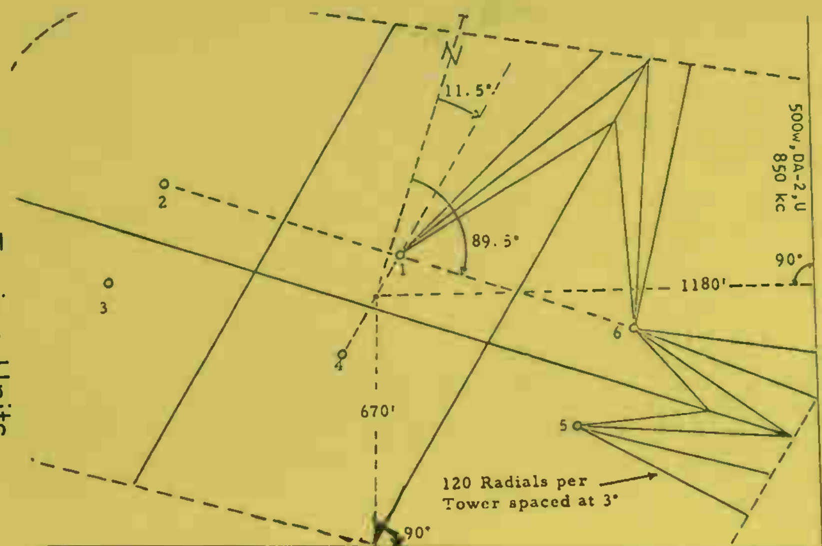
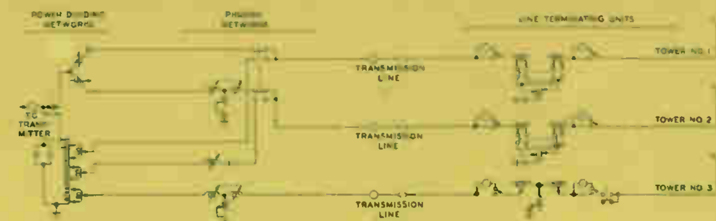
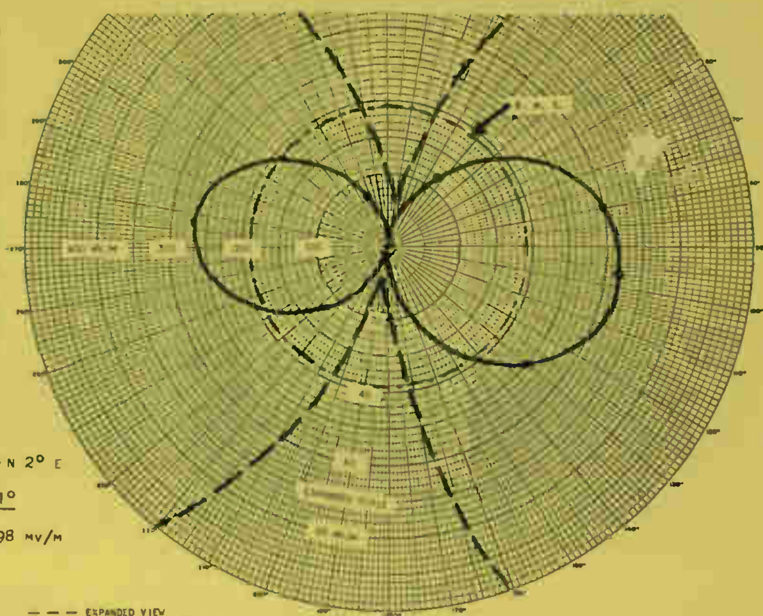
# NRC - CANADIAN AMERICAN NIGHT PATTERN BOOK

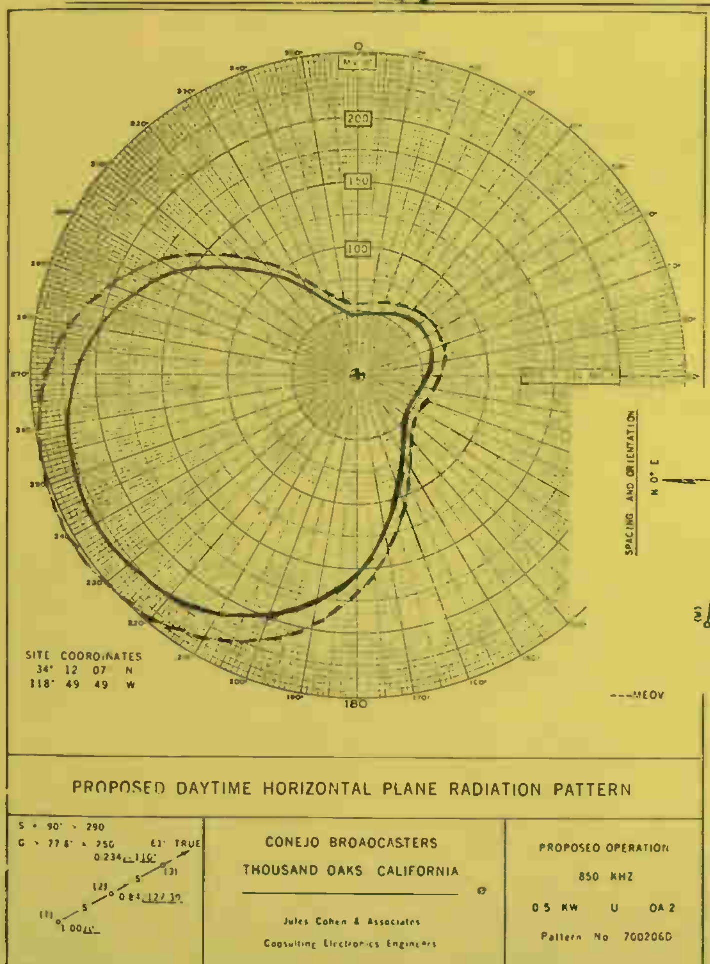



S = 332.37' - 90°
1/0° 1.016/126.1° 0.77/-81°
G = 330 FEET = 89.5° RMS = 98 MV/M

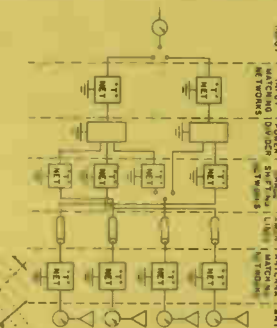
535 KHz to 1605 KHz

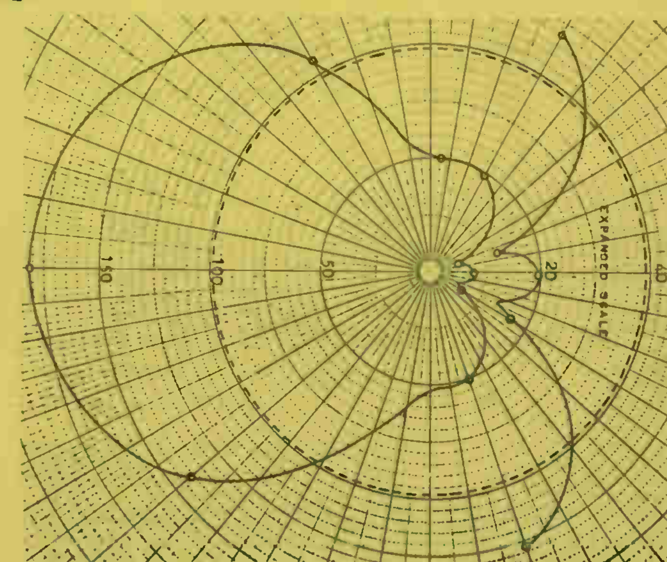



CP

N. LAT. 42° 50' 34"
W. LONG 106° 13' 07"
S = G = 90°-239'
RMS = 613 MV/M
THEORETICAL
OPERATING

FULLTIME AM




Facilities changes

New stations

PHASE SAMPLING LOOPS

MEASURED HORIZONTAL RADIATION PATTERN NIGHTTIME

UNATTENUATED FIELD INTENSITY AT ONE MILE

AM Antenna Phase Monitors

NATIONAL RADIO CLUB, P.O. Box 127, Boonton, N. J., 07005

The Publishing Committee of the National Radio Club takes great pleasure in dedicating this Pattern Book to the senior Editor of DX NEWS,

**Ernest R. Cooper**

Ernie Cooper's weekly column, MUSINGS OF THE MEMBERS, has appeared in each issue of DX NEWS for the last 27 years and has been a cornerstone of the NRC since the first Musing appeared in 1947. The volunteer workers who have produced this volume feel that it is only appropriate to dedicate it to the Editor whose unpaid volunteer efforts over the past 27 years have made the NRC the world leader in the medium wave DX hobby!

# CREDITS

This volume is the result of volunteer and unpaid efforts of many club members. Several hundred man-hours were consumed during the various phases of the project:

Obtaining patterns and information: Wes Boyd, Paul K. Hart, Charles Schaffer and Russell J. Edmunds. Valuable assistance was also provided by: Steve Taafe, Tom McCormack, Doc Hardester, Scott Brockway, Craig Cook, Joe Kureth, Ernie Wesolowski, Jerry Robertson, Pierre Tremblay, Andy Rugg, John Oldfield, Bill Feidt, and Eric Norberg.

Scaling and drawing patterns: Wes Boyd and John Silliman.

Keying: John Silliman, Wes Boyd, Gordon P. Nelson, Mark Katz, George Kelly and Jerry Starr.

Typing: Don Erickson, Glenn Cooper, Jerry Starr, Wes Boyd, Rick Briggs and John Silliman.

Composition and formatting: Wes Boyd, Gordon P. Nelson, George Kelly, Mark Katz and Russell J. Edmunds.

Printing: Colony Printing, Denville, N. J.

# FOREWARD

The second edition of the NRC Night Pattern Book was made possible through the cooperation of club members and owners of the previous publication. Suggestions from DXers, broadcasters and other owners have been included in this book. Without their suggestions, consideration and cooperation, this edition would not have been possible. Similar books are available in the "over $100" price range, but we feel that our Night Pattern Book is equally informative at a price which makes it available to a much wider audience.

Our previous edition only showed directional patterns for stations operating in the U.S. and Canada. This edition not only includes new or changed patterns, but also limited time stations that were omitted from the previous book. Also included are Mexican stations operating at powers over 1000 watts. As in the previous book, Canadian low power repeaters are not shown. Hawaiians are not shown as there are no directional stations in the 50th state, and we felt it was too far removed from the mainland to merit estimating coverage. The 107 broadcast band frequencies have been reduced to 77 pages by doubling and tripling up on some frequencies. Class IV (graveyard) Canadian patterns will be found on a separate map page at the end of the book.

Patterns shown are the actual measured horizontal radiation patterns as licensed by the appropriate governmental body. Presentation is the polar plot showing measured field intensity in millivolts per meter (mV/m) at one mile. Most patterns in this book are at the 300 mV/m scale, but most stations with powers of 10,000 watts or more are drawn at the 900 mV/m scale to help reduce clutter on some frequencies. Those patterns drawn at the 900mV/m scale are marked "*" near the key number. Patterns without such indication are all drawn at the 300 mV/m scale. An example is the page for 750-760-770-780. Here KFMB San Diego (5kW) appears to have similar coverage to KOB or KCRL (both 50kW) until you look for the "*" indication on these two stations. These two patterns would actually be three times larger than shown, but the reduced scale avoids clutter.

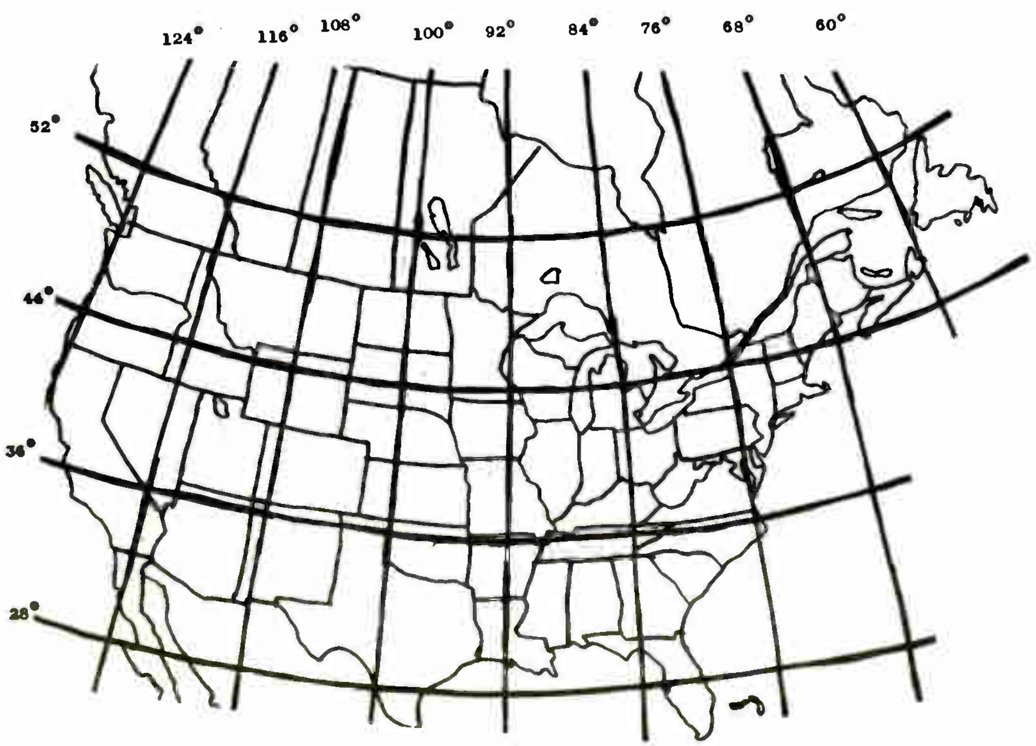
Limited time stations use the same scaling procedure, but are drawn with dashed lines to distinguish them from fulltime facilities. Stations operating nondirectionally are represented by estimated average field in mV/m for the appropriate class of station. In all cases, however, patterns shown do not indicate <u>actual station coverage</u>.

Approximately 1400 patterns have been scaled and drawn for this edition of the NRC Night Pattern Book. As in the previous edition, there were a few patterns which eluded us, and these are marked as "not available". Missing patterns as well as corrections, additions and other changes will appear in DX News to allow you to keep your book as up to date as possible.

Articles have been included on the basics of directional antenna patterns, treaties and allocations, understanding polar plot patterns, estimating daytime coverage, night coverage and others. Most of these are slightly condensed versions of articles which previously

The maps used are not the common Mercator projection, but a modified Lambert projection. In most cases bearings are close enough to being straight lines so that corrections are unnecessary. North is not uniformly directed towards the top of the page but varies in direction from east coast to west coast. It's best to judge true north by state boundaries, etc. (See atached map.)

We suggest that DX'ers be careful when discussing patterns with stations in reception reports. Should you log a station with an indicated null in your direction, don't jump to the conclusion that the pattern is out of adjustment. Technical complications associated with conductivity, skywave propagation, tilting of layers of the ionosphere, auroral conditions and other highly variable factors can allow such receptions.




# About the NRC

The National Radio Club is the largest and oldest hobby group dealing exclusively with medium-wave DX'ing (established in 1933). The NRC's magazine-bulletin, DX NEWS, is published weekly during the winter DX season for a total of 30 issues per year and is crammed with information specifically by and for the MW DX'er. In our latest publication year we carried more than 1000 pages of information exclusively for the MW DX'er - feature and technical articles, the latest FCC and DOT information, plus page upon page of invaluable tips from our membership telling what's actually being heard. The NRC was the first DX club to produce a handy-sized bulletin by commercial printing - not mimeograph.

The NRC is a nonprofit, volunteer-operated club, and membership dues go to pay the expenses of printing and mailing DX NEWS for the membership, and for other essential club services. Since each member's dues pays for his portion of the NRC's operating costs, and for his share of postage, dues are dependent upon postal rates. At present rates the dues are $14.00 yearly for First Class mail delivery and $15.00 for domestic Air Mail. Special airmail rates can be arranged for overseas members. If you're an active MW DX'er or just getting started, you'll get a wealth of unique information by joining the NRC today!

The NRC offers numerous special publications for members and non-members alike, although most prices to members are discounted. Our other major effort is our Domestic Station Log, currently in its 3rd edition in its current format. This book lists all U.S. and Canadian stations on AM by frequency and gives addresses, powers, pattern types, network, schedules etc. We also publish Reprint Reference Manuals including many former articles from DX NEWS on such subjects as Antennas and Receivers, as well as offering Xerox reprints of many other inportant articles. Our introductory booklet entitled "Getting Started In Medium Wave DX'ing" contains many articles on introductory phases of the hobby and is free with every new membership. Non-members may obtain the book for the regular price. We are even now working on still further publishing efforts.

NRC'ers are among the friendliest people around, and informal gatherings and get-togethers take place in many parts of the country. Our annual conventions held over every Labor Day weekend attract many many members from the U.S., Canada and foreign countries for a long weekend of DX discussions, station tours, shoptalk and general partying...

# HOW TO USE THIS BOOK

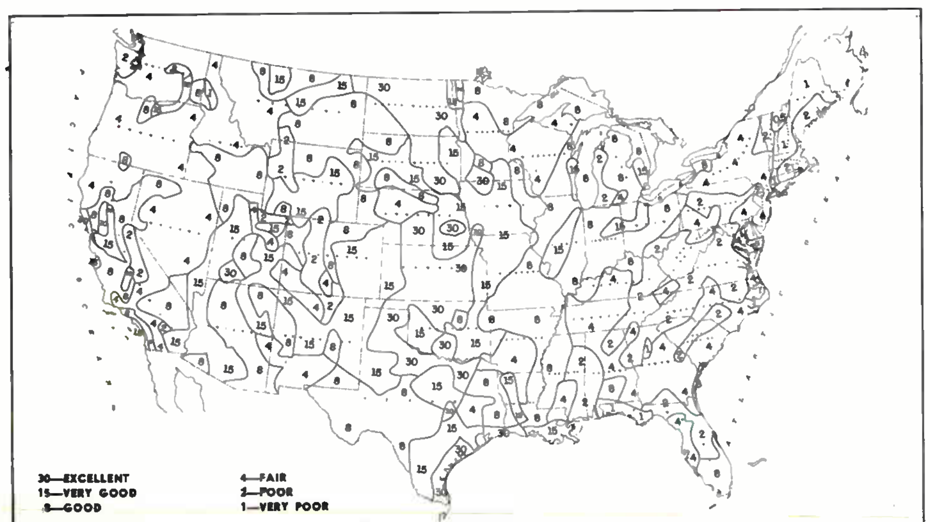
In the allocation of frequencies, the F.C.C. (Federal Communications Commission) and the C.R.T.C. (Canadian Radio-Television Commission) specify the signal intensity contours that are to be protected from interference. At the same time they specify the minimum field the station should develop over the city of license, and the minimum field the station itself should develop. Exact fields vary with the class of station, and the sub-classifications. In the U.S. the F.C.C. requires the following minimum fields (stated in millivolts per meter, or mV/m).

Class I Stations:
225 mV/m one mile from the antenna, for 1000 watts nondirectional.
Class II & III Stations:
175 mV/m one mile from the antenna, for 1000 watts nondirectional.
Class IV Stations:
150 mV/m one mile from the antenna, for 1000 watts nondirectional (75 mV/m for 250 watts and 47.5 mV/m for 100 watts).

Few stations actually operate at these minimum fields. Most operate with fields about 10% above the minimum. Class IV's usually develop closer to 175 mV/m; Class III's develop closer to 190 mV/m; Class II's develop closer to 220 mV/m; and Class I's develop around 240 mV/m, if not more. (The minimum requirements for Class II & III stations are the same, but most Class II's develop more field than Class III's, and almost as much as most Class I's.)

A station's primary service area is that area where groundwave isn't subject to interference. This primary service area depends upon the station's frequency, power and the ground conductivity. To show how conductivity varies across the U.S., a copy of the F.C.C.'s R-3 conductivity map has been included. Values are stated in millimhos (mmhos), a unit of conductivity.

**ESTIMATED GROUND CONDUCTIVITY**




Class I stations are protected to the 0.1mV/m contour daytime. All the other classes are protected to the 0.5 mV/m contour. The distance from the station's antenna to this contour depends on frequency as much as it depends on power. In the U.S. stations are licensed at powers of 250, 500, 1000, 2500, 5000, 10000, 25000 and 50000 watts. (The 100 watt power was dropped in the mid '60s, and the 2500 watt power is new.) Canadian powers are 100, 250, 500, 1000, 2500, 5000, 10000, 15000, 25000 and 50000 watts.

The field strength of any station varies according to the square of its power, so it is possible to calculate the field at powers other than 1000 watts using the fields mentioned earlier. Increasing to twice the power increases the field to 141.4%; halving power reduces the field to 70.7%. An increase to four times the power doubles the field, while reducing to one fourth power reduces the field to half. Going to five times the power increases the field to 224%, and a reduction to one fifth reduces the field to 44.7%. Increasing to ten times the power increases the field to 316%; reducing to one tenth reduces the field to 31.6%. An increase in power of 50 times increases the field to 707%, and a reduction to one fiftieth reduces the field to 14.1%.

Class IV Stations:

| Power Watts | Minimum Field | Average Field |
|---|---|---|
| 1000 | 150mV/m | 175mV/m |
| 500 | 106 | 124 |
| 250 | 75 | 88 |
| 100 | 47 | 55 |

Class III Stations:

| Power Watts | Minimum Field | Average Field |
|---|---|---|
| 5000 | 392mV/m | 425mV/m |
| 1000 | 175 | 190 |
| 500 | 124 | 134 |

Class I Stations:

| Power Watts | Minimum Field | Average Field |
|---|---|---|
| 50000 | 1596mV/m | 1702mV/m |
| 10000 | 714 | 761 |
| 5000 | 505 | 538 |
| 1000 | 225 | 240 |

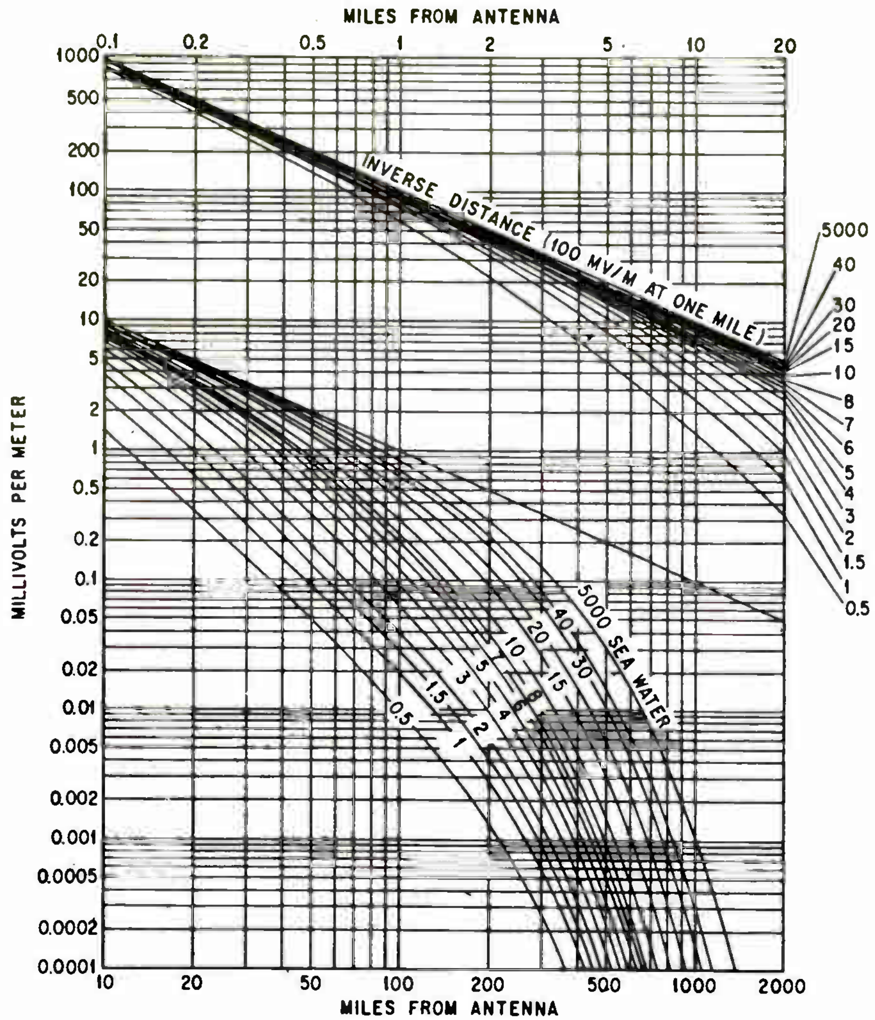
Class II Stations:

| Power Watts | Minimum Field | Average Field |
|---|---|---|
| 50000 | 1241mV/m | 1560mV/m |
| 10000 | 555 | 697 |
| 5000 | 392 | 493 |
| 1000 | 175 | 220 |

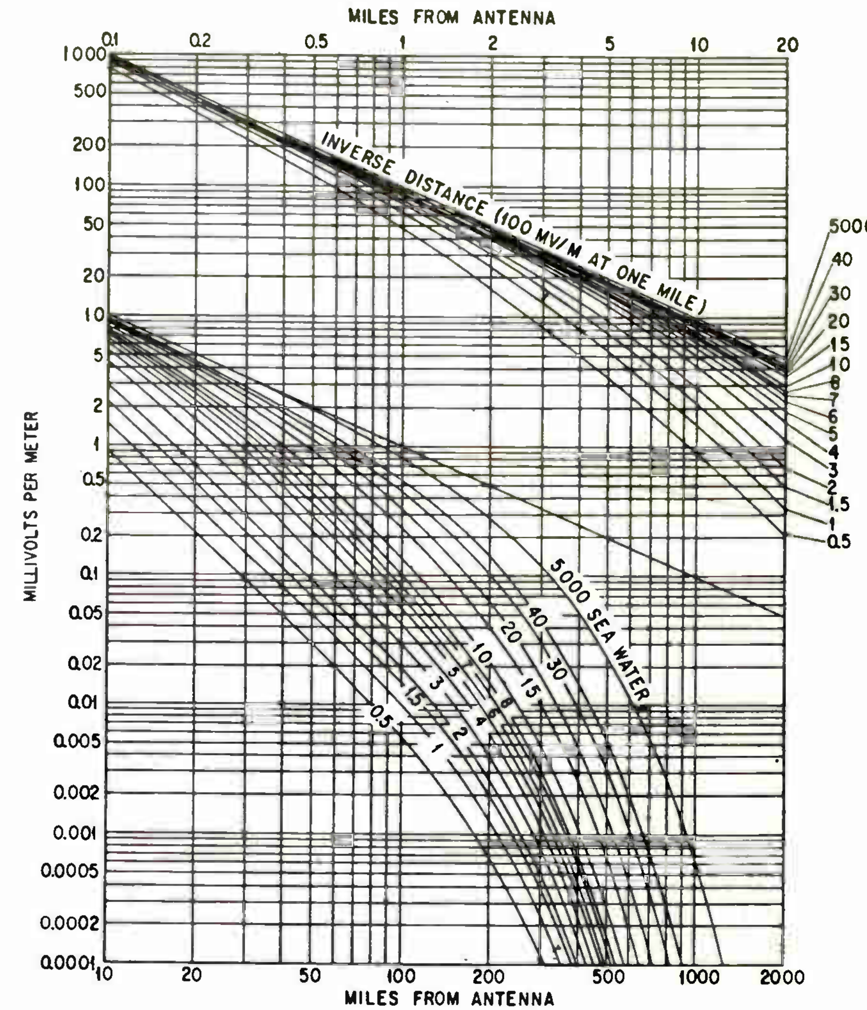
A change in power by a factor of two is a change of 3 decibels (dB), or about half an S unit. Changing by a factor of four is a change of 6 dB, or just under one S unit. A factor of five is a change of 7 dB, or just over one S unit. Going by a factor of ten is a 10 dB change, or about 1½ S units. Changing power by a factor of 50 is a change of 17 dB, or just under 3 S units.

