	127	19.5-31.2	18	0.26	.047	0.94	7.50	3.75	72	15	.039	0.78

NIGHT-TIME INTERFERENCE ANALYSIS FOR STATION ..CKEY, TORONTO, ONTARIO...... POWER 10 kW DA-2 FREQUENCY. ..590. .kc/s (of

(1) STATIONS RECEIVING INTERFERENCE					(2) STATIONS CAUSING INTERFERENCE					(3)		(4)	(5)
CALL SIGN	CLASS	POWER	MODE	LOCATION	CALL SIGN	CLASS	POWER	MODE	LOCATION	SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)
												APPX. F PAGE 36 NARBA	
WOW	III	5	ND-U	OMAHA, NEBRASKA	KHQ	III	5	ND-U	SPOKANE, WASHINGTON	1250	106	0.7-1.9	525
					CKRS	III	1	DA-1	JONQUIERE, QUEBEC	1300	255	0.4-1.4	425
					CFAR	III	1N/10D	DA-D	FLIN FLON, MANITOBA	1020	255	1.5-4.4	180
					KSUB	III	1	DA-N	CEDAR CITY, UTAH	1050	050	1.2-4.0	163
					WGTM	III	5	DA-2	WILSON, NORTH CAROLINA	1000	299	1.7-4.7	180
					WLVA	III	1	DA-2	LYNCHBURG, VIRGINIA	890	293	2.8-6.1	127
					KTBC	III	1N/5D	DA-N	AUSTIN, TEXAS	820	012	3.5-7.1	50*
					WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	1250	275	0.7-1.9	115
					CKEY	III	10	DA-2	TORONTO, ONTARIO	785	265	4.0-7.6	55
										860	260 & 270	3.0-6.5	95
										795	262 & 268	3.8-7.5	75
CFAR	III	1N/10D	DA-D ND-N	FLIN FLON, MANITOBA	KHQ	III	5	ND-U	SPOKANE, WASHINGTON	620	049	3.5-7.1	525
					WOW	III	5	ND-U	OMAHA, NEBRASKA	960	346	2.0-5.2	435
					WKZO	III	5	DA-N	KALAMAZOO, MICHIGAN	1125	326	0.6-3.2	630
					KID	III	1N/5D	DA-N	IDAHO FALLS, IDAHO	890	029	5.3-6.1	225
					CKEY	III	10	DA-2	TORONTO, ONTARIO	1260	317	0.5-3.0	625

TAB[illegible] 5-3

FREQUENCY . . . 590 . kc/s			PRESEN[illegible]GHT LIMITATIONS (of all stations possibly affected)					VALUES (LIMITING)		PROPOSE NIGHT LIMITAT[illegible]ONS		
(3)		(4)	(5)	(6A)	(6B)	(6C)	(7)	(8A)	(8B)	(9A)	(9B)	(9C)
SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)	'E' AT (4) FROM (2) TOWARDS (1) FOR 100 MV/M AT 1 MILE RADIATED, DURING 10% OF TIME (MV/M)	UNDESIRED 10% SKYWAVE FIELD EXISTING AT (1) CAUSED BY RADIATION AT (4) FROM (2). (MV/M)	EXISTING CONTOUR LIMITATION TO (1) CAUSED BY (2) (MV/M)	COLUMN (6C) R. S. S. LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE RADIATION AT (4) FROM (2) TOWARDS (1) (mV/m AT 1 mile) TO PRODUCE (8A)	PROPOSED RADIATION AT (4) OF (2) TOWARDS (1) (MV/M AT 1 MILE)	UNDESIRED 10% SKYWAVE FIELD AT (1) CAUSED BY PROPOSED RADIATION AT (4) FROM (2) (MV/M)	PROPOSED LIMITATION TO (1) CAUSED BY (2) (MV/M)
		APPX. F PAGE 36 NARBA		APPX. E PAGE 35 NARBA	$\frac{(5)\times(6A)}{100}$	20 x (6B)		APPX. B NOTE 4 NARBA			$\frac{(9A)\times(6A)}{100}$	(9B) x 20 REFER TO (8A)
1250	106	0.7-1.9	525	.017	.089	1.78	*					
1300	255	0.4-1.4	425	.015	.064	1.28	*					
1020	255	1.5-4.4	180	.031	.056	1.12						
1050	050	1.2-4.0	163	.028	.046	0.92						
1000	299	1.7-4.7	180	.033	.059	1.18	*					
890	293	2.8-6.1	127	.045	.057	1.14						
820	012	3.5-7.1	50*	.055	.027	0.54						
1250	275	0.7-1.9	115	.017	.019	0.38						
785	265	4.0-7.6	55	.061	.034	.68		1.25	103	68	.0415	.83
860	260 & 270	3.0-6.5	95	.049	.046	.92		1.25	127	84	.0412	.82
795	262 & 268	3.8-7.5	75	.059	.044	.88	2.48	1.25	106	76	.045	.90
820	049	3.5-7.1	525	.055	.289	5.78	*					
960	346	2.0-3.2	435	.037	.161	3.22						
1125	326	0.6-3.2	630	.030	.189	3.78	*					
890	029	5.3-6.1	225	.046	.105	2.10						
1260	317	0.5-3.0	625	.016	.100	2.00	6.9	3.45	1075	920	.147	2.94

NIGHT-TIME INTERFERENCE ANALYSIS FOR STATION ... CKEY, TORONTO, ONTARIO ..... POWER 10 KW DA-2 FREQUENCY: 590 ... kc/s (of

(1) STATIONS RECEIVING INTERFERENCE					(2) STATIONS CAUSING INTERFERENCE					(3)		(4)	(5)
CALL SIGN	CLASS	POWER	MODE	LOCATION	CALL SIGN	CLASS	POWER	MODE	LOCATION	SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)
												APPX. F PAGE 36 NARBA	
WKZO	III	5	DA-N	KALAMAZOO, MICHIGAN	WOW	III	5	ND-U	OMAHA, NEBRASKA	550	077	7.4-12.8	428
					CFAR	III	1N/10D	DA-D	FLIN FLON, MANITOBA	1120	135	0.7-3.3	180
					CKRS	III	1	DA-1	JONQUIERE, QUEBEC	830	247	3.4-7.0	135
					WRTH	III	1N/0.5D	DA-2	WOOD RIVER, ILLINOIS	330	044	13.8-23.2	133
					CKEY	III	10	DA-2	TORONTO, ONTARIO	315 min.	257 - 261	14.5-24.3	56
CKRS	III	1	DA-1	JONQUIERE, QUEBEC	WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	416	000	10.5-18.0	585
					VOCM	III	10	DA-N	ST. JOHN'S NEWFOUNDLAND	850	282	3.0-6.2	260
					WROW	III	1N/5D	DA-2	ALBANY, NEW YORK	420	017.5	10.5-17.8	310
					WMBS	III	1	DA-N	UNIONTOWN, PENNSYLVANIA	735	034	4.6-8.3	233
					WOW	III	5	ND-U	OMAHA, NEBRASKA	1325	058	0-1.2	433
					WKZO	III	5	DA-N	KALAMAZOO, MICHIGAN	820	054	3.5-7.1	340
					CKEY	III	10	DA-2	TORONTO, ONTARIO	520	047 - 048.5	8-13.7	340
VOCM	III	10	DA-N	ST. JOHN'S, NEWFOUNDLAND	WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	1230	060	0-2.0	343
					CKEY	III	10	DA-2	TORONTO, ONTARIO	1340	068	0-1.0	140

TABL. -4

FREQUENCY: 590...kc/s			PRESENT NIGHT LIMITATIONS (of all stations possibly affected)					VALUES (LIMITING)		PROPOSED NIGHT LIMITATIONS		
(3)		(4)	(5)	(6A)	(6B)	(6C)	(7)	(8A)	(8B)	(9A)	(9B)	(9C)
SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)	'E' AT (4) FROM (2) TOWARDS (1) FOR 100 MV/M AT 1 MILE RADIATED, DURING 10% OF TIME (MV/M)	UNDESIRED 10% SKYWAVE FIELD EXISTING AT (1) CAUSED BY RADIATION AT (4) FROM (2) (MV/M)	EXISTING CONTOUR LIMITATION TO (1) CAUSED BY (2) (MV/M)	COLUMN (6C) R. S. S. LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE RADIATION AT (4) FROM (2) TOWARDS (1) (mV/m AT 1 MILE) TO PRODUCE (8A)	PROPOSED RADIATION AT (4) OF (2) TOWARDS (1) (MV/M AT 1 MILE)	UNDESIRED 10% SKYWAVE FIELD AT (1) CAUSED BY PROPOSED RADIATION AT (4) FROM (2) (MV/M)	PROPOSED LIMITATION TO (1) CAUSED BY (2) (MV/M)
		APPX. F PAGE 36 NARBA		APPX. E PAGE 35 NARBA	$\frac{(5)\times(6A)}{100}$	20 x (6B)		APPX. B NOTE 4 NARBA			$\frac{(9A)\times(6A)}{100}$	(9B) x 20 REFER TO (8A)
550	077	7.4-12.8	428	.112	.479	9.58	*					
1120	135	0.7-3.3	180	.023	.041	0.82						
830	247	3.4-7.0	135	.054	.073	1.46						
330	044	13.8-23.2	133	.200	.270	5.4	*					
315 min.	257 - 261	14.5-24.3	56	.207	.116	2.32	11.0	5.4	130	80	.165	3.3
416	000	10.5-18.0	585	0.16	.938	18.76	*					
850	282	3.0-6.2	260	.050	.103	2.6						
420	017.5	10.5-17.8	310	.156	.485	9.70	*					
735	034	4.6-8.5	235	.070	.164	3.28						
1325	058	0-1.2	435	.014	.061	1.22						
820	054	3.5-7.1	340	.055	.187	3.74						
520	047 - 048.5	8-13.7	340	.122	.415	8.3	21.1	9.70	398	334	.407	8.14
1230	060	0-2.0	345	.0175	.0604	1.20	*					
1340	068	0-1.0	140	.0137	.0192	0.38		1.25 min.	456	76	.0104	0.21

NIGHT-TIME INTERFERENCE ANALYSIS FOR STATION ...CKEY, TORONTO, ONTARIO...... POWER 10 kW DA-2 FREQUENCY: ..590..kc/s (of

(1)					(2)					(3)		(4)	(5)
STATIONS RECEIVING INTERFERENCE					STATIONS CAUSING INTERFERENCE								
CALL SIGN	CLASS	POWER	MODE	LOCATION	CALL SIGN	CLASS	POWER	MODE	LOCATION	SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)
												APPX. F PAGE 36 NARBA	
WMBS	III	1	DA-N	UNIONVILLE, PENNSYLVANIA	WKZO	III	5	DA-N	KALAMAZOO, MICHIGAN	350	118	13.0-21.8	73
					WEEI	III	5	DA-1	BOSTON, MASSACHUSETTS	500	252	8.4-14.4	131
					WARM	III	5	DA-2	SCRANTON, PENNSYLVANIA	270	246	17.3-28.2	72
					WOW	III	5	ND-U	OMAHA, NEBRASKA	870	090	3.0-6.4	433
					CKEY	III	10	DA-2	TORONTO, ONTARIO	260	184	18.0-29.3	56
WVLK	III	1N/5D	DA-2	LEXINGTON, KENTUCKY	WOW	III	5	ND-U	OMAHA, NEBRASKA	660	104	5.6-9.9	430
					WLVA	III	1	DA-2	LYNCHBURG, VIRGINIA	300	280	15.3-25.5	120
					WGTM	III	5	DA-2	WILSON, NORTH CAROLINA	410	296	10.8-18.3	170
					WKZO	III	5	DA-N	KALAMAZOO, MICHIGAN	310	168	14.8-24.7	250
					WMBS	III	1	DA-N	UNIONVILLE, PENNSYLVANIA	280	245	16.5-27.3	160
					CKEY	III	10	DA-2	TORONTO, ONTARIO	475	216	9.0-15.4	69
CKEY	III	10	DA-2	TORONTO, ONTARIO	WARM	III	5	DA-2	SCRANTON, PENNSYLVANIA	250	311	18.7-30.3	275
					WMBS	III	1	DA-N	UNIONVILLE, PENNSYLVANIA	270	003	17.2-28.[illegible]	280
					WVLK	III	1N5D	DA-2	LEXINGTON, KENTUCKY	475	032	9.0-15.4	182
					WOW	III	5	ND-U	OMAHA, NEBRASKA	900	071	2.6-5.9	435
					WROW	III	1N/5D	DA-2	ALBANY, NEW YORK	295	286	15.6-26.0	103

TABLE 5-3

FREQUENCY: ..590..kc/s			PRESENT NIGHT LIMITATIONS (of all stations possibly affected)					VALUES (LIMITING)		PROPOSED NIGHT LIMITATIONS		
(3)		(4)	(5)	(6A)	(6B)	(6C)	(7)	(8A)	(8B)	(9A)	(9B)	(9C)
SEPARATION BETWEEN (1) & (2) MILES	BEARING FROM (2) TOWARDS (1) DEGREES	VERTICAL ANGLES OF RADIATION FROM (2) TOWARDS (1) DEGREES	EXISTING RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE)	'E' AT (4) FROM (2) TOWARDS (1) FOR 100 MV/M AT 1 MILE RADIATED, DURING 10% OF TIME (MV/M)	UNDESIRED 10% SKYWAVE FIELD EXISTING AT (1) CAUSED BY RADIATION AT (4) FROM (2) (MV/M)	EXISTING CONTOUR LIMITATION TO (1) CAUSED BY (2) (MV/M)	COLUMN (6C) R. S. S. LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE LIMITATION TO (1) CAUSED BY (2) (MV/M)	PERMISSIBLE RADIATION AT (4) FROM (2) TOWARDS (1) (MV/M AT 1 MILE) TO PRODUCE (8A)	PROPOSED RADIATION AT (4) OF (2) TOWARDS (1) (MV/M AT 1 MILE)	UNDESIRED 10% SKYWAVE FIELD AT (1) CAUSED BY PROPOSED RADIATION AT (4) FROM (2) (MV/M)	PROPOSED LIMITATION TO (1) CAUSED BY (2) (MV/M)
		APPX. F PAGE 36 NARBA		APPX. E PAGE 35 NARBA	(5)x(6A) / 100	20 x (6B)		APPX. B NOTE 4 NARBA			(9A)x(6A) / 100	(9B) x 20 REFER TO (8A)
350	118	13.0-21.8	73	.190	.139	2.78						
500	252	8.4-14.4	131	.128	.168	3.36	*					
270	246	17.3-28.2	72	.235	.17	3.4	*					
870	090	3.0-6.4	433	.048	.208	4.16	*					
260	184	18.0-29.3	56	.240	.134	2.68	6.33	3.16	66	59	1.42	2.84
660	104	5.6-9.9	430	.085	.365	7.30	*					
300	280	15.3-25.5	120	.217	.260	5.20						
410	296	10.8-18.3	170	.160	.272	5.44						
310	168	14.8-24.7	250	.210	.525	10.50	*					
280	245	16.5-27.3	160	.230	.368	7.36	*					
475	216	9.0-15.4	69	.137	.095	1.90	14.7	7.3	266	90	.123	2.46
250	311	18.7-30.3	275	.250	.688	13.76	*					
270	003	17.2-28.3	280	.235	.658	13.16	*					
475	032	9.0-15.4	182	.137	.25	5.0						
900	071	2.6-5.9	435	.044	.191	3.8						
295	286	15.6-26.0	103	.220	.227	4.5	19					

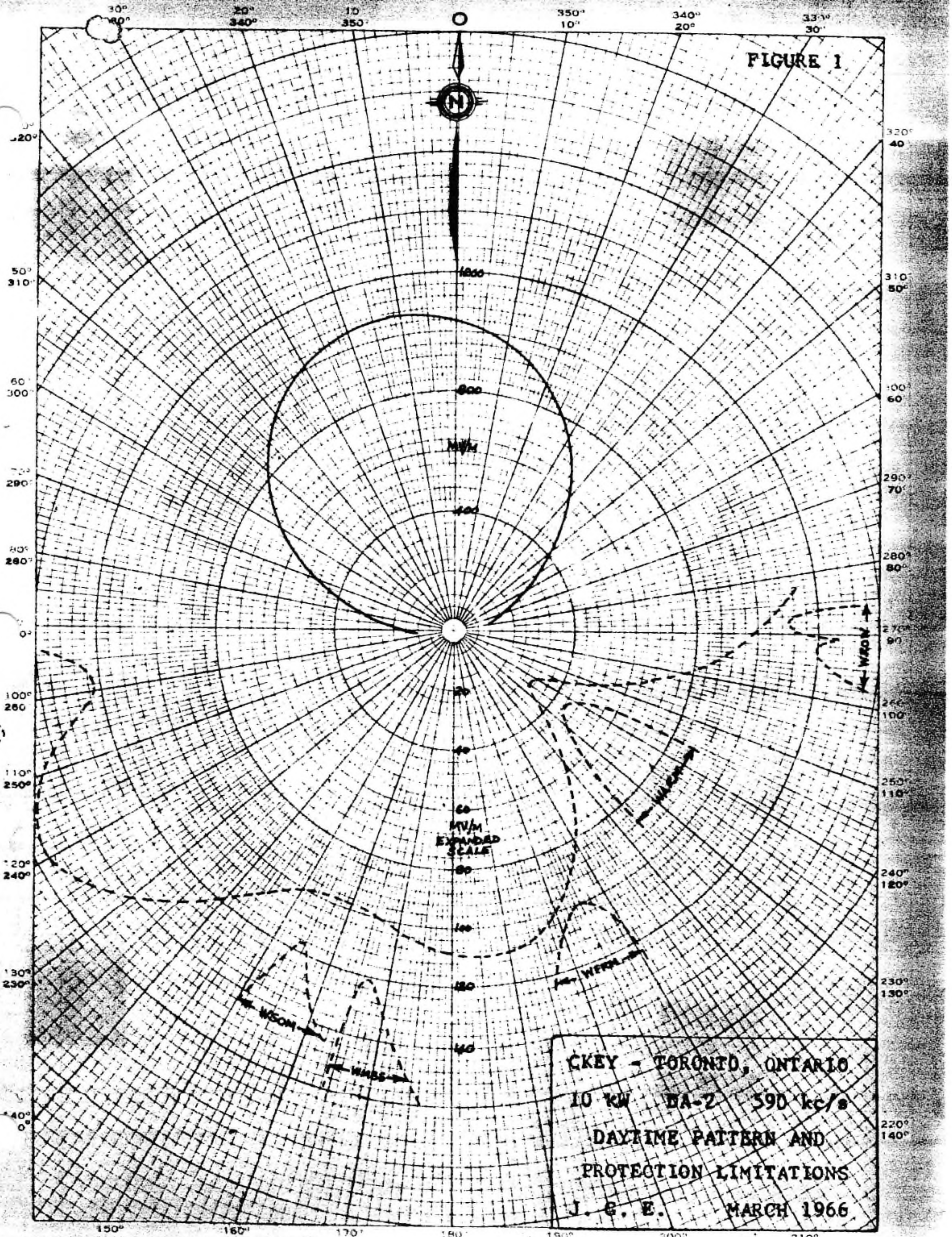


FIGURE 1
MV/M
MV/M
EXPANDED
SCALE
WKZO
CKEY - TORONTO, ONTARIO
10 KW DA-2 590 kc/s
DAYTIME PATTERN AND
PROTECTION LIMITATIONS
J. C. E. MARCH 1966

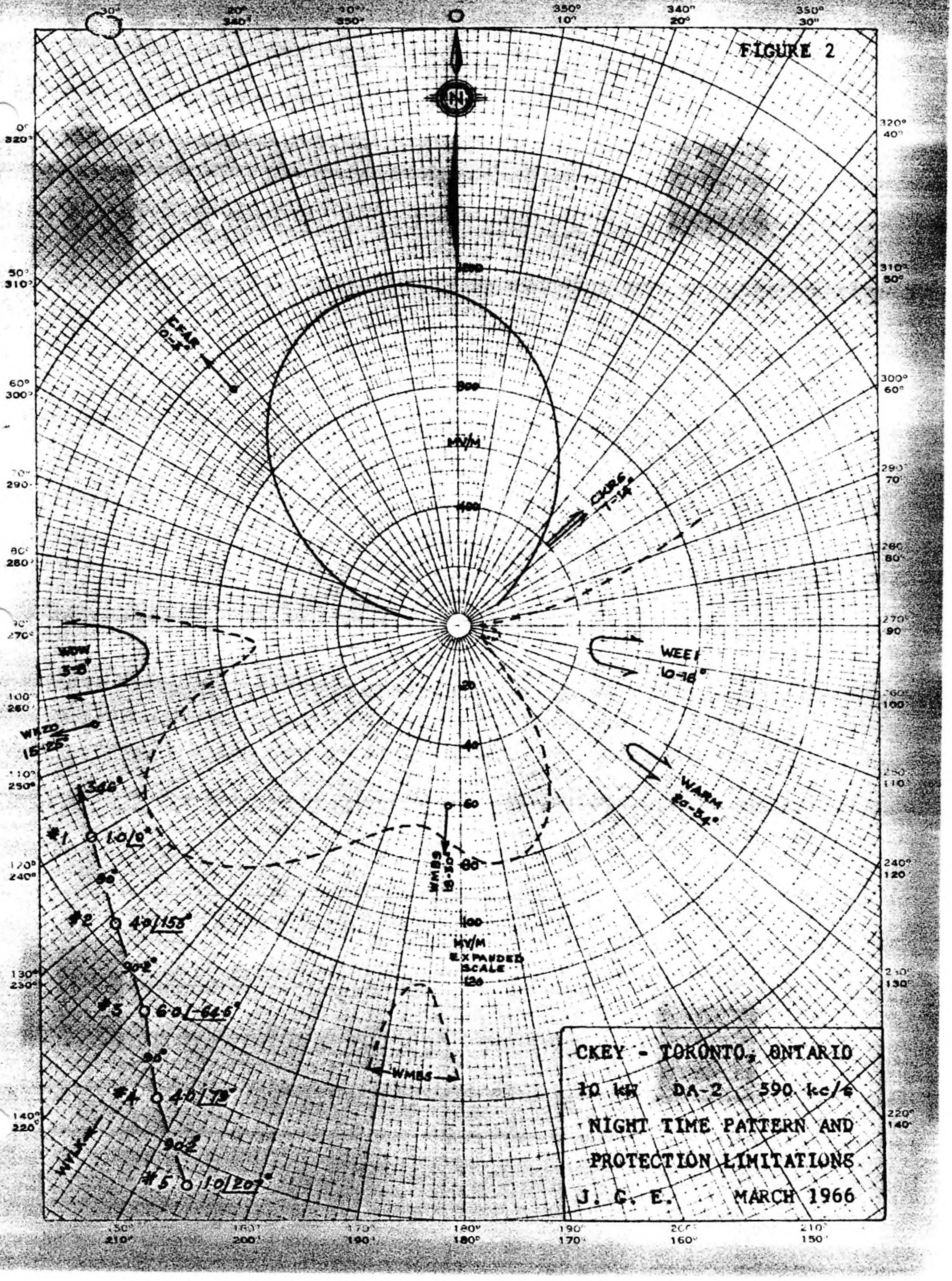
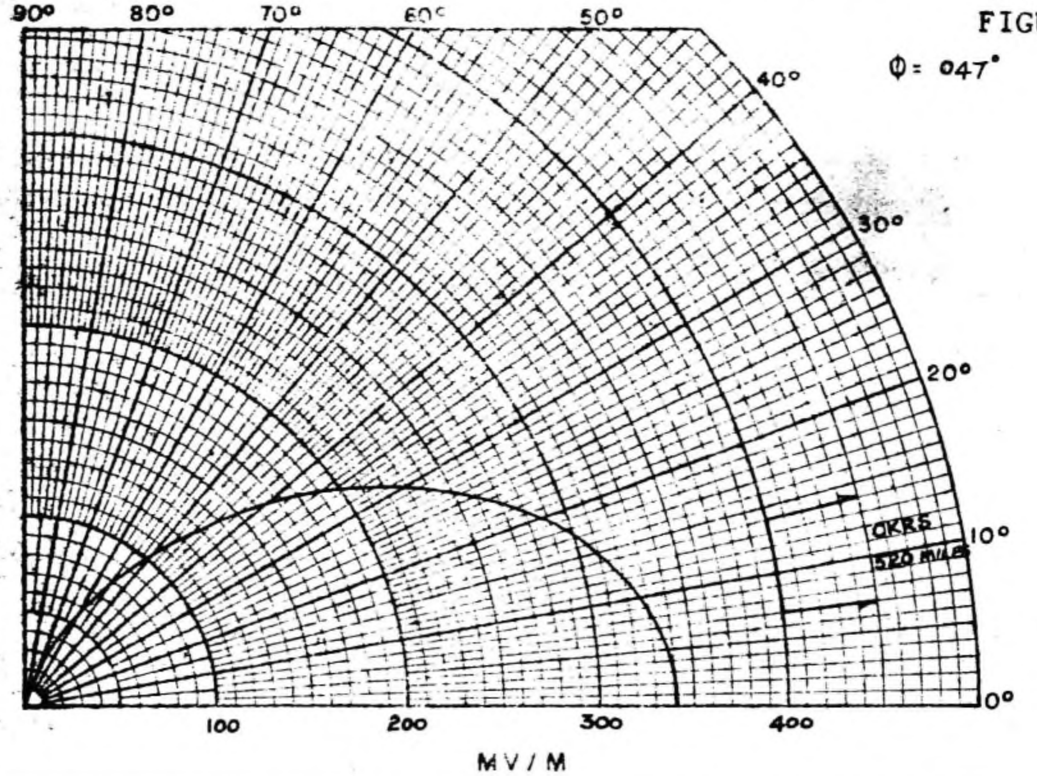
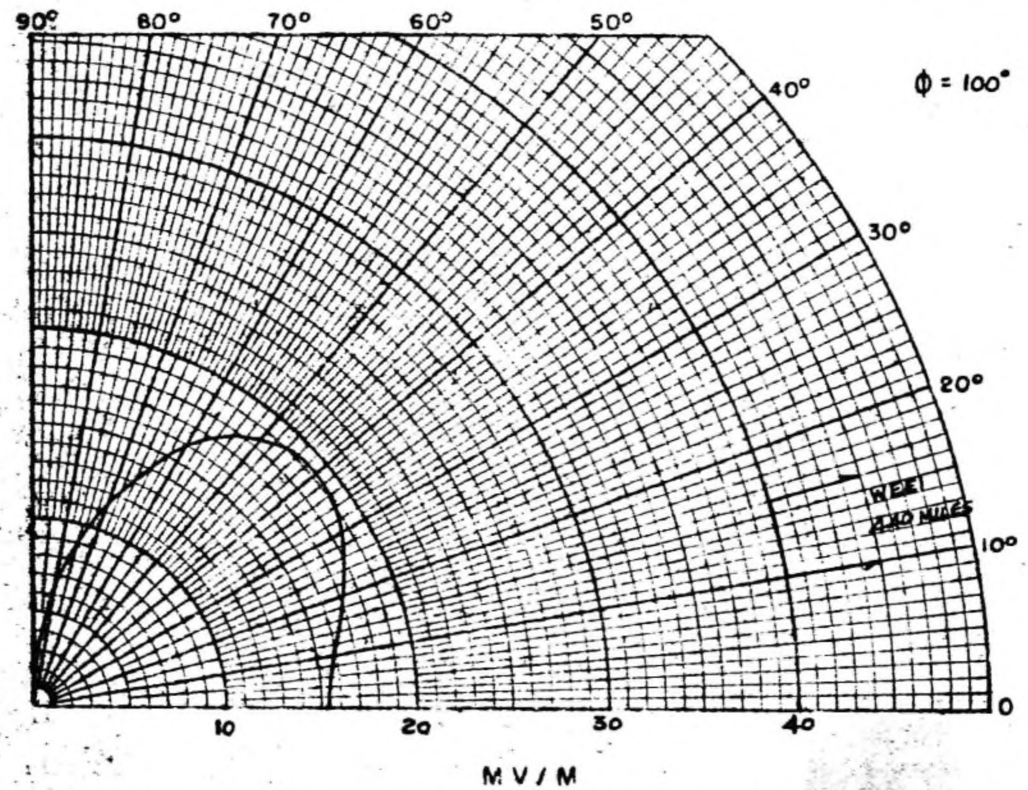