Looking at the field in mV/m, you'll note tremendous changes in field as power increases. The actual change is really much less when you consider the change in decibels for the same power increase.

The conductivity graphs in this article represent the effect of conductivity upon attenuation at different frequencies. These graphs are similar to those in older N.A.B. (National Association of Broad-

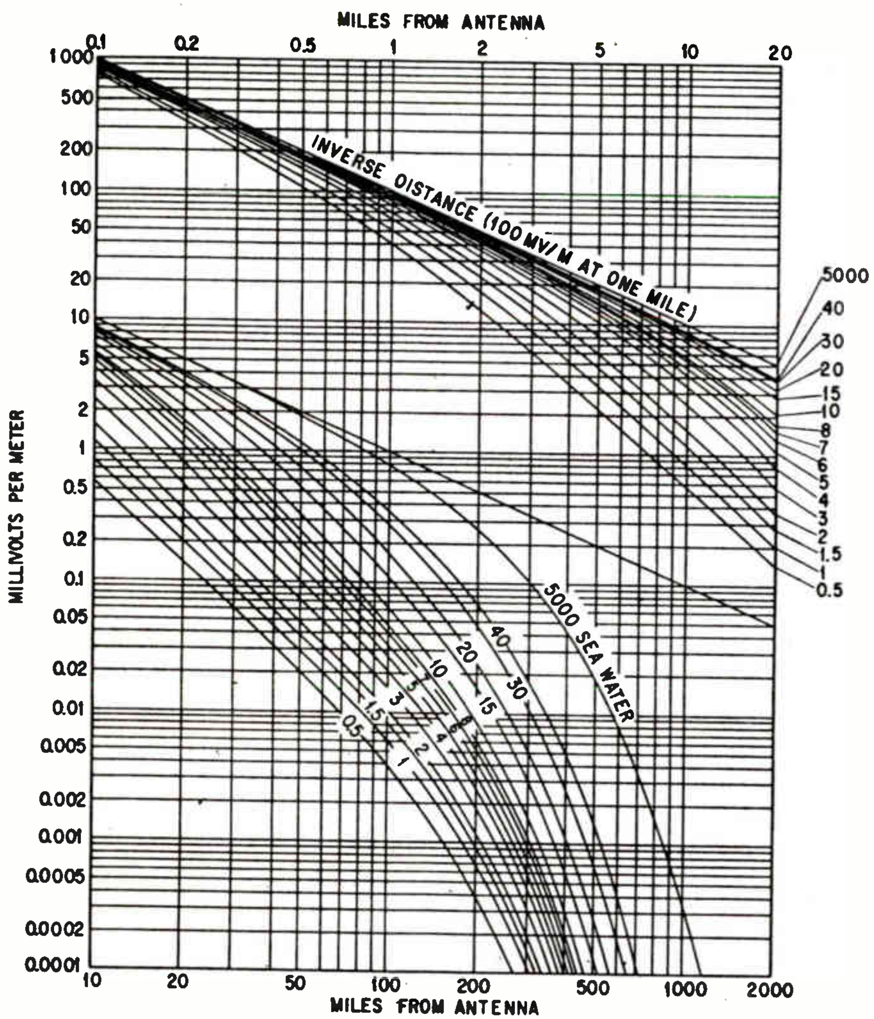



**Graph 1.** Groundwave field intensity vs. distance, 540–560 kc. Computed for 550 kc, $\epsilon = 15$, and the ground conductivities expressed in mmhos/m for which the curves are labeled.

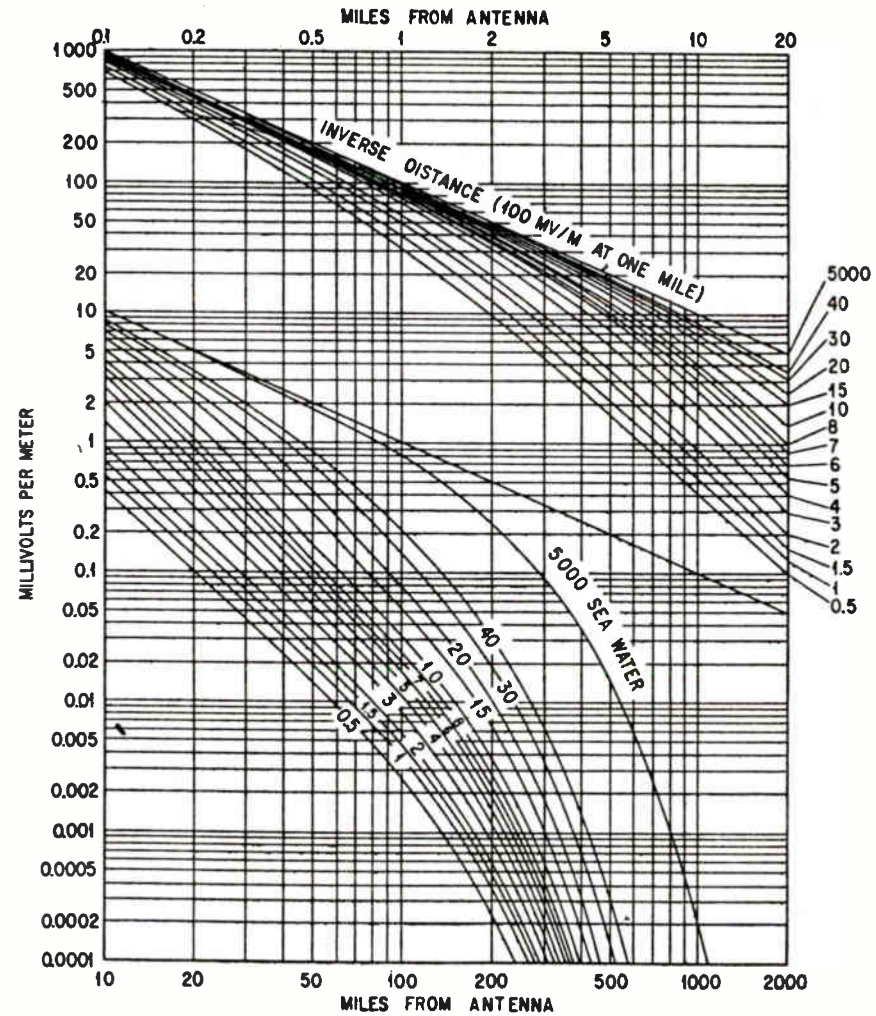



**Graph 7.** Groundwave field intensity vs. distance, 720–760 kc. Computed for 740 kc. $\epsilon = 15$, and the ground conductivities expressed in mmhos/m for which the curves are labeled.

These graphs show groundwave field intensity curves plotted against distance for different values of conductivity. The reference 100 mV/m assumes that the station has the power and efficiency for an inverse-distance field of 100 mV/m at one mile.




Graph 12. Groundwave field intensity vs. distance, 970–1030 kc. Computed for 1000 kc, $\epsilon = 15$, and the ground conductivities expressed in mmhos/m for which the curves are labeled.




Graph 16. Groundwave field intensity vs. distance, 1250–1330 kc. Computed for 1290 kc, $\epsilon = 15$, and the ground conductivities expressed in mmhos/m for which the curves are labeled.

These graphs show groundwave field intensity curves plotted against distance for different values of conductivity. The reference 100 mV/m assumes that the station has the power and efficiency for an inverse-distance field of 100 mV/m at one mile.

casters) Engineering Handbooks, and are simpified versions of similar F.C.C. graphs. Only five graphs are shown in this article to show changes across the broadcast band. There are actually some 20 graphs used to cover the entire band in both the N.A.B. and F.C.C. publications.

Looking at the graph for 550 kHz, the top curve for 5000 mmhos intersects 100mV/m at one mile, and 10mV/m at 10 miles. This shows that the unattenuated field is dependent only on distance. It also shows that groundwave field is inversely proportional to distance.

Again using the graph for 550 kHz, we'll find the distance to the 0.5mV/m contour for a 5000 watt Class III station in a conductivity of 10 mmhos. First we must use the previous values of the field in mV/m at one mile, and then convert this figure to a totally different figure to be used in finding the 0.5mV/m distance on the graphs.

The field of 0.5mV/m is also 500uV/m (microvolts per meter), so we must multiply 500uV/m times 100mV/m (the scale used on the graphs) to find an answer of 50,000. Now divide this by 425mV/m (the average field of a 5000 watt Class III station) to arrive at the figure of 118 uV/m. Convert this field back to mV/m, for a field of 0.12mV/m to be used on the graphs.

Go down the left hand portion of the graph until you find the field of 0.12 mV/m. Follow this directly across the page until it intersects with the curve for a conductivity of 10 mmhos. From this point go straight down the page and read the mileage. In this example our 5000 watt Class III station develops 0.5 mV/m out about 150 miles from the antenna.

Finding the distance to any other contour uses the same procedure. Find the field you want, convert that field into uV/m, and multiply it by 100. Divide that answer by the field in mV/m for the power and class of station desired. Convert that answer to mV/m and find it on the left hand side of the graphs. Follow this out to the desired conductivity, then down the page to find the mileage.

The following chart gives the necessary "graph fields" for finding the 0.5 mV/m contour of a Class III station developing 190 mV/m at one mile.

| Power, watts | Average Field, mV/m | Graph Field, uV/m |
|---|---|---|
| 250 | 95 | 526 |
| 1000 | 190 | 263 |
| 5000 | 425 | 118 |
| 10000 | 600 | 83 |
| 50000 | 1343 | 37 |
| 250000 | 3000 | 17 |
| 1000000 | 6000 | 8.5 |

Using these fields and the system described previously, the distance to the 0.5 mV/m contour has been calculated at different frequencies and powers. Because of the distances involved, these were not calculated at powers over 50 kW on lower frequencies. All estimates are based on conductivity of 10 mmhos.

| 550 kHz Watts | 0.5 mV/m Miles | 740 kHz Watts | 0.5 mV/m Miles | 1000 kHz Watts | 0.5 mV/m Miles |
|---|---|---|---|---|---|
| 250 | 74 | 250 | 54 | 250 | 40 |
| 1000 | 105 | 1000 | 77 | 1000 | 55 |
| 5000 | 155 | 5000 | 108 | 5000 | 77 |
| 10000 | 195 | 10000 | 122 | 10000 | 87 |
| 50000 | 230 | 50000 | 168 | 50000 | 122 |
| | | 250000 | 215 | 250000 | 160 |

| 1290 kHz Watts | 0.5 mV/m Miles | 1600 kHz Watts | 0.5 mV/m Miles |
|---|---|---|---|
| 250 | 32 | 250 | 23½ |
| 1000 | 41 | 1000 | 31 |
| 5000 | 58 | 5000 | 46 |
| 10000 | 66 | 10000 | 52 |
| 50000 | 93 | 50000 | 75 |
| 250000 | 126 | 250000 | 105 |
| 1000000 | 155 | 1000000 | 130 |

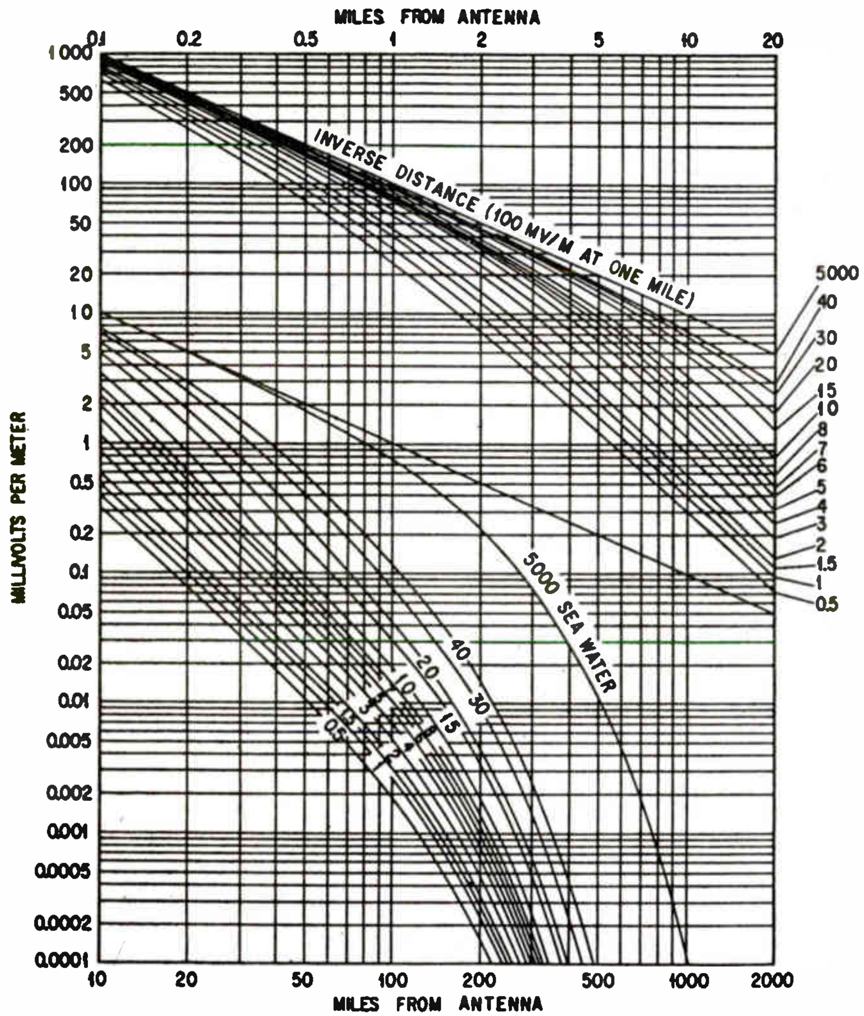
Remember that these figures are based on the assumption that a Class III station could operate at powers over 5000 watts, and on a clear channel. The sole purpose of this chart is to show what powers are required to produce similar coverage as frequency increases, using the same type antenna and with the same ground conductivity.

Notice that 5000 watts on 550 kHz would have similar coverage to 50,000 watts on 1000 kHz, or about two million watts up on 1600 kHz. A station with 50,000 watts on 1290 kHz would have slightly less coverage than 1000 watts down on 550 kHz. Using 50,000 watts on 1600 kHz would develop almost identical coverage to that of a 250 watt station on 550 kHz.

It's also possible to estimate coverage on other frequencies using these same graphs. As an example, a 1000 watt station on 1000 kHz has coverage of 55 miles, and on 1290 kHz, 41 miles. The midpoint between these mileages is 48 miles, while the midfrequency is 1145 kHz. Had a graph for 1140 kHz actually been used, the coverage would have come out to 47 miles, so our estimate of 48 miles is quite close.

The distance to the 0.5 mV/m contour also varies as values of conductivity change. In the following chart conductivities of 2 mmhos, 5 mmhos and 20 mmhos were used to find the distance to our 5000 watt, Class III station's 0.5 mV/m contour.

| | Distance in Miles: | | |
|---|---|---|---|
| Freq. in kHz | 2 mmhos | 5mmhos | 20 mmhos |
| 550 | 61 | 101 | 207 |
| 640 | 52 | 87 | 185 |
| 740 | 44 | 72 | 160 |
| 840 | 40 | 64 | 140 |
| 940 | 35 | 56 | 123 |
| 1000 | 33 | 52½ | 113 |
| 1140 | 29½ | 45½ | 98 |
| 1210 | 27½ | 42½ | 91 |
| 1290 | 26½ | 39½ | 85 |
| 1350 | 25 | 37½ | 79 |
| 1470 | 23½ | 34½ | 73 |
| 1560 | 21½ | 31½ | 67 |




**Graph 19A.** Groundwave field intensity vs. distance, 1560–1640 kc. Computed for 1600 kc, $\epsilon = 15$, and the ground conductivities expressed in mmhos/m for which the curves are labeled.

# WMBS RADIO, Uniontown

## 590 KC 1000 WATTS

IS ONE OF THE BEST BUYS
IN THE ENTIRE COUNTRY.

**WMBS Radio**

**590 KC**

**1000 Watts**

surpasses coverage given by 50,000 watts on 1110 KC

### FREQUENCY and POWER relationship

| FREQUENCY RANGES | WATTS OF POWER | | | | | |
|---|---|---|---|---|---|---|
| | 250 MILES RADIUS | 1000 MILES RADIUS | 5000 MILES RADIUS | 10,000 MILES RADIUS | 25,000 MILES RADIUS | 50,000 MILES RADIUS |
| 540-560 | 110 | 170 | 225 | 278 | 312 | 335 |
| 570-590 | 108 | 162 | 220 | 268 | 310 | 325 |
| 600-620 | 103 | 153 | 200 | 250 | 300 | 318 |
| 630-650 | 101 | 150 | 195 | 240 | 290 | 310 |
| 660-680 | 100 | 140 | 190 | 235 | 278 | 305 |
| 690-710 | 96 | 135 | 185 | 228 | 265 | 300 |
| 720-760 | 90 | 130 | 170 | 200 | 220 | 265 |
| 770-810 | 82 | 120 | 160 | 185 | 210 | 235 |
| 820-860 | 78 | 110 | 150 | 175 | 192 | 225 |
| 870-910 | 72 | 98 | 137 | 160 | 180 | 210 |
| 920-960 | 70 | 96 | 130 | 150 | 165 | 200 |
| 970-1030 | 64 | 87 | 120 | 140 | 155 | 185 |
| 1040-1100 | 61 | 84 | 115 | 135 | 149 | 175 |
| 1110-1170 | 55 | 74 | 110 | 120 | 145 | 160 |
| 1180-1240 | 53 | 72 | 98 | 115 | 130 | 155 |
| 1250-1330 | 50 | 65 | 90 | 110 | 115 | 142 |
| 1340-1420 | 48 | 62 | 86 | 100 | 112 | 135 |
| 1430-1510 | 38 | 53 | 80 | 90 | 103 | 130 |
| 1520-1600 | 30 | 50 | 74 | 87 | 98 | 115 |

**All the above estimated .5MV/M contours assuming a ground conductivity of 20 and a ½ wave antenna in all cases. Estimations based on FCC conductivity curves dated 1954.**

The figures in the conductivity of 20 mmhos follow rather closely those in WMBS's "Frequency and Power Relationship" chart. Differences are due to WMBS estimating coverage using a half wave antenna, while our estimates are for a quarter wave antenna. Further proof is found in a statement found on the coverage map of KSFO in San Francisco, stating "With 5000 watts at 560 on the dial, KSFO delivers a strong, clear signal to an area greater than that which could be reached by a station with 250,000 watts at 1110 kHz, or a station with two million watts at 1500 kHz."

These examples give a good idea of how radically a station's pattern can affect reception of that station in different directions. With patterns like these in wide use across the U.S. and Canada, it is obvious that many mysteries of strong or poor reception can be explained with the information contained here in the NRC Pattern Book.

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## HOW DIRECTIONAL PATTERNS ARE PRODUCED ON THE BCB

* Wes Boyd, WHOT

The NRC Night Pattern Book contains some 1,450 different directional patterns. We're sure some questions will arise as to how such patterns are created. It is beyond the scope of this article to much more than scratch the surface of this subject. This is due mostly to the math involved which has been omitted here.

A basic rule of thumb is the number of towers in an array equals the number of nulls in the final pattern. This can be twisted around quite a bit as we will see later, but for the most part it's accurate enough to be very useful.

In our examples we will be dealing with ideal conditions. In reality, this is almost impossible due to buildings, power lines, etc. So rather than add more complexity to an already confusing subject, we will deal with ideal conditions.

A single vertical tower in a fixed location fed with a specific power will radiate equally in all directions. Now we assume a straight line running north and south of this tower. With the addition of a second tower, we can now create several basic directional patterns.

Phasing and spacing of this second (identical) tower controls the actual pattern. Null depth control and pattern shaping is accomplished by magnitude changes between the towers.

Moving tower #2 to a location 180 degrees north of tower #1, we develop a figure 8 pattern if both towers have equal power and magnitude. The field between tower #1 and tower #2 is 180 degrees out of phase and causes mutual cancellation. Identical conditions exist in the other direction allowing nulls to form north and south of the towers. Figure #1 is such a pattern.

An additional phase shift of 90 degrees on tower #2 will create a basic cardioid pattern. To the north, the field from tower #2 leads the field from tower #1 by 180 degrees thus the two will cancel out. Moving south of the towers we find that the fields combine and create a lobe. Figure #2 shows a cardioid. The field to the side of the towers creates a field some 41% stronger than nondirectional operation would.

Most arrays of more than two towers are only combinations of the simple patterns just explained. Additional towers in a figure 8 pattern will narrow the lobes and widen the nulls. Other towers could be used for a "dog leg" effect but we'll explain this later. Figure #3 shows such a figure 8.

We could use four towers for a figure 8 pattern. Here two basic figure 8 patterns are formed by each set of two towers. These interact mutually on each other for a pattern similar to that in figure #4.

Such interaction can be used with cardioids to form patterns with little power in very wide nulls. Two cardioids interacting will narrow the lobe and make it more powerful (figure #5). Still another cardioid could be added to achieve a pattern similar to figure #6.

Additional towers in an array are not always used to deepen/widen nulls or to create powerful lobes. They can be used to create "cloverleaf" or "dog leg" patterns for additional coverage.

The "dog leg" is created by having a tower offset in respect to the other towers. This allows the pattern to be twisted as shown in figure #7. You will note a small side lobe and similar small lobes in other multiple tower arrays. These are a product of the interaction of the two patterns.

"Cloverleaf" patterns can look like a cloverleaf or modified to look like figure #8. Most likely this is a combination of both cloverleaf and dog leg. It's really quite hard to say as there are so many possible combinations to achieve any specific pattern.

End fire arrays consist of three/four or more towers and the interaction of several different patterns. Figures #9 and #10 show how such patterns are created.

In figure #9 we use three towers to achieve the final pattern. Towers #1 and #2 create a figure 8 while towers #1 and #3 create a cardioid pattern. The interaction of these two patterns will give the final pattern shown.

The pattern obtained in figure #10 uses three basic patterns. Two are basic figure 8 patterns with magnitude changes. This simple means one tower has more power than another and so develops greater field in that direction. Such magnitude changes are used on two figure 8 patterns.

Our first figure 8 is between towers #1 and #2 with the magnitude being greater in tower #2. Another figure eight is developed between towers #1 and #3 with the greater magnitude on tower #1. Finally a cardioid develops between towers #1 and #4. The interaction of these patterns creates the final pattern shown.

If necessary, such multiple patterns can interact upon themselves. Figure #11 shows a pattern developed with the combination of two of the patterns we developed in figure #9.

As mentioned earlier, it's well beyond the scope of this article to do much more than scratch the surface. However, we hope some questions have been answered.

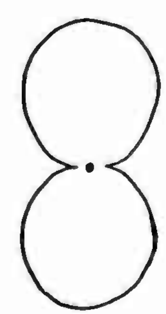

FIGURE #1

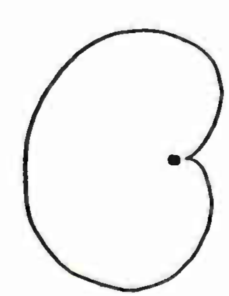

FIGURE #2

FIGURE #3

FIGURE #4

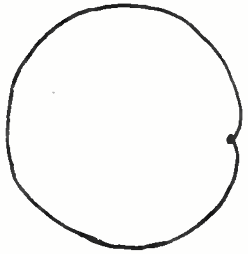

FIGURE #5

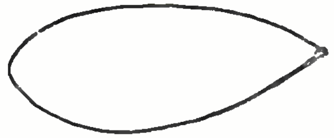

FIGURE #6

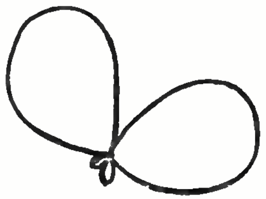

FIGURE #7

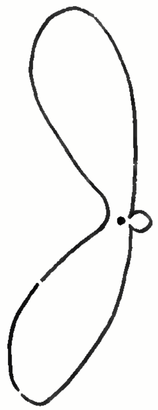

FIGURE #8

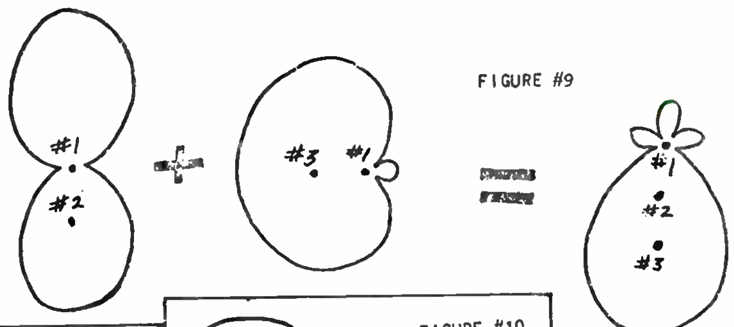


FIGURE #9

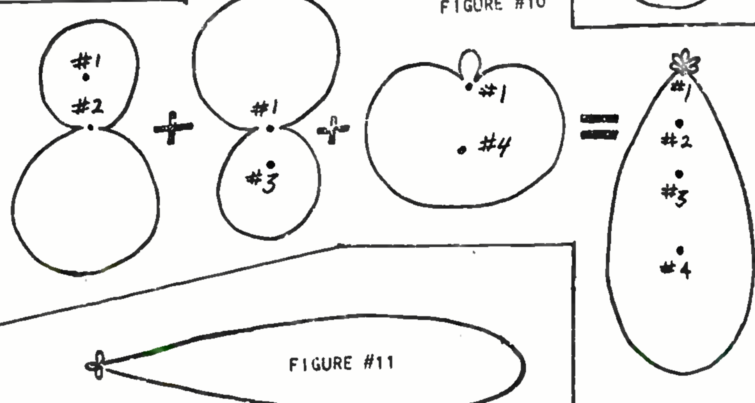


FIGURE #10

FIGURE #11

## VARIATIONS IN VERTICAL PATTERNS

-Wes Boyd

This article is intended to answer some of the questions from owners of the first edition of the NRC Night Pattern Book. The patterns shown are the measured patterns; however, these are measured at ground level (zero degrees). They make no attempt to show any skywave radiation that may exist. In reality, the FCC doesn't acknowledge such radiation at angles much above 50 degrees.

Figure #1 is information available in the FCC's Rules and Regulations. It indicates vertical radiation at different antenna heights for 1,000 watts non directional on the left hand side. The right hand side shows everything scaled to 100 mv/m; however, we won't be using this section.

With the left hand section we can read the field in mv/m at one mile. It can be noted that shorter towers have much more skywave radiation than taller ones. In most cases the possible use of such towers is offset by the increased cost for them.

The bottom line indicates the field, and we can see a 0.25 wavelength tower develops 180 mv/m at one mile. This can be increased to 200 mv/m by going to a tower 0.311 wavelength but both are very similar. If height were increased to 0.5 wavelength, the field increases to 230 mv/m, with reduced skywave. A further increase to 0.625 wavelength increases to 280 mv/m with even less skywave signal.

We could reach similar fields with a 0.25 wavelength tower but the power required isn't licensed by the FCC. To reach 230 mv/m, we would need about 1,500 watts and for 280 mv/m, we need about 2,000 watts.

Increasing height much beyond 0.5 wavelength does increase the field at one mile BUT also develops a secondary lobe. This can be seen in figure #1 at an angle of about 60 degrees and a field of about 80 mv/m. In most cases this is outside of most stations' coverage when it returns to earth. However, KDKA-1020, Pittsburgh, Penna., uses such a tower and has problems. Our secondary lobe returns and causes interference with normal groundwave signal. This creates a "hole" with severe fading from about 45 to about 70 miles from the transmitter.

Figure #2 shows different tower heights required by the FCC for the different classes of stations. We can also estimate what the tower height should be at 0.25, 0.5, and 0.625 wavelength at different frequencies. It should be noted that the tallest towers are required for clear channel class I stations; however, they also are to serve the largest areas.

A class I station operating on 600 kHz (if the FCC would allow it) would have a tower height of about 550 feet unless limited to 500 feet by the FAA. In reality, most stations stay closer to 0.25 wavelength towers which would be closer to 400 feet tall. Class II and III stations on this frequency could use towers of about 300 feet. In these cases, the height is less than 0.25 wavelength and the skywave is increased.

Some stations on upper frequencies do use tall towers for the increased coverage. Many of these can be spotted in the NRC Night Pattern Book by the increased coverage of stations of similar power. Some will not be very obvious due to poor conductivity around the transmitter, keeping the field at one mile reduced from what it might reach.

WHOT-1330 has its night transmitter site on an old strip mine. This will keep the field down from what it might achieve at a better site. However, it still has more coverage than other 1,000 watters with similar patterns.

Compare the patterns on 1410 kHz of WING/WPOP and KQV/WDOV. These all use 5,000 watts full time and the patterns of the examples are very similar. WING and WPOP show the Dayton station is using tall towers or is located at a very excellent site. The same is true when you compare KQV/WDOV but the Pittsburgh station uses towers of over 0.5 wavelength for the additional coverage.

FCC § 3.190, FIGURE 5

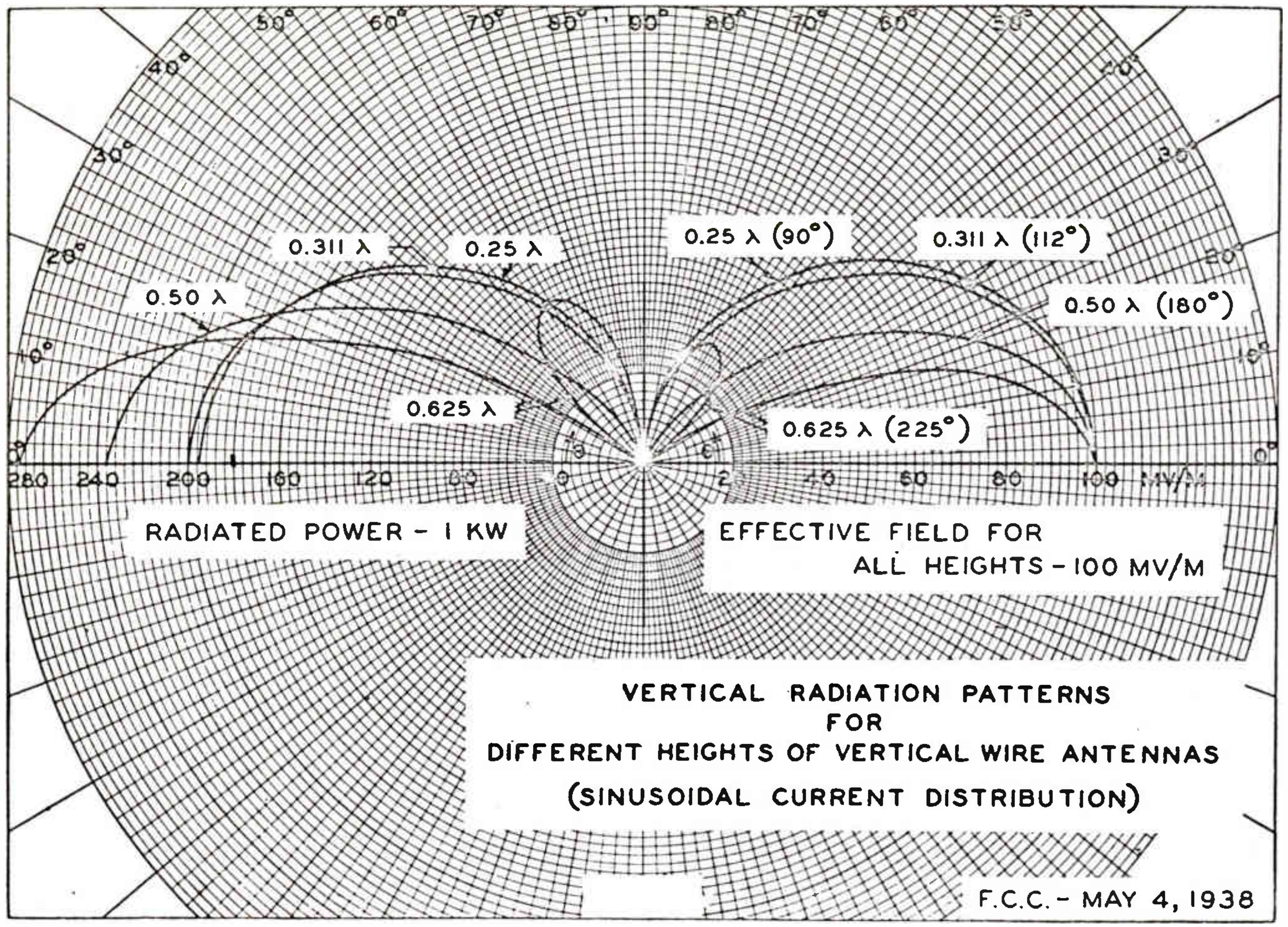


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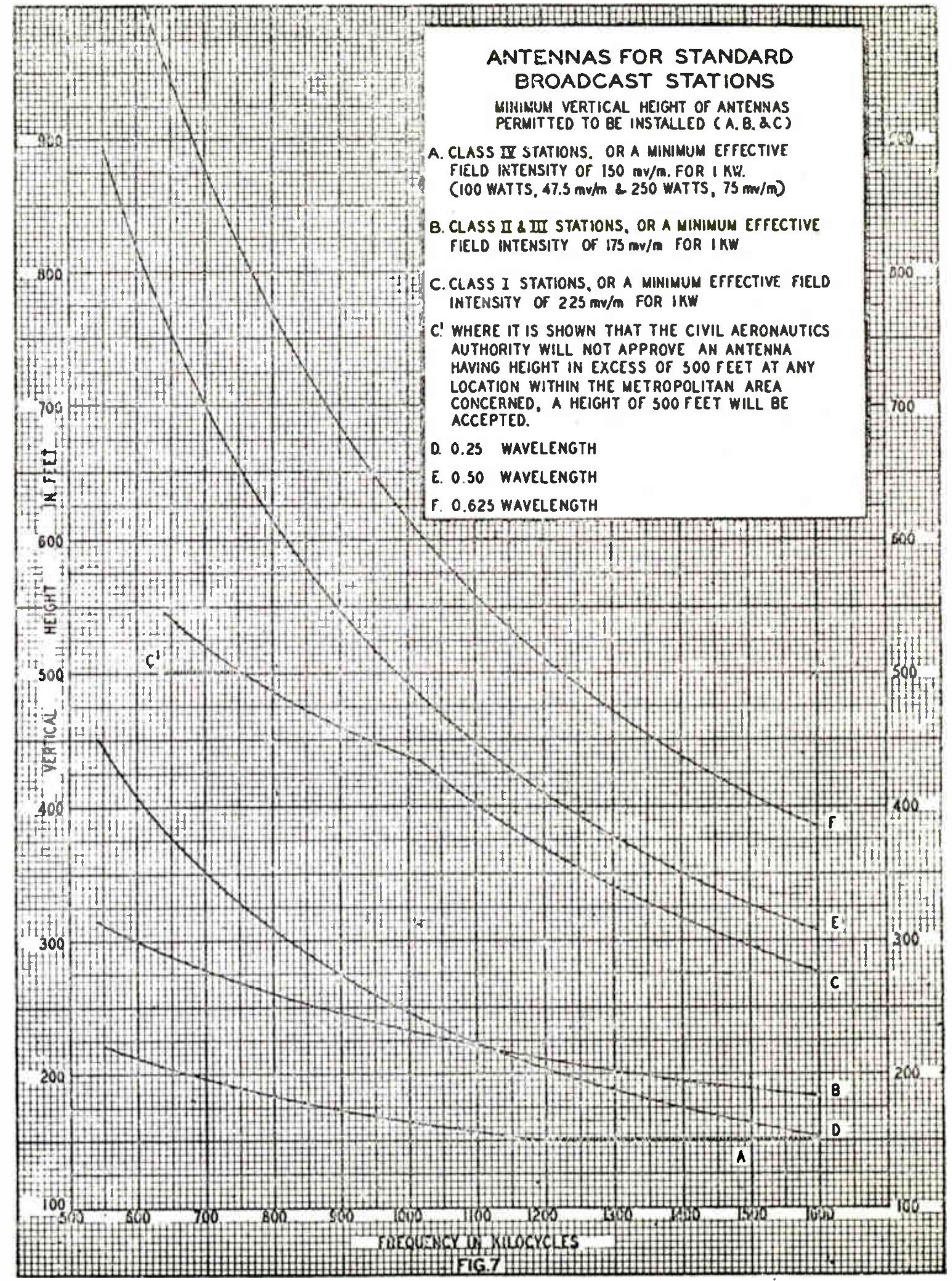
**Fig. 1**




FCC § 3.190, FIGURE 7

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**Fig. 2**

# Basics of Directional Patterns

by Paul K. Hart*

As the population increases in the United States and Canada, more media services of all types are required. This includes medium wave broadcasting where greater choice of programming material is available and as a consequence more stations can be supported by advertising revenue. All stations legally transmitting in the U.S. and Canada are licensed by the F.C.C. in Washington or the D.O.T. in Ottawa, in keeping with the international treaty obligations contained in the North American Regional Broadcasting Agreement (N.A.R.B.A.). A more detailed discussion of the relationship between channel allocations and the N.A.R.B.A. will be found elsewhere in this book.

With more than 5,000 stations in the U.S. and Canada operating on only 107 channels, many stations have been forced to make use of directional transmitting antennas to reduce interference to an acceptable level. Many stations now operate with highly sophisticated directional antennas in order to meet the strict interference criteria contained in the F.C.C. and D.O.T. rules and regulations.

It is important to realize that the formal interference criteria established by the licensing agencies are based upon the ordinary home-type broadcast receiver. DXers with highly sophisticated receiving equipment are often able to hear distant stations even though the listener is located in a null of the transmitter antenna pattern. When reporting reception to these highly directional stations it is therefore most important to stress in your reception report that you are a DXer and not a regular listener with "ordinary" receiving equipment.

The allocation of frequencies by the F.C.C. and D.O.T. involves specification of a signal intensity contour of the station coverage area which must be protected from objectionable interference from other licensed stations. This contour level varies with the class of the station on the channel (i.e., Clear, Regional, or Local).

The primary service area of a station is the region where the ground-wave signal is free from objectionable interference from other licensed stations. The secondary coverage area is the region covered by the sky-wave signal; while the secondary coverage area may be protected from interference from other stations by F.C.C./D.O.T. rules and regulations, fading and other propagation effects may prove important in actual practice.

During the daylight hours the sky-wave signal is almost totally absorbed in the lower ionosphere at broadcast band frequencies; thus secondary coverage of any particular station exists only at night. There is also an intermittent coverage area located just on the edge of the ground-wave daytime service area; this area is outside the regular primary service area and is often subject to extreme fading and distortion as the result of destructive interference between the station's own sky-wave and ground-wave signals.

Directional antenna systems are used to provide primary and secondary coverage without interference to existing stations on the same and nearby frequencies. The problem of satisfying all of the interference criteria specified by the licensing agency can be very complex in actual practice, often necessitating elaborate engineering studies and costly directional antenna arrays.

Suppose a new station is proposed to operate on 1420 with 1,000 watts day and night. In another town 25 miles away there is a station operating on 1430 with 500 watts non-directional daytime. The new facility must provide protection to the existing coverage of the second station. Since the second station does not operate at night, secondary protection is not required. However, other stations operating on 1420 will suffer interference unless radiation is limited towards them at night. This may require 4, 5, 6 or even more towers in the transmitting array.

In this case the station might require two different patterns, one for daytime and one for night. The exact values for these antenna fields are set forth in the rules and regulations in accordance with the interference criteria. Care must be taken in designing directional patterns so they not only protect the required stations but provide adequate coverage throughout the primary coverage area.

A common tactic near coastlines is to locate the transmitter inland so the peak of the pattern covers the city of interest and then goes out to sea; while fine for foreign DXers, this common approach often results in very weak radiation in the direction of the opposite coast. Similiar tactics are often used by stations close to the borders. Many stations reduce power at night in conjunction with pattern changes to limit the interference to the required level. In recent years more stations have been using separate transmitter sites for day and night operation.

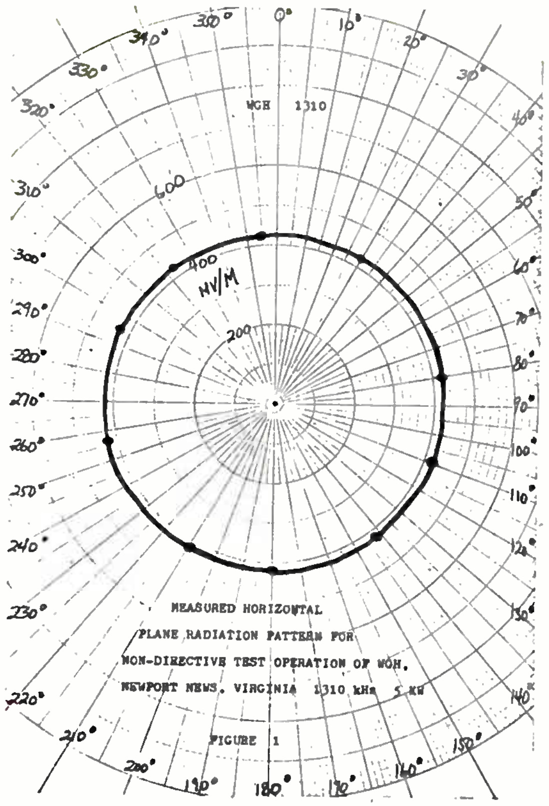
Bear in mind that the pattern is a graphical representation of field intensity generated by the combination of the transmitter and antenna system. All of the patterns shown in this volume are polar plot patterns showing field intensity at one mile from the antenna as measured at ground level (0 degrees elevation). This style of presentation is used because it is the form in which data must be supplied to the licensing agencies; additional discussion of the relationship between pattern size, field strength, and S-units will be found elsewhere in this volume.

Were a station to test with 50,000 watts into a dummy load antenna, the field strength at one mile might well be unmeasurable - this is the extreme case of an inefficient antenna! The same station with identical power loaded properly into an efficient antenna would produce a very high field strength at one mile. The less efficient the antenna, the weaker the field strength produced by a particular transmitter power. This illustrates a basic fact: transmitter output power alone is not the only factor which determines station coverage - antenna efficiency and directionality must also be considered if actual receptions are to make any sense at all.

Figure 1 is the non-directional daytime pattern for WGH, Newport News, Virginia on 1310 kHz. This pattern is unusual because it is almost perfectly non-directional in practice as well as theory. The bearings around the outside indicate the compass heading FROM THE ANTENNA referred to TRUE NORTH corresponding to 0 degrees (or 360 degrees) at the top of the plot. The distance from the center of the pattern to the curve in any direction is proportional to the signal intensity in millivolts per meter (mV/m), the standard measure of field strength, as measured one mile from the antenna. Figure 1 shows that the 5,000 watt WGH transmitter generates a field of 420 mV/m in all directions. Were the transmitter power reduced to 1,000 watts, this field drops to 188 mV/m - or a bit less than half the 5,000 watt coverage (remember that the field strength varies as the square of the power). If WGH wanted to increase the field from 420 mV/m to 840 mV/m (twice ~~the coverage~~), they would have to increase transmitter power to 20,000 watts.

Another concept essential to any discussion of directional patterns is the RMS field. The RMS field shown on the patterns in this article is the field strength a station would generate

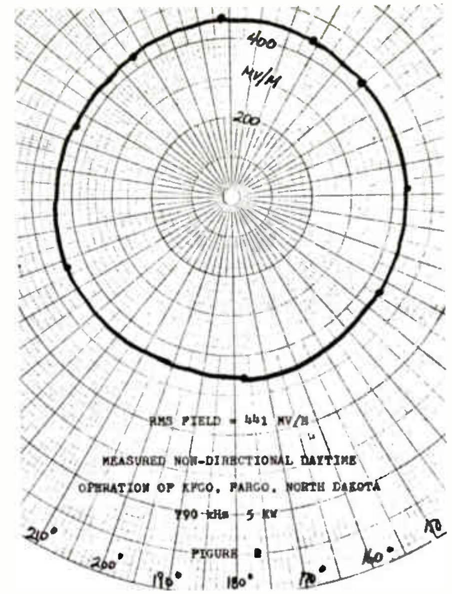
* condensed and abridged from the original article in DX NEWS by permission of the author by Wes Boyd and Gordon Nelson.

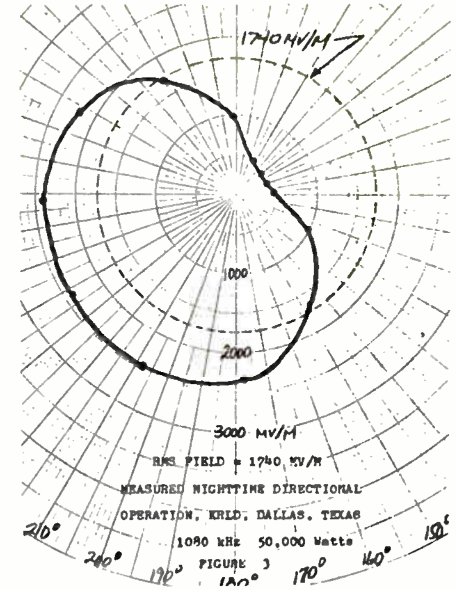



if all of the station's power were radiated in a PERFECT CIRCLE. The non-directional pattern of WGH is almost a perfect circle so the RMS will be very close to 420 mV/m.

Figure 2 is the non-directional daytime pattern of KFGO, Fargo, N.D. on 790 kHz. Note that even tough this station has but a single tower and is therefore supposedly non-directional, the coverage is not actually uniform in all directions. This is caused by factors such as non-uniform ground conductivity and such terrain features as buildings, power lines, and other structures. Since the pattern is not perfectly circular, a separate RMS value is given, 441 mV/m. Notice that WGH's RMS is only 420 mV/m compared with KFGO's 441 mV/m while both use the same transmitter power. This indicates that KFGO is using its transmitter power more effectively and more of it is being translated into field strength. For the most part the RMS is a useful indicator of the efficiency of the transmitter/antenna combination.

The F.C.C. and D.O.T. require that certain minimum values of field strength be generated with assigned powers for all stations. These minimum fields vary with the power and class of the station. The stations which are required to have the most efficient antennas are the Class I (Clear Channel) stations; this explains why these stations have huge antennas and vast coverage areas. The least strict requirements are for Local and daytime stations, although in no case will the F.C.C. permit new construction of an antenna less than 150 feet in height.



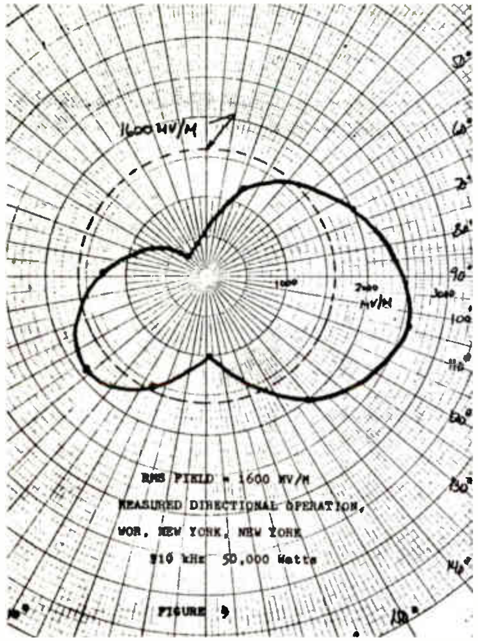



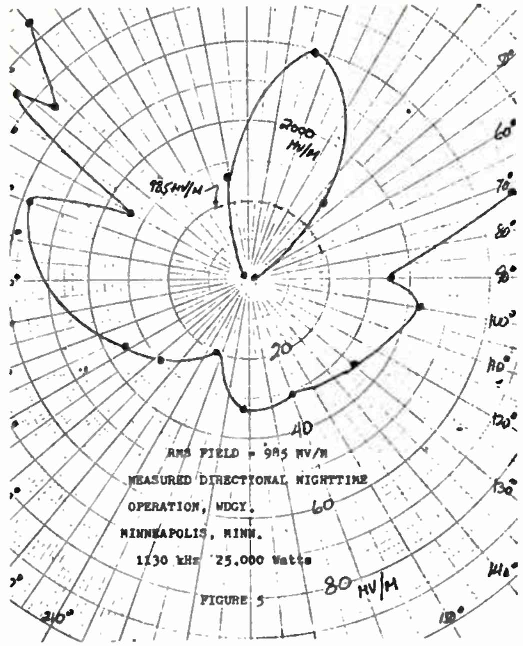

Directional patterns on the broadcast band are produced by employing multiple vertical towers and driving each tower with a definitely established and carefully maintained fraction of the total transmitter output power. As a result of tower spacing and electrical tuning networks, the radiated power is altered in amplitude and phase as required to produce cancellation or reinforcement effects which create the pattern. The design and construction of directional patterns is a very complex business and beyond the scope of this article. One simple rule-of-thumb of value to DXers is that the number of nulls in the pattern is equal to the number of towers in the directional array. This is not always the case but it holds often enough to be useful. In the remainder of this article we will deal with the final measured patterns without going too deeply into the details of the antennas themselves. DXers interested in more details are referred to the numerous articles which have appeared in DX NEWS and which are available as reprints from NRC headquarters.

The polar plot patterns shown here are of some stations selected to illustrate typical situations for discussion. The original sheets have details including tower location, phasing, spacing, height, and orientation which are not included in the interest of simplicity.

Figure 3 shows 50,000 watt KRLD in Dallas on 1080 kHz. This pattern is typical of the simplest types using two towers aligned along a line of peak and null. The RMS value of 1740 mV/m indicates a very good antenna efficiency. This pattern protects WTIC, Hartford, Conn., and WTIC mutually protects KRLD. Notice the direction of the very broad peak in the pattern. All of West and South Texas (along with most of the Southwest) lies in the KRLD secondary coverage area, thus guaranteeing interference-free reception over a wide area at night.

Figure 4 is WOR, New York City, on 710 kHz. This is a non-symmetrical pattern produce produced by a three tower array in a triangular layout. There are many other fulltime stations on 710 but they have patterns which protect WOR and are located a good distance from New York City. The main lobe covers N.Y.C., Long Island, and most of New England. Wor's southwest lobe covers New Jersey and a large portion of Pennsylvania. The RMS value of 1,600 mV/m indicates good antenna efficiency; it is lower than some other 50,000 watt stations however. This is because as antenna arrays become increasingly complex, the RMS produced for the same power input usually drops because of the power losses in the associated power lines and tuning




**networks.**

Figure 5 is WDGY, Minneapolis, Minn. on 1130 kHz. This pattern was achieved with 25,000 watts and a complex 9 tower system. In this pattern the nulls off the back of the array are so deep that a separate expanded scale is necessary to plot them. It is a safe bet that WDGY's transmitter is located to the south or southwest of Minneapolis-St. Paul area. His signal in these cities and to the north must be fantastic, but the signal must drop off quite rapidly to the south of the transmitter site.