FIGURE 2
MV/M
WOW 3-8°
WEEI 10-18°
CKRS 7-14
CFAR 0-4°
WKZO 15-25°
WARM 20-54°
WMBS 16-30°
WMES
MV/M EXPANDED SCALE
#1 1.0/0°
#2 4.0/158°
#3 6.0/-64.6°
#4 4.0/73°
#5 1.0/207°
WTLX
CKEY - TORONTO, ONTARIO
10 kW DA-2 590 kc/s
NIGHT TIME PATTERN AND
PROTECTION LIMITATIONS
J. C. E. MARCH 1966
POLAR CO-ORDINATE

FIGURE 3-1





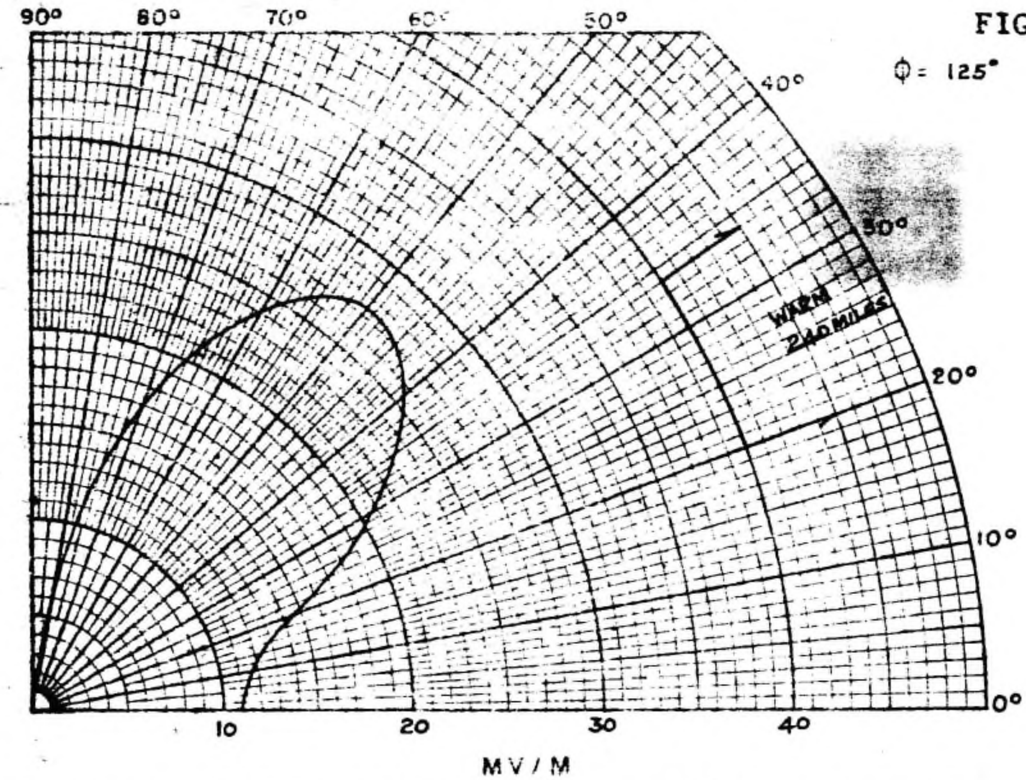
VERTICAL RADIATION PATTERNS

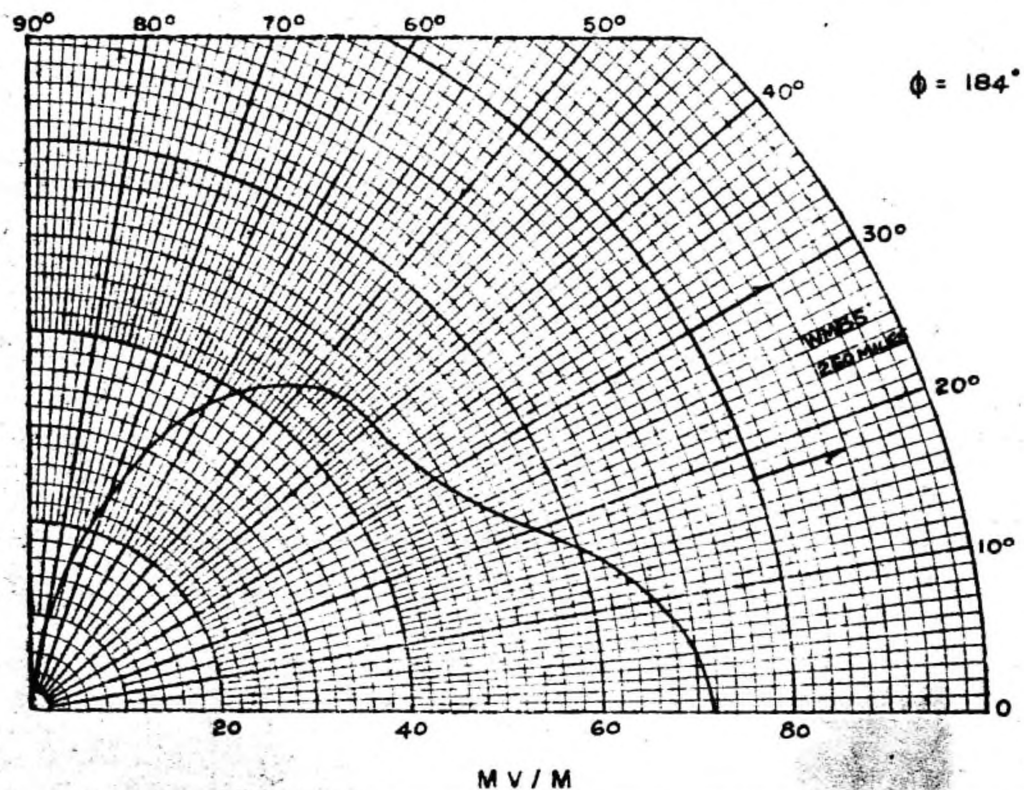
CKEY - TORONTO, ONTARIO

10 kW DA-2 590 kc/s

J. G. E. MARCH 1966

FIGURE 3-2





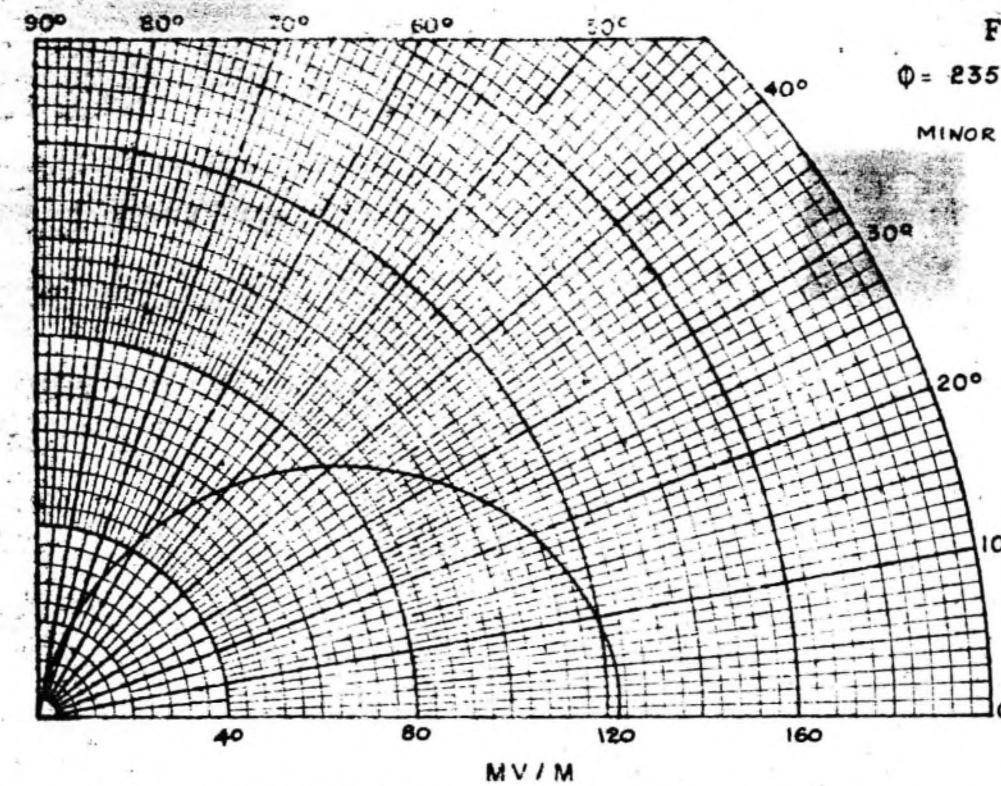
VERTICAL RADIATION PATTERNS

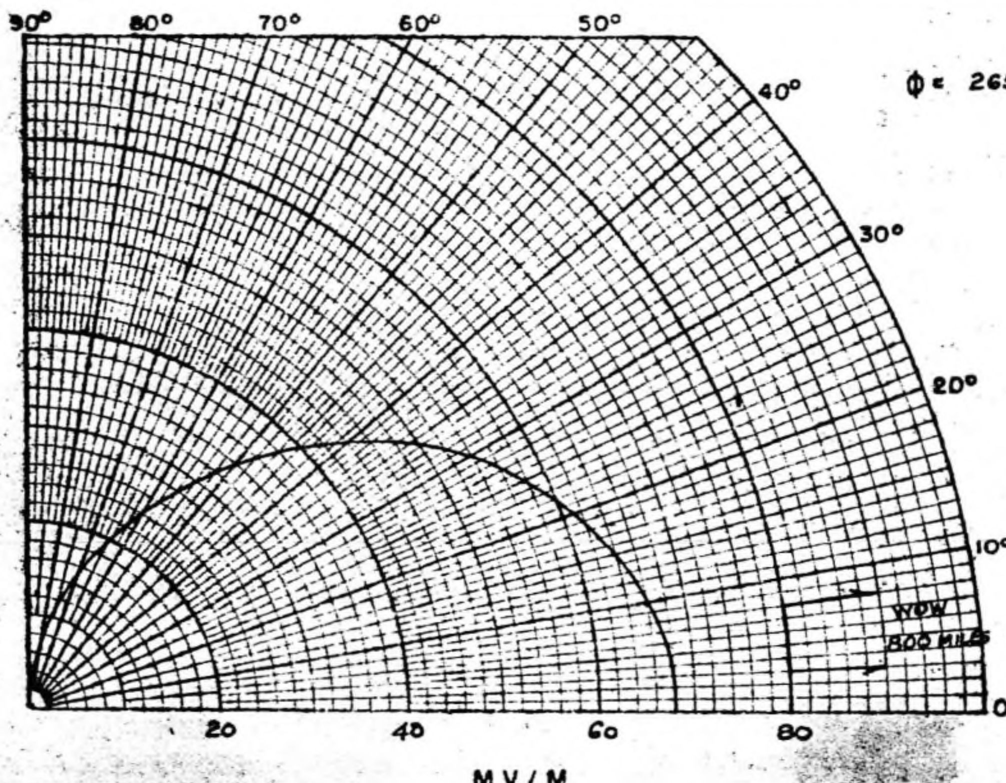
CKEY - TORONTO, ONTARIO

10 kW DA-2 590 kc/s

J. G. E. MARCH 1966

FIGURE 3-3



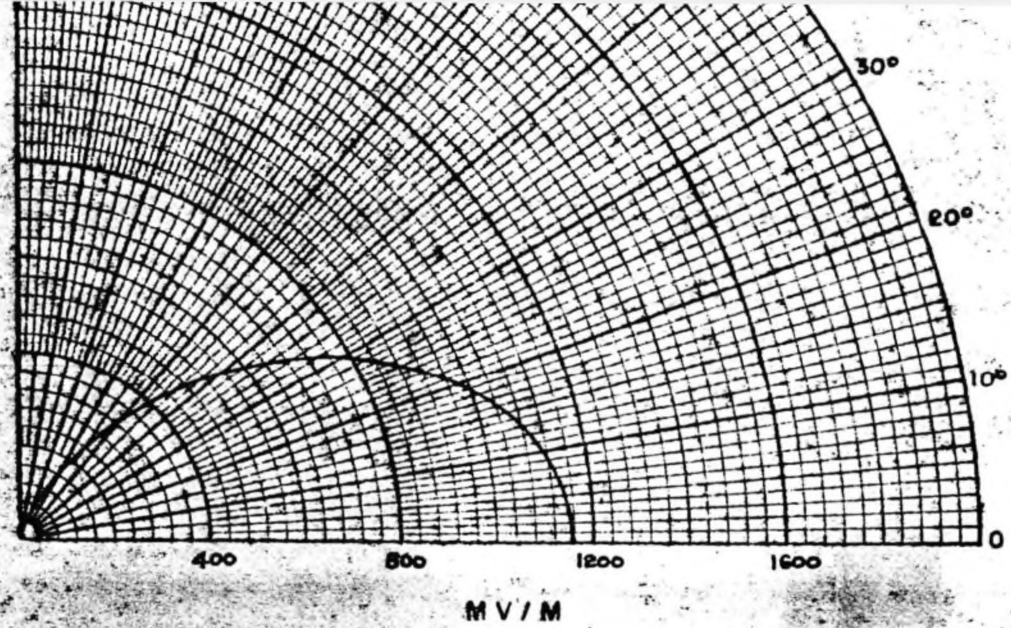


VERTICAL RADIATION PATTERNS

CKEY - TORONTO, ONTARIO

10 kW DA-2 590 kc/s

J. G. E. MARCH 1966



VERTICAL RADIATION PATTERNS

CKEY - TORONTO, UNTARIO

10 kW DA-2 590 kc/s

J. G. E. MARCH 1966

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
CLEVELAND, OHIO

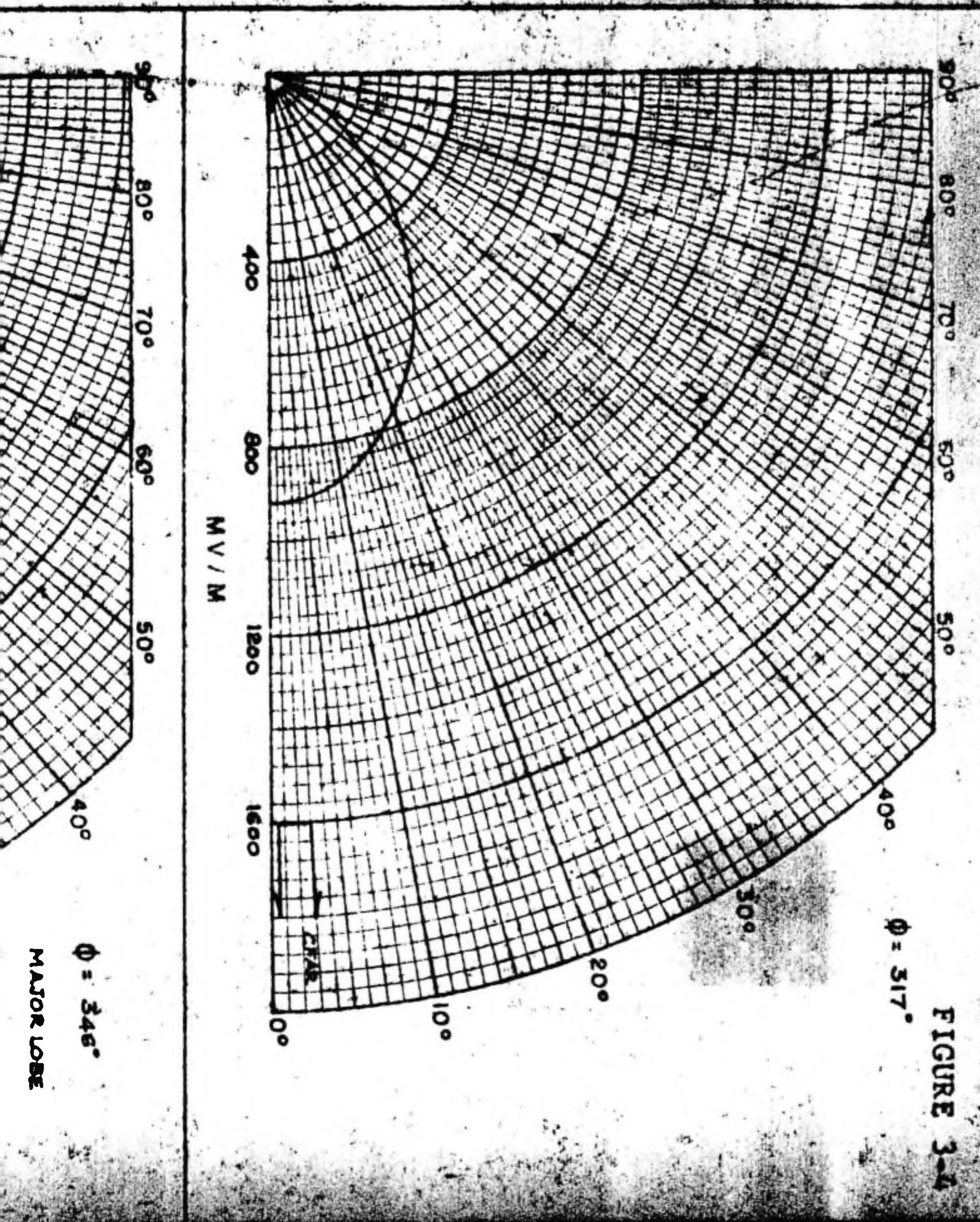
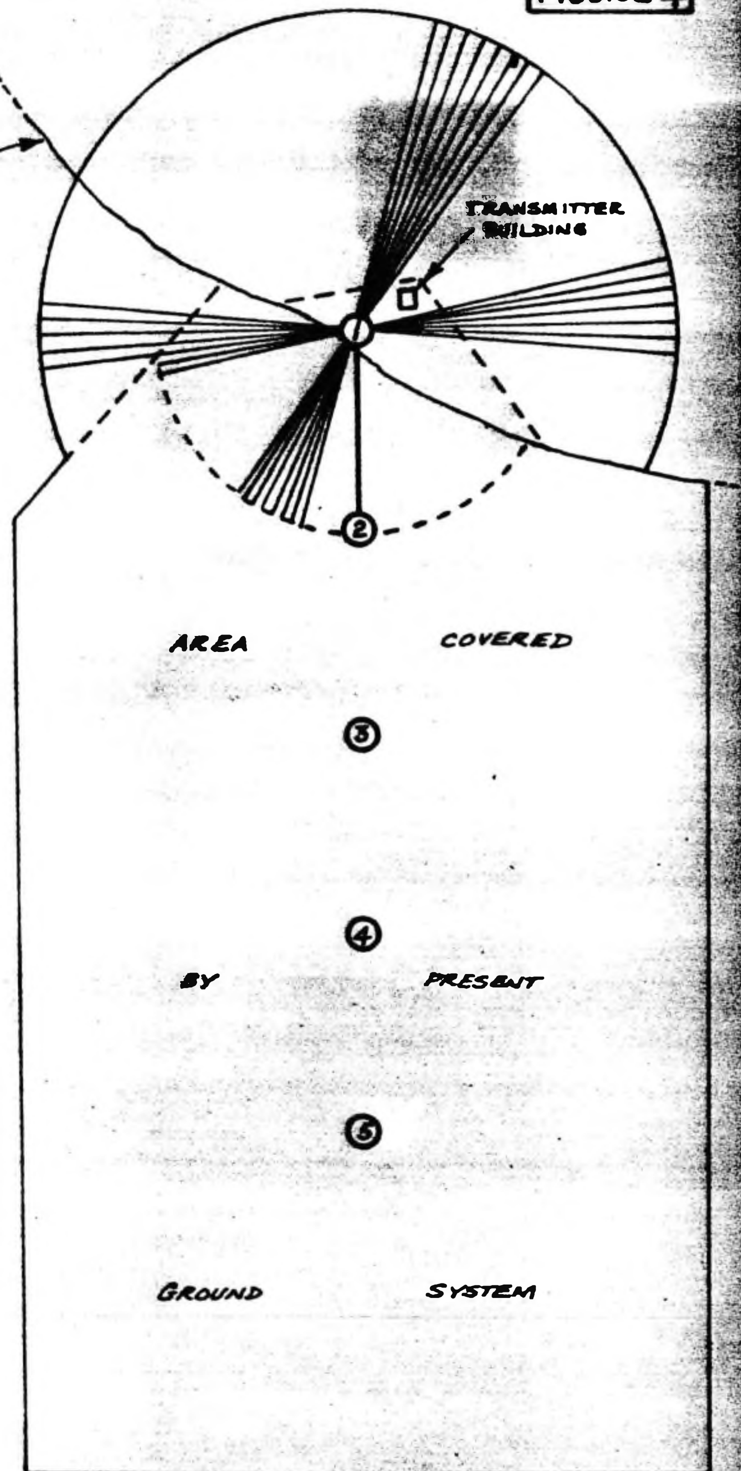


FIGURE 4



RADIALS ARE #10 AWG SOFT DRAWN BARE COPPER, EXTENDING EITHER 670' (0.4λ) FROM NEW NORTH TOWER WHERE POSSIBLE OVERLAND, OR 420' (0.25λ) OVER WATER AND BURIED IN THE LAKE BED. BONDED TO PRESENT NORTH TOWER RADIALS AT CROSSINGS.

AT THE TOWER BASE, RADIALS ARE BONDED TO A COPPER RING WHICH IN TURN, IS BONDED TO THE THREE TUBULAR STEEL PILES THAT FORM THE SUPPORTING TRIPOD.

SCALE: 1" = 400'

CKEY – TORONTO, ONTARIO

PROPOSED 10kW DA-2 590 kc/s

SKETCH OF SITE & GROUND SYSTEM
SHOWING TYPICAL TOWER #1 RADIALS

J.G. ELDER MARCH 1966

ELDER ENGINEERING LIMITED

TABLE 1

ANTENNA DESCRIPTION SHEET

STATION CALL:	CKEY
MAIN STUDIO:	TORONTO, ONTARIO
FREQUENCY:	590 kc/s
POWER:	10 kW
CLASS:	III
MODE:	DA-2
TIME:	UNLIMITED
NOTIFICATION LIST NO.:	211 DATE: May 18, 1966
GEOGRAPHICAL LOCATION:	Latitude: 43° 36' 33" North Longitude: 79° 23' 20" West
ARRAY CHARACTERISTICS:	Five 1" diameter vertical copper elements, base insulated, series fed; mounted and insulated within self-supporting, sectionalized steel towers; each top-loaded by a series inductor and hat of 50 feet diameter. Vertical radiation characteristic approximately same as for 45° non-loaded antenna.

TOWER:	#1 NORTH	#2 N.C.	#3 CENTRE	#4 S.C.	#5 SOUTH
HEIGHT:	150'	150'	150'	150'	150'(32.4°)
SPACING:	416.7' 90°	reference	417.9' 90.2°	832.7' 179.9°	1250' 270°
TRUE BEARING:	346°	reference	163.5°	167.2°	166°
DAY RATIO:	0.17	1.00	2.90	2.64	1.02
DAY PHASE:	150°	175°	-70°	70°	-150°
NIGHT RATIO:	1.00	4.00	6.00	4.00	1.00
NIGHT PHASE:	0°	153°	-64.5°	79°	-153°

GROUND SYSTEM:	120 equally spaced #10 AWG bare copper radial wires per tower buried 6 - 8" deep or sunk in the lake bottom and of average effective length 0.4λ (670').
PREDICTED EFFICIENCY:	165 mV/m for 1 kW 521.5 mV/m for 10 kW

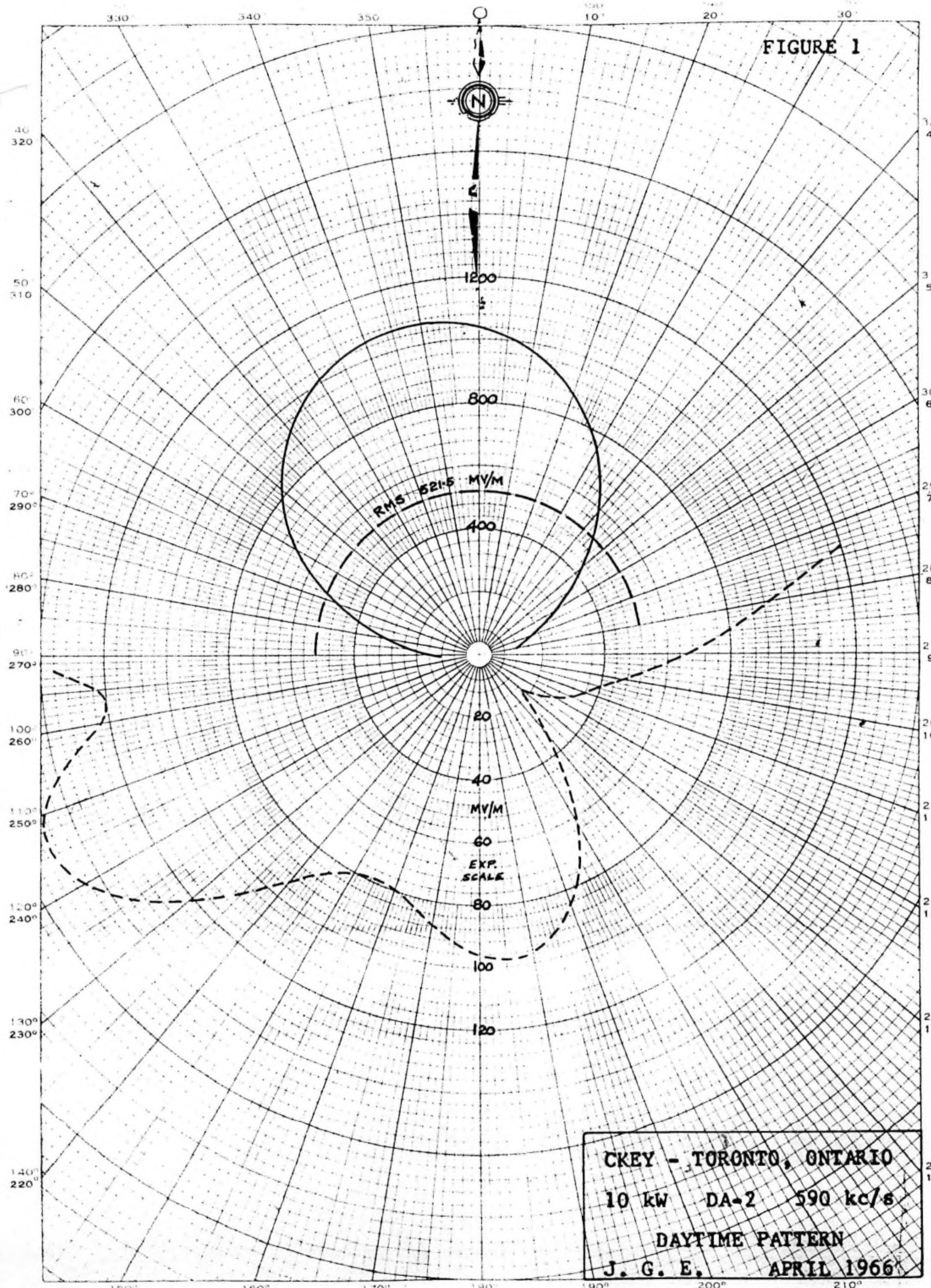


FIGURE 1
RMS 521.5 MV/M
1200
800
400
20
40
MV/M
60
EXP. SCALE
80
100
120
CKEY - TORONTO, ONTARIO
10 kW DA-2 590 kc/s
DAYTIME PATTERN
J. G. E. APRIL 1966
POLAR CO-ORDINATE
MADE IN U. S. A.