On 1130 the primary stations are KWKH Shreveport, La., WNEW New York City, and CKWX Vancouver, B.C. All 3 stations operate with 50,000 watts full time; however the location of the 3 leaves a "dead spot" on 1130 in the mid-west. In this "dead spot" the trio of WCAR Detroit, Mich., WISN Milwaukee, Wis., and WDGY Minneapolis, Minn. operate with powers ranging from 10,000 to 50,000 watts. All 3 of these "secondary" stations operate under very strict rules so that none of them interfere with each other or any of the primary stations. Due to the relatively close geographical spacing of these "secondary" stations (all with high power) very sophisticated patterns are required. All three stations operate with patterns that are very similar.

Looking back at KRLD's night pattern you will notice that the pattern crosses the RMS field at 150 and 330 degrees. If you lived along either of these bearings the power from KRLD is 50,000 watts whether the pattern is used or not. If you lived in the "back" of the pattern the signal would be less than 50,000 watts. Along the bearing of 60 degrees the power at night is about 3,000 watts. For those in Arizona wondering why KRLD is so powerful for 50,000 watts, the power at a bearing of 260 degrees is almost 100,000 watts.

In the case of the WDGY pattern the power along a bearing of 17 degrees is almost 300,000 watts. At the same time WDGY's power at 180 degrees is less than 50 watts. The peak value of the curve on a bearing of 17 degrees for WDGY is almost 3,000 mV/m. This is more than KRLD achieves (2450 mV/m maximum) and KRLD has a more efficient antenna system! Considering that WDGY's pattern uses 1/4 wavelength towers while KRLD uses 1/2 wavelength towers the power from WDGY's narrow high intensity beam is fantastic.

## NARBA ALLOCATIONS AND PRIORITY COUNTRIES

Here is a breakdown of the broadcast band frequencies and priorities as set by the N.A.R.B.A. To make this useful as possible we have omitted all regional and local channels.

| | | | |
|---|---|---|---|
| 540 | Canada I-A, Mexico I-A | 1010 | Canada I-A |
| 640 | USA I-A, Canada I-B | 1020 | USA I-A |
| 650 | USA I-A | 1030 | USA I-A |
| 660 | USA I-A | 1040 | USA I-A |
| 670 | USA I-A | 1050 | Mexico I-A |
| 680 | USA I-B | 1060 | Mexico and USA I-B |
| 690 | Canada I-A, Mexico I-B | 1070 | Canada and USA I-B |
| 700 | USA I-A | 1080 | USA I-B |
| 710 | USA I-B | 1090 | Mexico and USA I-B |
| 720 | USA I-A | 1100 | USA I-A |
| 730 | Mexico I-A | 1110 | USA I-B |
| 740 | Canada I-A, Mexico I-D | 1120 | USA I-A |
| 750 | USA I-A | 1130 | USA and Canada I-B |
| 760 | USA I-A | 1140 | Mexico and USA I-B |
| 770 | USA I-A | 1160 | USA I-A |
| 780 | USA I-A | 1170 | USA I-B |
| 800 | Mexico I-A | 1180 | USA I-A |
| 810 | USA I-B | 1190 | Mexico and USA I-B |
| 820 | USA I-A | 1200 | USA I-A |
| 830 | USA I-A | 1210 | USA I-A |
| 840 | USA I-A | 1220 | Mexico I-A |
| 850 | USA and Mexico I-B | 1500 | USA I-B |
| 860 | Canada I-A | 1510 | USA I-B |
| 870 | USA I-A | 1520 | USA I-B |
| 880 | USA I-A | 1530 | USA I-B |
| 890 | USA I-A | 1540 | Bahamas I-A, USA I-B |
| 900 | Mexico I-A | 1550 | Canada and Mexico I-B |
| 940 | Canada and Mexico I-B | 1560 | USA I-B |
| 990 | Canada I-A | 1570 | Mexico I-A |
| 1000 | Mexico and USA I-B | 1580 | Canada I-A |

# Abbreviations

CLASS OF OPERATION:

| | |
|---|---|
| DA-1 | Unlimited hours of operation; same pattern day and night |
| DA-2 | Unlimited hours; different patterns day and night |
| DA-N | Unlimited hours of operation; directional nights only |
| ND | Nondirectional |

MISCELLANEOUS:

| | |
|---|---|
| CP | Construction Permit |
| mV/m | millivolts per meter |
| kw | kilowatt |
| kHz | kilohertz |
| NARBA | North American Regional Broadcast Agreement |
| FCC | Federal Communications Commission |
| DOT | Department of Transport (Canada) |
| RMS | Root mean square |

SITING OF DIRECTIONAL MW STATIONS
*Wes Boyd

In construction of directional antenna systems, several factors must be considered. #1. Protection to existing stations on the same or on adjacent frequencies. #2. Providing maximum coverage of the city of license. #3. The expense of land in locations that could be used. #4. Coverage of adjacent communities if desired or necessary.

These requirements make transmitter site placement very unique. As an example, we shall look at some typical class IV installations. Normally these operate with 1,000 watts daytime, 250 watts night non directional. Most such stations have towers of 150 feet or a bit taller.

Several stations operating on these frequencies will use excellent antenna systems to obtain maximum coverage. In most cases this also involves coverage to a larger adjacent city. With careful transmitter placement, they can obtain coverage in cities several miles away that normally wouldn't be covered.

EXAMPLES::::

WENZ 1450 Highland Springs (Richmond), Virginia; the city of license is about 5 miles east of Richmond. By locating the transmitter about 1 1/2 miles to the west of Highland Springs, that city receives excellent coverage. This also places the transmitter about 3 1/2 miles east of Richmond and also provides rather good coverage of that city.

WEXL 1340 Royal Oak, Michigan, is some 5 miles north of Detroit. As with WENZ transmitter placement allows coverage of the larger city. In this case, the transmitter is 1 1/2 miles south of Royal Oak. Such a location offers excellent coverage of both the city of license and Detroit.

WVON 1450 Cicero, Illinois, and WOPA 1490 Oak Park, Ill., both are located in areas that provide excellent coverage of Chicago. These communities are adjacent to Chicago on the city's west side. From here, transmitter sites on top of buildings in the area will have great coverage.

Such rooftop installations are not always used to provide maximum coverage. If properly used, they can increase or decrease coverage. Location of antennas of one-quarter wavelength on buildings of the same height will reduce coverage. A shorter building would provide more coverage; however, not as much as one over one-quarter wavelength tall would.

Among other stations using transmitter placement to serve communities other than the city of license: WNIA 1230 New York; WJMO 1490 Ohio; WLPM 1450 Virginia; WSMY 1400 N.C.; WFOM 1230 Georgia; WXVW 1450 Indiana.

Several years ago the F.C.C. made an attempt to limit the number of radio stations in larger communities. At the time, many stations were licensed to these cities and used the F.C.C.'s ruling to become licensed fulltime. If the city had adequate service, they wouldn't license any more fulltime stations for it. This allowed daytimers to relicense the stations to suburban cities without (in the F.C.C.'s terms) local service.

These stations would become licensed for fulltime operation. Then with careful transmitter placement, be able to serve the larger community anyhow. The coverage was not as good as it could be (or should be) to serve these larger cities. However, poor night coverage is better than signing off the air. Some of these included WCUE 1150, Akron, Ohio; WVOL 1470 Nashville, Tenn., and KUDL 1380, Kansas City.

During this same era, other stations went on the air as daytimers licensed to suburban cities. Then after several years, finally were given permission to operate fulltime. In both cases, the stations placed transmitters so they would provide coverage of the larger communities. These include WHOT 1330, WPAT 930, KDAY 1580, KQRS 1440, WYOO 980, etc.

In most cases, the area to be served determines the shape of the pattern more than the protection to existing stations does. Many stations could have lower power or less complicated patterns if the extra communities were not wanted in the coverage area.

KFXD 580 Nampa, Idaho, wouldn't require such a night pattern if coverage of Boise, Idaho, wasn't wanted. On such a lower frequency, the coverage is tremendous even at lower power levels. The large west lobe has enough signal to let the transmitter be several miles from Nampa. Since Boise is about 10 miles east of Nampa, the transmitter could be midway between them. Such a location allows the front lobe to serve the city of license while the lobe to the northeast will provide a very good signal in Boise.

Similar transmitter placement was used by WSAR 1480 Fall River, Mass. With a location west of Fall River, the east lobe covers the city of license. At the same time, the secondary lobe north/northwest covers Providence, R.I.

WTSN 1270 Dover, N.H., has a location just west of Dover. This allows Dover to be in the main lobe east. The back lobe provides coverage of Rochester, N.H., for a secondary coverage. At the same time, the front lobe is powerful enough to provide a good signal in Portsmouth.

WIBX 950 and WRUN 1150 Utica, New York, use transmitter placement to provide coverage of Rome, New York, (10 miles away) but both used different systems. WIBX 950 has a location to the west of Utica so it lies in the east lobe. This allows Rome to be covered by the lobe to the North. WRUN 1150 is located to the northwest of Utica so it lies in the southeast lobe. The lobe to the northwest then covers Rome.

Dallas/Fort Worth, Texas, provides similar problems in transmitter placement. Of the stations here, KLIF 1190 is the most unique. Protection to WOAI 1200, KVOO 1170 and other 1190 stations are required. The pattern used offers this protection but makes coverage of both cities difficult. Transmitter location near Irving, Texas, (northwest of Dallas) allows Dallas to be served with the lobe to the southeast. Then the main lobe southwest will cover Fort Worth with signals of excellent quality. With this pattern coverage of both cities is impossible unless the transmitter is in this area.

In coastal areas (New York City and Los Angeles are excellent examples), the stations have transmitters several miles inland. If stations in this area had moderate power and patterns aimed at the larger city, they would be almost as strong as stations licensed there. Others are licensed to communities surrounded by larger cities. They place the transmitter 10 miles away from the larger city and with power lobes cover both cities to serve the city of license. KDAY 1580 and KROQ 1500 in California are great examples of this.


KLAK 1600 WHHH 1440 WYOO 980 WIBV 1260

## SOME QUANTITATIVE ASPECTS OF VERTICAL PATTERNS

*Chris Lucas

The NRC Night Pattern Book has been a great aid to DXers. A glance is all it takes to see if a station nulls toward you or has a lobe in your direction. If you have compared the patterns shown with actual listening experiences, you will note some stations which should be heard are not while some with nulls in your direction are quite audible. This article will explain why this is so and should help you obtain more information from the pattern book.

The patterns shown in the pattern book indicate the electrical field strength in different directions from the transmitter due to radiation in the horizontal or ground plane. When considering nighttime skywave we must deal with radio waves leaving the antenna system at some angle above ground. This angle of elevation will be referred to as angle B in the following discussion. Radio waves at broadcast band frequencies normally propagate at night by reflection off the E layer of the ionosphere. The shorter the distance from the transmitter the greater the elevation of angle B. For single hop transmission beyond 700 miles, angle B is quite small. In this case the pattern book gives a good idea of how a station will be received. However, at distances progressively less than 700 miles, angle B becomes progressively larger and the pattern becomes considerably altered from the groundwave pattern indicated in the pattern book. However, only a certain type of pattern is applicable.

We will ignore for now that radio waves radiate preferentially in a ground plane. An antenna system composed of two or more towers located along a straight line produces a pattern with a special kind of symmetry. The pattern in three dimensions is symmetrical about a line connecting the bases of the towers. From here on this will be referred to as the "axis of symmetry". For the ground plane patterns shown in the pattern book, the two-dimensional pattern produced is symmetrical about an axis of symmetry.

EXAMPLES: WROW 590's pattern is symmetrical about an axis running almost N & S. That of WICC 600 is symmetrical about an NW-SE axis, as is WTOR 610. WVNJ 620 has an axis of symmetry running more or less N & S. WINR 680's axis goes NE-SW, while WELM 1410 is nearly N & S.

The results of this article can not be applied unless you know which axis of symmetry corresponds to the line in which the towers lie. Also it is not necessary to have in-line towers to produce a symmetrical pattern. Four towers located at the corners of a square will also produce a symmetrical pattern. Any calculations based on this article are accurate only if the towers are actually along a line.

At this point we will introduce another angle which we will call angle A. This is an acute angle between the axis of symmetry and a line from the transmitter to the receiver. A definition of this angle is shown in Figure #1.

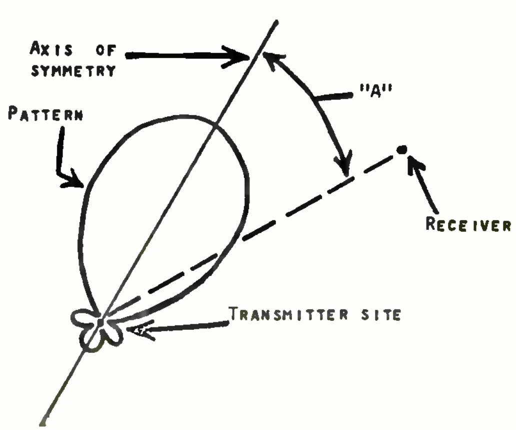



FIGURE I
DEFINITION OF ANGLE A.

Angle B has been defined as the elevation angle, and it varies with the transmitter-receiver separation. This separation is always measured along the great circle paths. Some trigonometry gives the following expression for the cosine of angle B.

$$\cos B = \frac{(3960 + H)\ \sin\left(\frac{D}{7920}\right)}{\sqrt{(31{,}363{,}200 + 7920\ H)\ \left(1 - \cos\frac{D}{7920}\right) + H^2}}$$

In this expression the arguments of the sine and cosine are in radians, and measured in miles. H is the reflection height and D is the transmitter-to-receiver distance along the surface of the earth. For distances under 700 miles and an assumed reflection height of 65 miles, this expression simplifies to:

$$\cos B = \frac{(0.508)\ D}{\sqrt{0.254\ D^2 + 4225}}$$

This expression will provide an answer with less than 1% error. Figure II is a graph of cosine B versus the transmitter-receiver distance D.

In determining the radiation pattern at angle B, we must look at the point on radiation pattern given in the pattern book and not at angle A. In reality, we should look at angle C which is obtained from the equation:

$$\cos C = (\cos A)\cdot(\cos B)$$
$$C = \arccos\ (\cos A)\cdot(\cos B)$$

In effect for skywave we must look at the pattern more broadside to the axis of symmetry than we would for groundwave. A few examples will help to make this clear.

Let's evaluate the signal WHOT 1330 has towards Flint, Michigan, where another station operates on the same frequency. Figure III shows the pertinent angles. In this example D is 210 miles and A is 56 degrees. A look at figure II shows that cos B is 0.858 for the distance of 210 miles. Cos A is 0.559 thus cos C = cos A · cos B = (0.559) · (0.858) = 0.480. This then makes the magnitude of angle C 61.3 degrees, and corresponds to a field strength of about 100 mv/m instead of the approximately 150 mv/m measured at angle A. It becomes apparent that this null near angle C was designed to protect the Flint, Michigan, station.

Example #2: Here we will evaluate the signal that WHOT 1330 directs towards Erie, Pa., where another station operates on 1330 kHz. The pattern might indicate to you that WHOT doesn't protect this station at all, but this is not the case. Using figure III again we find the angles of interest, A* and C*. The * being used to distinguish these angles from those used in connection with the station in Flint, Michigan. For this example, D = 74 miles and A = 11 degrees. Figure III tells us the value of cos B in this case is 0.502 and cos A is 0.982. Thus cos C = cos A · cos B = (0.982) · (0.502) = 0.493. This makes the magnitude of angle C 60.5 degrees, and this corresponds to a field strength of 120 mv/m at one mile towards Erie and lies quite close to the null. The groundwave radiation towards Erie is much higher (at angle A) at about 640 mv/m at one mile. This is a prime example of where a location seems to be in a lobe while it is really in a null as far as skywave is concerned. There is considerable error possible in these examples mostly due to the small size of the patterns in the pattern book and the slight errors that inevitably occurred in the drawing of these patterns. If we had the exact pattern of WHOT and knew the exact bearing of the axis of symmetry we may have found that Erie and Flint lie directly in the null instead of within a few degrees of the null.

Example #3: In this example, we will evaluate the signal received at Ithaca, New York, from WPTR 1540 Albany, New York. Figure IV shows the angles involved. For this example we have D = 142 miles and the corresponding cos B = 0.746 (Figure II) thus A = 29 degrees and cos A = 0.875.

Therefore cos C = cos A · cos B = (0.875) · (0.746) = 0.652 hence C = 49.3

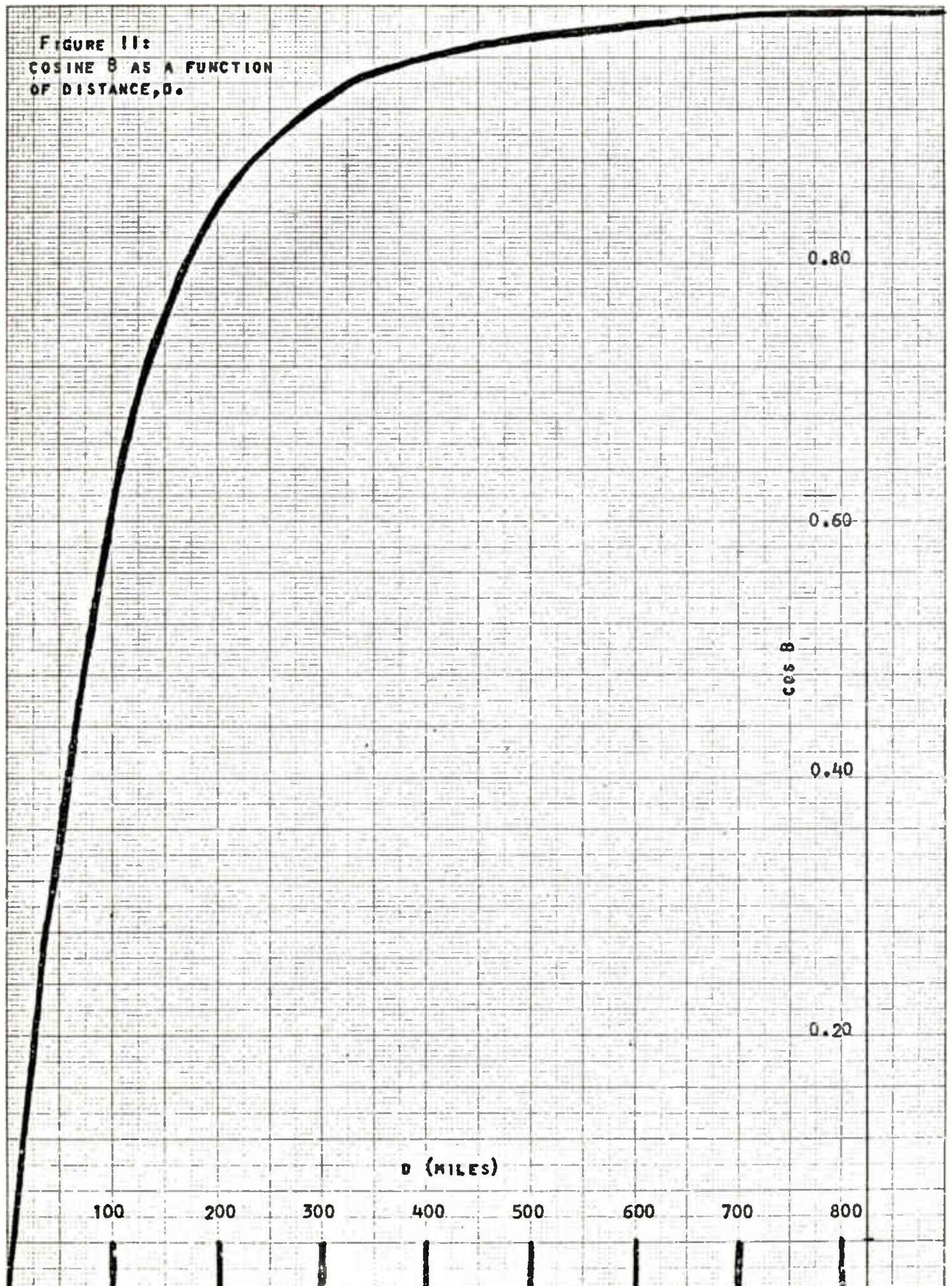
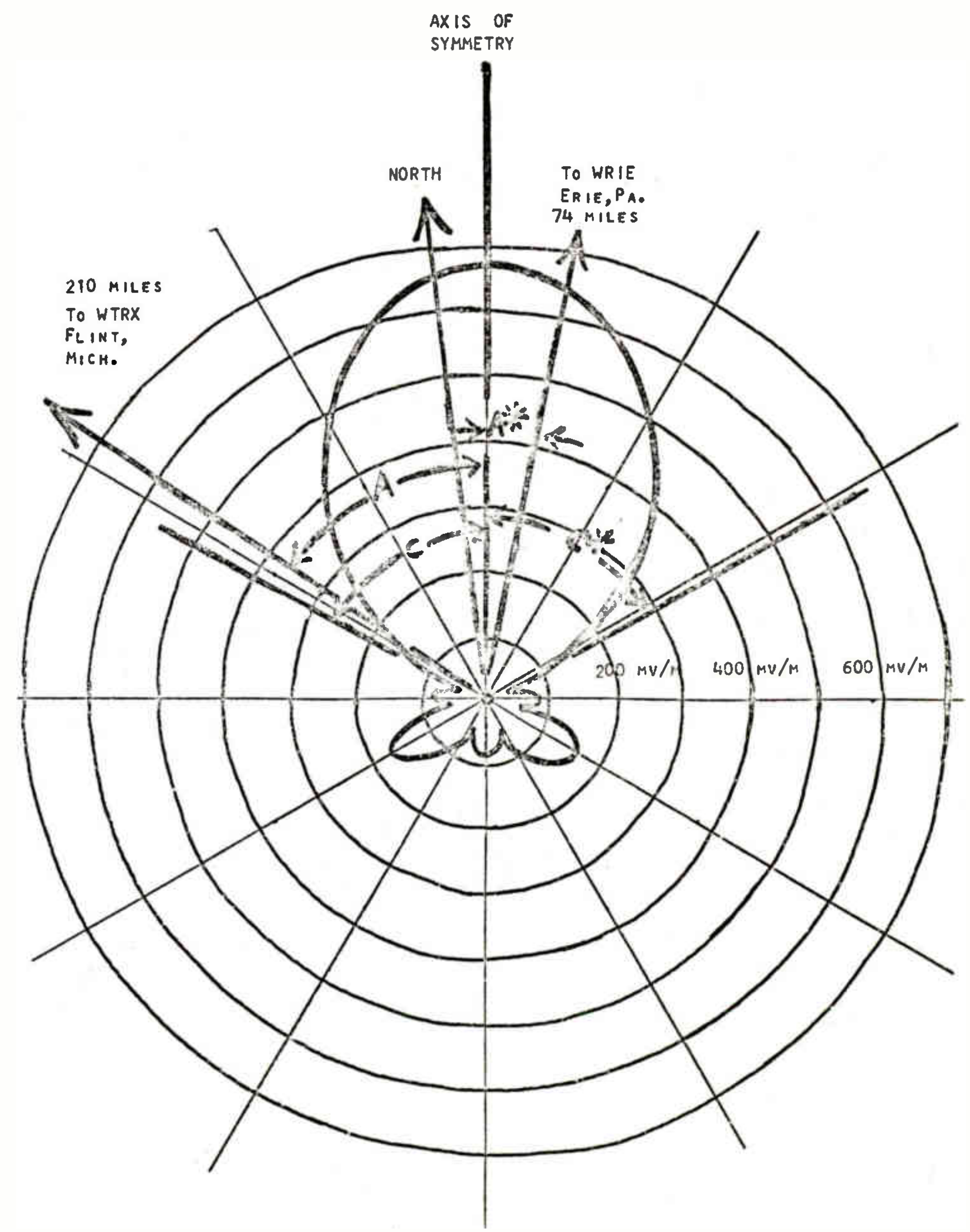



FIGURE II:
COSINE B AS A FUNCTION
OF DISTANCE, D.

FIGURE III: PATTERN OF WHOT CAMPBELL, OHIO AND THE ANGLES USED
IN CALCULATING SKYWAVE RADIATION TOWARDS ERIE, PA. AND FLINT, MICHIGAN.



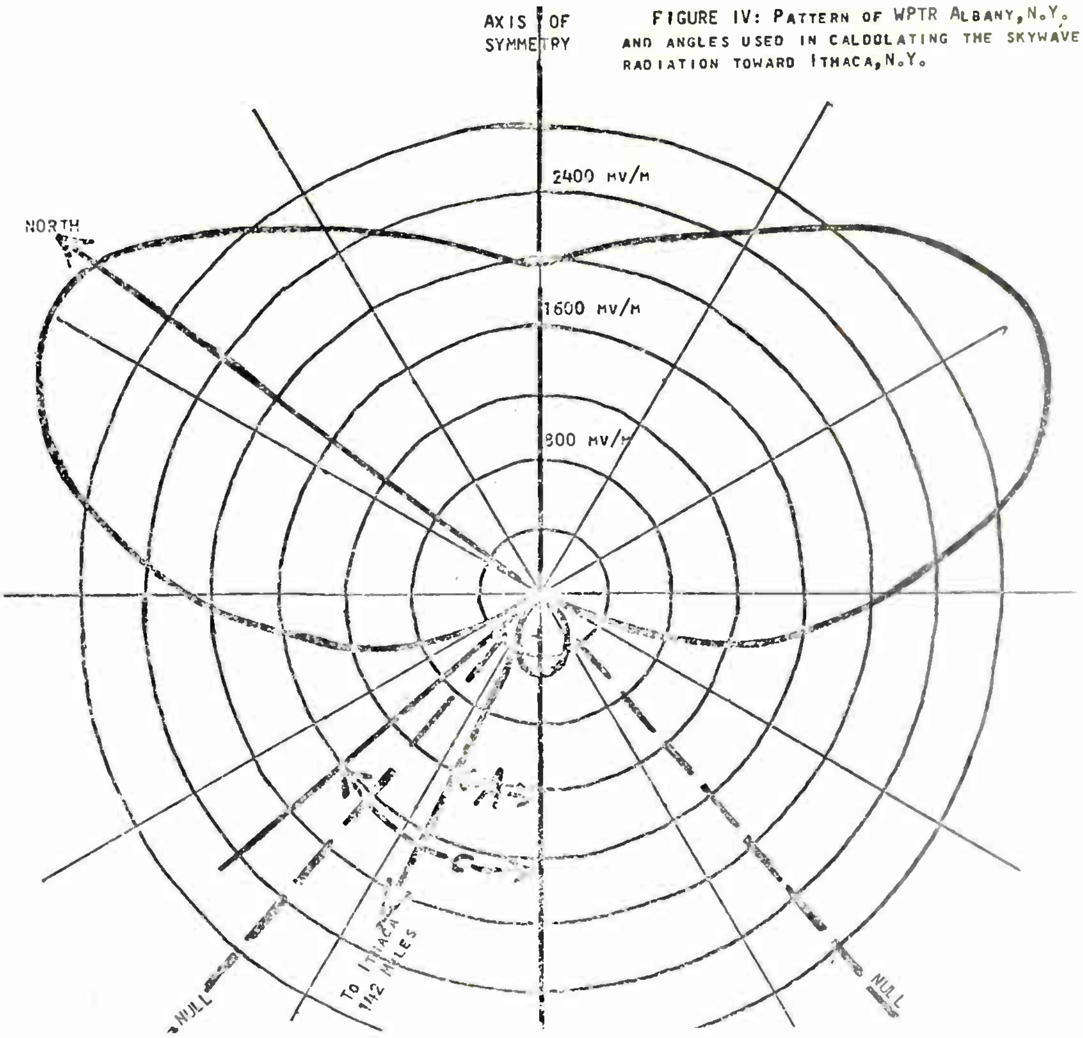



FIGURE IV: PATTERN OF WPTR ALBANY, N.Y. AND ANGLES USED IN CALCULATING THE SKYWAVE RADIATION TOWARD ITHACA, N.Y.

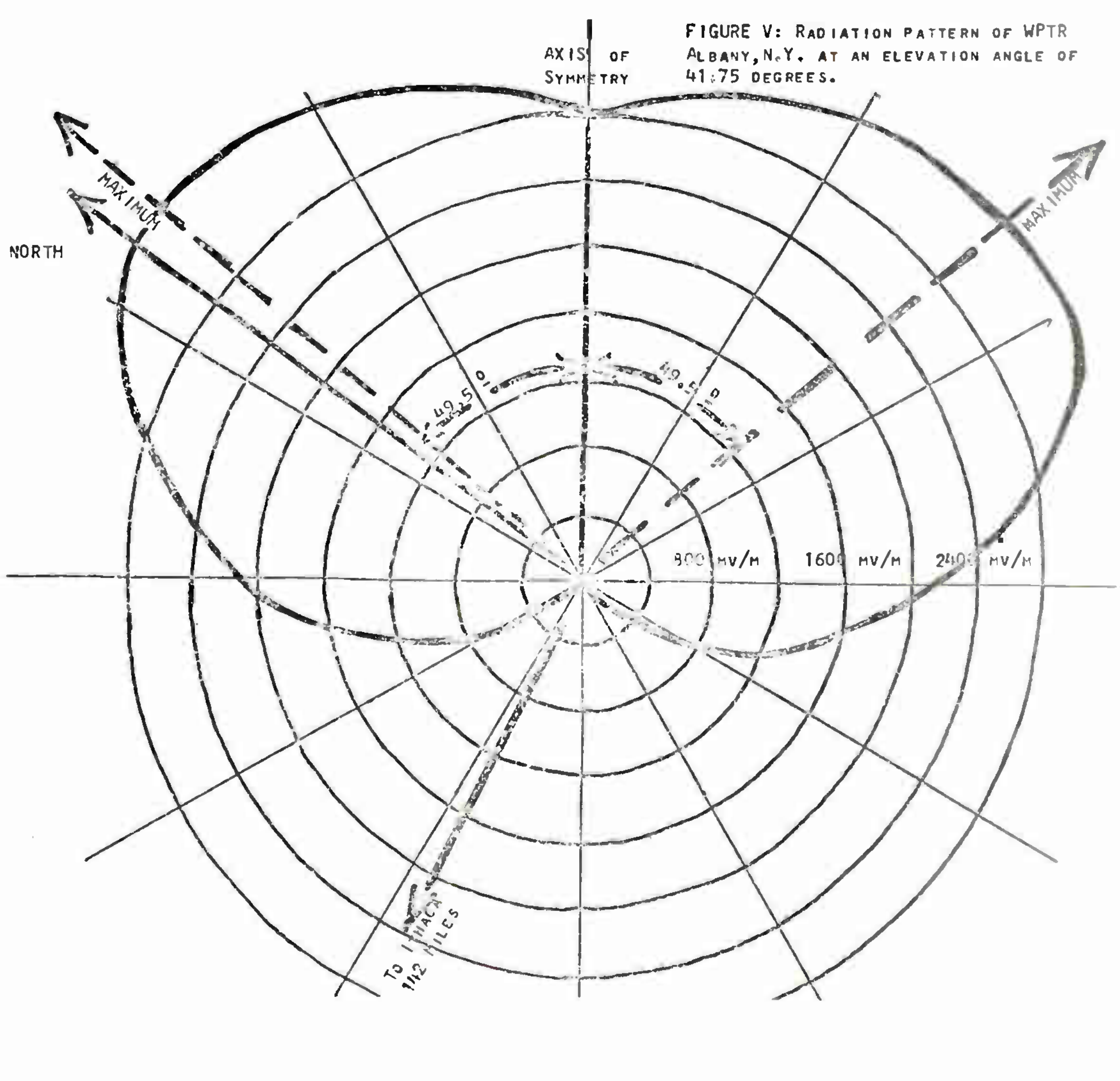



FIGURE V: RADIATION PATTERN OF WPTR ALBANY, N.Y. AT AN ELEVATION ANGLE OF 41.75 DEGREES.

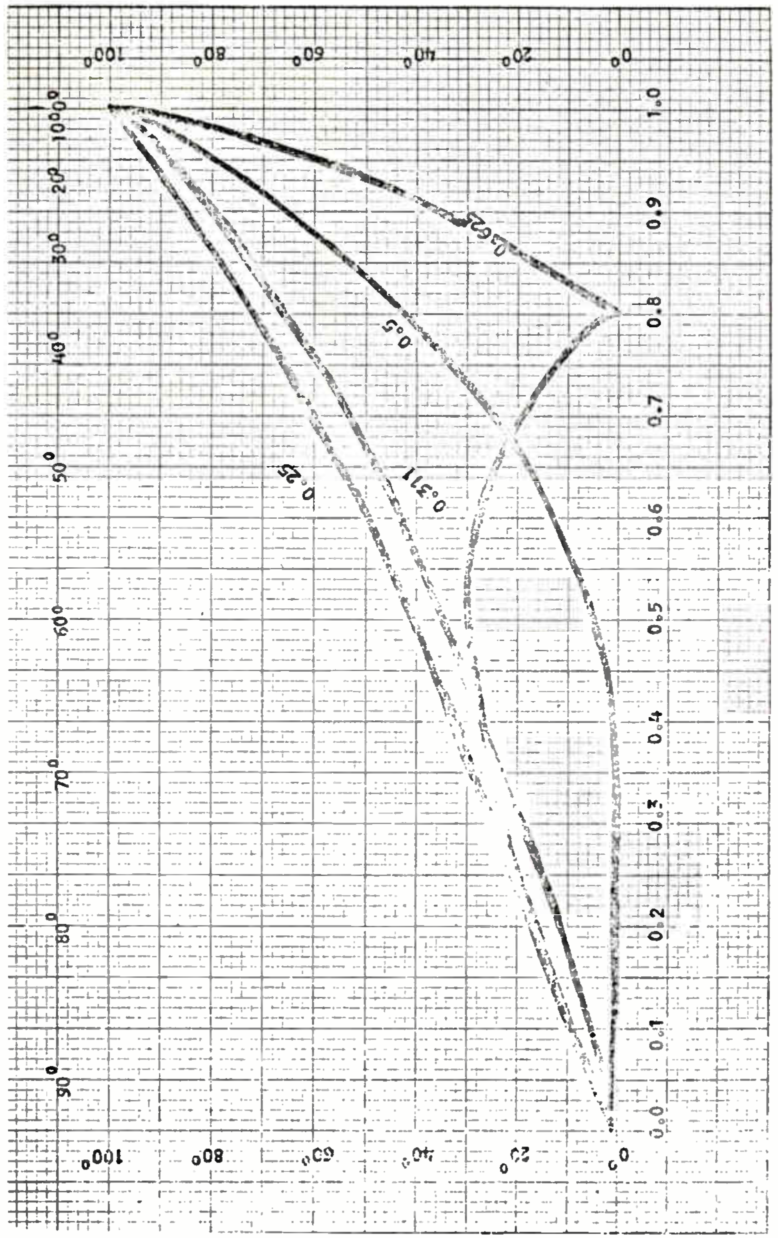



Fig. VI

degrees. This angle is very close to the null and it is difficult to get a value for the field strength at one mile. However, this should be a field of about 100 mv/m. It should be pointed out that the radial at angle C is on the other side of the null from the radial towards Ithaca at angle A. Groundwave signal towards Ithaca is approximately 300 mv/m at one mile at angle A.

Example #4: Instead of calculating the field at one point, we can calculate the entire pattern corresponding to radiation at a certain elevation angle (B). If we continue the case just considered, we can calculate the entire pattern. First we evaluate the pattern at an elevation angle of 41.75 degrees corresponding to the transmitter-receiver distance of 142 miles (cos B = 0.746). Several representative points can be taken and the resulting angle C and field strength evaluated. This has been done but to save space, the calculations won't be shown, rather the resulting pattern is shown in figure V. The pattern shows that if you were to circle the transmitter at a distance of 142 miles, you would get the strongest field in approximately North and East directions, 49.5 degrees from the axis of symmetry. These locations are a few miles west of Plattsburgh, New York, and the southern part of Boston, Mass. The weakest signals lie across the axis of symmetry to the southwest of Albany, 10 miles west of Scranton, Pa. We note the rear lobe has disappeared and that the pattern itself is somewhat smoother. This smoothness at high radiation angles is a general result.

You will remember that we assumed that transmitter towers radiate equally well at all angles above the horizon; this is just not true. However, the effect is the same whether a station is nondirectional (single tower) or directional (multiple towers). As angle B increases, the strength of radiation generally decreases. Extremely tall towers have peculiar variations in field strength with increasing B. Figure VI shows the relative radiation at various elevation angles B compared to radiation in the horizontal plane. It is plotted in cos B since we have been working directly with this quality in this article. Note that of cos B of about 0.80 the radiation drops to zero for a 5/8 wavelength antenna. This value of cos B corresponds to a transmitter-receiver distance of about 168 miles (see figure II). At this distance from a station using a 5/8 wavelength antenna, virtually no skywave will be received. It should be noted that the taller towers radiate a stronger signal in the ground plane than the shorter towers do. A radio station using a 5/8 wavelength tower has a ground plane field strength of almost double that of a station using a 1/4 wavelength antenna on the same frequency.

The pattern obtained for WPTR is not correct in magnitude although it is correct in shape (figure V). We would have to know the height of WPTR's towers if we were to get the correct magnitude of the pattern. If they were 1/2 wavelength tall, figure VI shows the field strength is 34% of that in the groundplane (B = 41.75 degrees, cos B = 0.746). Should these towers be 5/8 wavelength tall, then the appropriate factor is 12%.

Local WTKO 1470 recently began nighttime operation from four in-line towers on the south end of Ithaca. These towers seem to be 5/8 wavelength tall which means it should be difficult to receive them 165 to 170 miles from the transmitter. Reception would be difficult in Toronto, Ontario; Punxsutawney, Penna.; or Plainfield, New Jersey.

If a station uses towers of two or more different heights, as is often done, the results of calculations shown in this article will not be accurate even though the towers do lie in a straight line.

We should mention that the radiation pattern at some elevation angles can be different from the ground plane pattern shown in the pattern book. Especially for large angles which correspond to transmitter-receiver distances of less than 150 miles. If you are broadside to a station's antenna system, the pattern stays the same in your direction. Regardless of the distance, a null remains a null and a lobe remains a lobe.

SPECIAL INTERNATIONAL AGREEMENTS

Still another set of "clear channels" are shared as Class II frequencies with other countries. Those shared with Canada are 1070 and 1130. Those shared with Mexico are: 850-1000-1060-1090-1140 and 1190.

There are many other "Gentlemen's Agreements" that allow operations on other frequencies. Such U.S. operations are: New York City on 1010 and 1050 kHz, Cleveland on 1220 kHz, Santurce, P.R. on 730, and Alaska on 800 and 900 kHz. Similar agreements allow Canada to operate on 640-730-800-900-1050-1220 and 1580 kHz. Additional special arrangements permit Mexico to operate on 660-760-830 and 1030 kHz.

Further treaty agreements allow U.S. operations on certain Canadian I-A channels: 740-860-990 and 1580 kHz; these stations must be located a specified distance from the Canadian border and must employ directional antennas to limit radiation to Canada to prespecified levels.

If the preceeding special agreements were not enough to confuse the overall pattern, additional special arrangements allocate 1540 as Class I-A for the Bahama Islands, and 620 as Class I-C to the Dominican Republic. We will not consider the allocations for Cuba since most have not been honored since the Liberation government came to power.

Along with all these agreements as the use of frequencies, each country has its own rules for maximum transmitter power within the NARBA guidelines. While the U.S. and Canada limit power to 50 kw (recall that a NARBA I-A channel can contain a station operating with more than 50 kw), Mexico permits operation in excess of 50 kw. Regional channels in the U.S. are limited to 5,000 watts, but in Canada many stations operate with 10,000 or 50,000 watts on these channels. The regional channel power limit in Mexico is 25,000 watts. Local channels in the U.S. and Canada are very similar - almost all stations operate 1,000 daytime and 250 watts nondirectional at night.

There are some 15 or 20 stations in the U.S. operating with directional antennas in the daytime. Since Class IV stations are licensed for the most part as 250 watts nondirectional, the directional antennas are used to limit interference to adjacent channels at the 500 or 1000 watt level.

The few Canadians operating full-time with directional antennas are not difficult to understand either. These simply limit the power toward the U.S. to levels approaching the field strength they would achieve with 250 watts nondirectional. In all cases they have large lobes directed to the North.

Mexicans operating on local channels seem to have 3 different sets of rules, all dependent upon the location of the station. Those within 62 miles of the border operate with 250 watts non-directional full-time. Those from 62 to 93 miles operate 1,000 watts day and 250 watts nondirectional at night. All others operate with 1,000 watts day and 500 watts nondirectional at night.

# NRC PUBLICATIONS

The NRC is proud to announce its list of companion publications to the Domestic Station Log. All of these items are available from the National Radio Club

NATIONAL RADIO CLUB
PUBLICATIONS CENTER
Post Office Box 401
Gales Ferry, Conn
06335

**DOMESTIC LOG**

This spiral-bound volum
AM stations including l
networks, schedules and
members and $7.50 to no
America please enquire

**NIGHT ANTENNA PATTERN BO**

This spiral-bound volum
patterns of Canadian an
These patterns are drawn to scale from official government sources. Commercial publications of this sort cost more than ten times as much for this most valuable DX reference. Cost to members is $6.50 post-paid and to non-members $7.50 in U.S. and Canada. (New edition 1975)

**ANTENNA REFERENCE MANUAL**

This manual is a compilation of numerous articles on the subject of antennas for MW DXers which have appeared in the pages of DX NEWS over the past several years in one handy volume. Includes data on air- and ferrite-core loops, antenna tuners for longwires, and beverage antennas, along with various coupling devices. 60 pages, 5½ x 8½ booklet format. $2.25 in the U.S. and Canada.

**GETTING STARTED IN MEDIUM WAVE DX'ing**

This booklet is designed to assist the novice DXer in pursuit of the hobby. It includes introductory articles on foreign and domestic DX-ing as well as related topics. Included are articles on reception reports and safety and preventive maintenance of your DX gear. All members who pay the New Member Fee automatically receive a copy of this booklet. For non-members the cost is $1.25 in the U.S. and Canada.

**RECEIVER REFERENCE MANUAL**

This manual is similar to the above manual on antennas, except that the subject is DX receivers. It includes useful articles on receiver modifications and accessories, and reviews of many of the commonly used BCB DX receivers currently available. A must for the serious DX-er/experimenter. 72 pages, 5½ x 8½ booklet format. $2.50 U.S. and Canada.

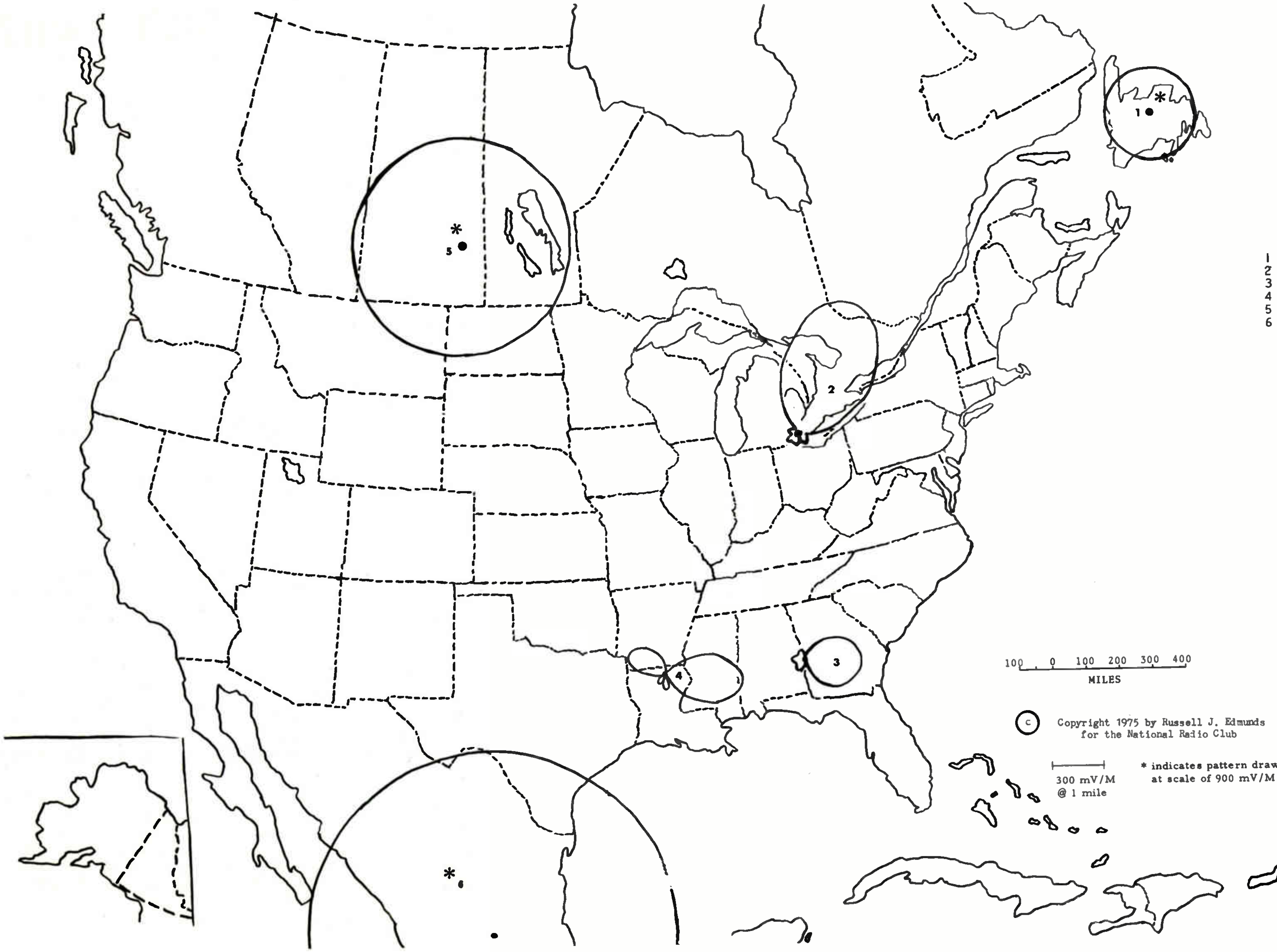
**LOG & PATTERN BOOK UPDATERS**

Periodic updaters for the NRC Domestic Station Log and the NRC Night-time Antenna Pattern Book are published in the pages of DX NEWS. Non-members may obtain reprints of these updaters in composite by ordering them through the NRC Reprint Service. Cost is $1.00 for members and $2.00 for non-members, covering all updaters from time of the most recent edition of the Log or Pattern Book to the date of the order.

# 540 KHZ

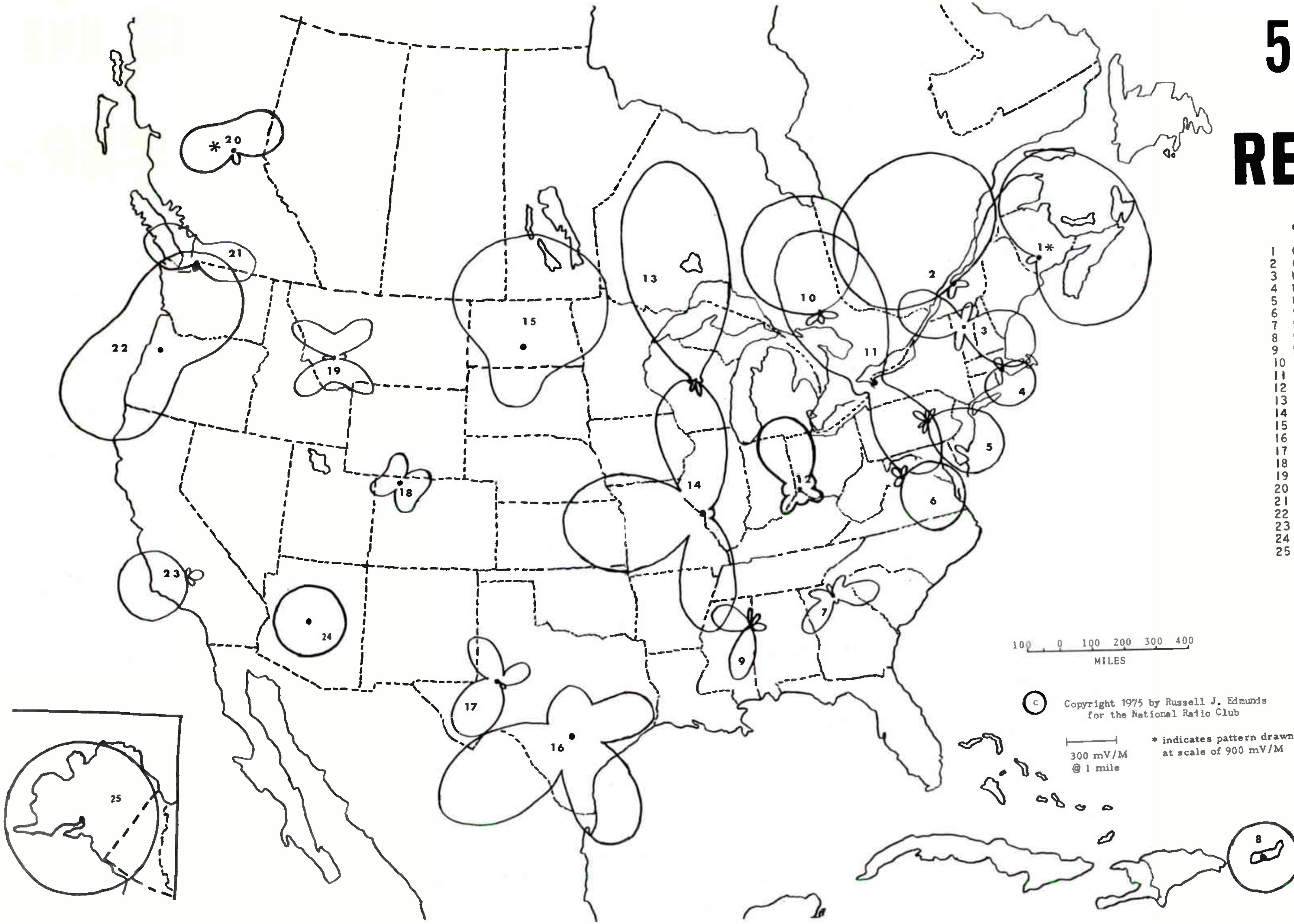
# CLEAR

| call | class | location |
|---|---|---|
| 1 CBT | ND | GRAND FALLS |
| 2 CBEF | DA-1 | WINDSOR |
| 3 WDAK | DA-N | COLUMBUS |
| 4 KNOE | DA-2 | MONROE |
| 5 CBK | ND | WATROUS |
| 6 XEWA | ND | SAN LUIS POTOSI |