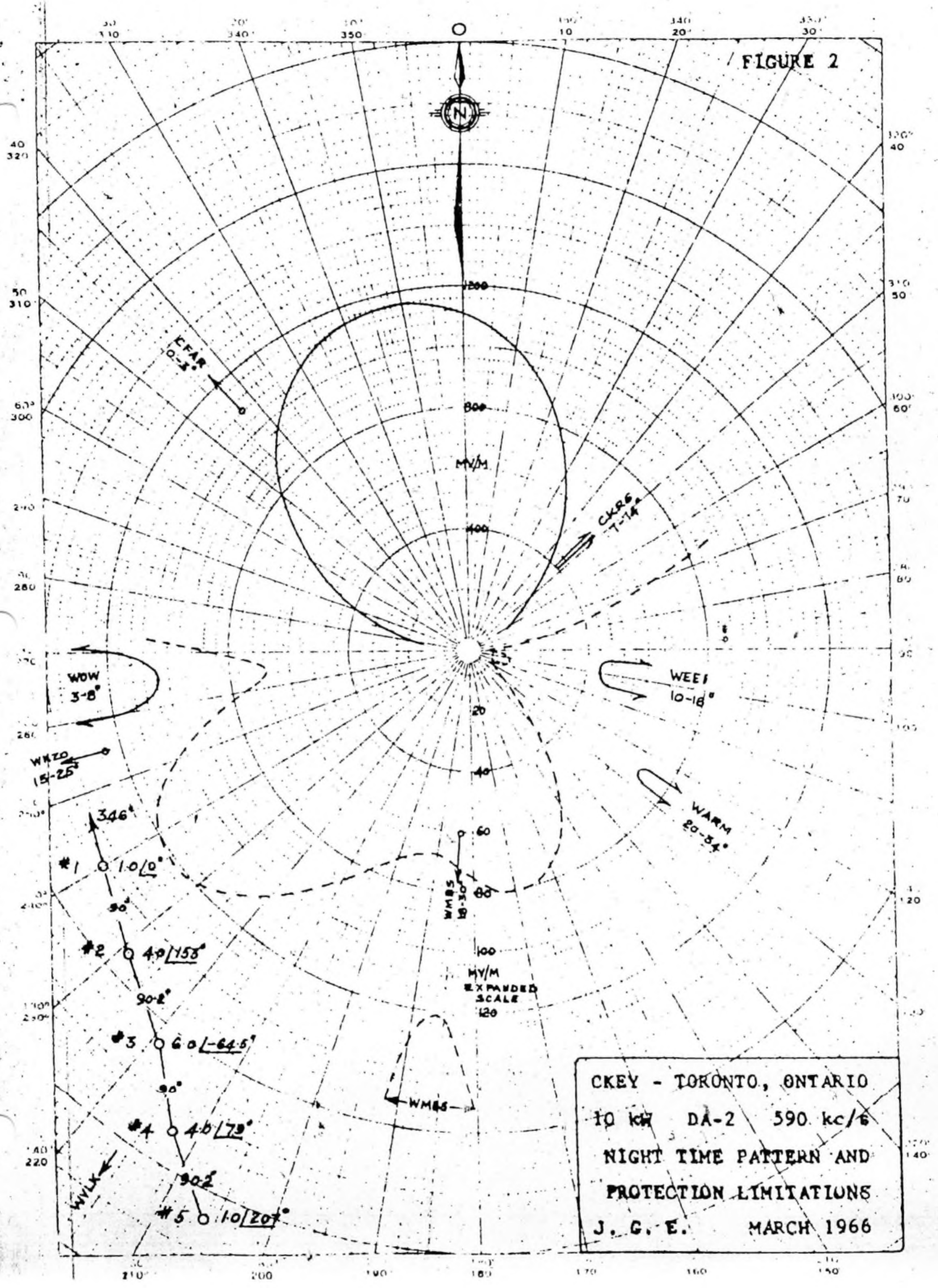


FIGURE 2
N
CKEY - TORONTO, ONTARIO
10 kW DA-2 590 kc/s
NIGHT TIME PATTERN AND
PROTECTION LIMITATIONS
J. G. E. MARCH 1966
MV/M
MV/M
EXPANDED
SCALE
CKFAR
10-5°
CKRS
7-14°
WOW
3-8°
WEEI
10-18°
WKZO
15-25°
WARM
20-34°
WMBS
18-30°
WMBS
WWLK
346°
#1 1.0/0°
90°
#2 4.0/155°
90.2°
#3 6.0/-64.5°
90°
#4 4.0/73°
90.2°
#5 1.0/207°

M-H (Shoreacres) 1-14

Schedule 12 : 11

Chairman of Shoreacres Broadcasting Company Limited is Donald G. Campbell. Mr. Campbell has an extensive background in broadcasting, publishing, finance, management and administration. He is President of Maclean-Hunter Limited, Shoreacres' parent company. He is active in business, broadcasting and community affairs.

President of Shoreacres Broadcasting Company Limited is Douglas C. Trowell. He is General Manager of CKEY. Mr. Trowell began on the program side of radio 20 years ago, later went into radio time sales, then promotion management, followed by sales management and then became station manager.

He has served as director and officer of numerous industry groups, including Central Canada Broadcasters' Association of which he is now President, Broadcast News Ltd., Bureau of Broadcast Measurement, Radio-Television Executives Society (now the Canadian Broadcasting Executives Society). He was Program Chairman of the Radio Commercial Festival held in Toronto in 1965 and Chairman of the 1970 Central Canada Broadcasters' Association Convention. Mr. Trowell joined Shoreacres Broadcasting Company Limited and CKEY in 1961.

He was appointed by the Ontario Government to serve on the Council of the Ontario College of Art.

Vice-President of Shoreacres Broadcasting Co. Ltd. is Stuart C. Brandy. He is Assistant General Manager of CKEY. Mr. Brandy began in radio as a transmitter operator and after experience gained in on-air work, sales, and sales management at several Ontario radio stations, became General Manager and Executive Vice President of CJSP, Leamington. He joined CKEY in 1963 as General Sales Manager. He is Chairman of the Radio Sales Bureau and is a director of Stephens & Towndrow Ltd., a sales representation firm.

CKEY Program Manager is Gene Kirby. After singing professionally with the Robert Shaw Chorale and other groups, Mr. Kirby entered the broadcast field while at college. First working professionally in Fredericton, N.B., he moved to stations in Ontario and Quebec, joining CKEY in

X

1961. He received special commendation from Life Magazine for his singular coverage of the Springhill Mine Disaster. He has made several commercials and public service announcements that have won international awards. He has also produced Canadian recordings and transcriptions on CKEY's Ampersand label with international distribution.

CKEY News Director is James R. Hunt, a journalism graduate of the University of Western Ontario with 23 years' experience in the communications field, 19 of them as reporter, feature writer and editor with the Toronto Star. He is a frequent guest on television and is the author of several books. Under his direction CKEY News has won several awards for news broadcasting.

CKEY Advertising, Research & Development Manager is Harvey M. Clarke. After newspaper and advertising agency experience in Kitchener and Toronto, Mr. Clarke worked with the broadcast industry for three years as the Advertising Manager of Capitol Records of Canada. He then joined radio station CFPL as its Promotion Manager. He joined CKEY in 1961. He is a former Vice-President of the International Broadcasters' Promotion Association and was their first Canadian officer. He is an active charter member of the Broadcast Research Council in which he served 3 terms as a director. He was a member of the Research and Development Committee of the Bureau of Broadcast Measurement and is now on the Member Requirement Committee of BBM.

CKEY Engineering Manager is William R. Onn. He started in engineering at CFPL Radio in London, subsequently became Chief Engineer of CHLO, St. Thomas. He joined CKEY in 1961. He is a charter member of the Society of Broadcast Engineers and a member of the Institute of Electrical and Electronic Engineers. He has also served as a Chairman of the Engineering Section of the Central Canada Broadcasters' Association.

CKEY Business Manager is D. G. Ulens. From work in actuarial departments of Northern Life in London and Hamilton, Mr. Ulens moved into the industrial fields with Canadian Industries Limited and Canadian Westinghouse, earning his R.I.A. degree before joining CKEY in 1961.

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From The Evening Telegram, October 20, 1951, page 10

VOCM 15th ANNIVERSARY

News Broadcasts, Tragic Fire Mark Growth of Radio Station VOCM

On October 19, 1936, at 8.00 p.m. and in the presence of a gathering of representative citizens which included R. B. Herder of the Evening Telegram, station VOCM was officially opened by the late Andrew Carnell, Mayor of St. John's, and began commercial broadcasting activities from the old Manual Training School, Parade Street. Started in 1933 on an experimental basis by W. B. Williams at Circular Road, it was destined to inaugurate a new era in Newfoundland broadcasting.

Basing its entire structure on news, it was the first to present a three times daily news broadcast. These, called "Terra Nova News" have been presented by the same firm--Harvey and Co. Ltd., since the station opened in 1936. Perhaps the most importa of these broadcasts was on the subject of "The Agreement Leasing Military Bases in Newfoundland to the United States," by His Honour Lt. Col. L. C. Outerbridge, C.B.E., D.S.O., on March 27 1941.

In 1944 VOCM and its managing director J. L. Butler, who also acted as news announcer, were cited in the Supreme Court of Newfoundland on the charge of contempt of Court. This action was taken by the then Attorney General Hon. L. E. Emerson and an attempt was made to sequester the station. The reason for the court action was created by a news comment, which deplored the not infrequent attacks on Newfoundland women during the blackout period by drunken members of the armed forces. VOCM and its announcer were defended by Hon. L. R. Curtis and a watching brief was taken by Solicitor E. J. Phelan, K.C., on behalf of Messrs. Harvey & Co., sponsors of the news bulletin, in which the comment was made. The decision of the court, the last one hande down by the late Sir William Horwood, Chief Justice, dismissed the action.

From The Evening Telegram, October 20, 1951, page 10 (Continued)

One tragic broadcast through VOCM was never completed. It was the Saturday night barn dance program from the K. of C. Hostel. The latter burned to the ground with a loss of 99 lives and was believed to be the result of enemy action during the Second World War.

Twelve minutes after the broadcast started at eleven o'clock Saturday night fire broke out, and for a few seconds stark drama was broadcast as men and women struggled for their lives. Two members of the VOCM cast perished, these were Gus Duggan, son of Tom Duggan, and Hector Woodley, a Canadian seaman who was appearing as guest artist. Marjorie Clarke, feature singer, was terribly burned. Others escaped with minor burns through a side window near the stage. The VOCM remote equipment was destroyed.

Outstanding programs through the years have included the annual Sunshine Camp Radio Auction, hockey and sports features from Bell Island, from the Old Capital--Harbour Grace and for three successive years the baseball championships from Grand Falls. During recent years a mobile transmitting unit has been added and the Telegram Road Race is now an annual event for VOCM listeners.

Special features heard each week are the Church Services every Sunday evening, the Rotary Luncheon each Thursday and Town Meeting in Canada. Regional program each afternoon and the morning Breakfast Club with Chef Mengie Shulman, whose program rating 90 per cent of the audience according to Elliot-Haynes survey is tops for all Canada. Enjoyed by thousands every Sunday is the Salvation Army Band, the Bible Talk, Echoes at Eventide with Harold Ivany and Leighton Hutchings, L.T.C.L., at the console of the studio organ.

On the technical side VOCM has been vastly improved since Confederation. Two years ago new studios were obtained in the heart of the business district and now the entire top floor of the Pope Building, Water Street, is utilized to care for the station' interests.

From The Evening Telegram, October 20, 1951, page 10 (Continued)

A year ago the station's power was increased from 250 to 1,000 watts, but more important was the change in frequency from the middle of the dial to the low frequency end at 590 KC. It is not generally known, but competent engineers claim that 1,000 watts on the low frequency end will do the work of 25,000 watts in the middle of the dial and are equal to 50,000 watts at the upper, or high frequency end.

A survey of actual field strength measurements in Newfoundland is now being carried out, and preliminary tests have demonstrated that VOCM signal strength at points 60 and more miles away are second only to the powerful CBC transmitter, which like VOCM, operates on low frequency end of the dial.

The VOCM 278 foot radiator--the highest in Newfoundland, together with the ground system comprising 14 miles of copper wire buried deep in marshy soil at Rossland, contributes greatly to broadcasting the signals throughout Newfoundland. The reliable transmitter, installed a year ago, has given trouble-free performance for more than 5,000 hours. The only interruptions have been due to power supply failure or lightning surges.

When it was officially opened 15 years ago Mayor Carnell jokingly remarked that VOCM tonight is the "Voice of Carnell Mayor." It has since been called the Voice of the Common Man. The Freedom Station and many others. It does, however, occupy a unique niche in Canadian broadcasting in that it has the only "V" call for a commercial station. It has served Newfoundland for fifteen years under the same management, and it hopes to continue to merit the slogan it has adopted--"Newfoundland's Own."

PA 6276-88
Brief

STATION CALL:	CKEY
STUDIO LOCATION:	TORONTO, ONTARIO
SUBMISSION:	FINAL PROOF OF PERFORMANCE
SUBMISSION DATE:	16 MAY 1986
LICENCEE:	KEY RADIO LIMITED
CONSULTANT:	J. GORDON ELDER, P. ENG.

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TABLE OF CONTENTS

FINAL PROOF OF PERFORMANCE – STATION CKEY

1-INTRODUCTION

The work described herein was carried out between October 1985 and May 1986, on behalf of KEY Radio Limited. It included extensive tests, measurements and adjustments that were performed on CKEY's array.

This report consitutes a final proof of performance, as required by Broadcast Procedure One, Rule 16, because of the "critical" array design and protection tolerance.

We submit that the results demonstrate good agreement with the authorized facilities.

2-INSTALLATION

The design, materials and workmanship employed in this system fully conform with recongnized standards of good engineering practice and with commitments contained in Section 19 of the technical brief.

The nine vertical mast radiators are painted and lighted in accordance with the Department of Communications BP 16. The aviation hazard lighting is as specified in Transport Canada's letter dated November 14, 1980 and painting is per TP-382.

3-TREATMENT OF RERADIATORS

Two potential sources of reradiation were identified. One was a 100' communications mast within the 2 V/m contour. The other was a high voltage hydro tower line in the main lobe running east and west through Grimsby. Close in measurements were made on the mast which, when analyzed indicated a very low level of reradiation. Computer analysis of scattering from the power line indicated that its reradiation level was also very low. Therefore, no treatment was required.

It is our belief from these analysis that the pattern's far field is not significantly affected by reradiation. However, local reradiation greatly affected the accuracy of field strength measurements made near the power lines, in particular, the ratio ones. Therefore, the radial measurements were relied upon, to determine the true size and shape of the pattern, with ratio data included, merely as supplementary information.

4-MEASUREMENT METHODS

Tower self impedances were measured by the bridge method, with other towers floated and lighting transformers connected. Results recorded herein were obtained in November 1985.

The electrical lengths of the sampling lines were measured to verify that they were equal within ±0.5°.

The electrical lengths of the RF transmission lines were also measured.

The phasor components were pre-set to their design values.

The initial testing and adjustment of the array involved ratio measurements on two circuits and short radials on critical bearings using transmitter powers between 0.5 and 50 kW. During this preliminary phase, adjustments were made to improve the pattern, flatten the transmission lines and optimize the common point. In addition possible sources of reradiation and sampling system errors were considered as causes of pattern distortion. Finally, a northerly set of radial measurements was made to establish the value of radiated field, and the impedances, bandwith and power distribution were measured.

These initial measurements and adjustments are documented more fully in the Preliminary Proof of Performance.

For the Final Proof of Performance, measurements and adjustments were made using a larger ratio measurement circuit consisting of sixty-five points around the array at distances up to 23 km, in an attempt to reduce measurement errors caused by scattering from the numerous high voltage power lines traversing the area.

An iterative approach was taken (using selected points from the circuit described above as well as short radials on critical bearings) in making adjustments to optimize the pattern, using graphical and computer analysis of interim measurement data to determine what further adjustments to make. This iterative procedure involved the trial of fifteen different patterns before the final one was achieved.

All measurements and adjustments with the exception of common point measurements were made under modulation with transmitter powers of 30 kW and later, 50 kW.

All field intensity measurements were made at unobstructed locations as far as possible from large metallic objects. The meters were periodically recalibrated against each other and any variations were less than ±2%.

On completion of the array adjustments, phasor components were retrimmed for minimum VSWR on the transmission lines. Prescribed measurements were made on fifteen radial bearings and also at the sixty-five ratio points. All final measurements including these radial ones were made at a nominal power of 50 kW.

5-RESULTS

After careful refinement using the methods already described, a radiation pattern was obtained that meets all day and night protection requirements at 50 kW.

The phasor and power distribution system operate efficiently. VSWR's are less than 1.14:1 on all transmission lines.

The radial measurements show the shape and size of the measured horizontal radiation pattern to be in good agreement with those notified. The ratio measurements generally conform, but differ on some bearings.

We attribute this mainly to local scatter, as noted previously. Minor changes in local ground conductivity between February when the omni-measurements were made and April, when the final set of directional measurements were made, may also contribute.

The measured ground conductivity was generally in the range 8 - 15 mS/m on the Niagara Peninsula, which is slightly higher than the map value for that area. Further west, the conductivity was in the 5 - 10 mS/m range, which is typical for that area. In the region immediately to the north of Lake Ontario the conductivity ranged from 8 - 15 mS/m which is slightly higher than the map values for that area. Further to the north, in the region around Gravenhurst, the measured conductivity dropped to 1.5 - 2 mS/m, which is lower than the map values.

The measured 1000 and 250 mV/m contours are both smaller than the predictions contained in the technical brief. This is likely due to shadowing by the Niagara Escarpment in the case of the 1000 mV/m contour and to interpolation errors in the 250 mV/m contour, since it is mostly over water.

The measured 100 and 5 mV/m contours are in good agreement with the predicted ones.

The measured 25, 17.4 and 15 mV/m contours are larger than the predicted ones, most likely due to actual conductivities which were greater than those assumed for the area the contours occupy.

The 0.5 mV/m measured contour does not extend as far north as predicted but does extend farther south. Again, this is most likely due to actual conductivities which differ from map values.

6- INSTRUMENTS USED

CLASS	MANUFACTURER	TYPE	ACCURACY
Field Intensity Meter	Potomac	FIM-21,41	±5%
Antenna Monitor	Potomac	AM-19S	1%,1°
R.F. Bridge	Delta Electronics	OIB-2,3	±1Ω ±5%
Receiver Generator	Delta Electronics	RG-1,RG-3	
Thermoammeters		various	

7-ENGINEER'S SEAL AND SIGNATURE

The work documented in this report was carried out by the undersigned, assisted by W. R. Onn, CKEY's Vice-President of Engineering and his staff.

K. Stuart Hahn, B.A.Sc.

J. Gordon Elder, P. Eng.

TABLE 1

ANTENNA DESCRIPTION SHEET

STATION CALL: CKEY

MAIN STUDIO: TORONTO, ONTARIO

FREQUENCY: 590 kHz

POWER: 50 kW

CLASS: III

MODE: DA-1

TIME: UNLIMITED

NOTIFICATION LIST NO.: .... DATE ....

GEOGRAPHICAL LOCATION: Latitude: 43° 09' 10" North
Longitude: 79° 32' 04" West

ARRAY CHARACTERISTICS: Nine guyed steel towers of uniform cross section; base insulated, series fed; no top loading; overall height above ground 455', height above base insulator 450' (97.1°)

NUMBER	SPACING FEET	SPACING DEGREES	TRUE BEARING DEGREES	FIELD RATIO	PHASE DEGREES
1	1110.8	239.76	288.544	0.309	-119.6
2	886.6	191.38	268.470	0.630	- 4.2
3	791.5	170.85	239.334	0.329	109.3
4	416.9	90	332	0.505	-112.0
5	Ref	Ref	Ref	1.000	0.0
6	416.9	90	152	0.513	113.0
7	789.0	170.311	61.548	0.212	-122.2
8	889.5	192	89.5	0.433	- 3.0
9	1143.5	246.824	108.37	0.227	108.9

GROUND SYSTEM: 120 equally spaced radials per tower of #10 AWG soft drawn bare copper buried 6" to 18" deep where possible, of average length exceeding 667' (.4λ) excluding those along common chords; minimum length 417' (.25λ), maximum length 1000' (.6λ); Counterpoise at base of each tower

PREDICTED EFFICIENCY: 1361.715 mV/m for 50 kW 2191.4@1km
(UNATTENUATED FIELD AT ONE MILE) 192.576 mV/m for 1 kW

IMPEDANCE DATA

TOWER BASE SELF (NOVEMBER 1985)

FREQUENCY kHz	#1	#2	#3	#4	#5
565	57.0+j 94.6	54.0+j 91.5	59.0+j 99.4	61.0+j 96.1	56.0+j 91.0
575	61.0+j107.0	58.0+j102.9	64.0+j110.4	67.0+j107.2	61.0+j101.8
585	66.0+j122.3	62.0+j115.8	70.0+j125.2	73.0+j122.3	64.0+j118.2
595	76.0+j133.3	67.0+j131.5	77.5+j136.3	82.0+j134.2	69.0+j129.7
605	84.0+j147.0	72.0+j145.2	85.0+j147.6	89.0+j146.1	74.0+j143.4
615	91.0+j160.5	79.0+j158.7	94.0+j158.7	96.0+j159.6	80.0+j157.4
590*	72.5+j127.5	65.3+j124.3	74.9+j129.6	78.0+j127.6	67.3+j123.6

FREQUENCY kHz	#6	#7	#8	#9
565	61.0+j 96.6	62.0+j 96.1	55.0+j91.5	58.0+j 94.1
575	66.5+j107.2	68.0+j107	59.0+j102.9	62.5+j105.2
585	73.0+j122.2	75.0+j121.2	63.0+j119.0	68.0+j121.1
595	81.0+j133.9	83.0+j132.7	66.5+j132.1	75.5+j133.9
605	88.0+j145.2	90.0+j143.8	72.0+j144	83.0+j143.2
615	96.0+j154	98.0+j155.9	78.0+j158.7	92.0+j160
590*	77.6+j126.5	79.3+j126.1	65.6+j124.7	73.2+j126.6

* Averaged Values

Average self impedance on 590 kHz is 72.6+j126.3

DAY PATTERN COMMON POINT IMPEDANCE MEASUREMENTS

January 6, 1986

FREQUENCY kHz	IMPEDANCE OHMS
570	58.0+j20.5
575	63.3+j10.9
580	58.5+j 5.2
585	54.5+j 0.4
590	50.5+j 0.0
595	46.0+j 2.7
600	46.0+j 5.1
605	45.6+j 6.1

TABLE 3-1

IMPEDANCE, CURRENT AND POWER DIVISION

TRANSMITTERS:

MAIN - HARRIS MW50C

ALTERNATE - Two COLLINS 10 kW 820-8-F

MAIN TRANSMITTER P. A. PLATE	Volts	9,300
	Amperes	6.5
	Watts In	60,450
	Efficiency	82.59%
	Watts Out	49,928

TABLE 3-2

IMPEDANCE, CURRENT AND POWER DIVISION

	IMPEDANCE OHMS	CURRENT AMPS	POWER WATTS
COMMON POINT	50 + j0	31.6	49,928
LINE INPUT			
1	50 + j6.5	10.2	5,202
2	54 - j1.8	10.4	5,841
3	-54 + j0	2.95	-470
4	48 - j2.4	15	10,800
5	49 + j0	19.6	18,824
6	50 + j1.6	4.9	1,201
7	49 + j5.3	7.2	2,540
8	53 + j4.1	10.1	5,407
9	54.5+ j3	2.3	288
			49,633
TOWER			
1	144.7+j146.3	5.82	4,901
2	33.5+j114.5	12.90	5,575
3	-13.7+j108	6.7	-615
4	116.0+j223	8.25	11,298
5	49.5+j128.6	19.5	18,822
6	7.2*+j102.1	10.4	779
7	298.0+j291.5	2.73	2,221
8	70.0+j127.1	8.3	4,822
9	9.1+j 89.7	4.75	205
			48,008
OMNI DIRECTIONAL OPERATION			
TOWER #5	67.3+j123.6	17.4	20,376

* INCLUDES 5.7 OHM STABILIZING RESISTORS

TABLE 4

ANTENNA MONITOR READINGS

POTOMAC AM-19D

TOWER	MAGNITUDE	PHASE
1	29.0	-108.5
2	64.7	-6.0
3	33.8	102.5
4	42.4	-101.9
5	101.0	0.0
6	53.4	111.1
7	13.9	-106.2
8	43.2	-3.2
9	24.0	105.0