# 550 KHZ

# REGIONAL

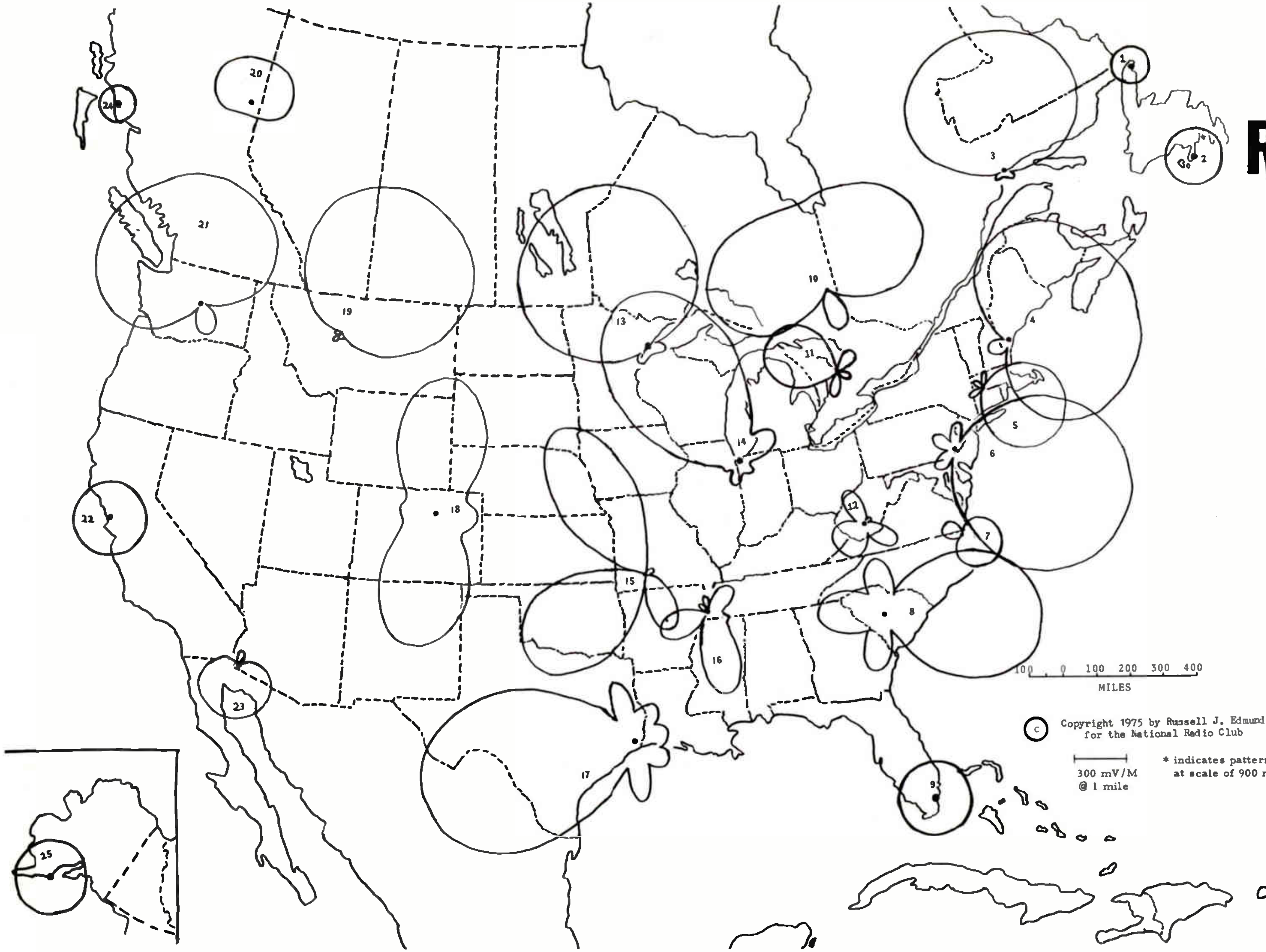





| | call | class | location |
|---|---|---|---|
| 1 | CFNB | DA-2 | FREDERICKTON |
| 2 | CHLN | DA-2 | TROIS-RIVIERES |
| 3 | WDEV | DA-2 | WATERBURY |
| 4 | WGNG | DA-N | PAWTUCKET |
| 5 | WHLM | DA-2 | BLOOMSBURG |
| 6 | WSVA | DA-N | HARRISONBURG |
| 7 | WGGA | DA-N | GAINESVILLE |
| 8 | WPAB | ND | PONCE |
| 9 | WCBI | DA-2 | COLUMBUS |
| 10 | CHNO | DA-2 | SUDBURY |
| 11 | WGR | DA-N | BUFFALO |
| 12 | WKRC | DA-2 | CINCINNATTI |
| 13 | WSAU | DA-2 | WAUSAU |
| 14 | KSD | DA-N | ST. LOUIS |
| 15 | KFYR | DA-N | BISMARK |
| 16 | KTSA | DA-N | SAN ANTONIO |
| 17 | KCRS | DA-2 | MIDLAND |
| 18 | KRAI | DA-N | CRAIG |
| 19 | KBOW | DA-N | BUTTE |
| 20 | CKPG | DA-N | PRINCE GEORGE |
| 21 | KARI | DA-2 | BLAINE |
| 22 | KOAC | DA-2 | CORVALLIS |
| 23 | KAFY | DA-N | BAKERSFIELD |
| 24 | KOY | ND | PHOENIX |
| 25 | KENI | ND | ANCHORAGE |

# 560 KHZ

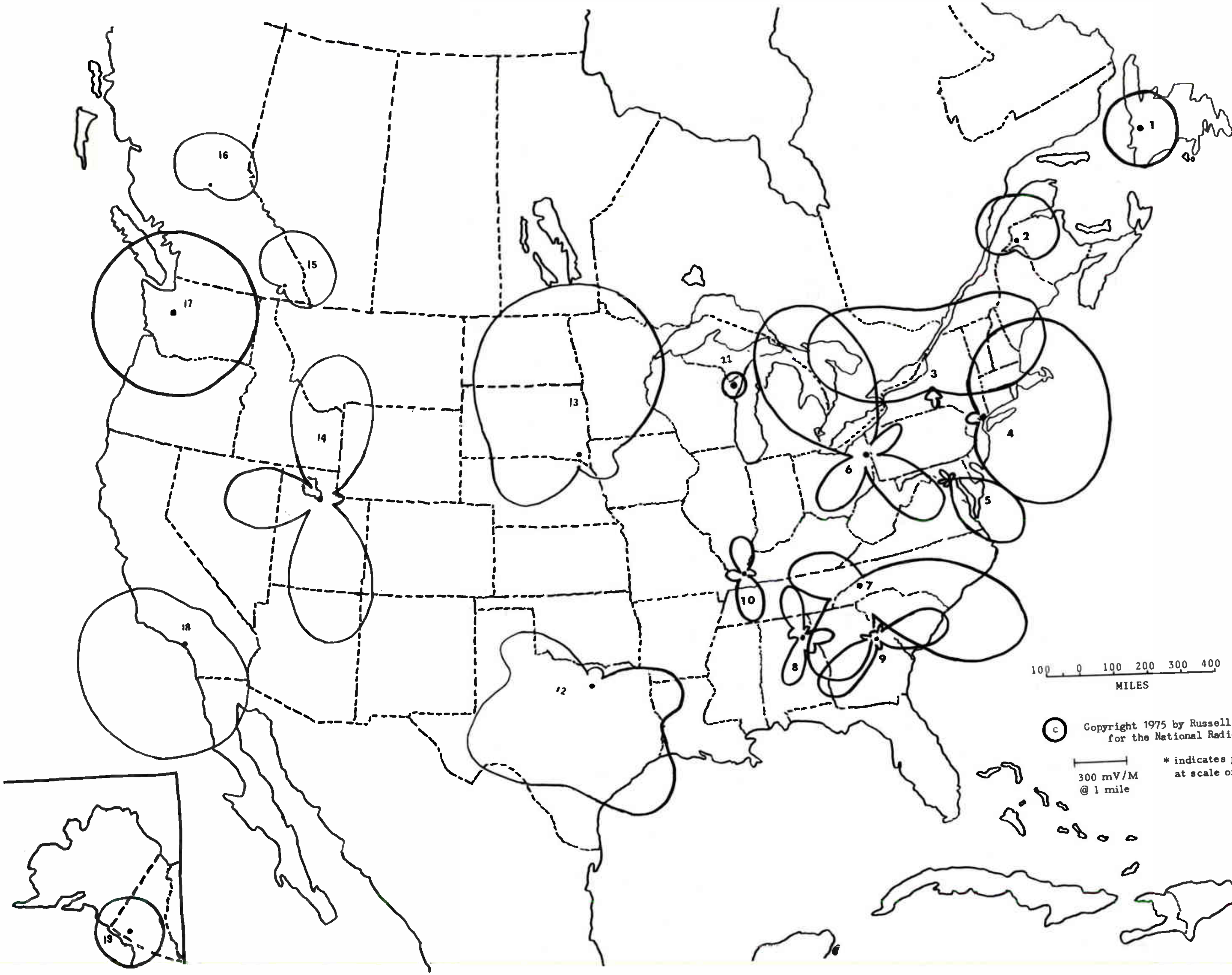
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | C | ND | ST. ANTHONY |
| 2 | CHCM | ND | MARYSTOWN |
| 3 | CKCN | DA-2 | SEPT-ILES |
| 4 | WGAN | DA-1 | PORTLAND |
| 5 | WHYN | DA-1 | SPRINGFIELD |
| 6 | WFIL | DA-2 | PHILADELPHIA |
| 7 | WGAI | DA-2 | ELIZABETH CITY |
| 8 | WIS | DA-N | COLUMBIA |
| 9 | WQAM | ND | MIAMI |
| 10 | CJKL | DA-N | KIRKLAND LAKE |
| 11 | CFOS | DA-2 | OWENS SOUND |
| 12 | WJLS | DA-N | BECKLEY |
| 13 | WEBC | DA-2 | DULUTH |
| 14 | WIND | DA-2 | CHICAGO |
| 15 | KWTO | DA-N | SPRINGFIELD |
| 16 | WHBQ | DA-2 | MEMPHIS |
| 17 | KLVI | DA-N | BEAUMONT |
| 18 | KLZ | DA-1 | DENVER |
| 19 | KMON | DA-N | GREAT FALLS |
| 20 | CKNL | DA-N | FORT ST. JOHN |
| 21 | KPQ | DA-N | WENATCHEE |
| 22 | KSFO | ND | SAN FRANCISCO |
| 23 | KBLU | DA-N | YUMA |
| 24 | CHTK | ND | PRINCE RUPERT |
| 25 | KVOK | ND | KODIAK |

# 570 KHZ

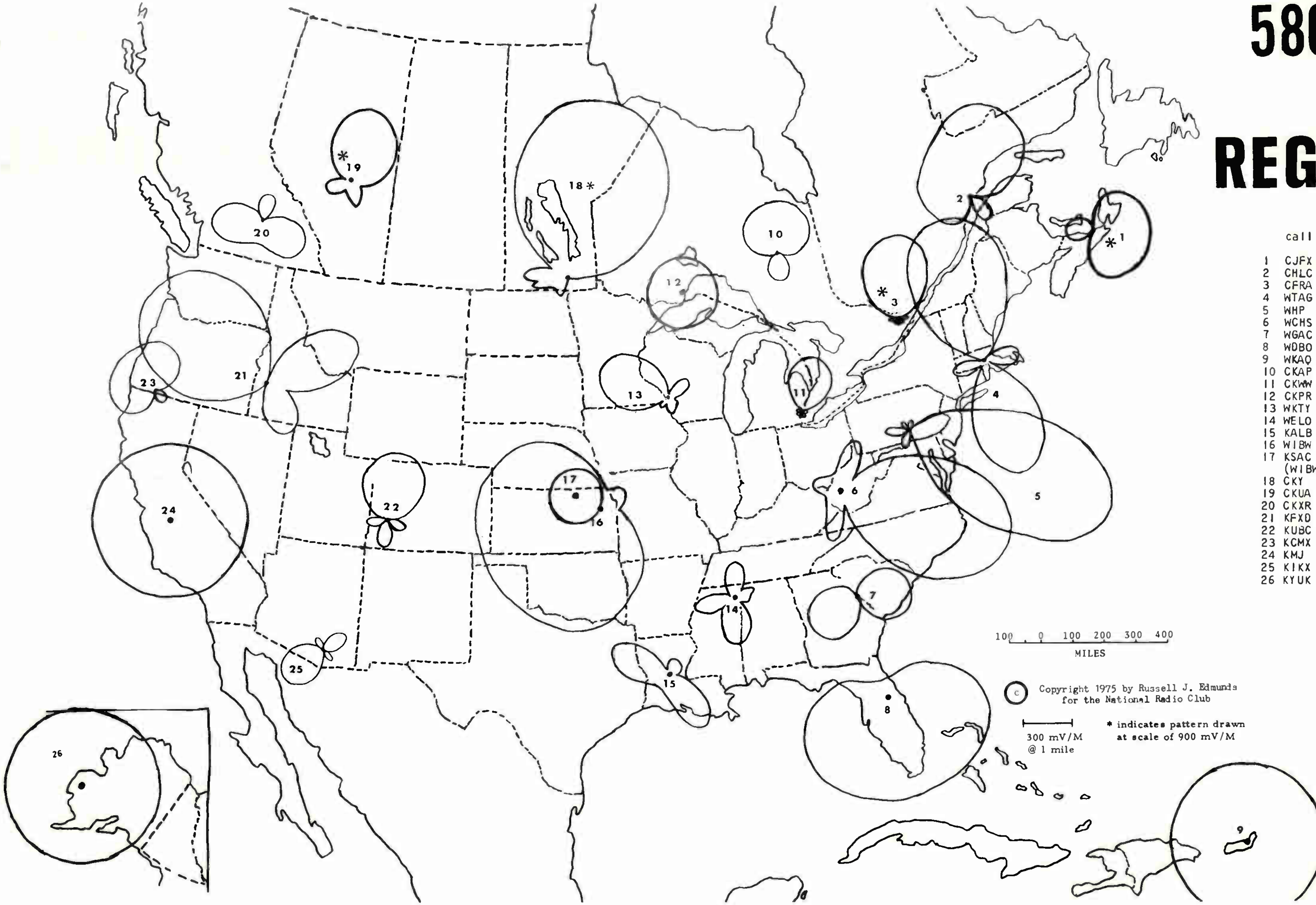
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CFCB | ND | CORNER BROOK |
| 2 | CJEM | DA-N | EDMUNDSTON |
| 3 | WSYR | DA-2 | SYRACUSE |
| 4 | WMCA | DA-1 | NEW YORK |
| 5 | WGMS | DA-2 | BETHESDA |
| 6 | WKBN | DA-N | YOUNGSTOWN |
| 7 | WWNC | DA-N | ASHEVILLE |
| 8 | WAAX | DA-N | GADSDEN |
| 9 | WACL | DA-N | WAYCROSS |
| 10 | WKYX | DA-2 | PADUCAH |
| 11 | WMAM | ND | MARINETTE |
| 12 | WFAA | DA-2 | DALLAS |
| 13 | WNAX | DA-N | YANKTON |
| 14 | KLUB | DA-1 | SALT LAKE CITY |
| 15 | CKEK | DA-1 | CRANBROOK |
| 16 | CKCQ | DA-2 | QUESNEL |
| 17 | KVI | ND | SEATTLE |
| 18 | KLAC | DA-N | LOS ANGELES |
| 19 | CFWH | ND | WHITEHORSE |

# 580 KHZ

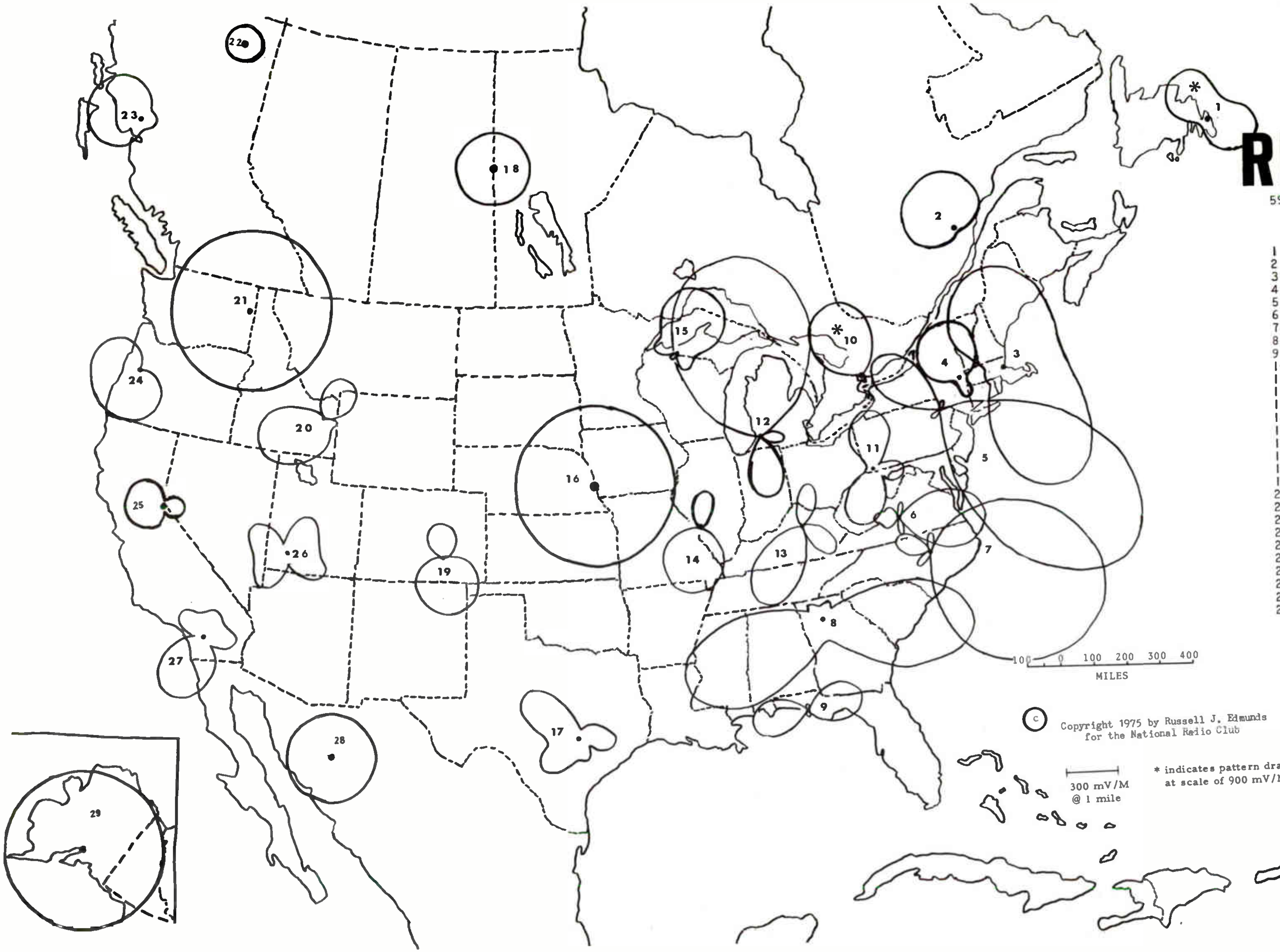
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CJFX | DA-1 | ANTIGONISH |
| 2 | CHLC | DA-2 | HAUTERIVE |
| 3 | CFRA | DA-N | OTTAWA |
| 4 | WTAG | DA-2 | WORCESTER |
| 5 | WHP | DA-N | HARRISBURG |
| 6 | WCHS | DA-N | CHARLESTON |
| 7 | WGAC | DA-N | AUGUSTA |
| 8 | WDBO | DA-N | ORLANDO |
| 9 | WKAQ | ND | SAN JUAN |
| 10 | CKAP | DA-N | KAPUSKASING |
| 11 | CKWW | DA-1 | WINDSOR |
| 12 | CKPR | ND | THUNDER BAY |
| 13 | WKTY | DA-2 | LA CROSSE |
| 14 | WELO | DA-2 | TUPELO |
| 15 | KALB | DA-N | ALEXANDRIA |
| 16 | WIBW | DA-N | TOPEKA |
| 17 | KSAC | ND | MANHATTEN |
| | (WIBW & KSAC SHARE TIME) | | |
| 18 | CKY | DA-2 | WINNIPEG |
| 19 | CKUA | DA-2 | EDMONTON |
| 20 | CKXR | DA-2 | SALMON ARM |
| 21 | KFXD | DA-N | NAMPA |
| 22 | KUBC | DA-N | MONTROSE |
| 23 | KCMX | DA-2 | ASHLAND |
| 24 | KMJ | ND | FRESNO |
| 25 | KIKX | DA-N | TUCSON |
| 26 | KYUK | ND | BETHEL |

# 590 KHZ

# REGIONAL



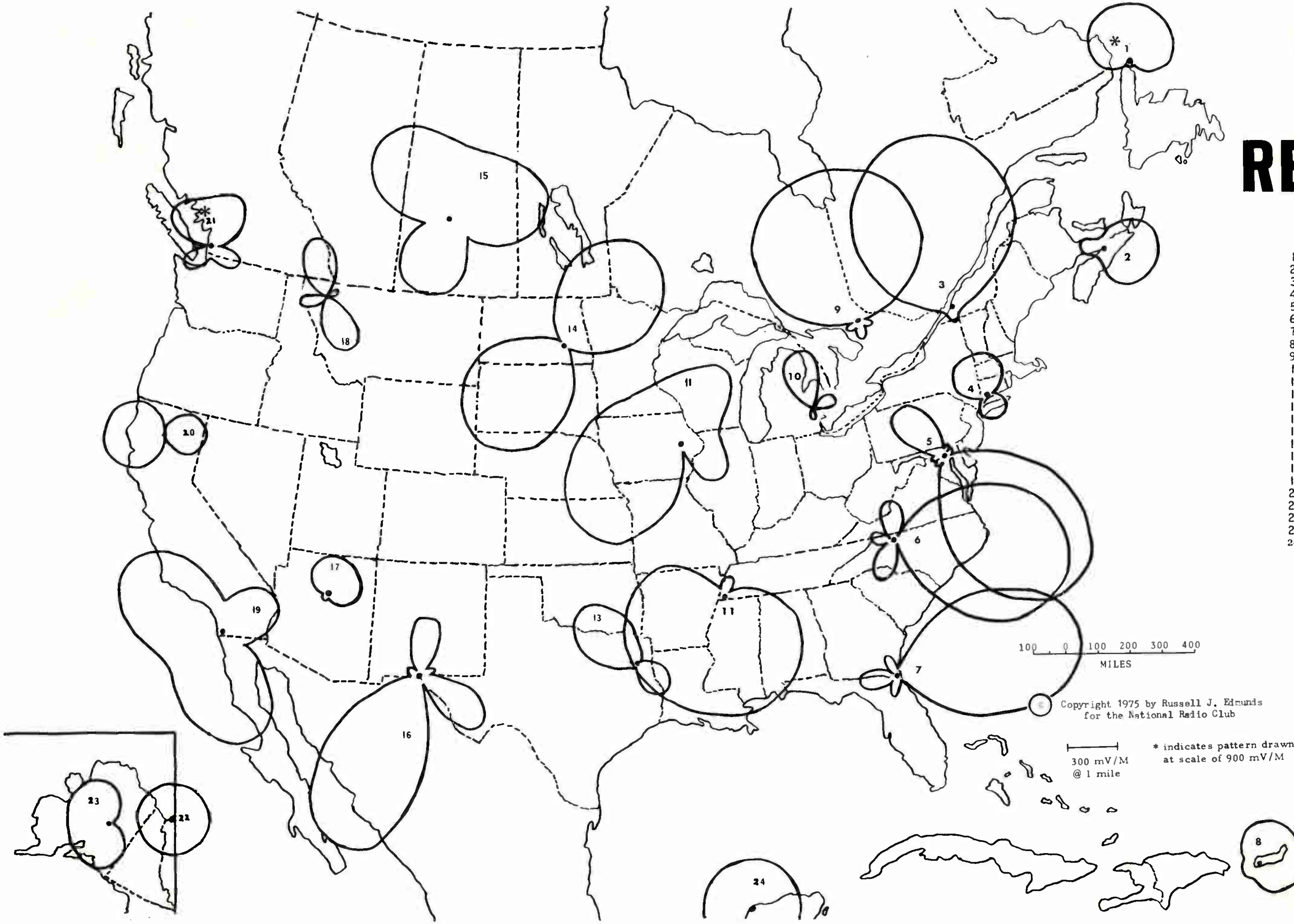



590

| | call | class | location |
|---|---|---|---|
| 1 | VOCM | DA-N | ST. JOHNS |
| 2 | CKRS | DA-1 | JONQUIERE |
| 3 | WEEI | DA-1 | BOSTON |
| 4 | WROW | DA-2 | ALBANY |
| 5 | WARM | DA-2 | SCRANTON |
| 6 | WLVA | DA-2 | LYNCHBURG |
| 7 | WGTM | DA-2 | WILSON |
| 8 | WPLO | DA-N | ATLANTA |
| 9 | WDLP | DA-N | PANAMA CITY |
| 10 | CKEY | DA-2 | TORONTO |
| 11 | WMBS | DA-N | UNIONTOWN |
| 12 | WKZO | DA-N | KALAMAZOO |
| 13 | WVLK | DA-2 | LEXINGTON |
| 14 | WRTH | DA-2 | WOOD RIVER |
| 15 | WJMS | DA-N | IRONWOOD |
| 16 | WOW | ND | OMAHA |
| 17 | KLBJ | DA-N | AUSTIN |
| 18 | CFAR | ND | FLIN FLON |
| 19 | KCSJ | DA-2 | PUEBLO |
| 20 | KID | DA-N | IDAHO FALLS |
| 21 | KHQ | ND | SPOKANE |
| 22 | CFNL | ND | FORT NELSON |
| 23 | CFTK | DA-1 | TERRACE |
| 24 | KUGN | DA-N | EUGENE |
| 25 | KTHO | DA-N | S. LAKE TAHOE |
| 26 | KSUB | DA-N | CEDAR CITY |
| 27 | KFXM | DA-2 | SAN BERNARDINO |
| 28 | XEHO | ND | HERMOSILLO |
| 29 | KHAR | ND | ANCHORAGE |