TABLE 5-1

RATIO FIELD STRENGTH MEASUREMENTS

POINT NUMBER	BEARING DEGREES	FIELD STRENGTH mV/m DA-1	FIELD STRENGTH mV/m OMNI	DA-1 / OMNI × 891.66 =	FIELD @ 1 MILE mV/m	FIELD @ 1 km mV/m
1	80	2.0	82	0.02439	21.7	34.9
2	87.5	4.05	83	0.04880	43.5	70.0
3	90	5.5	72	0.07639	68.1	110
4	97	1.53	77	0.01987	17.7	28.5
5	102	6.9	76	0.09079	81.0	130
6	106	5.9	80	0.07375	65.8	106
7	110.5	3.45	81	0.04259	38.0	61.2
8	116.5	7.3	84	0.0869	77.5	125
9	121	4.3	85	0.05059	45.1	72.6
10	124	2.8	72	0.03889	34.7	55.8
11	131	1.84	52	0.03538	31.5	50.8
12	135.5	2.1	55	0.03818	34.0	54.8
13	140	2.27	55	0.04127	36.8	59.2
14	146.5	4.0	54	0.07407	66.0	106
15	152.5	4.05	54	0.075	66.9	108
16	157.5	6.1	62	0.09839	87.7	141
17	164.5	7.8	60	0.13	116	187
18	170	5.8	63.5	0.09134	81.4	131
19	174	5.4	65	0.08308	74.1	119
20	180	4.7	71	0.06620	59.0	95.0
21	184.5	6.0	77	0.07792	69.5	112
22	191	5.0	80	0.0625	55.7	89.7
23	195	4.95	84	0.05893	52.5	84.6
24	200.5	2.42	93	0.02602	23.2	37.3
25	204	2.17	93	0.02333	20.8	33.5
26	210	6.3	91	0.06923	61.7	99.3
27	215	2.65	92	0.0288	25.7	41.3
28	220.5	1.57	90	0.01744	15.6	25.0
29	224	9.0	87	0.10345	92.2	148
30	230	7.4	80	0.0925	82.5	133

TABLE 5-2

RATIO FIELD STRENGTH MEASUREMENTS

POINT NUMBER	BEARING DEGREES	FIELD STRENGTH mV/m DA-1	FIELD STRENGTH mV/m OMNI	$\frac{\text{DA-1}}{\text{OMNI}} \times 891.66 =$	FIELD @ 1 MILE mV/m	FIELD @ 1 km mV/m
31	235	8.7	77	0.11299	101	162
32	239.5	7.2	90	0.08	71.3	115
33	244.5	7.7	86	0.08953	79.8	128
34	251	2.55	72.5	0.03517	31.4	50.5
35	255	7.2	70	0.10286	91.7	148
36	260.5	5.2	78	0.06667	59.4	96
37	263	4.45	73	0.06096	54.4	87.5
38	269	4.45	81	0.05494	49.0	78.8
39	275	5.6	83	0.06747	60.2	96.8
40	280	8.5	79	0.1076	95.9	154
41	285	13.8	80	0.1725	154	248
42	288.5	19.7	87	0.2264	202	325
43	294	30.6	115	0.2661	237	382
44	300	41	125	0.328	292	471
45	304	53	131	0.4046	361	581
46	310	90	141	0.6383	569	916
47	314.5	163	150	1.0867	969	1559
48	317	201	153	1.3137	1171	1885
49	325.5	340	183	1.8579	1657	2666
50	332	470	177	2.6554	2368	3810
51	340.5	580	162	3.5802	3192	5137
52	347	860	218	3.945	3518	5661
53	354.5	990	239	4.1423	3694	5944
54	360	1010	257	3.93	3504	5639
55	12	800	258	3.1008	2765	4449
56	20	605	252	2.4008	2141	3445
57	32	212	235	0.9021	804	1294
58	39.5	77	233	0.3305	295	474
59	43.5	40	211	0.1896	169	272
60	50.5	12.8	212	0.06038	53.8	86.6
61	55	5.6	156	0.0359	32.0	51.5
62	60	6.8	132	0.05152	45.9	73.9
63	66.5	5.5	117	0.04701	41.9	67.5
64	71	6.2	122	0.05082	45.3	72.9
65	75	3.2	142	0.02254	20.1	32.3

TABLE 6-1

RADIAL MEASUREMENT DATA

RADIAL BEARING: 000° TRUE

DATE: April 8, 14, 15 and 17, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m)
1	1.55	3380
2	1.9	2900
3	2.75	2050
4	2.87	1900
5	3.73	1380
6	4.36	1200
7	4.88	1150
8	5.05	1010
9	48.4	101
10	55.7	86
11	58.4	79
12	64.4	57
13	69.8	57.5
14	75.1	41
15	79.6	40
16	86	34
17	92.6	25.8
18	100.2	20.1
19	106	18.6
20	110.1	15.5
21	120.4	14.8
22	130.9	10.9
23	142.2	9.2
24	150.7	7.8
25	162	4.8
26	172.4	4.3
27	199.5	0.74
28	204.4	0.72
29	217.4	0.96
30	224.2	0.89
31	229	0.66
32	236.3	0.42
33	249.1	0.405
34	258	0.355
35	265.8	0.28
36	284.2	0.228
37	297.2	0.19
38	311.1	0.205

TABLE 6-2

RADIAL MEASUREMENT DATA

RADIAL BEARING: 030° TRUE

DATE: April 9 and 18, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	1.63	970
2	1.78	950
3	2.43	600
4	2.46	580
5	3.95	430
6	4.12	452
7	4.7	335
8	4.8	330
9	4.95	332
10	5.45	308
11	5.69	295
12	87.6	12.3
13	91.6	11.3
14	96.2	11.
15	100.5	8.7
16	104.7	8.2
17	111.2	6.4
18	117.5	5.5
19	120.4	5.1
20	124.7	4.3
21	136.7	3.7
22	147.5	2.98
23	157.2	2.62
24	160.6	2.18
25	164.3	1.9
26	172.5	1.53
27	177.8	1.23
28	185	1.03
29	219.5	0.22
30	229.5	0.32
31	238.3	0.221
32	246.7	0.192
33	258.2	0.152

RADIAL MEASUREMENT DATA

RADIAL BEARING: 060° TRUE

DATE: April 9 and 18, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	1.62	90
2	2.27	27.6
3	2.41	39
4	2.5	38
5	2.66	39.8
6	3.61	10.8
7	3.76	9.6
8	4.3	11
9	4.68	20.1
10	5.47	11.3
11	6.27	10.6
12	6.63	6
13	7.37	5.8
14	8.1	6
15	8.63	8.2
16	9.22	9.2
17	10.3	6.8
18	189.4	0.22
19	200.1	0.1
20	205.9	0.1

RADIAL MEASUREMENT DATA

RADIAL BEARING: 090° TRUE

DATE: March 27, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	1.1	54
2	2.45	21
3	3.65	22
4	4.6	33.5
5	4.8	30
6	5.05	23
7	5.8	24
8	6.65	5.4
9	7.3	5.4
10	8.3	4.9
11	8.7	10.5
12	9.05	10
13	9.85	9
14	11.4	5.4
15	13.4	7
16	15.2	5.5
17	17.2	4.1
18	18.55	4.3
19	22.25	3.35
20	24.35	2.38
21	27.5	2.25
22	29.3	1.2
23	32.5	1.67
24	35.	1.2
25	36.8	1.62
26	39.45	1.85

TABLE 6-5

RADIAL MEASUREMENT DATA

RADIAL BEARING: 110° TRUE

DATE: March 27, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	1.05	40
2	2.5	8.5
3	2.8	13.85
4	3.95	12.5
5	4.3	11.4
6	4.6	12.4
7	5.3	16.2
8	6.25	11.9
9	7.25	11
10	8.05	10.8
11	9.05	9.8
12	9.8	6.8
13	10.35	6.8
14	10.75	7.5
15	11.6	7.4
16	12.65	7.3
17	13.75	4.05
18	14.95	3.15
19	16.35	2
20	17.8	3.2
21	19.25	2.6
22	21.65	2.83
23	23.8	2.05
24	26.15	2.1
25	29.1	2.28
26	31.2	2.35
27	33.65	2.3
28	35.75	2.45
29	38.13	1.85
30	41.05	2.06
31	43.85	2.07

RADIAL MEASUREMENT DATA

RADIAL BEARING: 130° TRUE

DATE: March 31, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	0.98	80
2	1.23	68
3	2.7	24.8
4	3.15	20.5
5	3.28	17.9
6	4.9	14.8
7	5.7	13.3
8	6.0	10.5
9	6.78	10.3
10	8	4.05
11	8.1	4.9
12	9.1	2.5
13	10.32	2.52
14	12.02	3.18
15	14.28	2.3
16	15.86	2.3
17	18.78	2.02
18	21.25	1.3
19	22.7	1.48
20	24.4	0.45
21	26.94	0.82
22	29.82	0.57
23	32.84	0.72
24	35.86	0.76
25	38.13	0.62
26	40.32	0.8
27	43.27	1.15
28	46.25	0.5
29	48.42	1.05

RADIAL MEASUREMENT DATA

RADIAL BEARING: 150° TRUE

DATE: March 31, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m)
1	0.59	205
2	1.65	56
3	1.97	60
4	2.9	35.5
5	3.45	26
6	4.22	25.7
7	4.58	23.5
8	6.25	18.1
9	8.31	11.6
10	9.6	11
11	12.18	7.1
12	14.3	6.8
13	15.64	5.5
14	18.66	4.25
15	21.35	3.2
16	24.39	2.7
17	28.82	2.93
18	29.72	2.45
19	31.37	2.32
20	33.3	2.7
21	34.97	2.65

RADIAL MEASUREMENT DATA

RADIAL BEARING: 170° TRUE

DATE: April 2, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	0.51	207
2	1.55	90
3	2.48	48
4	3.87	33.5
5	4.03	30.2
6	5.2	26
7	7.73	18.8
8	8.65	17.5
9	10.67	11.8
10	11.12	11.6
11	12.5	9.7
12	13.74	8.4
13	15.18	8.2
14	16.73	6.6
15	17.74	6.1
16	19.34	5.7
17	21.38	4.8
18	23.54	4.6
19	26.18	3.8
20	27.15	3.85
21	28.84	3.77
22	32.6	3.2

RADIAL MEASUREMENT DATA

RADIAL BEARING: 190° TRUE

DATE: April 1, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m)
1	0.46	193
2	1.36	51
3	3.39	17.3
4	5.55	15
5	6.72	13.5
6	8.85	13
7	10.22	8.2
8	12.68	6.6
9	14.11	7.2
10	15.38	6.1
11	17.01	5.4
12	18.09	5.3
13	18.64	5.1
14	20.52	4.65
15	23.11	4.2
16	24.76	4.25
17	25.62	4.25
18	28.23	3.78
19	29.96	3.6
20	32.69	2.8
21	34.51	2.5

RADIAL MEASUREMENT DATA

RADIAL BEARING: 210° TRUE

DATE: April 1, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m)
1	0.43	230
2	1.35	43
3	1.98	37
4	2.57	37
5	3.46	24
6	4.6	10.5
7	6.07	4.4
8	6.64	4
9	7.1	4.2
10	7.68	3.4
11	8.22	3.6
12	9.48	4.55
13	11	6.8
14	12.28	8.2
15	13.1	7.2
16	14.6	5.9
17	14.95	5.9
18	15.98	6.2
19	16.7	6
20	20.3	3.1
21	21.25	2.2
22	24.83	1.93
23	27.55	2.1
24	30.55	0.6
25	33.48	1.67
26	34.86	0.88
27	35.53	0.8
28	36.77	0.62
29	39.13	0.85

RADIAL MEASUREMENT DATA

RADIAL BEARING: 230 ° TRUE

DATE: April 2, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m	
1	0.42	610	
2	0.77	150	
3	1.65	41	
4	2.3	40	
5	3.8	20	
6	4.3	23	
7	5.27	26	
8	5.57	25	
9	6.38	18	
10	6.65	17	
11	8.28	19	
12	8.7	19.2	
13	10.35	14.3	
14	11.74	13.8	
15	12.17	13	
16	13.3	8	
17	15.54	8.3	
18	17.29	5.6	
19	19.48	6.6	
20	23.2	5.1	
21	24.43	4.9	
22	25.92	6.4	
23	28.55	6	
24	31.13	5.3	
25	33.87	5.1	
26	34.8	5.5	
27	35.15	4.7	
28	36.52	4.1	
29	39	3.95	
30	43.23	3.95	
31	44.47	3.9	
32	47.19	3.12	
33	50.08	3.7	
34	52.25	2.63	* near power lines
35	56.25	1.82	* near power lines
36	58.03	1.9	* near power lines
37	62.2	1.47	

RADIAL MEASUREMENT DATA

RADIAL BEARING: 250° TRUE

DATE: April 3, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m	
1	0.53	807	
2	0.7	500	
3	1.65	33	
4	2.35	32.8	
5	3.66	17.3	
6	4	12.7	
7	4.65	20	
8	5.88	6.4	
9	7.63	13.8	
10	8.15	15	
11	9.1	13	
12	10.13	11	
13	10.87	9	
14	12.68	12.3	
15	14.96	10.3	
16	16.72	5.4	
17	19.02	3.23	
18	19.78	1.8	
19	22.92	2.3	*
20	25	2.45	*
21	27.66	4.4	*
22	30.91	3.8	* near power lines
23	32.22	4.6	*
24	35.38	3.35	*
25	37.75	3.35	*
26	40.47	3	*
27	43.42	2.55	*
28	46.22	2.3	*
29	49.17	1.84	*
30	51.87	2.1	*

RADIAL MEASUREMENT DATA

RADIAL BEARING: 250° TRUE

DATE: April 3, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
31	54.97	1.92
32	58.67	1.35
33	62.25	1.45
34	65.75	1.54
35	67.82	1.02
36	73.09	0.88
37	76.05	1.35
38	78.45	0.62
39	80.35	0.92
40	82.8	0.8
41	83.6	0.6
42	85.8	0.78
43	87.4	0.54
44	96.6	0.7
45	103.7	0.58
46	109.4	0.35
47	112.2	0.4

RADIAL MEASUREMENT DATA

RADIAL BEARING: 270° TRUE

DATE: April 4, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m)	
1	0.45	3500	
2	1.25	178	
3	1.43	145	
4	3.09	56	
5	4.72	22.2	
6	4.92	21.2	
7	5.58	18.2	
8	6.5	25	
9	7.37	10.5	
10	8.23	21.8	
11	8.54	18.3	
12	9.52	17.2	
13	10.5	11.8	
14	11.22	10.8	
15	12.09	9	
16	12.81	10.2	
17	14.45	4.2	
18	16.28	4.5	
19	18.69	1.9	
20	20.5	4.65	
21	22.57	4.1	*
22	24	4.6	*
23	25.74	6	*
24	28.9	4.5	*
25	30.44	4.4	* near power lines
26	33.45	3.4	*
27	37.14	2.83	*
28	39.74	2.9	*
29	43.1	2.25	*
30	45.45	1.62	*

RADIAL MEASUREMENT DATA

RADIAL BEARING: 270 ° TRUE

DATE: April 4, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
31	47.15	1.1
32	47.35	1.8
33	49.66	1.52
34	52.34	1.54
35	55.21	1.53
36	58.82	1.45
37	60.23	1.1
38	63.22	1.1
39	66.77	0.6
40	69.35	0.54
41	71.72	0.58
42	75.79	0.6
43	79.5	0.35
44	83.5	0.41
45	86.6	0.27
46	91	0.27
47	92.4	0.29

RADIAL MEASUREMENT DATA

RADIAL BEARING: 300° TRUE

DATE: April 8, 9 and 10, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	0.43	5800
2	0.62	3200
3	1.2	700
4	1.45	600
5	2.19	320
6	2.6	265
7	2.93	232
8	3.59	212
9	4.61	158
10	5.48	107
11	6.22	89
12	7.1	64
13	7.9	64.5
14	8.63	54
15	10.06	41
16	11.74	32.9
17	14.52	27
18	16.07	20.5
19	16.85	17.3
20	22	23
21	24.2	13.7
22	31	17.9
23	34.1	13.9
24	38.1	11.1
25	40.7	11.2
26	43.7	7.5
27	46.4	5.2
28	49.7	4.9
29	52.8	3.75
30	55.4	3.1

RADIAL MEASUREMENT DATA

RADIAL BEARING: 300° TRUE

DATE: April 8, 9 and 10, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
31	59.9	2.9
32	62.7	2.8
33	68.2	2.72
34	71.8	2.6
35	77.7	1.93
36	83.3	1.92
37	86.2	1.65
38	90.5	1.45
39	95.8	1.13
40	101.8	1.18
41	110.6	1.22
42	114.6	1.01
43	120.3	0.91
44	130	0.9
45	136	0.76
46	145.2	0.62
47	155.2	0.62
48	164.7	0.4
49	174.1	0.58
50	184.9	0.34
51	192.3	0.25
52	204.2	0.24

RADIAL MEASUREMENT DATA

RADIAL BEARING: 330° TRUE

DATE: April 8, 10 and 11, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
1	0.55	7000
2	0.8	5000
3	1.64	2460
4	1.8	1900
5	1.93	1800
6	2.25	1450
7	2.46	1350
8	2.7	1290
9	2.92	1140
10	3.85	740
11	3.98	680
12	5.34	350
13	5.95	440
14	6.38	390
15	6.6	440
16	28.8	95
17	31.6	86
18	34.5	72
19	39.5	61.5
20	42.2	56
21	45.3	48
22	48.5	42
23	51.5	34
24	55	33
25	59.5	32.3
26	65.8	26.4
27	72.5	20.6
28	77.6	15.3
29	80.6	13.4
30	87	12.4

RADIAL MEASUREMENT DATA

RADIAL BEARING: 330° TRUE

DATE: April 8, 10,11 and 16, 1986

POINT NUMBER	DISTANCE (KILOMETRES)	FIELD STRENGTH (mV/m
31	93.9	9.5
32	100.3	7.9
33	105.6	7.8
34	108.9	6.4
35	119.8	5.2
36	126.8	4.65
37	132.8	4.4
38	137.4	3.59
39	143	3.56
40	149.1	2.95
41	159.5	2.4
42	167.2	2.17
43	176.6	1.88
44	185.9	1.91
45	193.8	1.55
46	231.7	1
47	331.5	0.4
48	340.8	0.308
49	366.7	0.225

TABLE 7

MEASURED DISTANCE (KILOMETRES) TO 50 kW CONTOUR

CKEY 50 kW

DEGREES BEARING	mV/m							
	1000	250	100	25	17.4	15	5	0.5
000	5.1	(20)	48.5	96	112	120	158	241
030	1.6	6.5	(16.3)	(53)	71	78	126	211
060			1.5	2.7	3.7	4.3	(12.5)	(91)
090			0.73	3.0	4.3	5.0	14.9	(58)
110			0.65	2.45	3.4	3.9	11.0	(70)
130			0.84	2.95	4.0	4.6	10.1	46
150		0.43	1.08	4.3	6.2	7.1	16.7	(85)
170		0.53	1.38	5.1	7.2	8.4	21.5	(110)
190		0.35	0.88	3.6	5.3	6.1	18.8	(115)
210		0.37	0.94	3.3	4.7	5.4	14.2	(47)
230		0.52	1.15	4.9	7.0	8.2	30	(114)
250		0.73	1.14	3.4	4.8	5.6	16	99
270	0.59	1.03	1.75	5.2	6.4	7.4	20	71
300	0.93	2.75	5.7	15	21	23.5	47	160
330	3.4	12	27	63	77	83	126	290

ELDER ENGINEERING INC.

NOTE: Figures in brackets are extrapolated over-water distances.

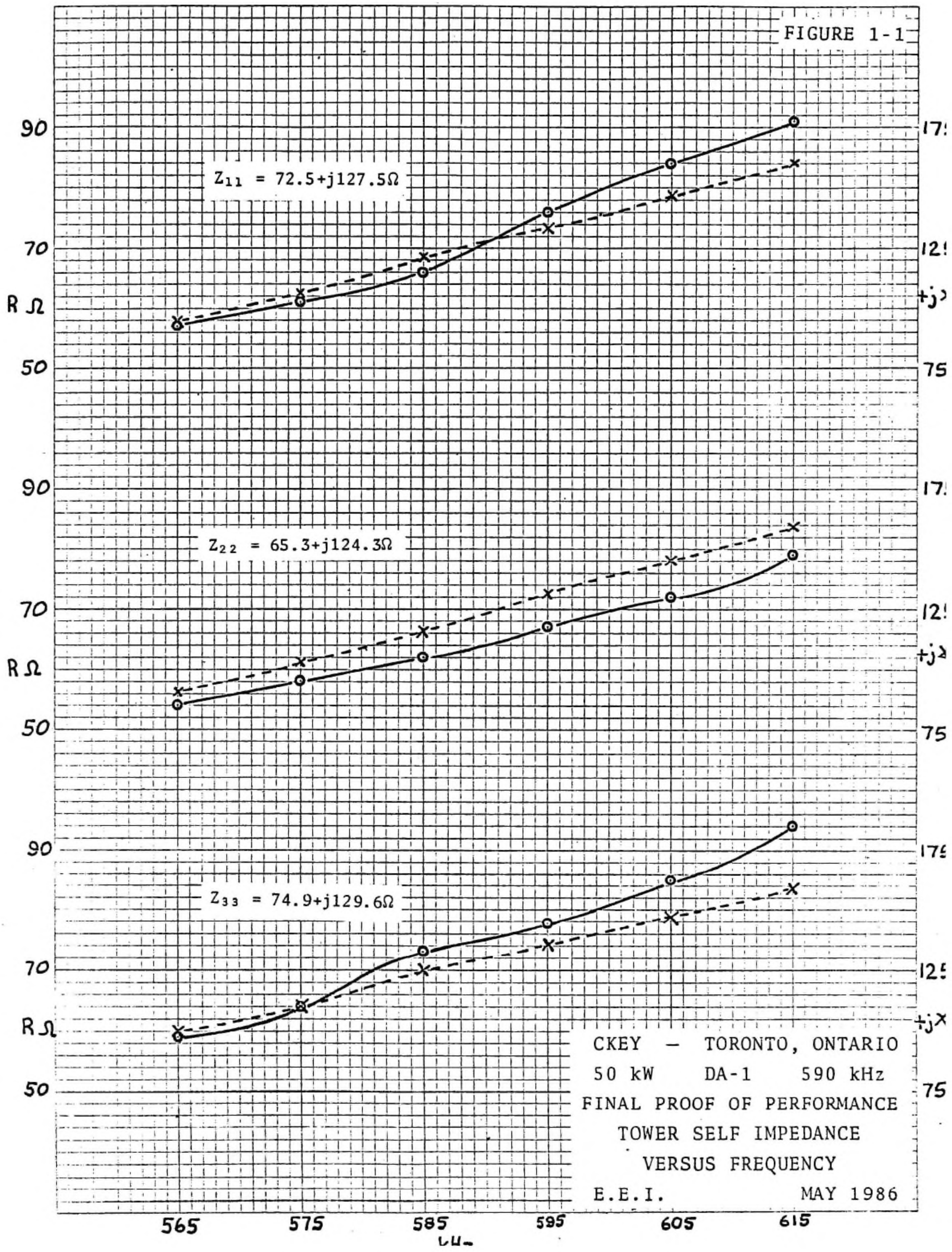


FIGURE 1-1

CKEY — TORONTO, ONTARIO
50 kW DA-1 590 kHz
FINAL PROOF OF PERFORMANCE
TOWER SELF IMPEDANCE
VERSUS FREQUENCY
E.E.I. MAY 1986

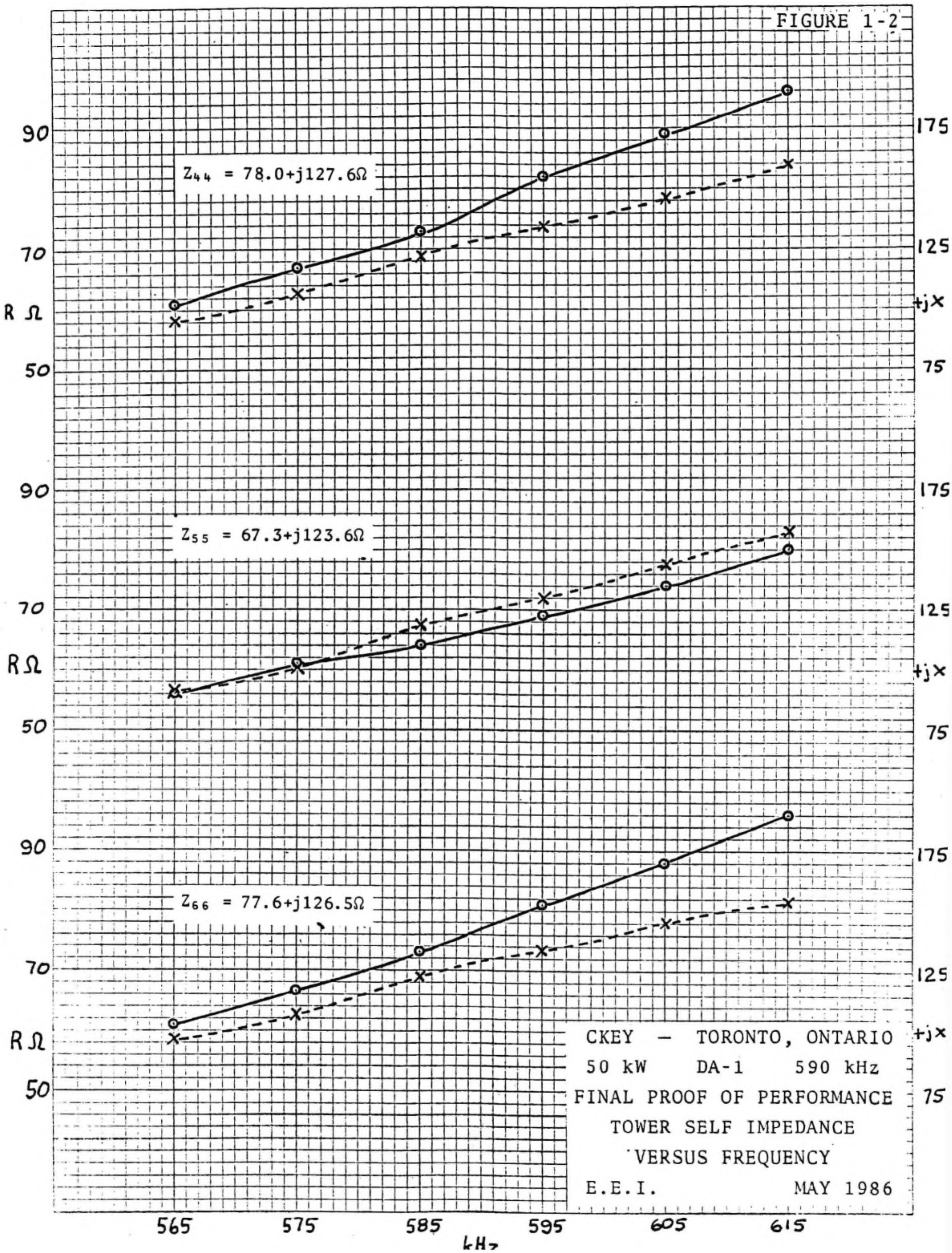


FIGURE 1-2
90
70
R Ω
50
175
125
+jX
75
Z_{44} = 78.0+j127.6Ω
Z_{55} = 67.3+j123.6Ω
Z_{66} = 77.6+j126.5Ω
565
575
585
595
605
615
kHz
CKEY — TORONTO, ONTARIO
50 kW DA-1 590 kHz
FINAL PROOF OF PERFORMANCE
TOWER SELF IMPEDANCE
VERSUS FREQUENCY
E.E.I. MAY 1986

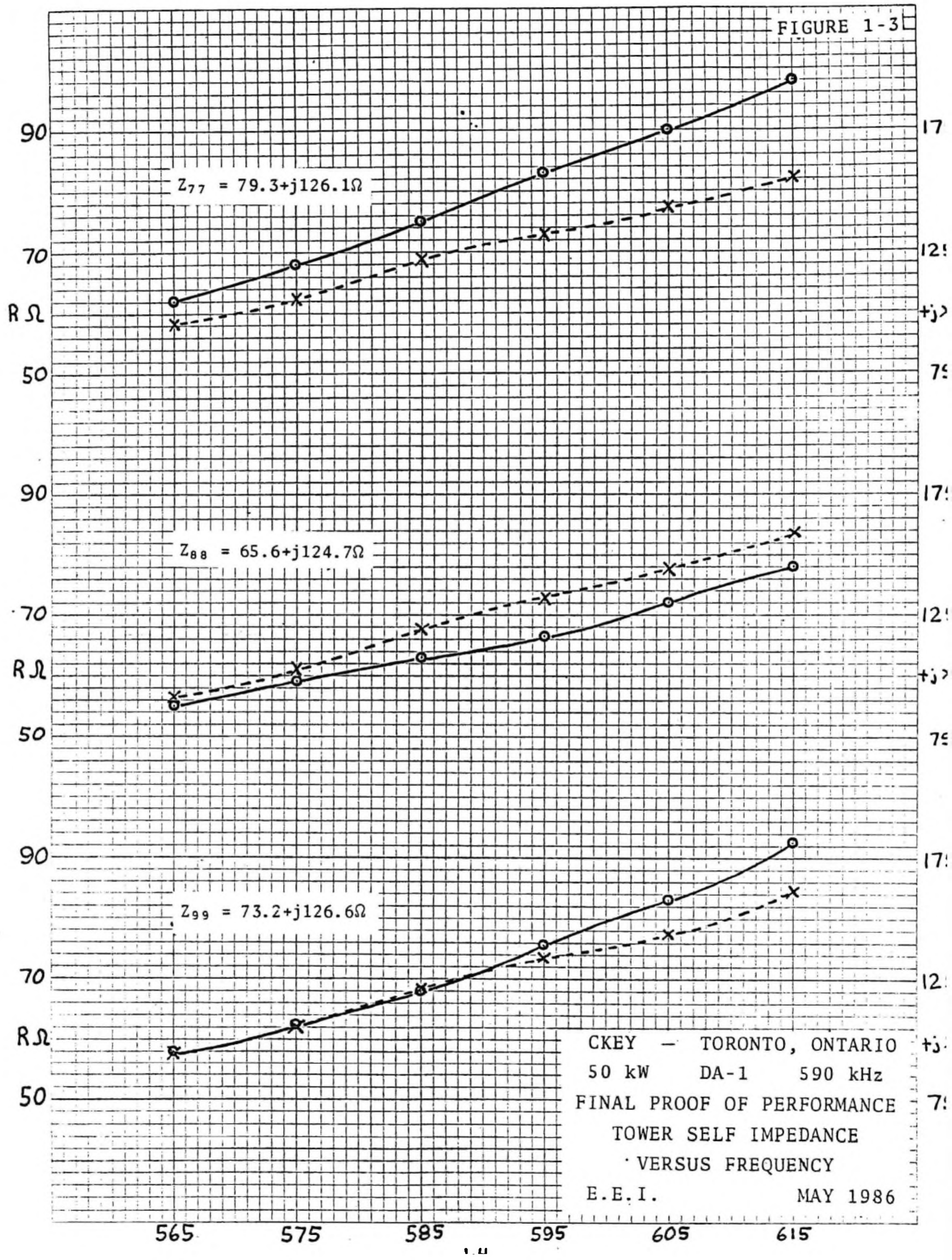


FIGURE 1-3
90
70
R Ω
50
Z_{77} = 79.3+j126.1Ω
Z_{88} = 65.6+j124.7Ω
Z_{99} = 73.2+j126.6Ω
+jX
565
575
585
595
605
615
CKEY — TORONTO, ONTARIO
50 kW DA-1 590 kHz
FINAL PROOF OF PERFORMANCE
TOWER SELF IMPEDANCE
VERSUS FREQUENCY
E.E.I. MAY 1986

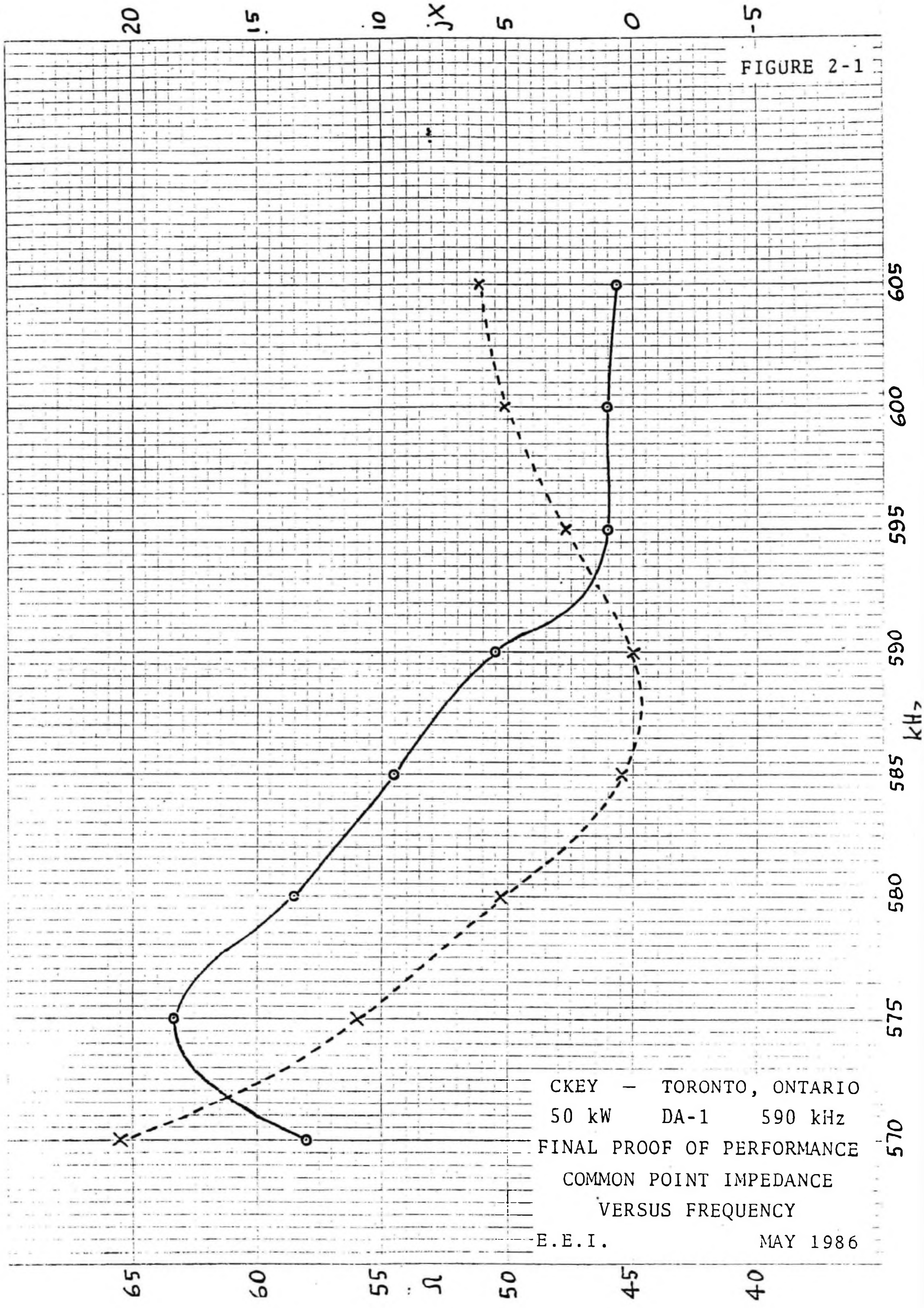
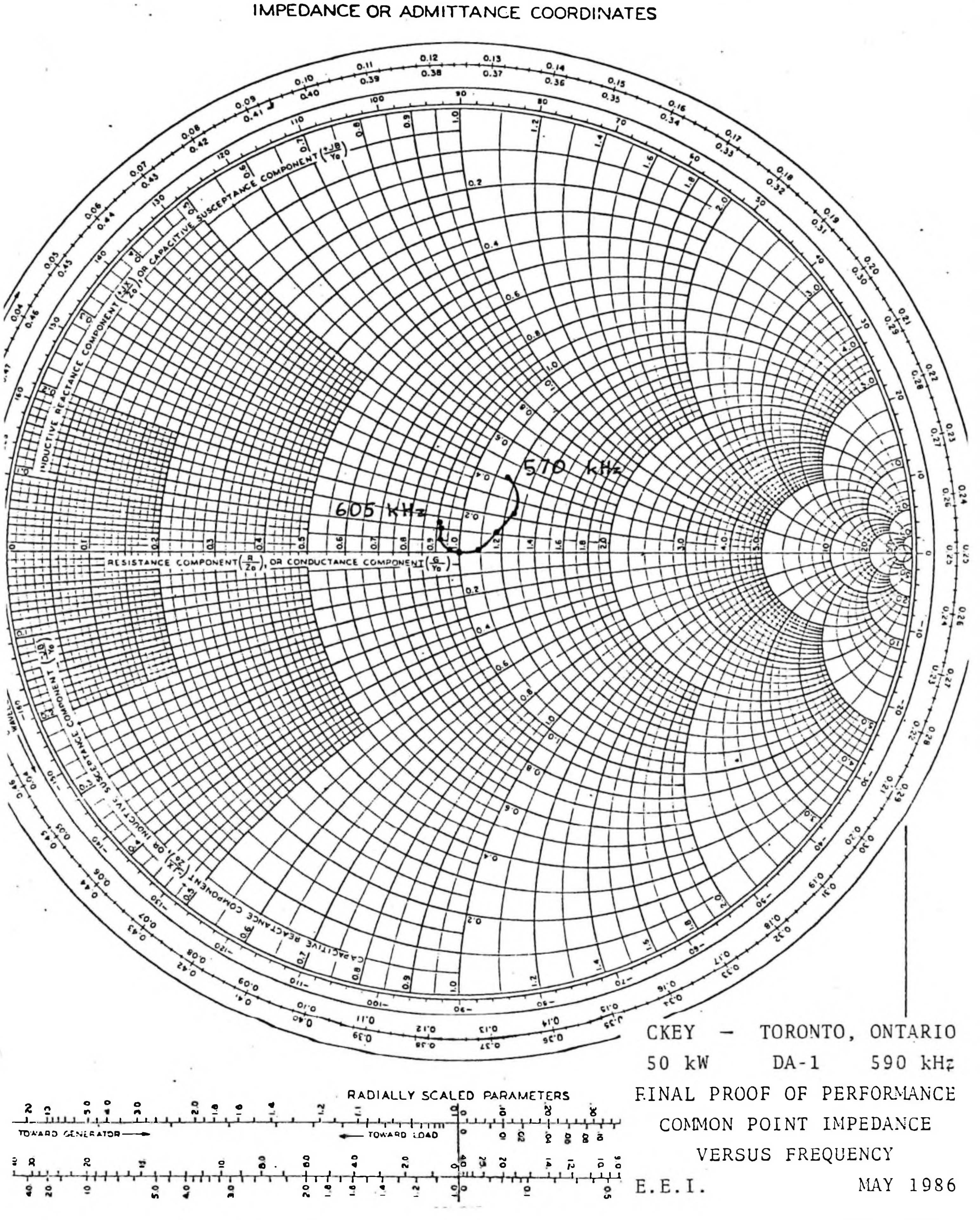


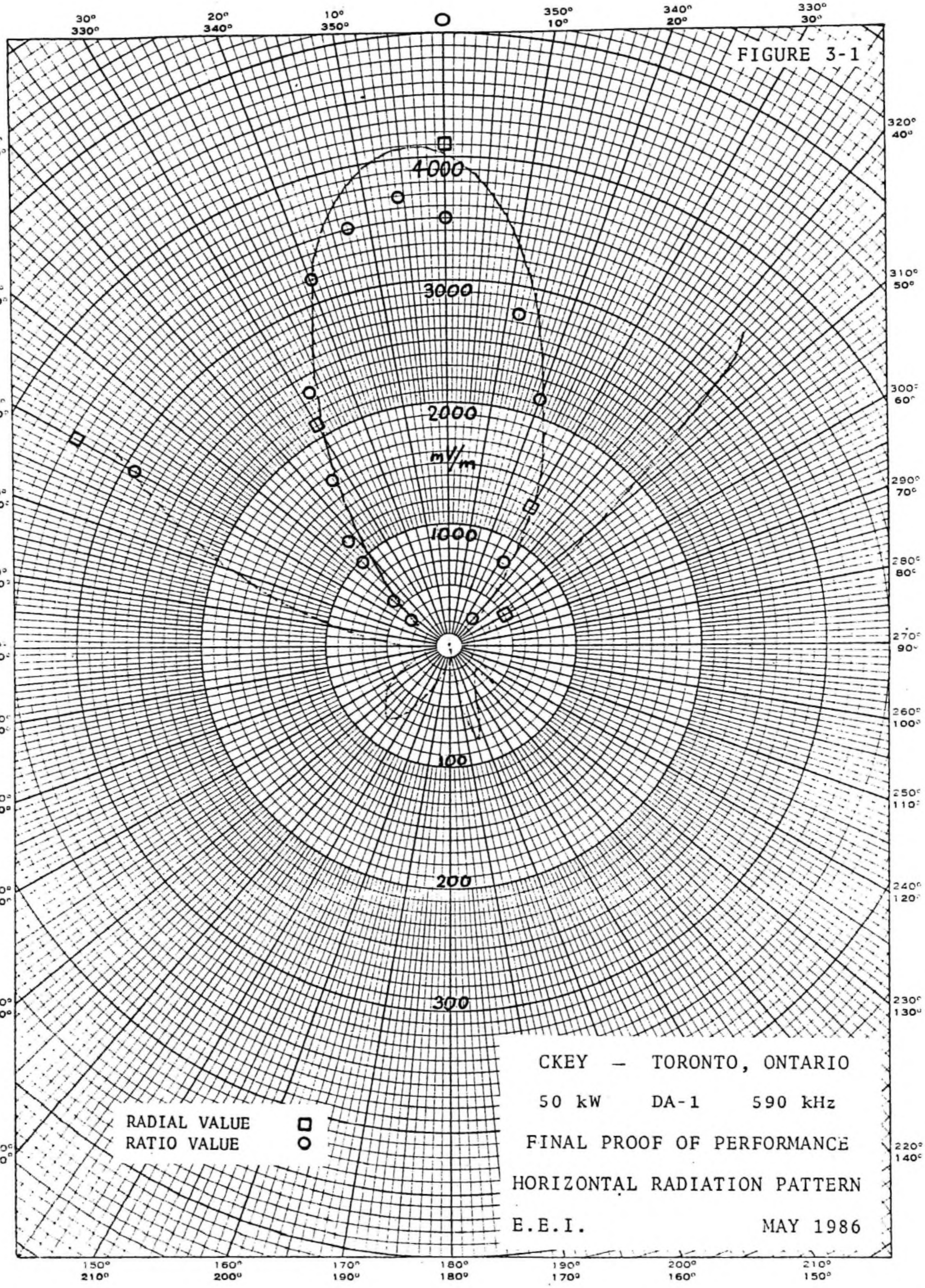
FIGURE 2-1

CKEY — TORONTO, ONTARIO
50 kW DA-1 590 kHz
FINAL PROOF OF PERFORMANCE
COMMON POINT IMPEDANCE
VERSUS FREQUENCY
E.E.I. MAY 1986

ME	TITLE	DWG. NO. FIGURE 2-2
TH CHART Form 756-N	GENERAL RADIO COMPANY, WEST CONCORD, MASSACHUSETTS	DATE



CKEY – TORONTO, ONTARIO
50 kW DA-1 590 kHz
FINAL PROOF OF PERFORMANCE
COMMON POINT IMPEDANCE
VERSUS FREQUENCY
E.E.I. MAY 1986



CKEY — TORONTO, ONTARIO

50 kW DA-1 590 kHz

FINAL PROOF OF PERFORMANCE

HORIZONTAL RADIATION PATTERN

E.E.I. MAY 1986

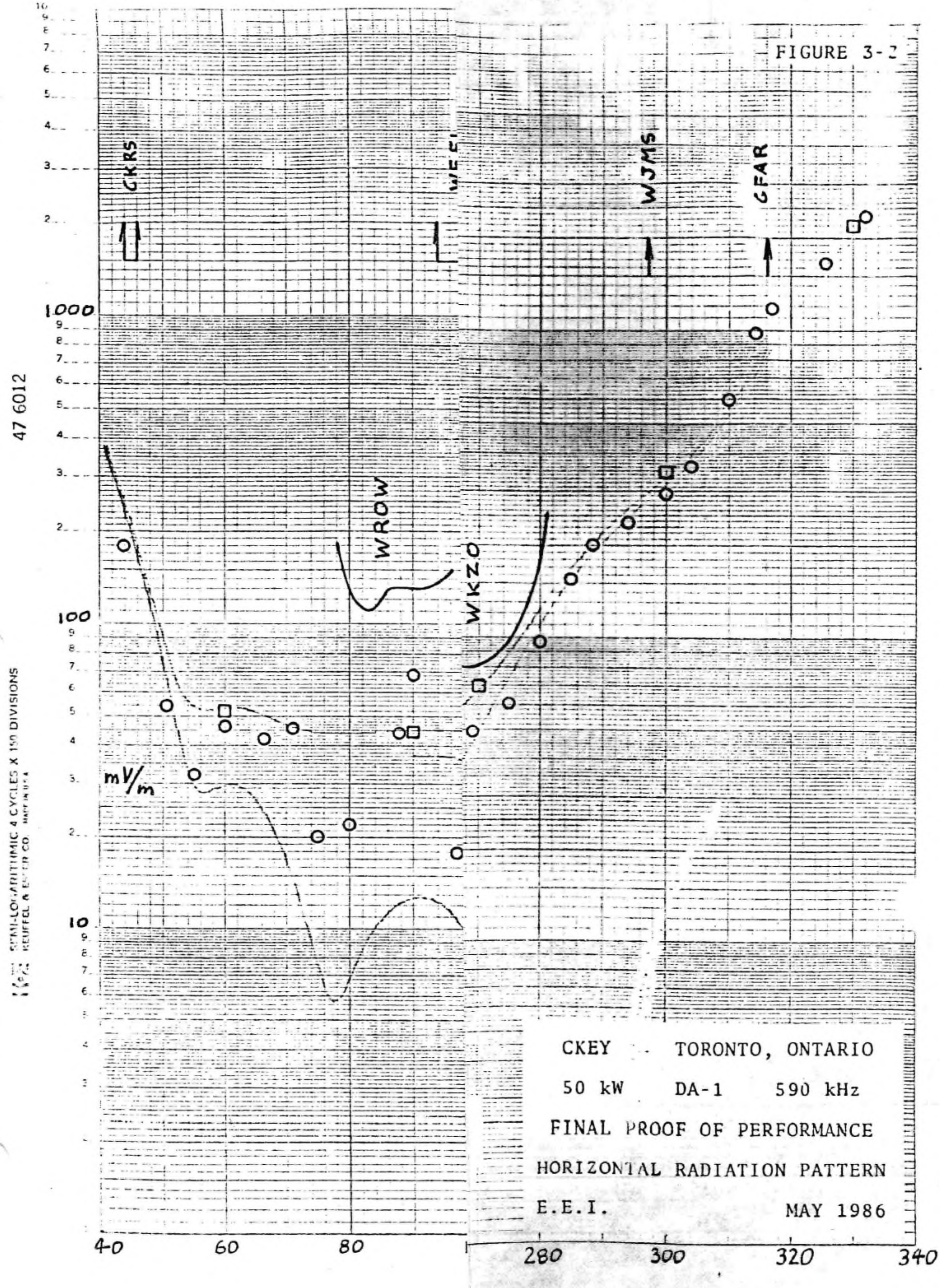
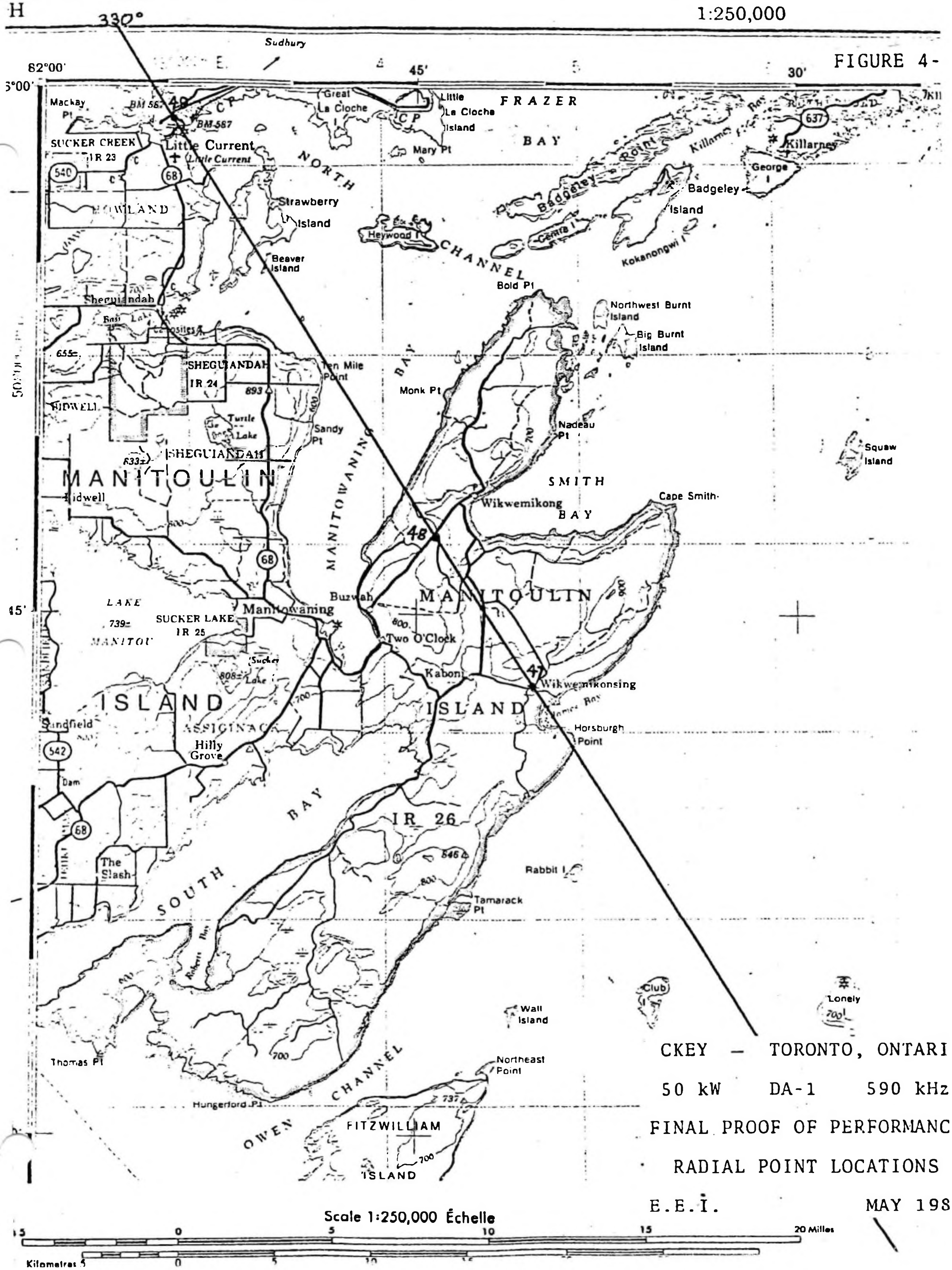


FIGURE 3-2
CKRS
WESI
WJMS
CFAR
WROW
WKZO
mV/m
1000
100
10
40
60
80
280
300
320
340
CKEY - TORONTO, ONTARIO
50 kW DA-1 590 kHz
FINAL PROOF OF PERFORMANCE
HORIZONTAL RADIATION PATTERN
E.E.I. MAY 1986
47 6012
SEMI-LOGARITHMIC 4 CYCLES X 150 DIVISIONS