# 600 KHZ

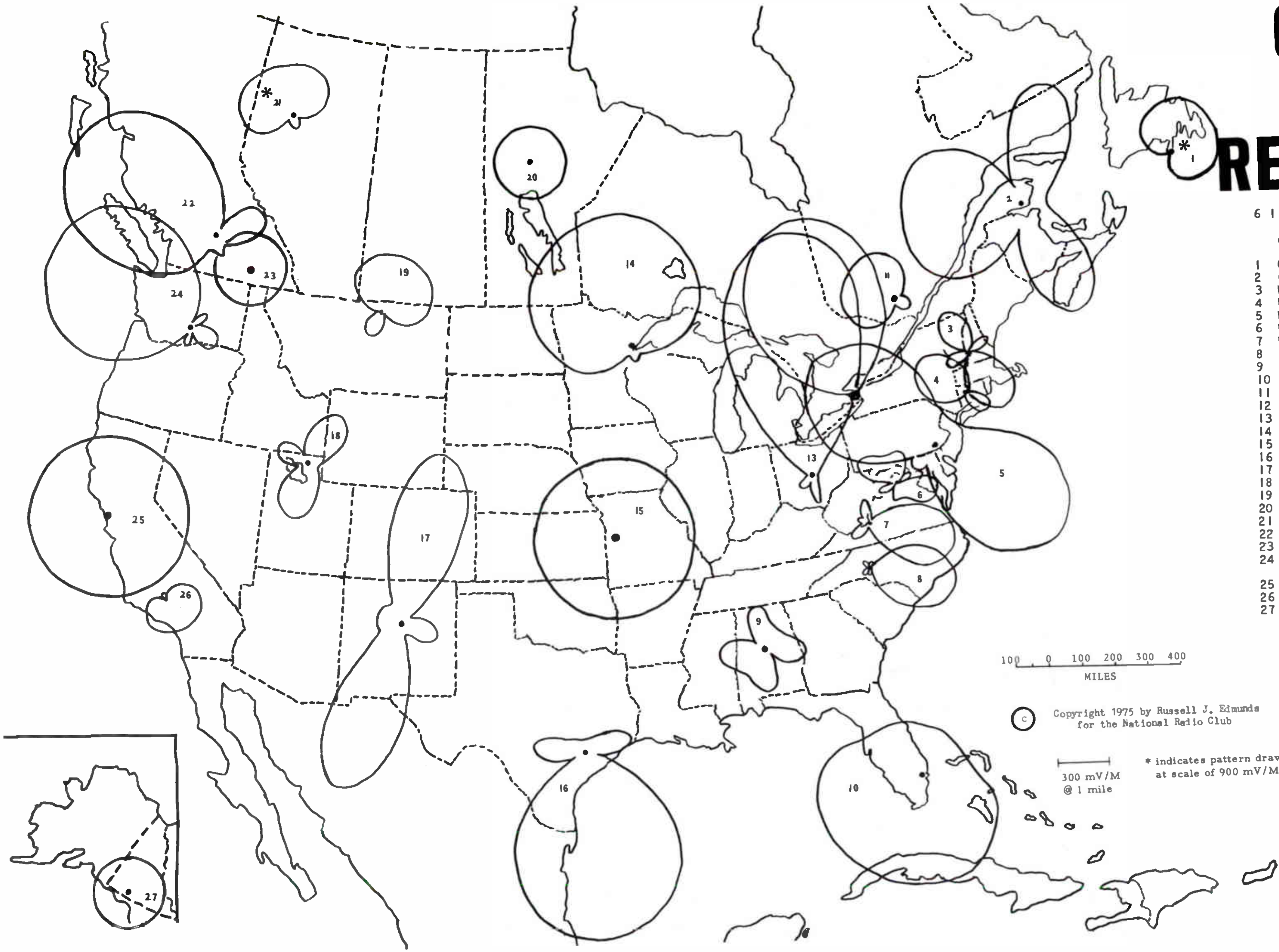
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CBNA | DA-2 | ST. ANTHONY |
| 2 | CKCL | DA-1 | TRURO |
| 3 | CFCF | DA-1 | MONTREAL |
| 4 | WICC | DA-2 | BRIDGEPORT |
| 5 | WCAO | DA-1 | BALTIMORE |
| 6 | WSJS | DA-2 | WINSTON-SALEM |
| 7 | WMBR | DA-N | JACKSONVILLE |
| 8 | WAEL | DA-1 | MAYAGUEZ |
| 9 | CFCH | DA-2 | NORTH BAY |
| 10 | WTAC | DA-2 | FLINT |
| 11 | WREC | DA-2 | MEMPHIS |
| 12 | WMT | DA-N | CEDAR RAPIDS |
| 13 | KTBB | DA-N | TYLER |
| 14 | KSJB | DA-1 | JAMESTOWN |
| 15 | CFQC | DA-N | SASKATOON |
| 16 | KROD | DA-N | EL PASO |
| 17 | KCLS | DA-N | FLAGSTAFF |
| 18 | KGEZ | DA-2 | KALISPELL |
| 19 | KOGO | DA-1 | SAN DIEGO |
| 20 | KVCV | DA-1 | REDDING |
| 21 | CJOR | DA-1 | VANCOUVER |
| 22 | C___ | ND | TUKTOYAKTUK |
| 23 | KTNC | DA-N | NORTH POLE |
| 24 | XEZ | ND | MERIDA |

# 610 KHZ

# REGIONAL

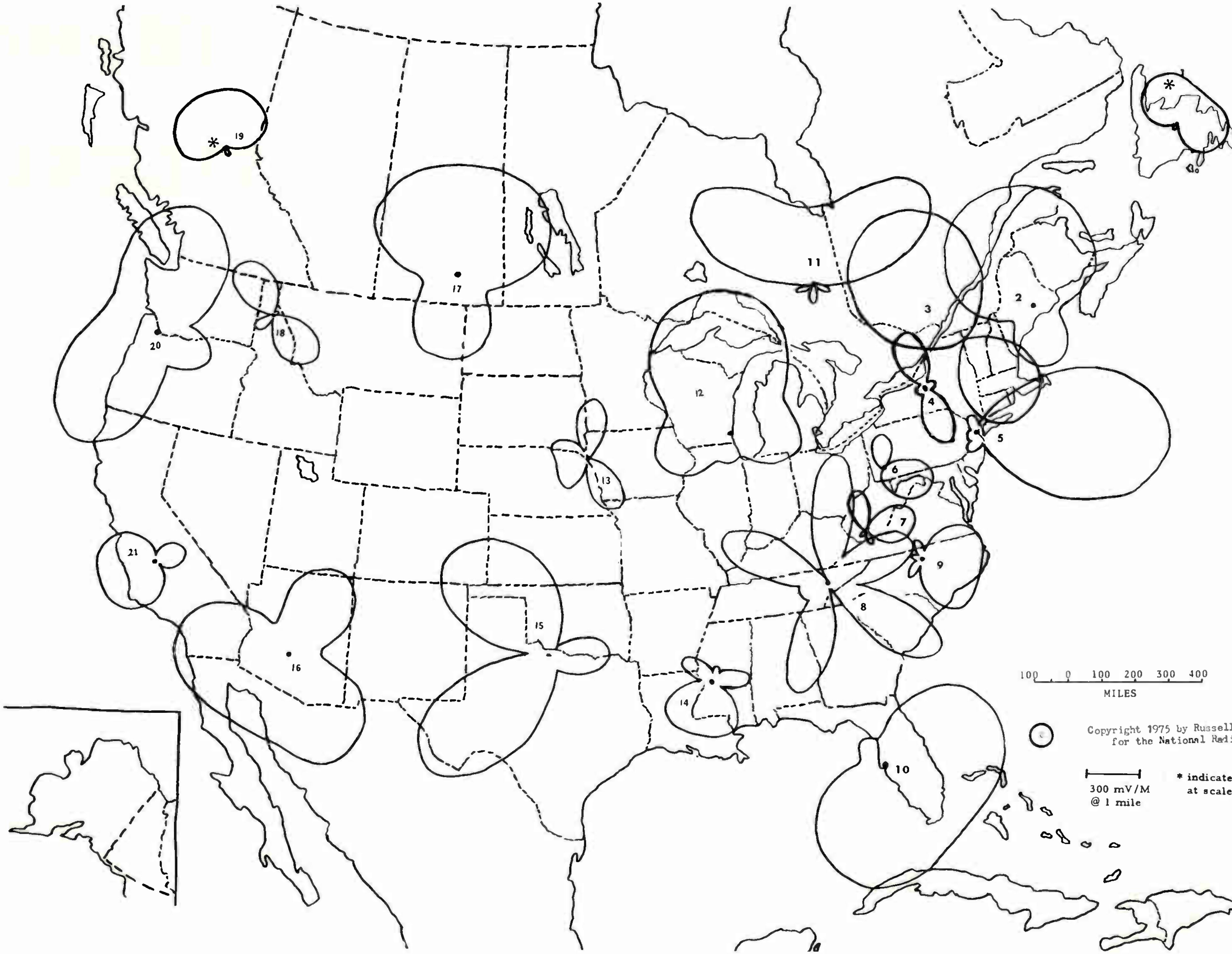



6 1 0 khz

| | call | class | location |
|---|---|---|---|
| 1 | CJOX | DA-2 | GRAND BANK |
| 2 | CHNC | DA-1 | NEW CARLISLE |
| 3 | WGIR | DA-2 | MANCHESTER |
| 4 | WSNG | DA-2 | TORRINGTON |
| 5 | WIP | DA-2 | PHILADELPHIA |
| 6 | WHPL | DA-2 | WINCHESTER |
| 7 | WSLS | DA-2 | ROANOKE |
| 8 | WAYS | DA-2 | CHARLOTTE |
| 9 | WSGN | DA-N | BIRMINGHAM |
| 10 | WIOD | DA-2 | MIAMI |
| 11 | CKML | DA-N | MONT LAURIER |
| 12 | CKTB | DA-1 | STE. CATHERINES |
| 13 | WTVN | DA-N | COLUMBUS |
| 14 | KDAL | DA-N | DULUTH |
| 15 | WDAF | ND | KANSAS CITY |
| 16 | KILT | DA-2 | HOUSTON |
| 17 | KRKE | DA-N | ALBUQUERQUE |
| 18 | KVNU | DA-N | LOGAN |
| 19 | KOJM | DA-2 | HAVRE |
| 20 | CHTM | ND | THOMPSON |
| 21 | CKYL | DA-N | PEACE RIVER |
| 22 | CHNL | DA-N | KAMLOOPS |
| 23 | CJAT | ND | TRAIL |
| 24 | KONA | DA-2 | KENNEWICK/ RICHLAND/PASCO |
| 25 | KFRC | ND | SAN FRANCISCO |
| 26 | KAVL | DA-2 | LANCASTER |
| 27 | CKRW | ND | WHITEHORSE |

# 620 KHZ

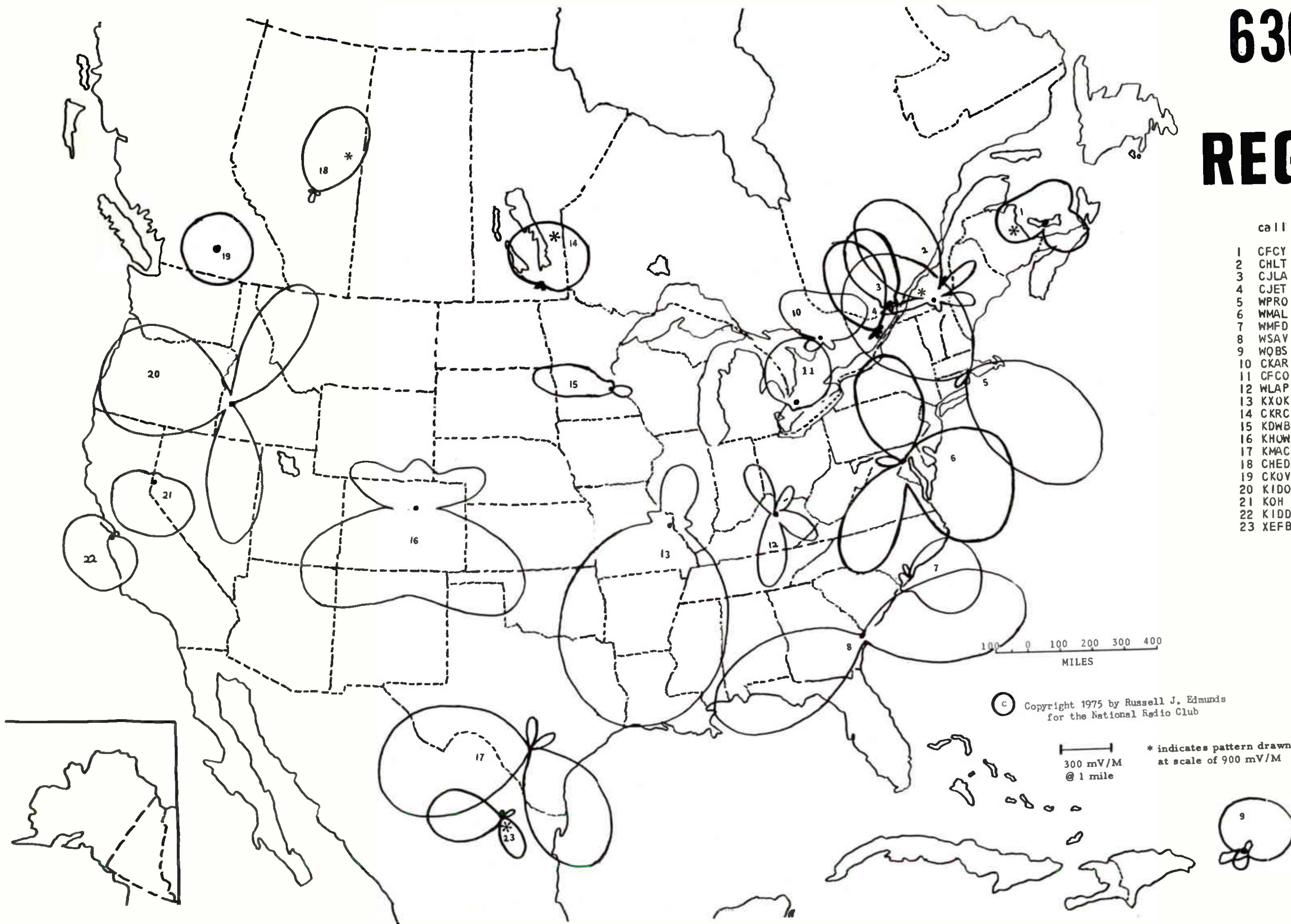
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CKCM | DA-1 | GRAND FALLS |
| 2 | WLBZ | DA-N | BANGOR |
| 3 | WVMT | DA-2 | BURLINGTON |
| 4 | WHEN | DA-N | SYRACUSE |
| 5 | WVNJ | DA-2 | NEWARK |
| 6 | WHJB | DA-2 | GREENSBURG |
| 7 | WWNR | DA-N | BECKLEY |
| 8 | WETE | DA-2 | KNOXVILLE |
| 9 | WDNC | DA-2 | DURHAM |
| 10 | WSUN | DA-N | ST.PETERSBURG |
| 11 | CFCL | DA-2 | TIMMINS |
| 12 | WTMJ | DA-2 | MILWAUKEE |
| 13 | KMNS | DA-2 | SIOUX CITY |
| 14 | WJDX | DA-N | JACKSON |
| 15 | KWFT | DA-N | WICHITA FALLS |
| 16 | KTAR | DA-N | PHOENIX |
| 17 | CKCK | DA-N | REGINA |
| 18 | KWAL | DA-N | WALLACE |
| 19 | CJCI | DA-N | PRINCE GEORGE |
| 20 | KGW | DA-1 | PORTLAND |
| 21 | KNGS | DA-N | HANFORD |

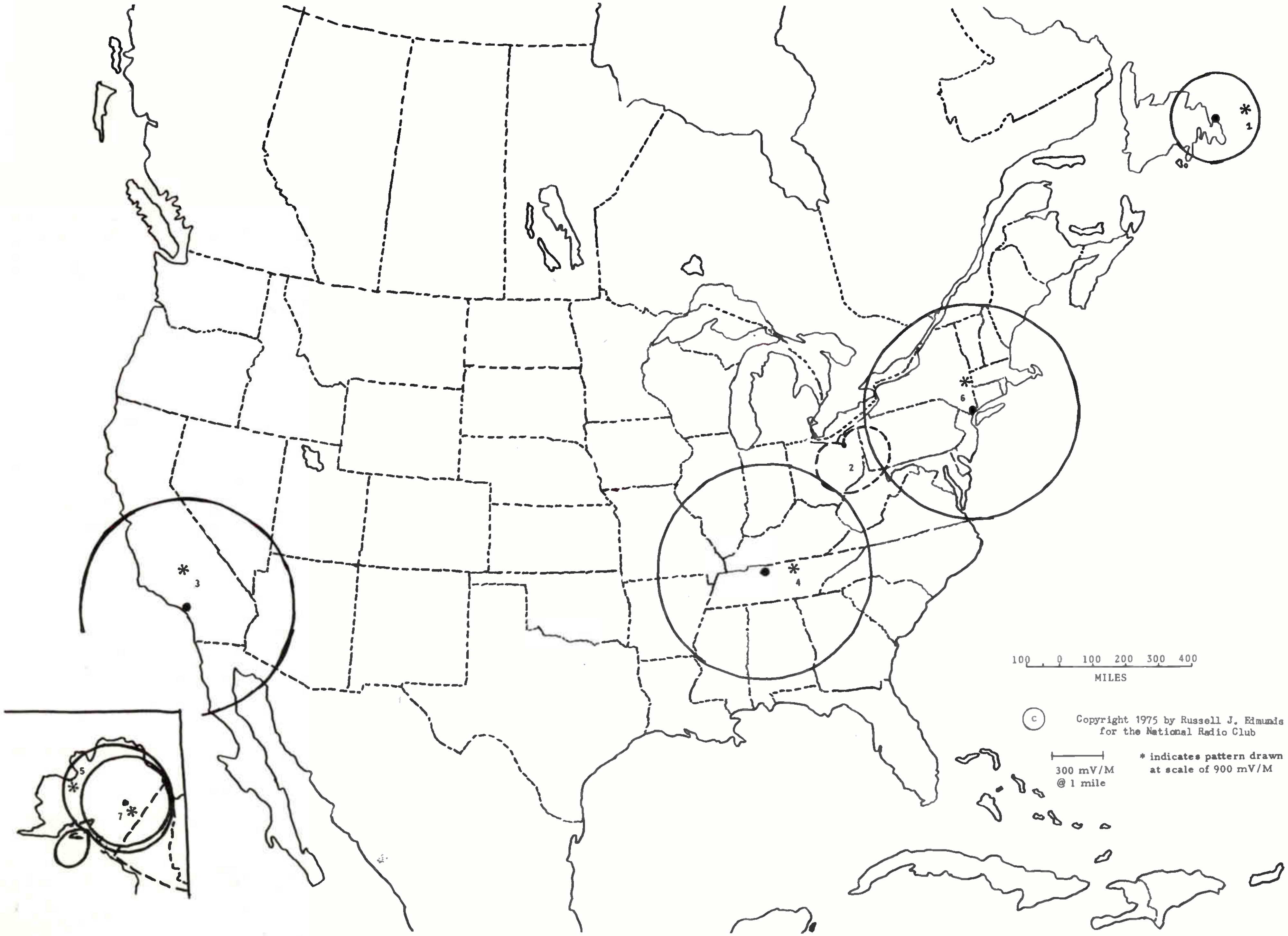
# 630 KHZ

# REGIONAL



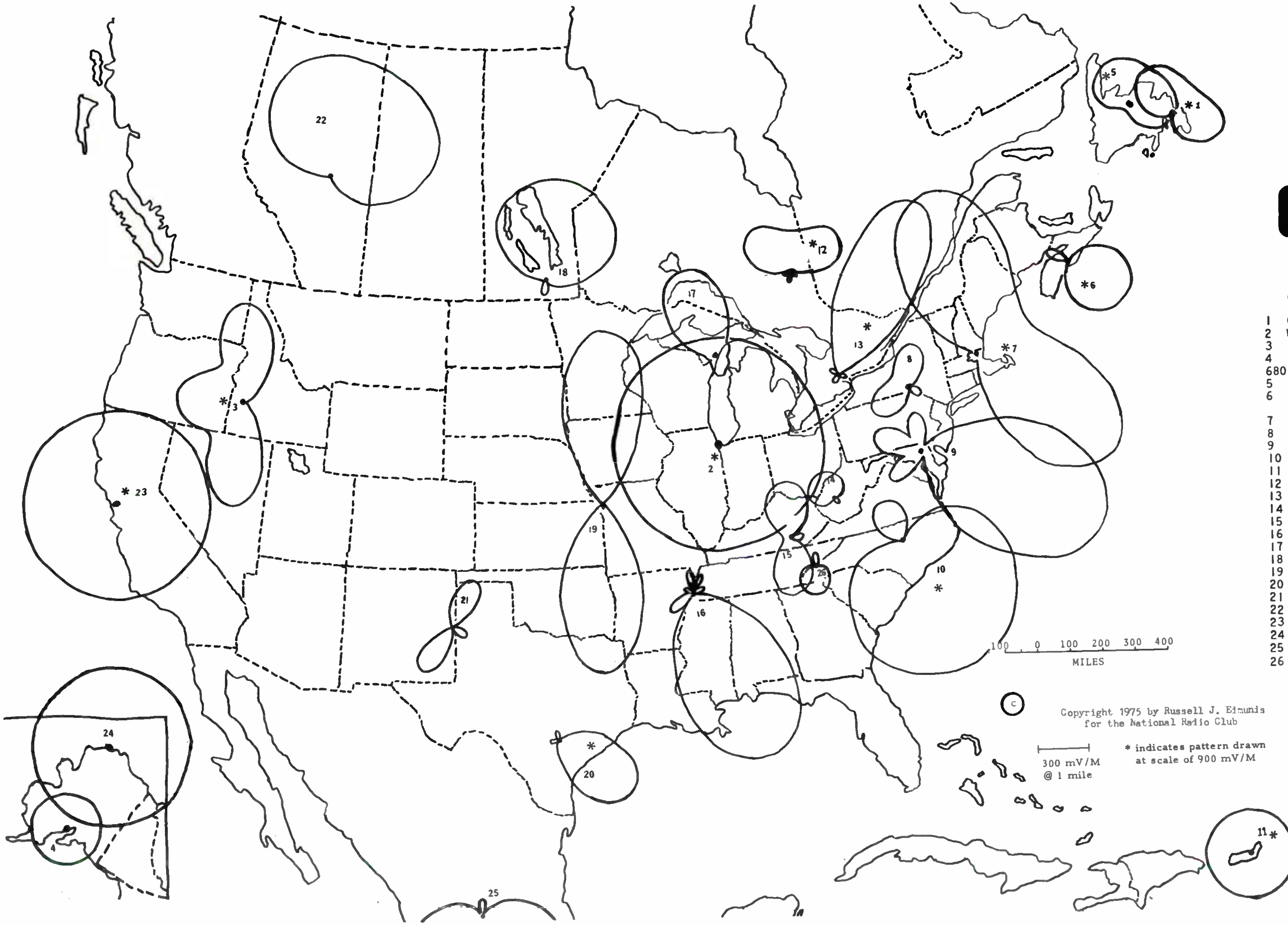

| | call | class | location |
|---|---|---|---|
| 1 | CFCY | DA-2 | CHARLOTTETOWN |
| 2 | CHLT | DA-2 | SHERBROOKE |
| 3 | CJLA | DA-2 | LACHUTE |
| 4 | CJET | DA-2 | SMITH FALLS |
| 5 | WPRO | DA-N | PROVIDENCE |
| 6 | WMAL | DA-2 | WASHINGTON |
| 7 | WMFD | DA-2 | WILMINGTON |
| 8 | WSAV | DA-N | SAVANNAH |
| 9 | WQBS | DA-N | SAN JUAN |
| 10 | CKAR | DA-N | HUNTSVILLE |
| 11 | CFCO | DA-2 | CHATHAM |
| 12 | WLAP | DA-1 | LEXINGTON |
| 13 | KXOK | DA-2 | ST. LOUIS |
| 14 | CKRC | DA-2 | WINNIPEG |
| 15 | KDWB | DA-2 | ST. PAUL |
| 16 | KHOW | DA-N | DENVER |
| 17 | KMAC | DA-2 | SAN ANTONIO |
| 18 | CHED | DA-2 | EDMONTON |
| 19 | CKOV | ND | KELOWNA |
| 20 | KIDO | DA-2 | BOISE |
| 21 | KOH | DA-N | RENO |
| 22 | KIDD | DA-2 | MONTEREY |
| 23 | XEFB | DA-2 | MONTERREY |

# 640 650 660 KHZ CLEAR




| | call | class | location |
|---|---|---|---|
| | 640 | | |
| 1 | CBN | ND | ST. JOHN'S |
| 2 | WHLO | DA-1 | AKRON (L) |
| 3 | KFI | ND | LOS ANGELES |
| | 650 | | |
| 4 | WSM | ND | NASHVILLE |
| 5 | KYAK | DA-2 | ANCHORAGE |
| | 660 | | |
| 6 | WNBC | ND | NEW YORK |
| 7 | KFAR | ND | FAIRBANKS |