H 1:250,000

FIGURE 4-



CKEY – TORONTO, ONTARI

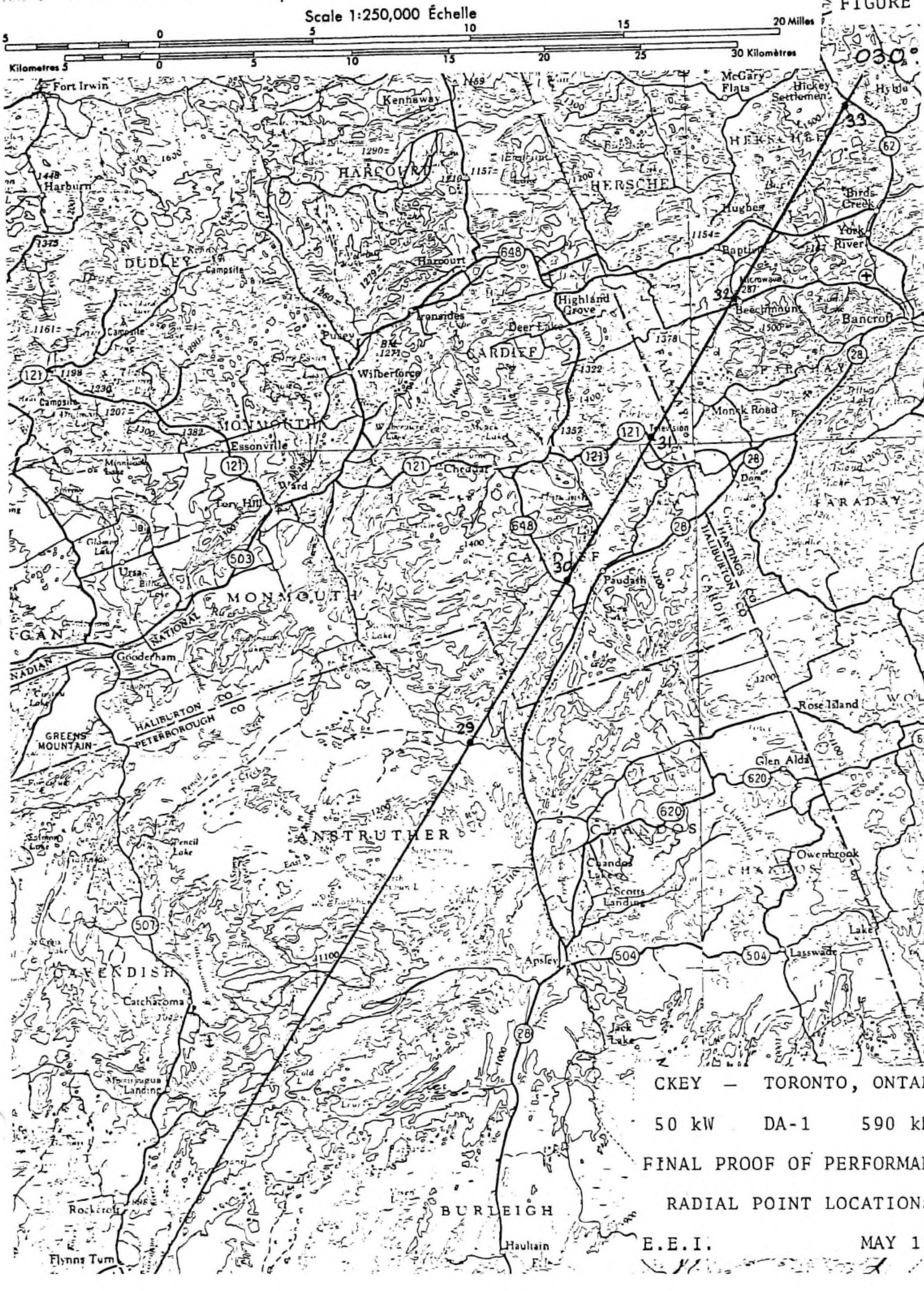
50 kW DA-1 590 kHz

FINAL PROOF OF PERFORMANC

RADIAL POINT LOCATIONS

E.E.I. MAY 198

FIGURE



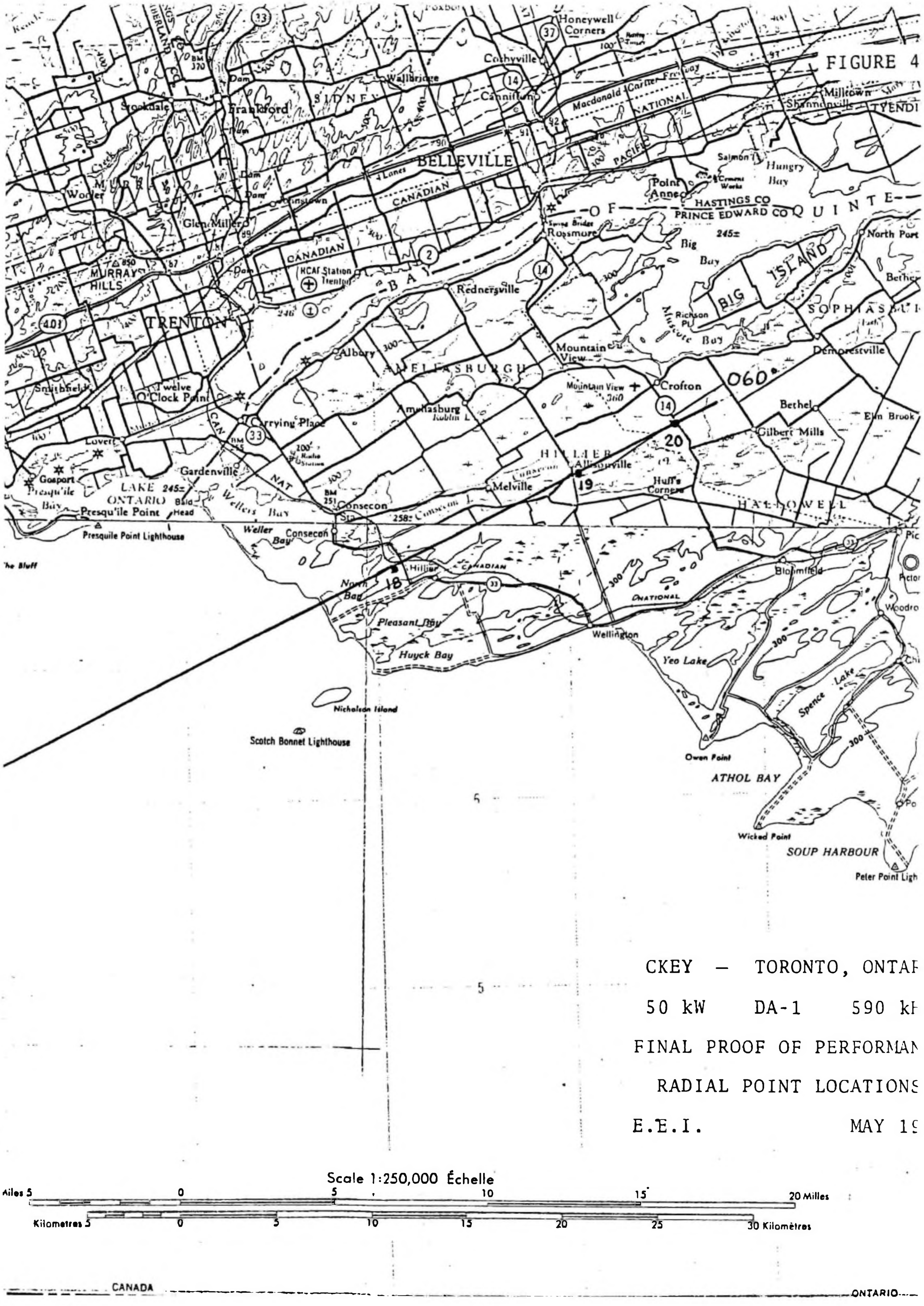
CKEY — TORONTO, ONTAR

50 kW DA-1 590 kH

FINAL PROOF OF PERFORMAN

RADIAL POINT LOCATIONS

E.E.I. MAY 19



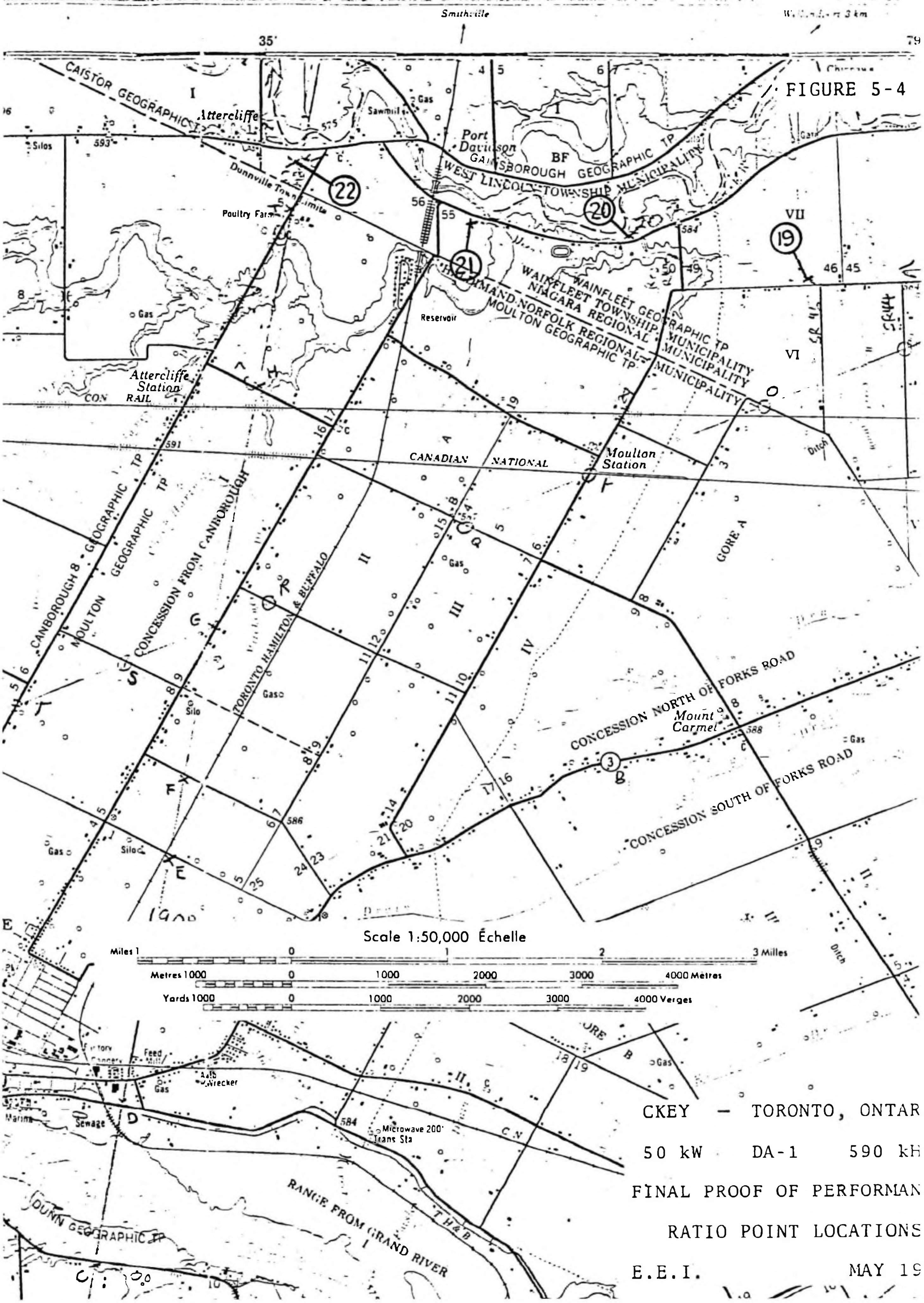
CKEY – TORONTO, ONTAR

50 kW DA-1 590 kH

FINAL PROOF OF PERFORMAN

RADIAL POINT LOCATIONS

E.E.I. MAY 19



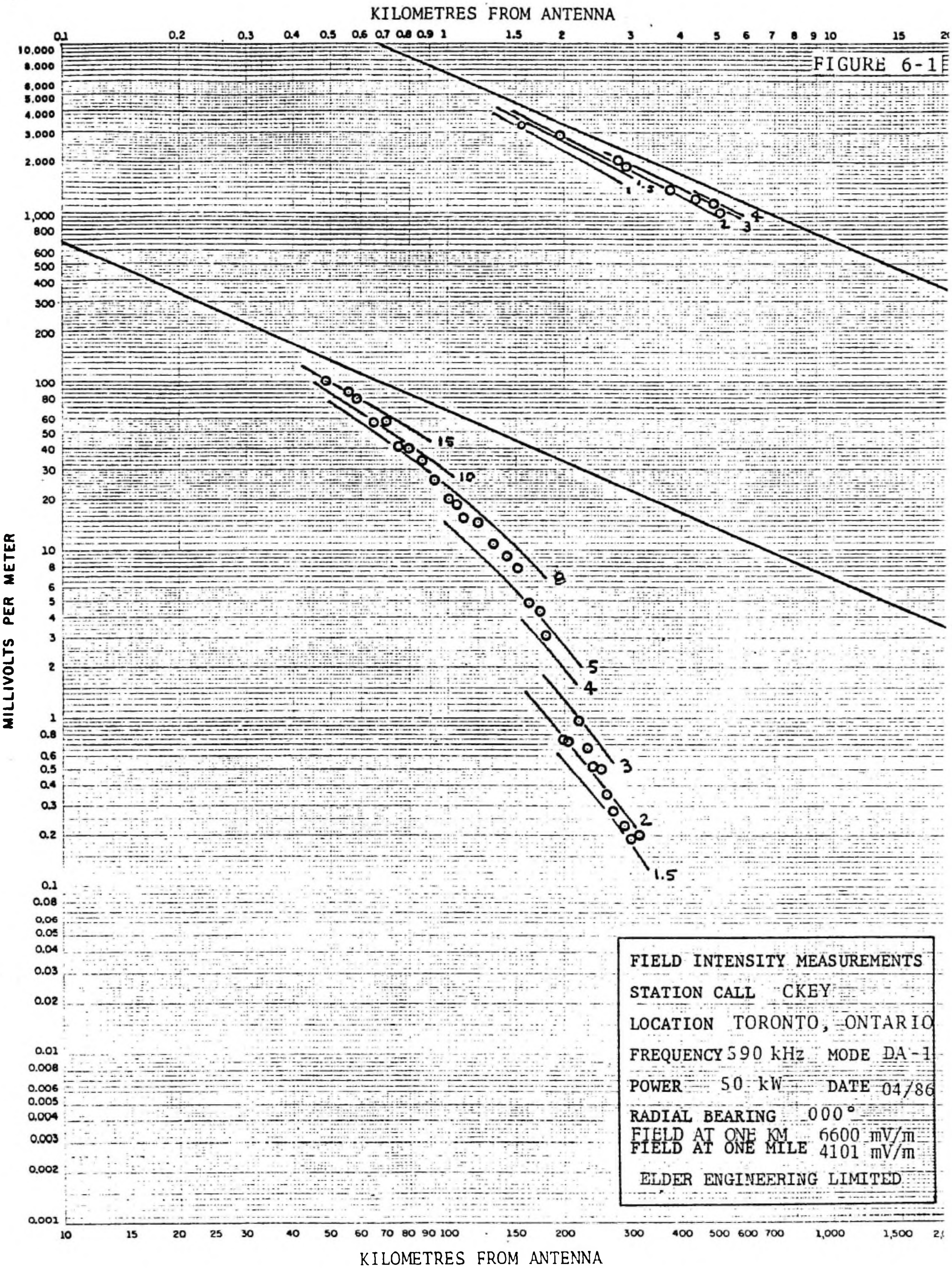
CKEY – TORONTO, ONTAR

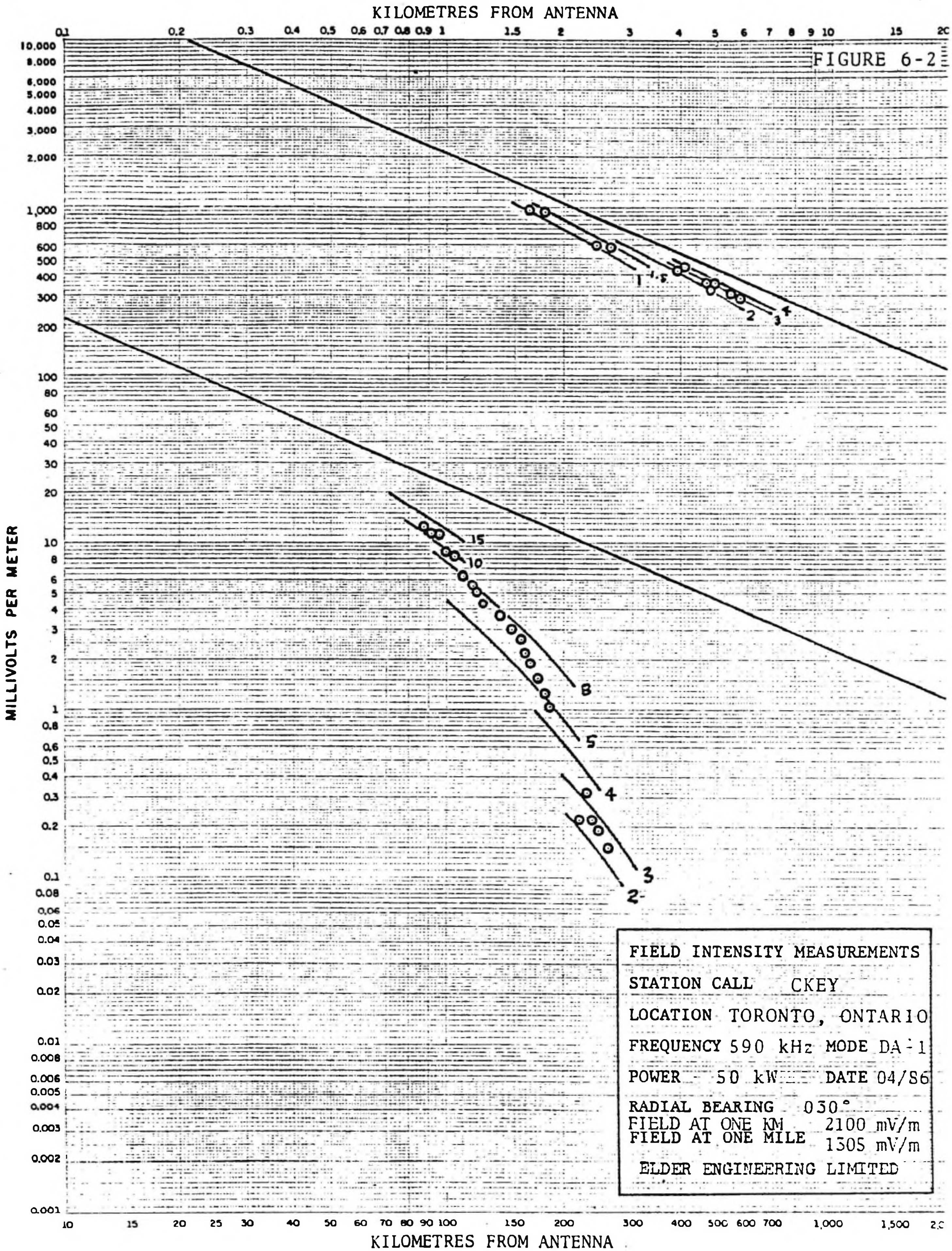
50 kW DA-1 590 kH

FINAL PROOF OF PERFORMAN

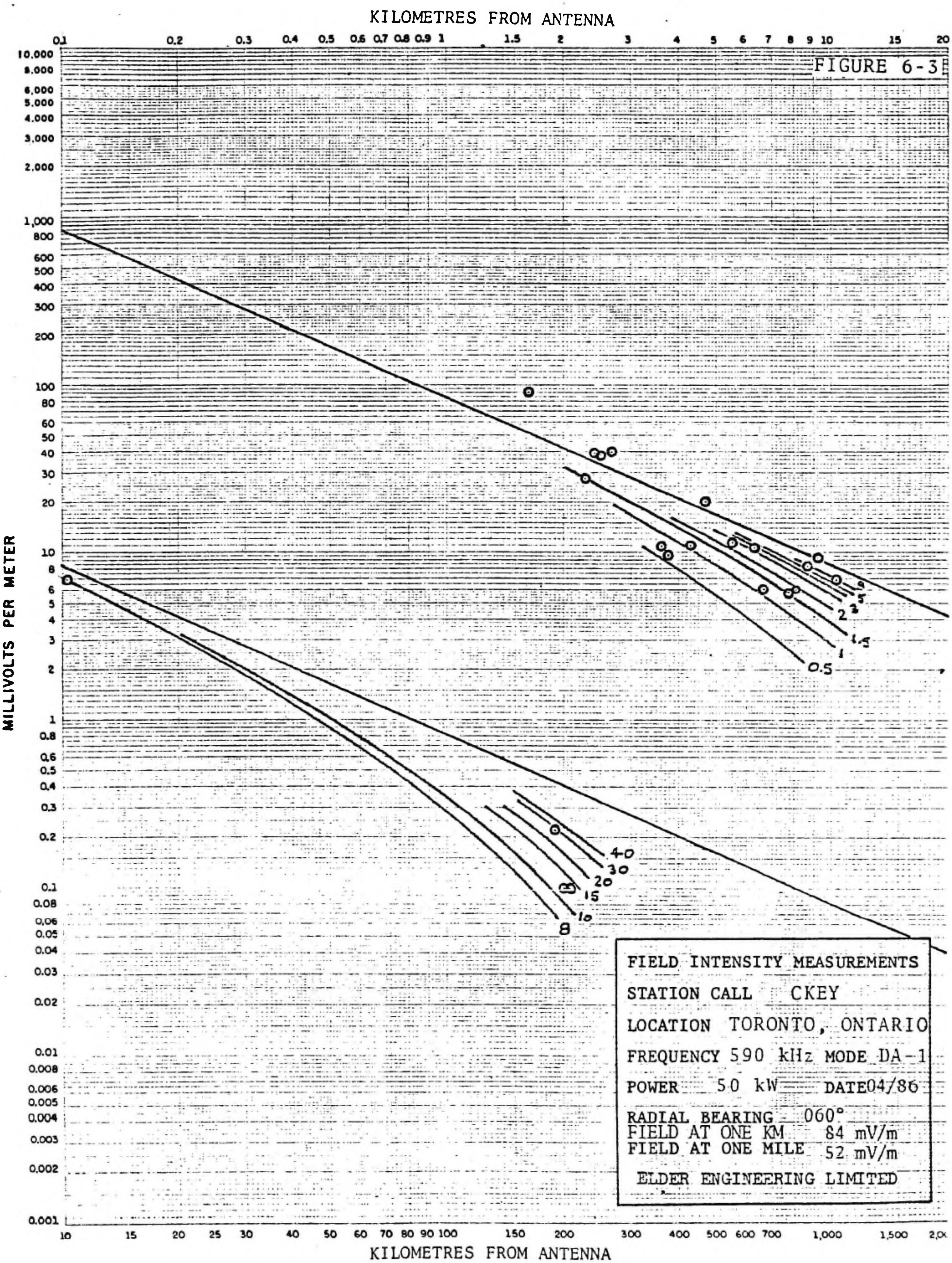
RATIO POINT LOCATIONS

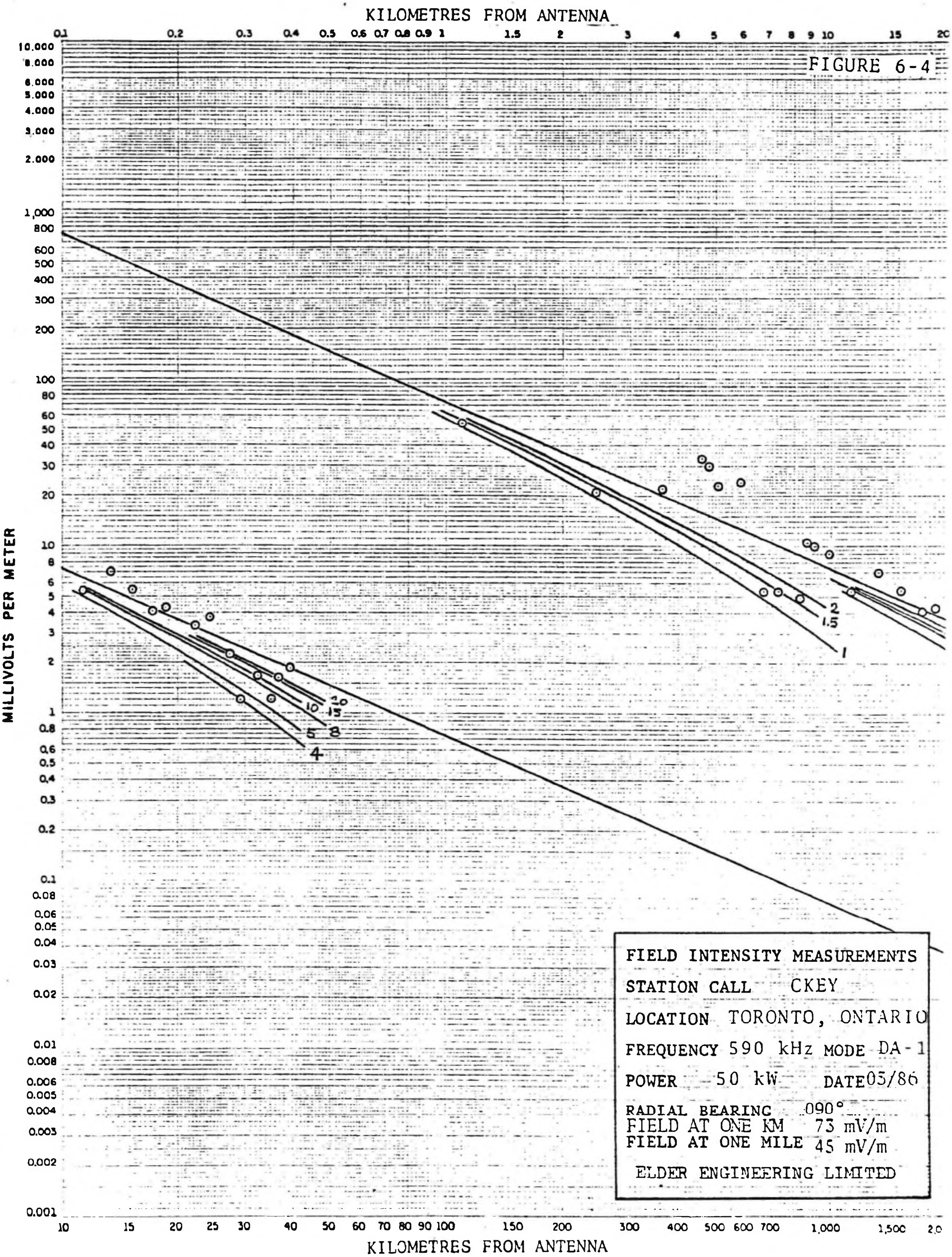
E.E.I. MAY 19

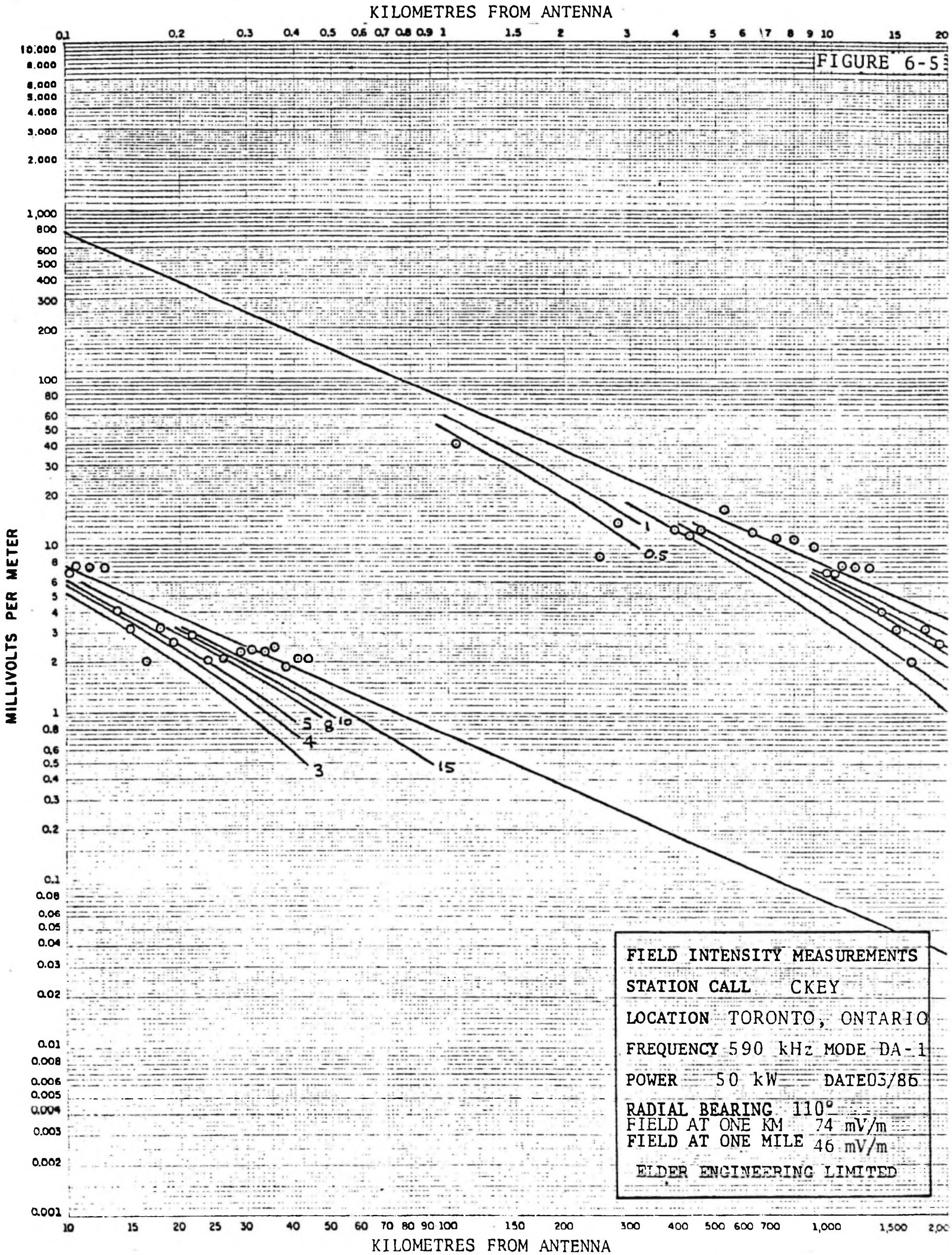

KILOMETRES FROM ANTENNA
FIGURE 6-1E
MILLIVOLTS PER METER
KILOMETRES FROM ANTENNA
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 000°
FIELD AT ONE KM 6600 mV/m
FIELD AT ONE MILE 4101 mV/m
ELDER ENGINEERING LIMITED



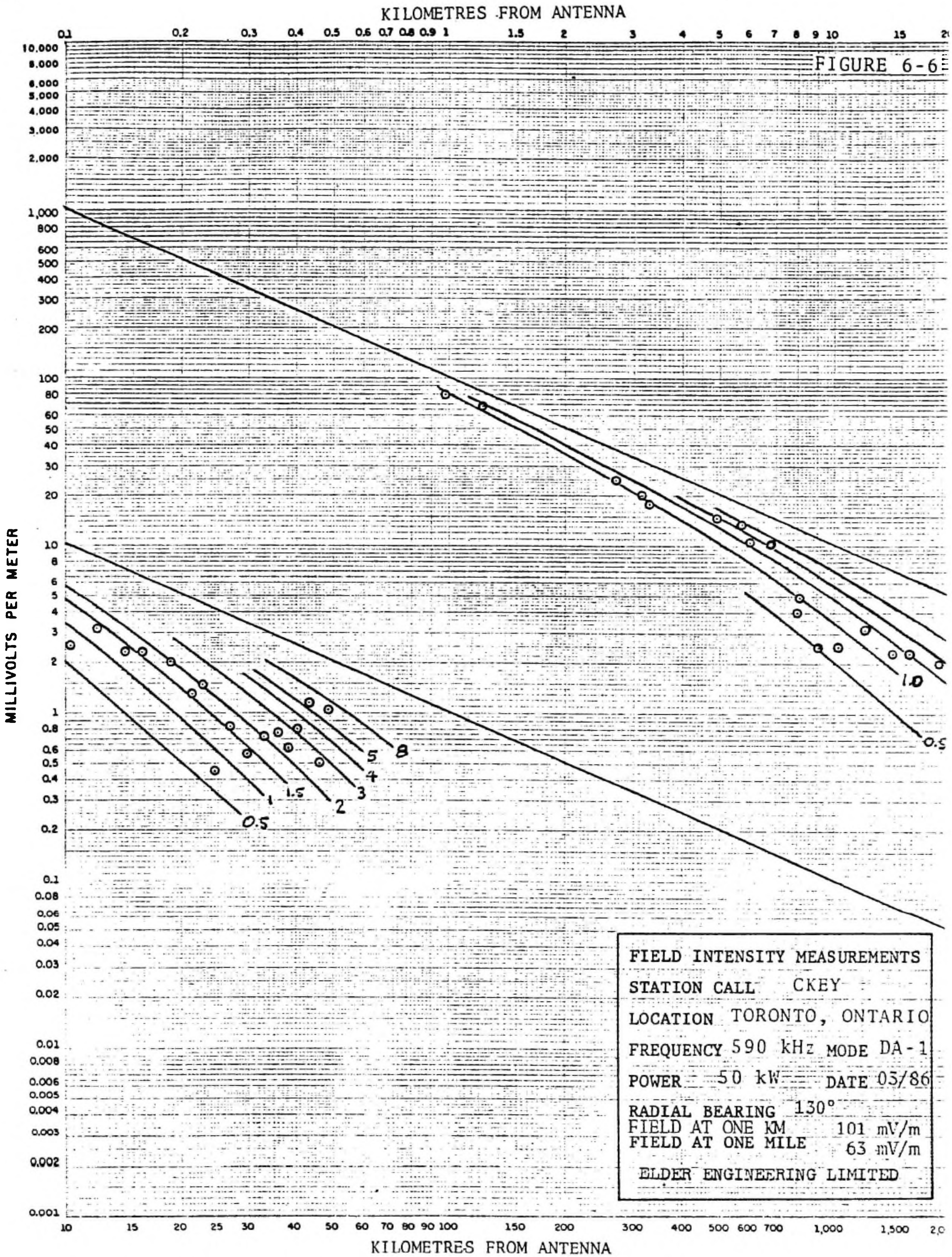
KILOMETRES FROM ANTENNA
FIGURE 6-2
MILLIVOLTS PER METER
KILOMETRES FROM ANTENNA
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 030°
FIELD AT ONE KM 2100 mV/m
FIELD AT ONE MILE 1305 mV/m
ELDER ENGINEERING LIMITED


KILOMETRES FROM ANTENNA
FIGURE 6-3E
MILLIVOLTS PER METER
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 060°
FIELD AT ONE KM 84 mV/m
FIELD AT ONE MILE 52 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA

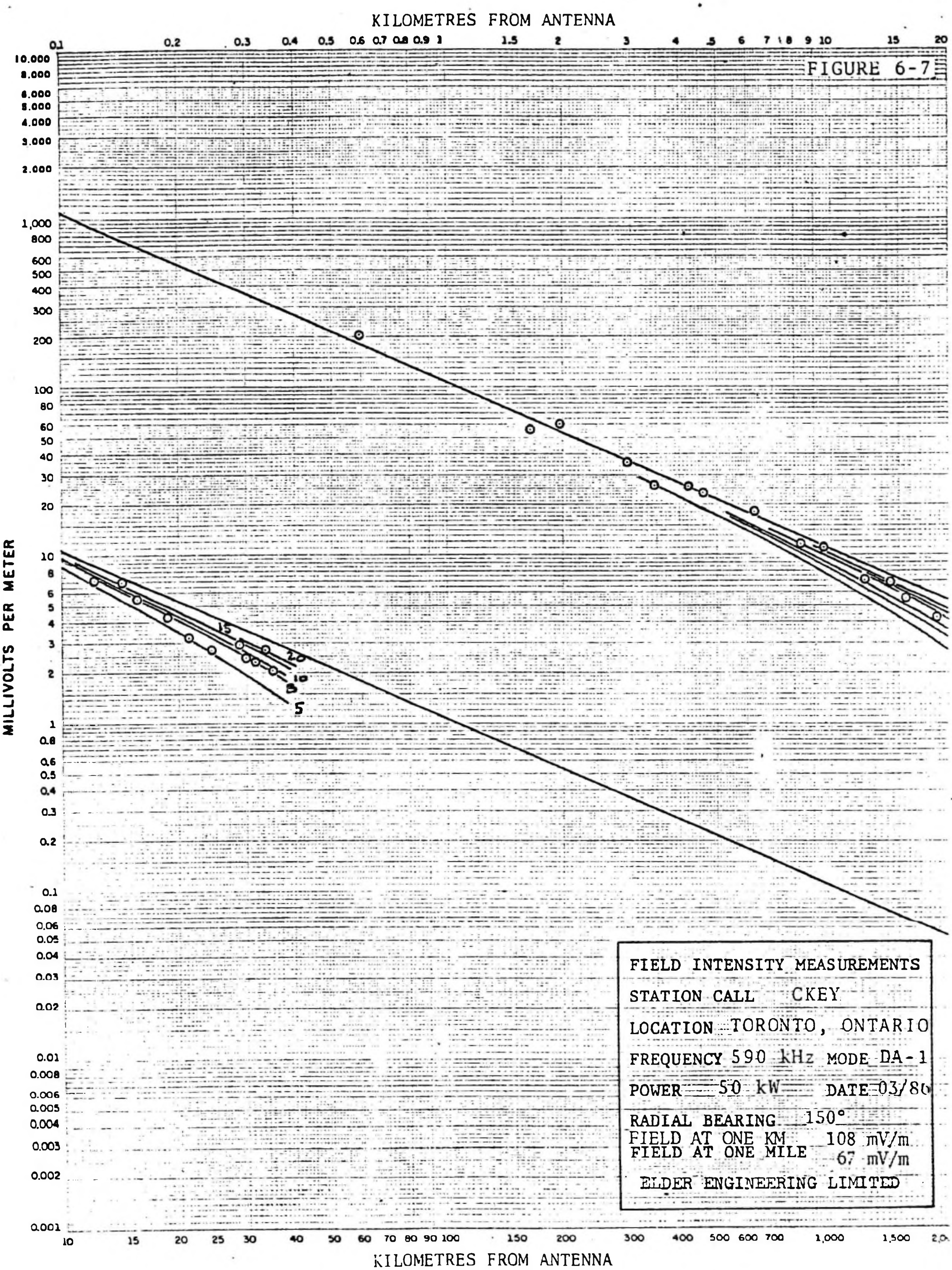

KILOMETRES FROM ANTENNA
FIGURE 6-4
MILLIVOLTS PER METER
KILOMETRES FROM ANTENNA
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 03/86
RADIAL BEARING 090°
FIELD AT ONE KM 73 mV/m
FIELD AT ONE MILE 45 mV/m
ELDER ENGINEERING LIMITED

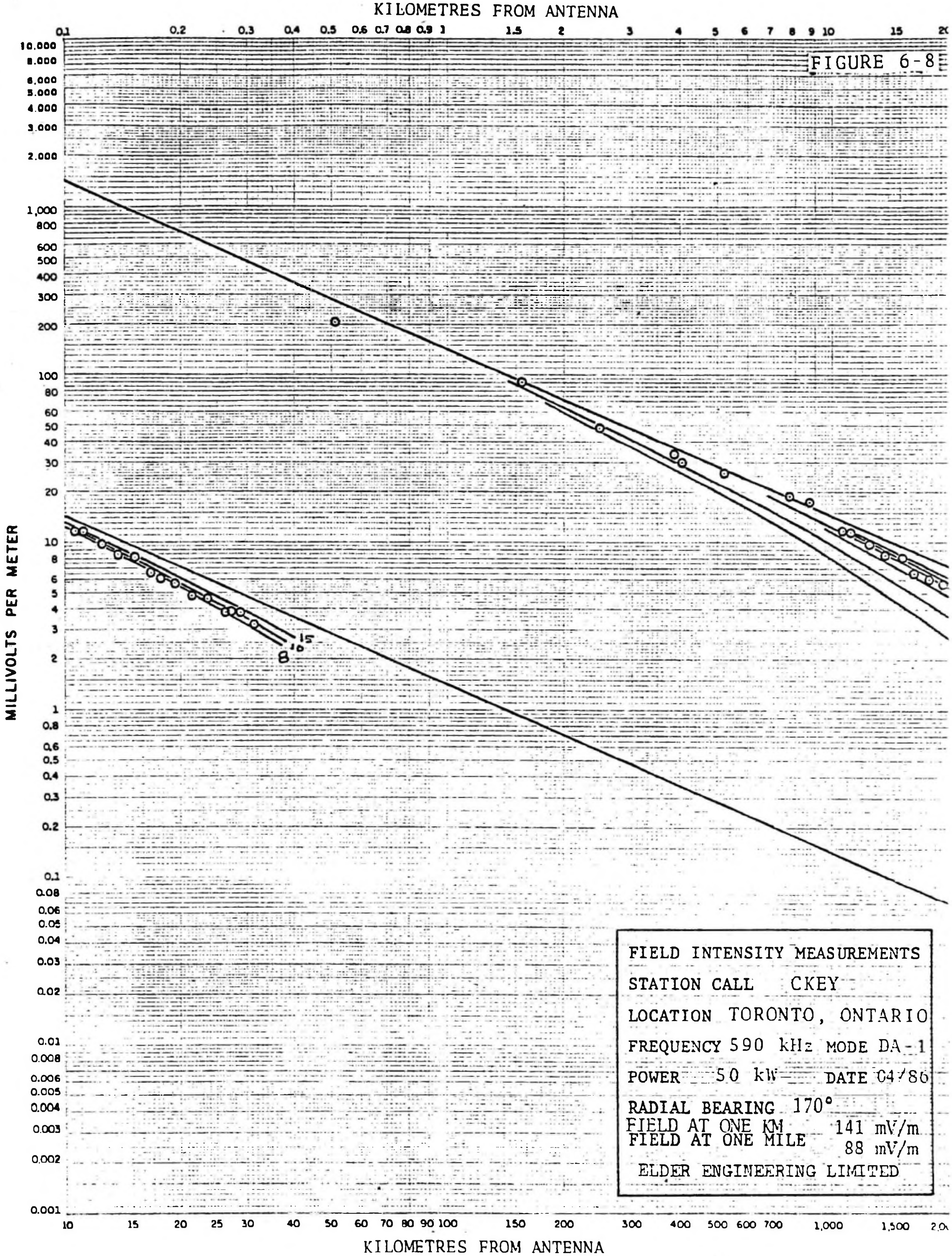


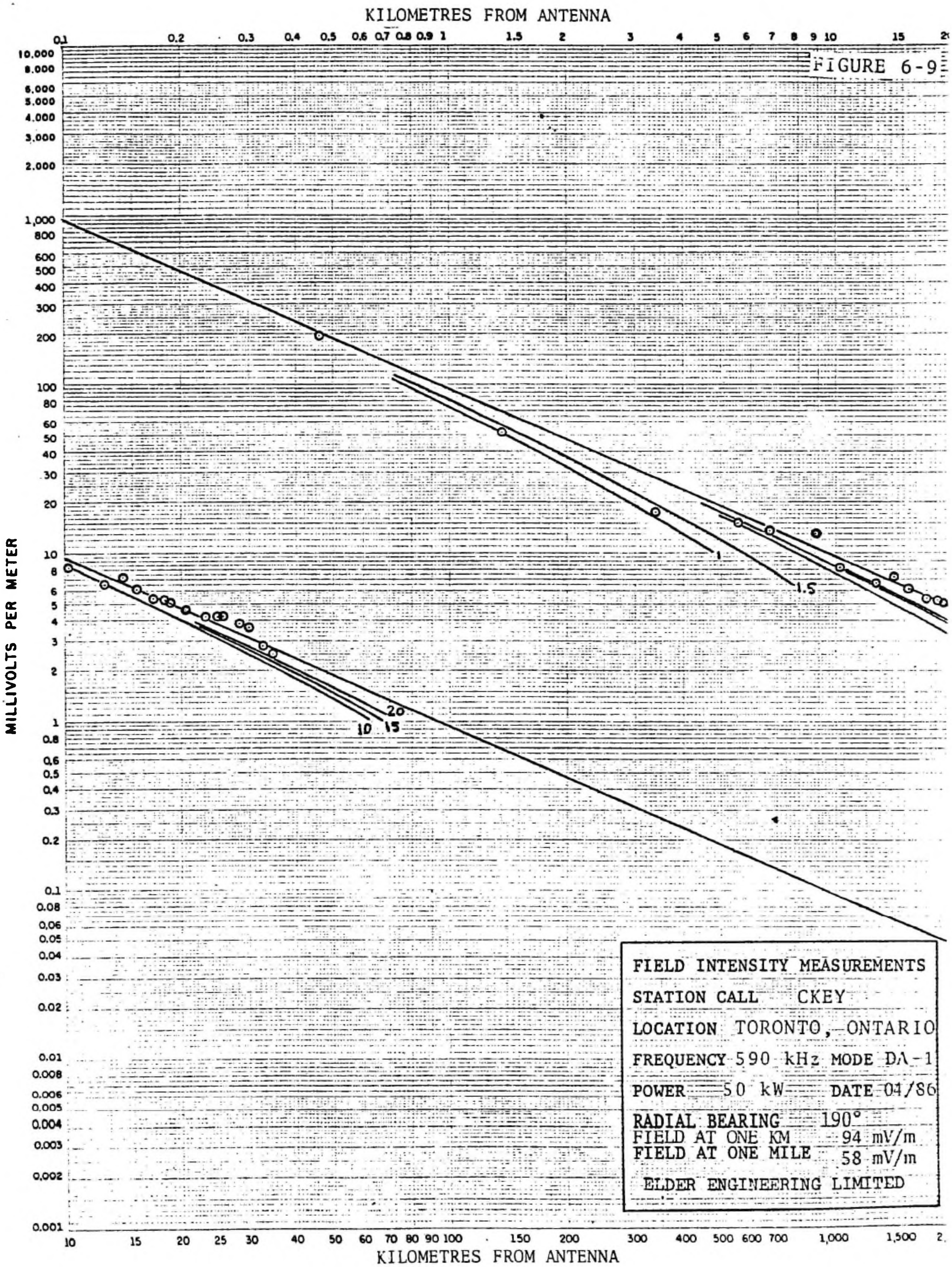
KILOMETRES FROM ANTENNA
FIGURE 6-5
MILLIVOLTS PER METER
1
0.5
5
8
10
4
3
15
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 03/86
RADIAL BEARING 110°
FIELD AT ONE KM 74 mV/m
FIELD AT ONE MILE 46 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA

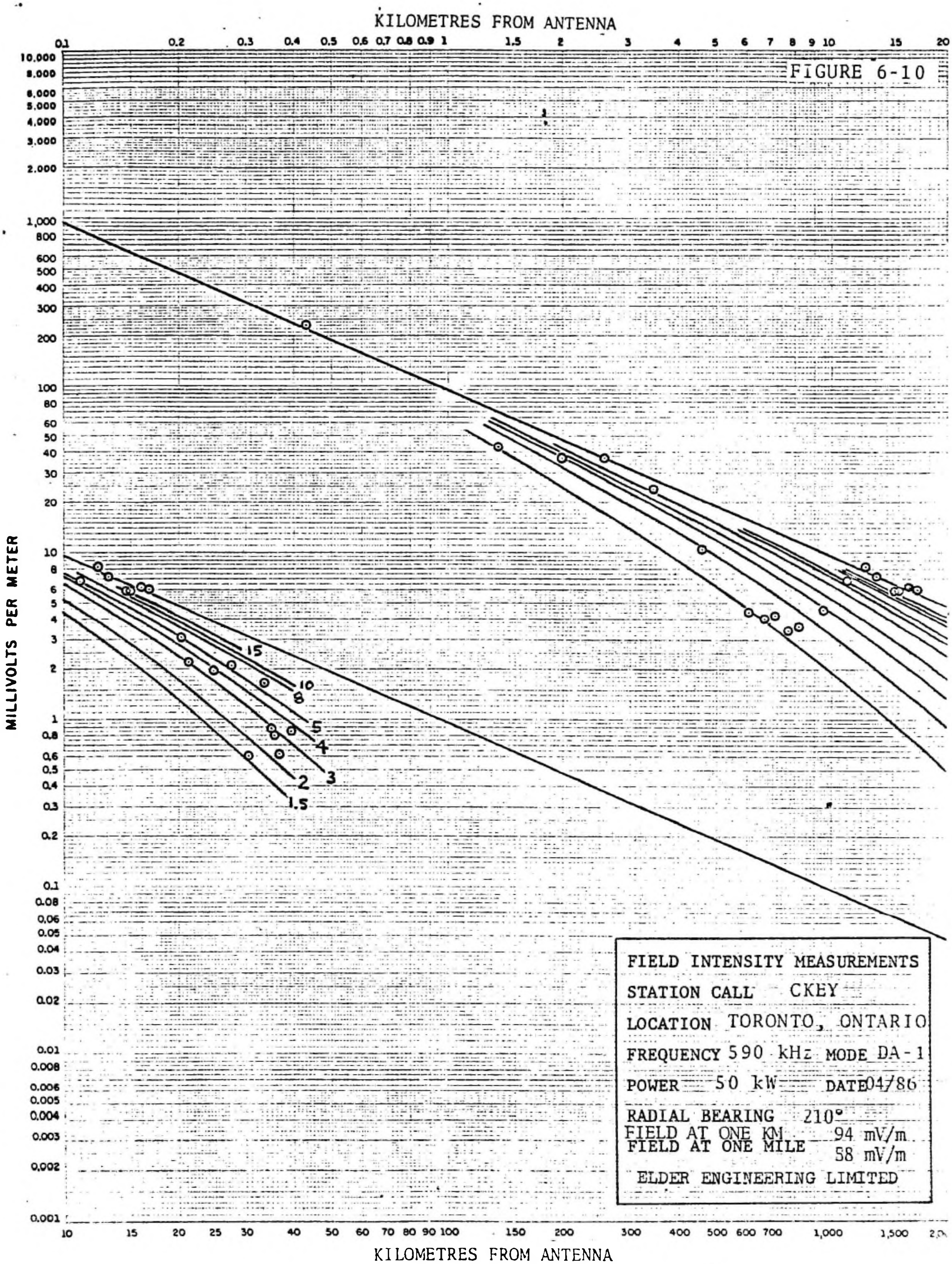


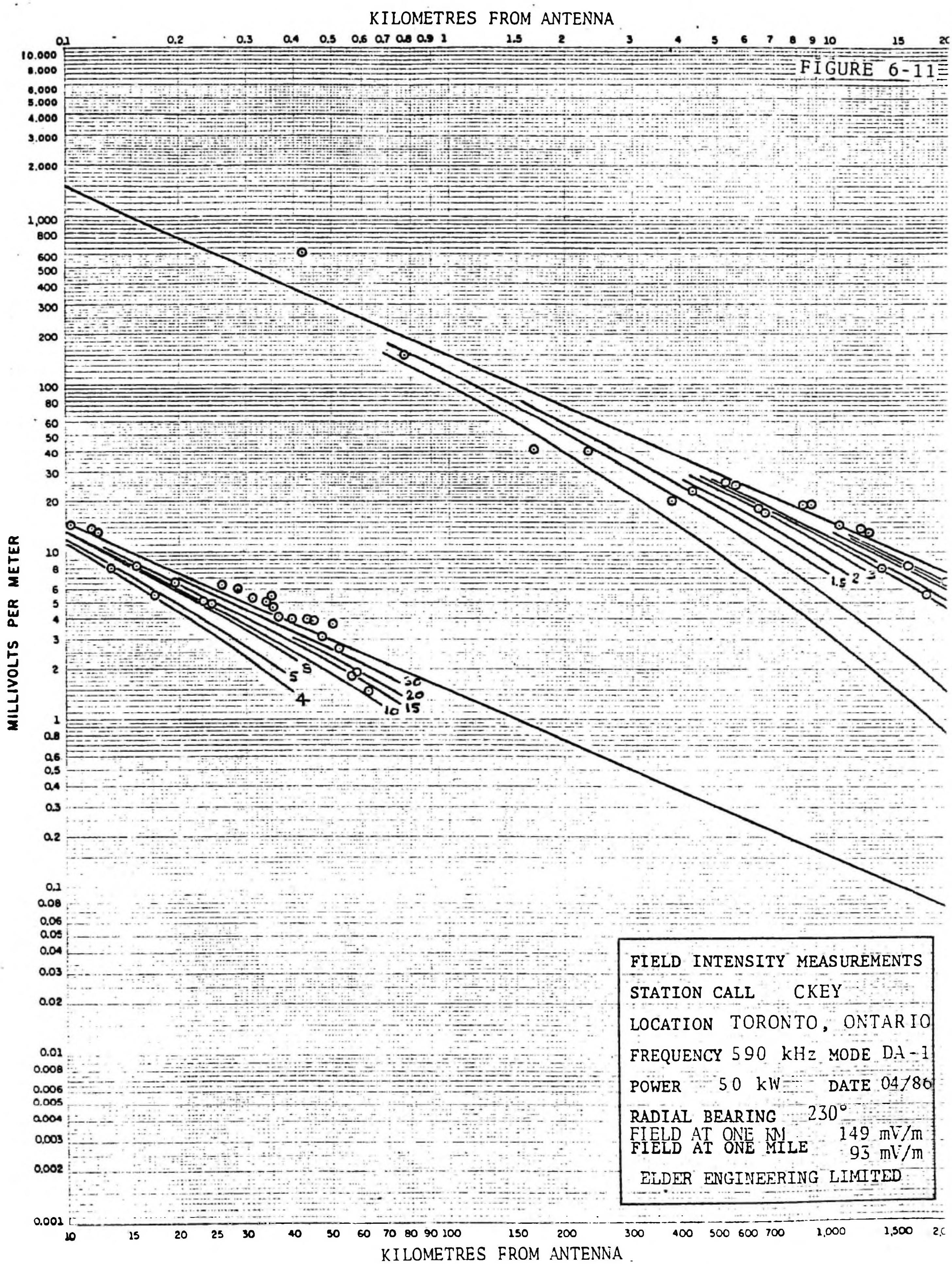
KILOMETRES FROM ANTENNA
FIGURE 6-6
MILLIVOLTS PER METER
0.5
1
1.5
2
3
4
5
8
1.0
0.5
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 03/86
RADIAL BEARING 130°
FIELD AT ONE KM 101 mV/m
FIELD AT ONE MILE 63 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA

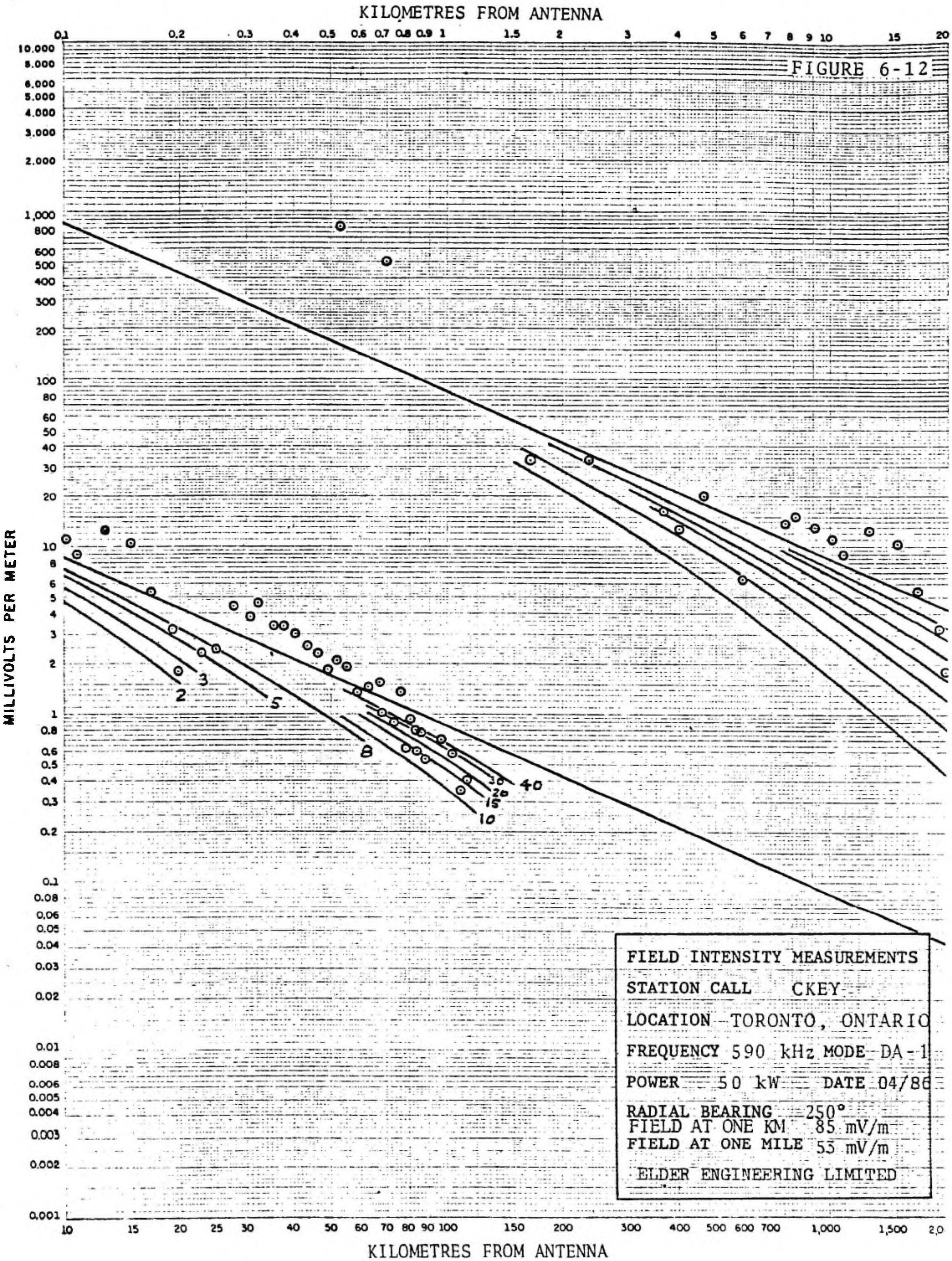

KILOMETRES FROM ANTENNA
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.5 2 3 4 5 6 7 8 9 10 15 20
FIGURE 6-7
10,000 8,000 6,000 5,000 4,000 3,000 2,000 1,000 800 600 500 400 300 200 100 80 60 50 40 30 20 10 8 6 5 4 3 2 1 0.8 0.6 0.5 0.4 0.3 0.2 0.1 0.08 0.06 0.05 0.04 0.03 0.02 0.01 0.008 0.006 0.005 0.004 0.003 0.002 0.001
MILLIVOLTS PER METER
15
20
10
8
5
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 03/80
RADIAL BEARING 150°
FIELD AT ONE KM 108 mV/m
FIELD AT ONE MILE 67 mV/m
ELDER ENGINEERING LIMITED
10 15 20 25 30 40 50 60 70 80 90 100 150 200 300 400 500 600 700 1,000 1,500 2,000
KILOMETRES FROM ANTENNA

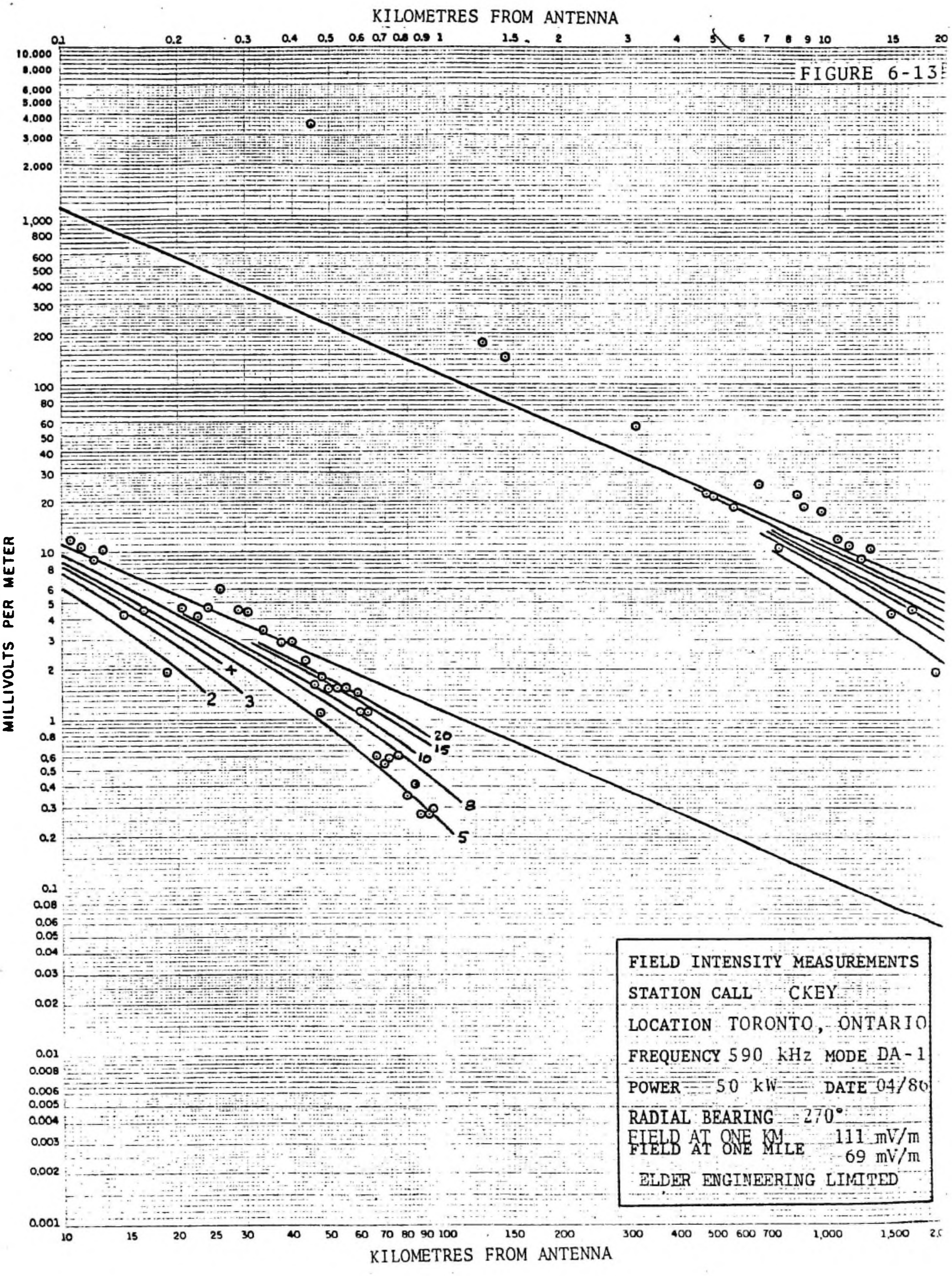

KILOMETRES FROM ANTENNA
FIGURE 6-8
MILLIVOLTS PER METER
15
10
8
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 170°
FIELD AT ONE KM 141 mV/m
FIELD AT ONE MILE 88 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA

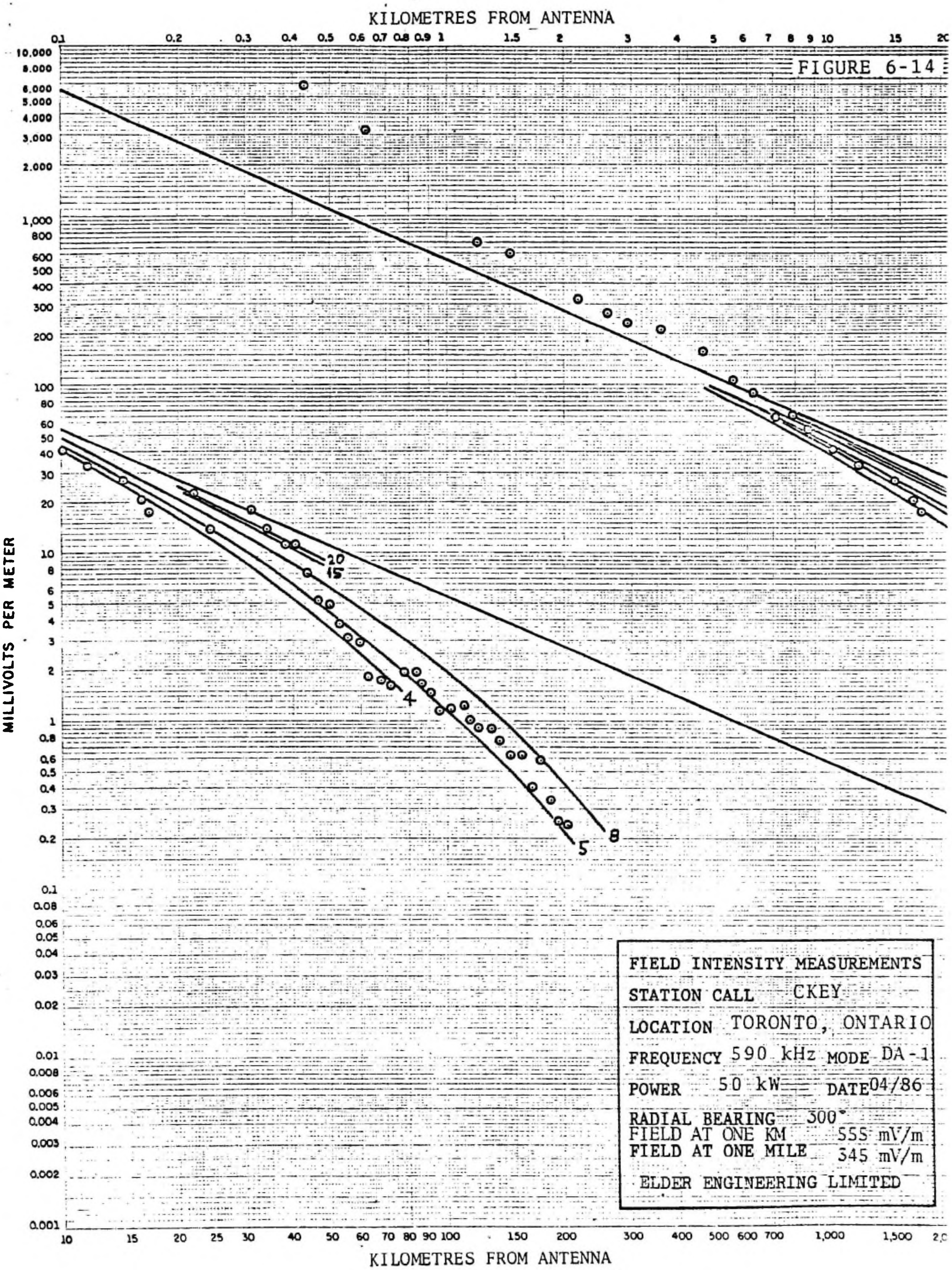

KILOMETRES FROM ANTENNA
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.5 2 3 4 5 6 7 8 9 10 15 20
FIGURE 6-9
MILLIVOLTS PER METER
10,000 8,000 6,000 5,000 4,000 3,000 2,000 1,000 800 600 500 400 300 200 100 80 60 50 40 30 20 10 8 6 5 4 3 2 1 0.8 0.6 0.5 0.4 0.3 0.2 0.1 0.08 0.06 0.05 0.04 0.03 0.02 0.01 0.008 0.006 0.005 0.004 0.003 0.002 0.001
1
1.5
20
15
10
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 190°
FIELD AT ONE KM 94 mV/m
FIELD AT ONE MILE 58 mV/m
ELDER ENGINEERING LIMITED
10 15 20 25 30 40 50 60 70 80 90 100 150 200 300 400 500 600 700 1,000 1,500 2
KILOMETRES FROM ANTENNA


KILOMETRES FROM ANTENNA
FIGURE 6-10
MILLIVOLTS PER METER
15
10
8
5
4
3
2
1.5
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 210°
FIELD AT ONE KM 94 mV/m
FIELD AT ONE MILE 58 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA


KILOMETRES FROM ANTENNA
FIGURE 6-11
MILLIVOLTS PER METER
1.5
2
3
5
4
30
20
15
10
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 230°
FIELD AT ONE KM 149 mV/m
FIELD AT ONE MILE 93 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA


KILOMETRES FROM ANTENNA
FIGURE 6-12
MILLIVOLTS PER METER
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 250°
FIELD AT ONE KM 85 mV/m
FIELD AT ONE MILE 53 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA


KILOMETRES FROM ANTENNA
FIGURE 6-13
MILLIVOLTS PER METER
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.5 2 3 4 5 6 7 8 9 10 15 20
10,000 8,000 6,000 5,000 4,000 3,000 2,000 1,000 800 600 500 400 300 200 100 80 60 50 40 30 20 10 8 6 5 4 3 2 1 0.8 0.6 0.5 0.4 0.3 0.2 0.1 0.08 0.06 0.05 0.04 0.03 0.02 0.01 0.008 0.006 0.005 0.004 0.003 0.002 0.001
2 3 4 5 8 10 15 20
10 15 20 25 30 40 50 60 70 80 90 100 150 200 300 400 500 600 700 1,000 1,500
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 270°
FIELD AT ONE KM 111 mV/m
FIELD AT ONE MILE 69 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA


KILOMETRES FROM ANTENNA
FIGURE 6-14
MILLIVOLTS PER METER
20
15
4
5
8
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 300°
FIELD AT ONE KM 555 mV/m
FIELD AT ONE MILE 345 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA

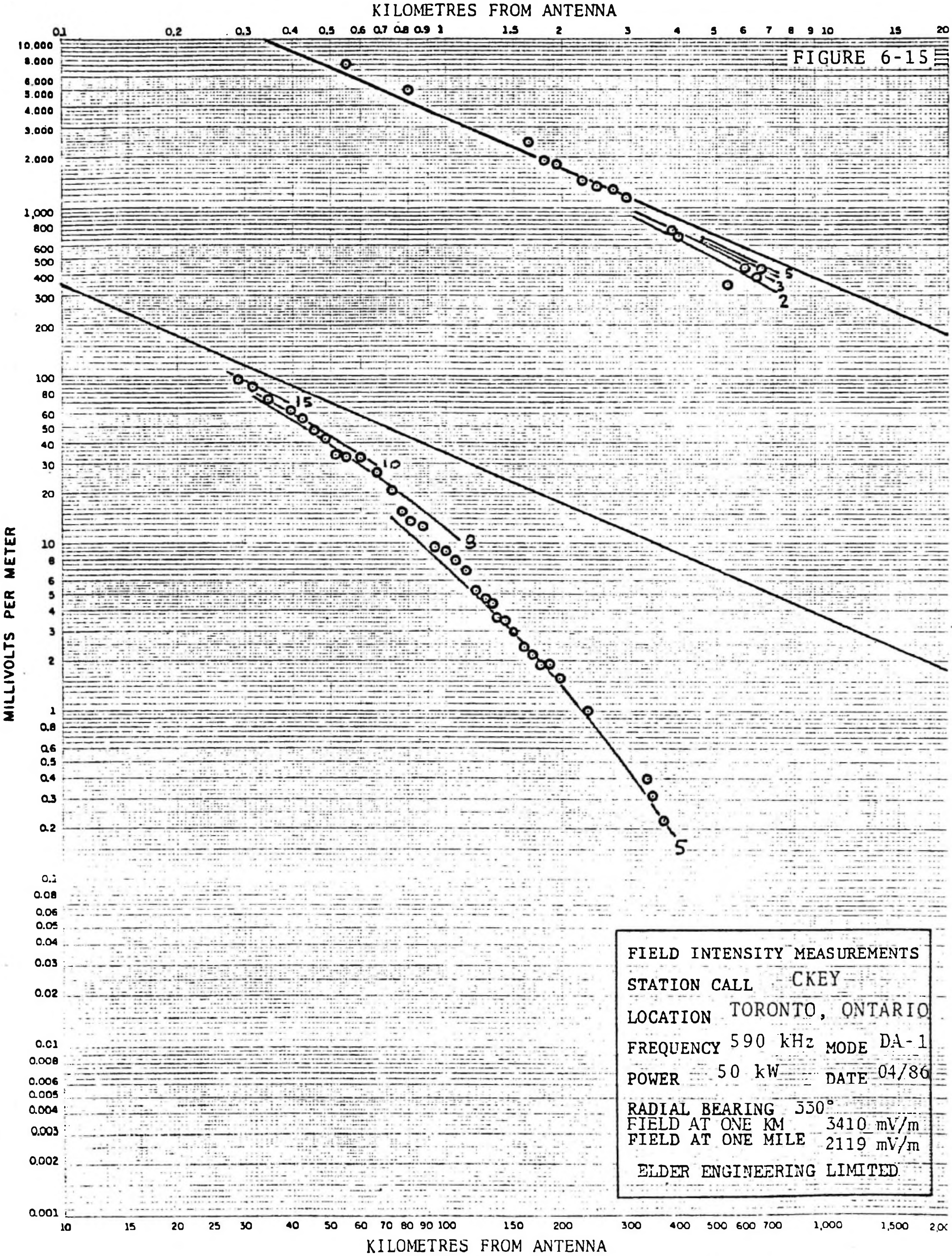
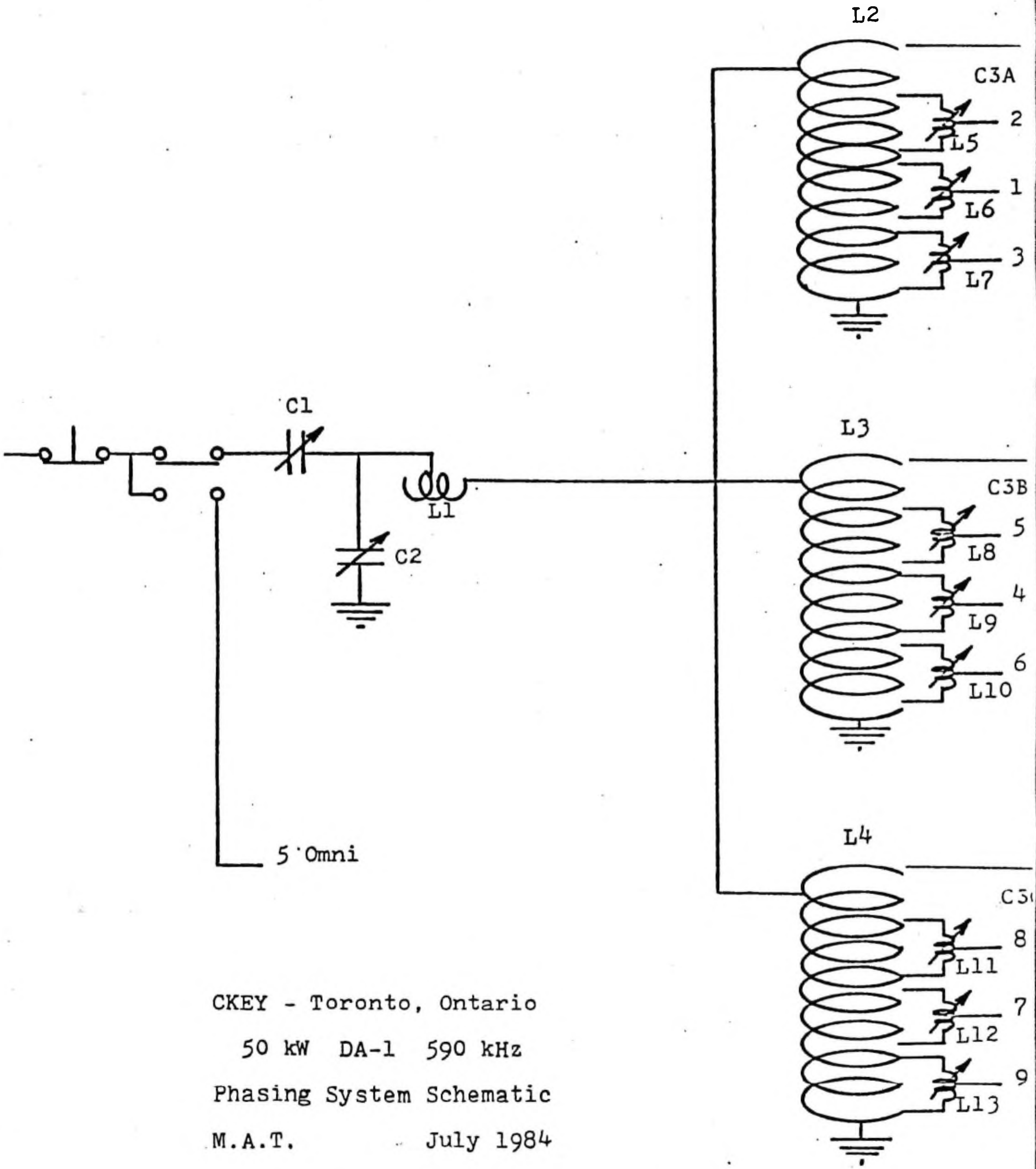

KILOMETRES FROM ANTENNA
FIGURE 6-15
MILLIVOLTS PER METER
FIELD INTENSITY MEASUREMENTS
STATION CALL CKEY
LOCATION TORONTO, ONTARIO
FREQUENCY 590 kHz MODE DA-1
POWER 50 kW DATE 04/86
RADIAL BEARING 330°
FIELD AT ONE KM 3410 mV/m
FIELD AT ONE MILE 2119 mV/m
ELDER ENGINEERING LIMITED
KILOMETRES FROM ANTENNA

FIGURE 8



CKEY - Toronto, Ontario

50 kW DA-1 590 kHz

Phasing System Schematic

M.A.T. July 1984

Revised October 1985

TABLE 1

ANTENNA DESCRIPTION SHEET

STATION CALL: CKEY
MAIN STUDIO: TORONTO, ONTARIO
FREQUENCY: 590 kHz
POWER: 50 kW
CLASS: III
MODE: DA-1
TIME: UNLIMITED
NOTIFICATION LIST NO.: .... DATE ....
GEOGRAPHICAL LOCATION: Latitude: 43° 09' 10" North
Longitude: 79° 32' 04" West

ARRAY CHARACTERISTICS: Nine guyed steel towers of uniform cross section; base insulated, series fed; no top loading; overall height above ground 455', height above base insulator 450' (97.1°)

NUMBER	SPACING FEET	SPACING DEGREES	TRUE BEARING DEGREES	FIELD RATIO	PHASE DEGREES
1	1110.8	239.76	288.544	0.309	-119.6
2	886.6	191.38	268.470	0.630	- 4.2
3	791.5	170.85	239.334	0.329	109.3
4	416.9	90	332	0.505	-112.0
5	Ref	Ref	Ref	1.000	0.0
6	416.9	90	152	0.513	113.0
7	789.0	170.311	61.548	0.212	-122.2
8	889.5	192	89.5	0.433	- 3.0
9	1143.5	246.824	108.37	0.227	108.9

GROUND SYSTEM: 120 equally spaced radials per tower of #10 AWG soft drawn bare copper buried 6" to 18" deep where possible, of average length exceeding 667' (.4λ) excluding those along common chords; minimum length 417' (.25λ), maximum length 1000' (.6λ); Counterpoise at base of each tower

PREDICTED EFFICIENCY: 1361.715 mV/m for 50 kW 2191.4@1km
(UNATTENUATED FIELD AT ONE MILE) 192.576 mV/m for 1 kW

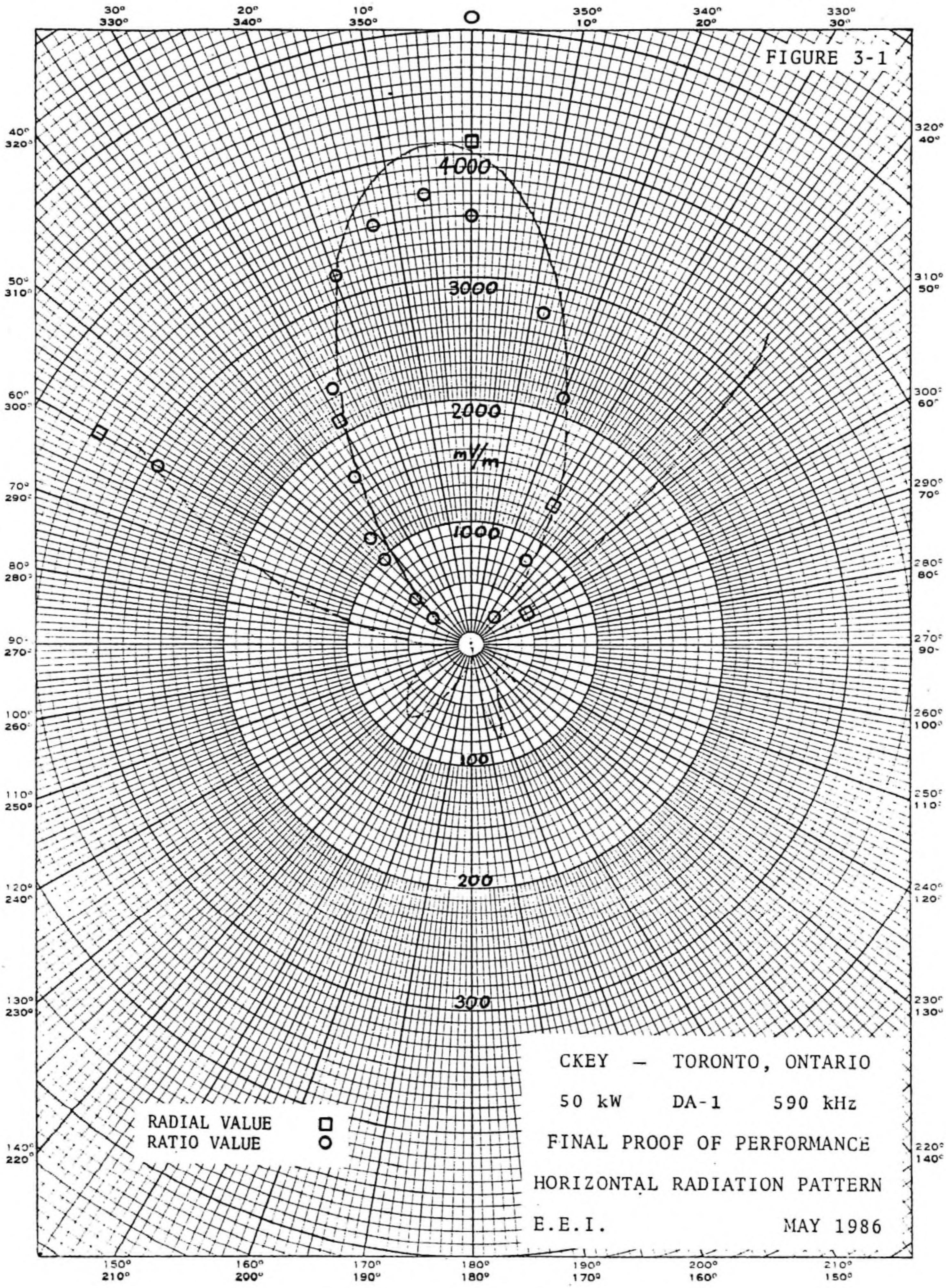


FIGURE 3-1

CKEY — TORONTO, ONTARIO

50 kW DA-1 590 kHz

FINAL PROOF OF PERFORMANCE

HORIZONTAL RADIATION PATTERN

E.E.I. MAY 1986