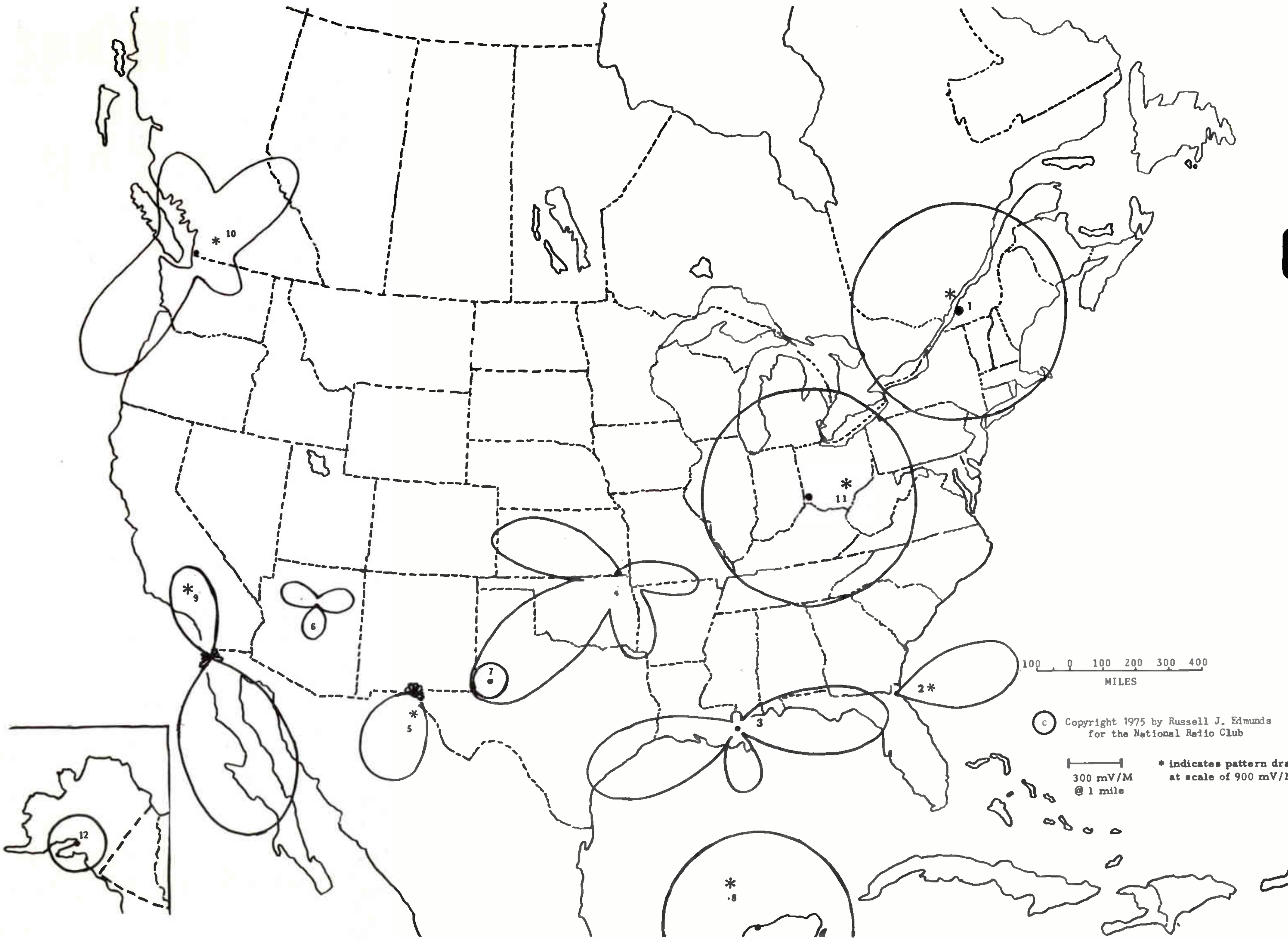
# 670
# 680 KHZ
# CLEAR




| | call | class | location |
|---|---|---|---|
| 1 | C___ | DA-2 | MUSGRAVETON |
| 2 | WMAQ | ND | CHICAGO |
| 3 | KBOI | DA-N | BOISE |
| 4 | KDLG | ND | DILLINGHAM |
| 680: | | | |
| 5 | CJCN | DA-2 | GRAND FALLS |
| 6 | CFDR | DA-2 | DARTMOUTH (po 790) |
| 7 | WRKO | DA-2 | BOSTON |
| 8 | WINR | DA-2 | BINGHAMTON |
| 9 | WCBM | DA-2 | BALTIMORE |
| 10 | WPTF | DA-N | RALEIGH |
| 11 | WAPA | ND | SAN JUAN |
| 12 | CKGB | DA-2 | TIMMINS |
| 13 | CFTR | DA-2 | TORONTO |
| 14 | WCAW | DA-2 | CHARLESTON |
| 15 | WCTT | DA-N | CORBIN |
| 16 | WMPS | DA-N | MEMPHIS |
| 17 | WDBC | DA-2 | ESCANABA |
| 18 | CJOB | DA-N | WINNIPEG |
| 19 | KFEQ | DA-2 | ST. JOSEPH |
| 20 | KKYX | DA-N | SAN ANTONIO |
| 21 | KAWA | DA-1 | CLOVIS |
| 22 | CHFA | DA-1 | EDMONTON |
| 23 | KNBR | ND | SAN FRANCISCO |
| 24 | K___ | ND | BARROW |
| 25 | XELG | DA-N | LEON |
| 26 | WMSJ | DA-N | SYLVA |

# 690 700 KHZ

# CLEAR

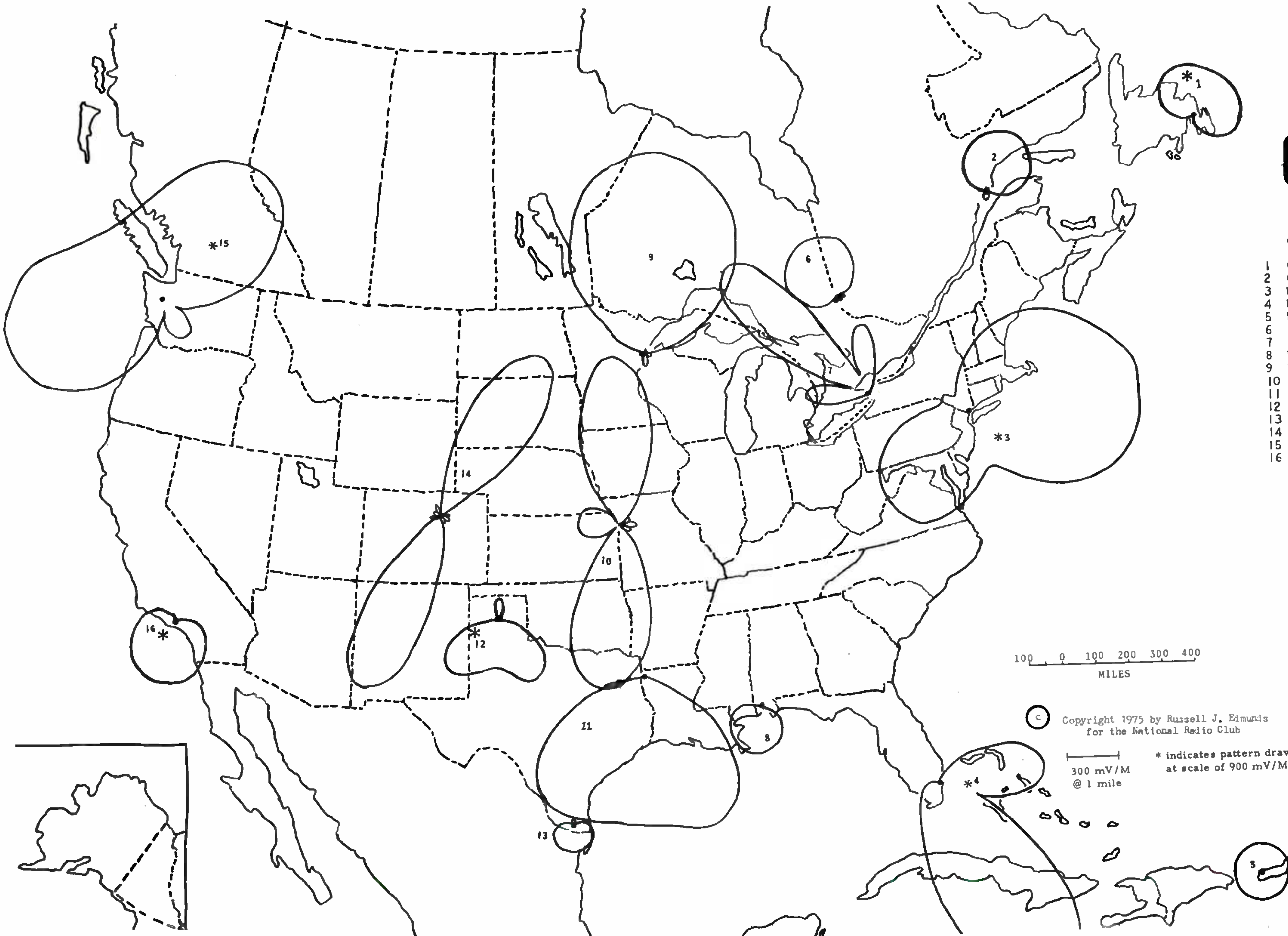





| | call | class | location |
|---|---|---|---|
| | 690 | | |
| 1 | CBF | ND | MONTREAL |
| 2 | WAPE | DA-N | JACKSONVILLE |
| 3 | WTIX | DA-2 | NEW ORLEANS |
| 4 | KGGF | DA-2 | COFFEYVILLE |
| 5 | KHEY | DA-2 | EL PASO |
| 6 | KEOS | DA-2 | FLAGSTAFF |
| 7 | KPET | ND | LAMESA |
| 8 | XETRAN | ND | PROGRESO |
| 9 | XETRA | DA-2 | TIJUANA |
| 10 | CBU | DA-1 | VANCOUVER |
| | 700 | | |
| 11 | WLW | ND | CINCINNATI |
| 12 | KBYR | ND | ANCHORAGE |

# 710 KHZ

# CLEAR

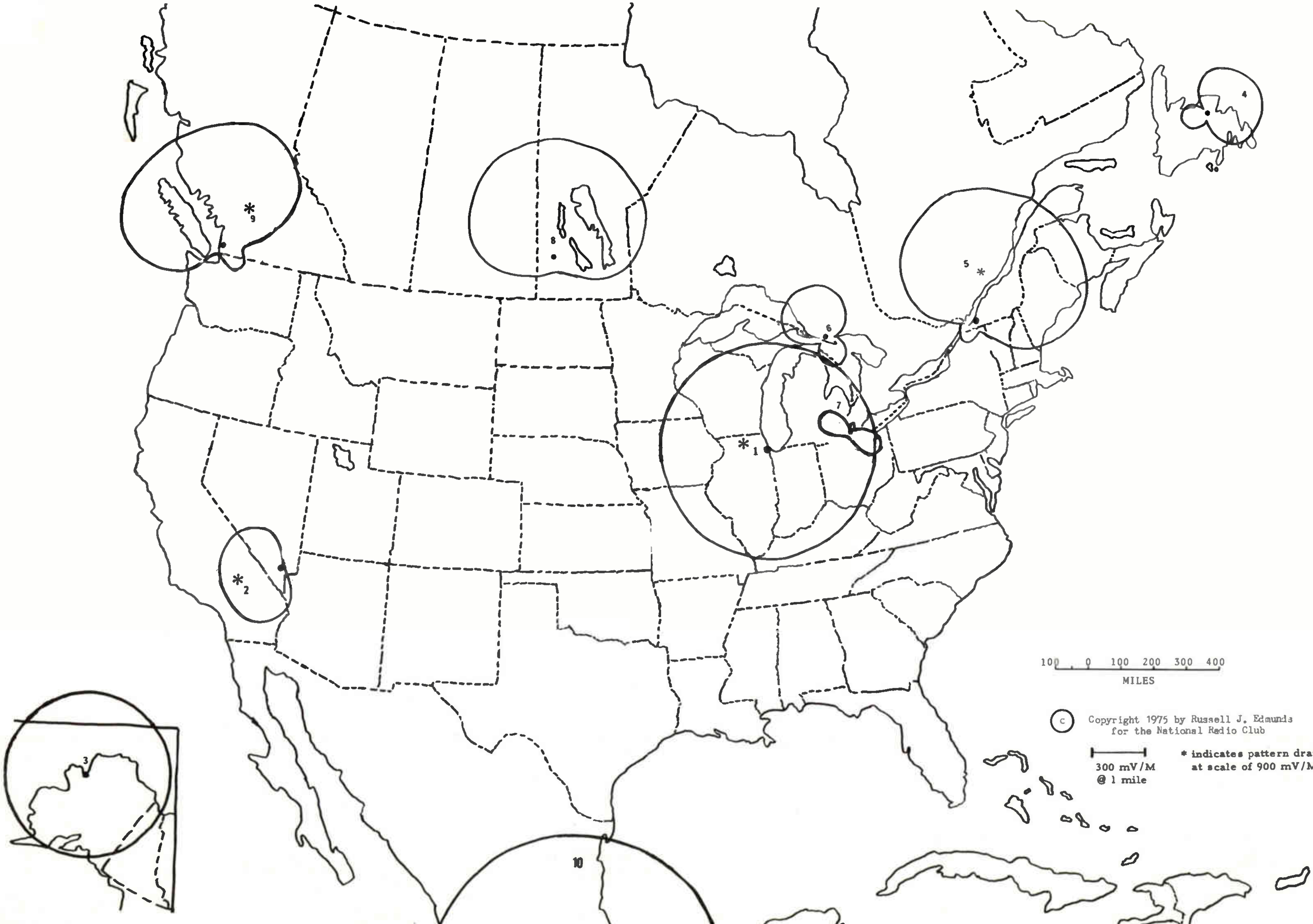



| | call | class | location |
|---|---|---|---|
| 1 | CKVO | DA-1 | CLARENVILLE |
| 2 | C___ | DA-1 | PORT CARTIER |
| 3 | WOR | DA-1 | NEW YORK |
| 4 | WGBS | DA-2 | MIAMI |
| 5 | WKJB | ND | MAYAGUEZ |
| 6 | CKVM | DA-N | VILLE MARIE |
| 7 | CJRN | DA-2 | NIAGARA FALLS |
| 8 | WKRG | DA-N | MOBILE |
| 9 | WDSM | DA-N | SUPERIOR |
| 10 | WHB | DA-2 | KANSAS CITY |
| 11 | KEEL | DA-2 | SHREVEPORT |
| 12 | KGNC | DA-2 | AMARILLO |
| 13 | KURV | DA-N | EDINBURG |
| 14 | KERE | DA-1 | DENVER |
| 15 | KIRO | DA-N | SEATTLE |
| 16 | KMPC | DA-N | LOS ANGELES |

# 720 730 KHZ

# CLEAR

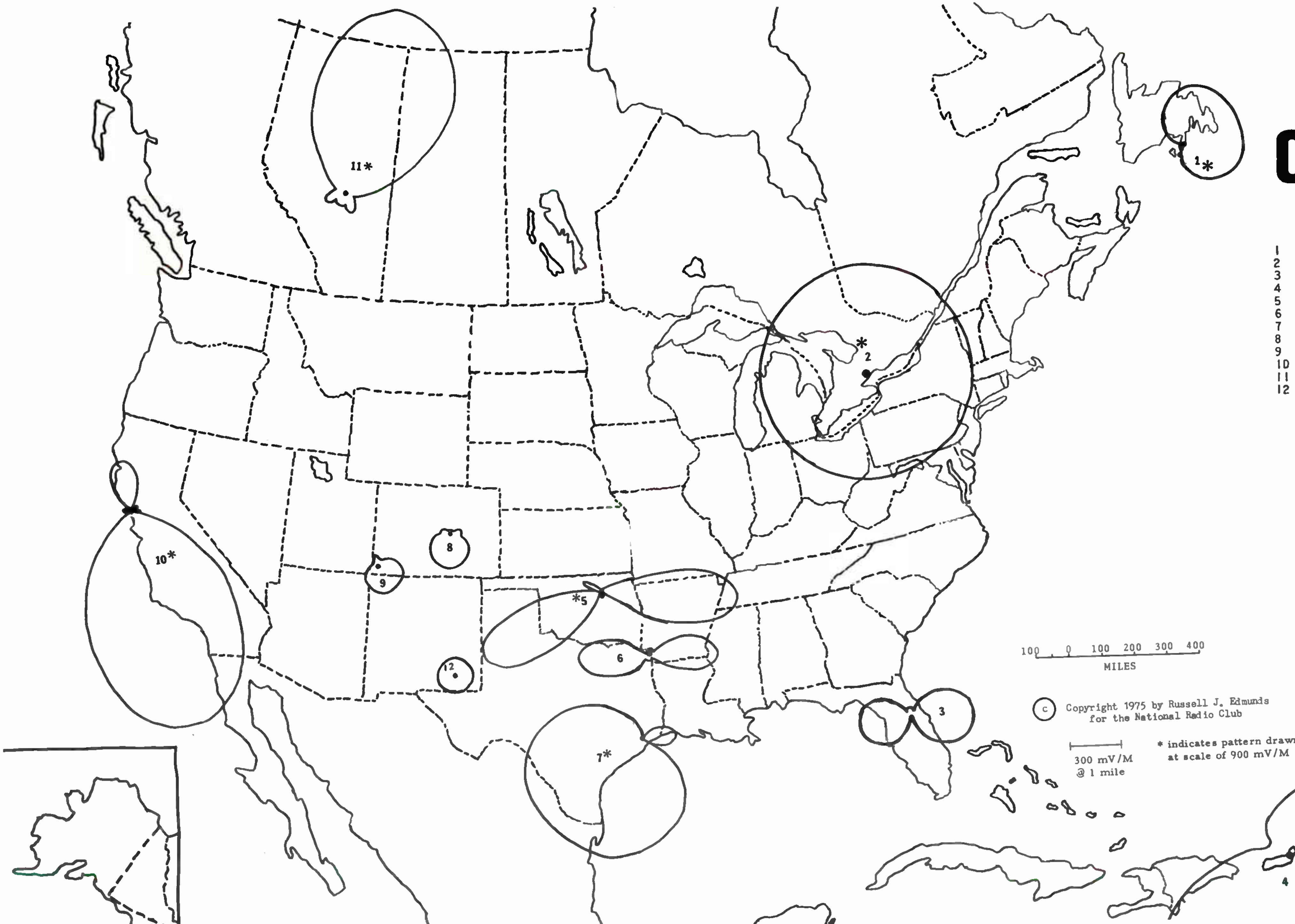
| | call | class | location |
|---|---|---|---|
| | 720 | | |
| 1 | WGN | ND | CHICAGO |
| 2 | KDWN | DA-N | LAS VEGAS |
| 3 | KOTZ | ND | KOTZUBUE |
| | 730 | | |
| 4 | CKGA | DA-N | GANDER |
| 5 | CKAC | DA-1 | MONTREAL |
| 6 | CJNR | DA-N | BLIND RIVER |
| 7 | CHYR-7 | DA-2 | LEAMINGTON * |
| 8 | CKDM | DA-N | DAUPHIN |
| 9 | CKLG | DA-2 | VANCOUVER |
| * | night operation only on 730, day is on 710/CHYR | | |
| 10 | XEX | ND | MEXICO, DF |



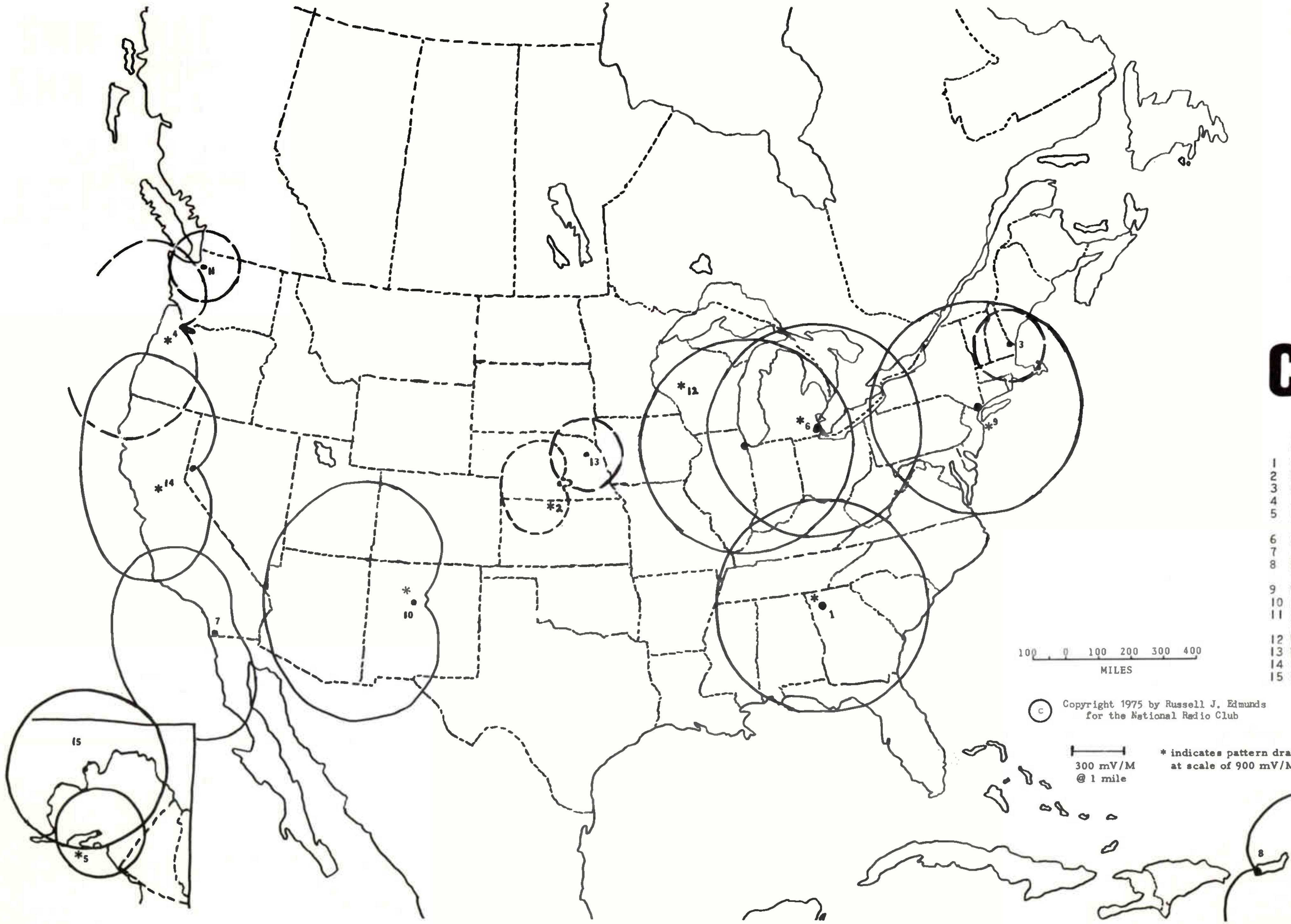
# 740 KHZ

# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | CBNM | DA-N | MARYSTOWN |
| 2 | CBL | ND | TORONTO |
| 3 | WKIS | DA-N | ORLANDO |
| 4 | WIAC | DA-1 | SAN JUAN |
| 5 | KRMG | DA-2 | TULSA |
| 6 | KCMC | DA-1 | TEXARKANA |
| 7 | KTRH | DA-2 | HOUSTON |
| 8 | KSSS | DA-N | COLORADO SPRINGS |
| 9 | KVFC | DA-N | CORTEZ |
| 10 | KCBS | DA-2 | SAN FRANCISCO |
| 11 | CBX | DA-2 | EDMONTON |
| 12 | KBAD | ND | CARLSBAD |



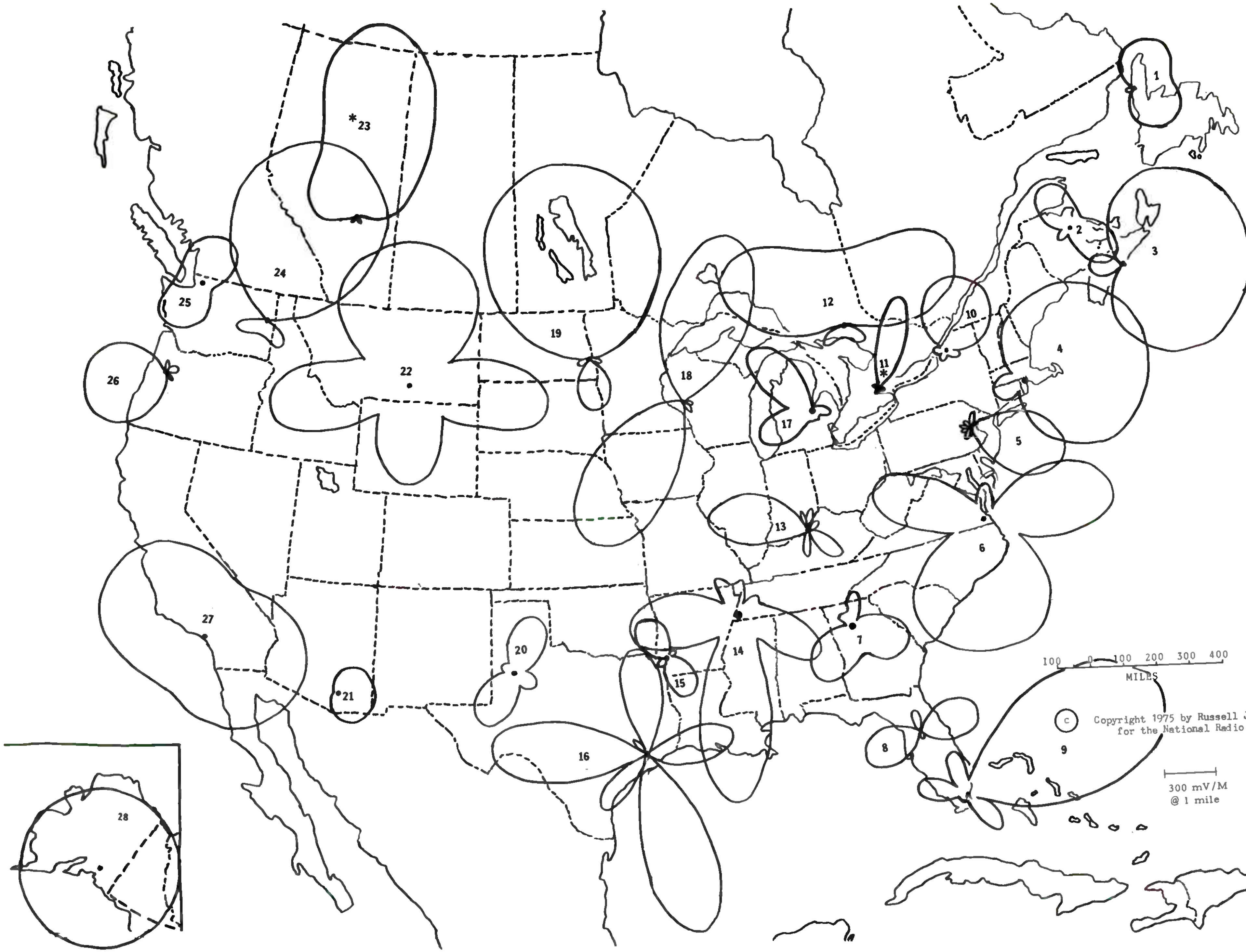
# 750
# 760
# 770
# 780
## KHZ
# CLEAR




| | CALL | CLASS | LOCATION |
|---|---|---|---|
| | 750 | | |
| 1 | WSB | ND | ATLANTA |
| 2 | KMMJ | DA-1 | GRAND ISLAND (L) |
| 3 | WHEB | ND | PORTSMOUTH (L) |
| 4 | KXL | DA-1 | PORTLAND (L) |
| 5 | KFQD | ND | ANCHORAGE |
| | 760 | | |
| 6 | WJR | ND | DETROIT |
| 7 | KFMB | DA-N | SAN DIEGO |
| 8 | WORA | DA-1 | MAYAGUEZ |
| | 770 | | |
| 9 | WABC | ND | NEW YORK |
| 10 | KOB | DA-N | ALBUQUERQUE |
| 11 | KXA | ND | SEATTLE (L) |
| | 780 | | |
| 12 | WBBM | ND | CHICAGO |
| 13 | WJAG | ND | NORFOLK (L) |
| 14 | KCRL | DA-N | RENO |
| 15 | KNOM | ND | NOME |

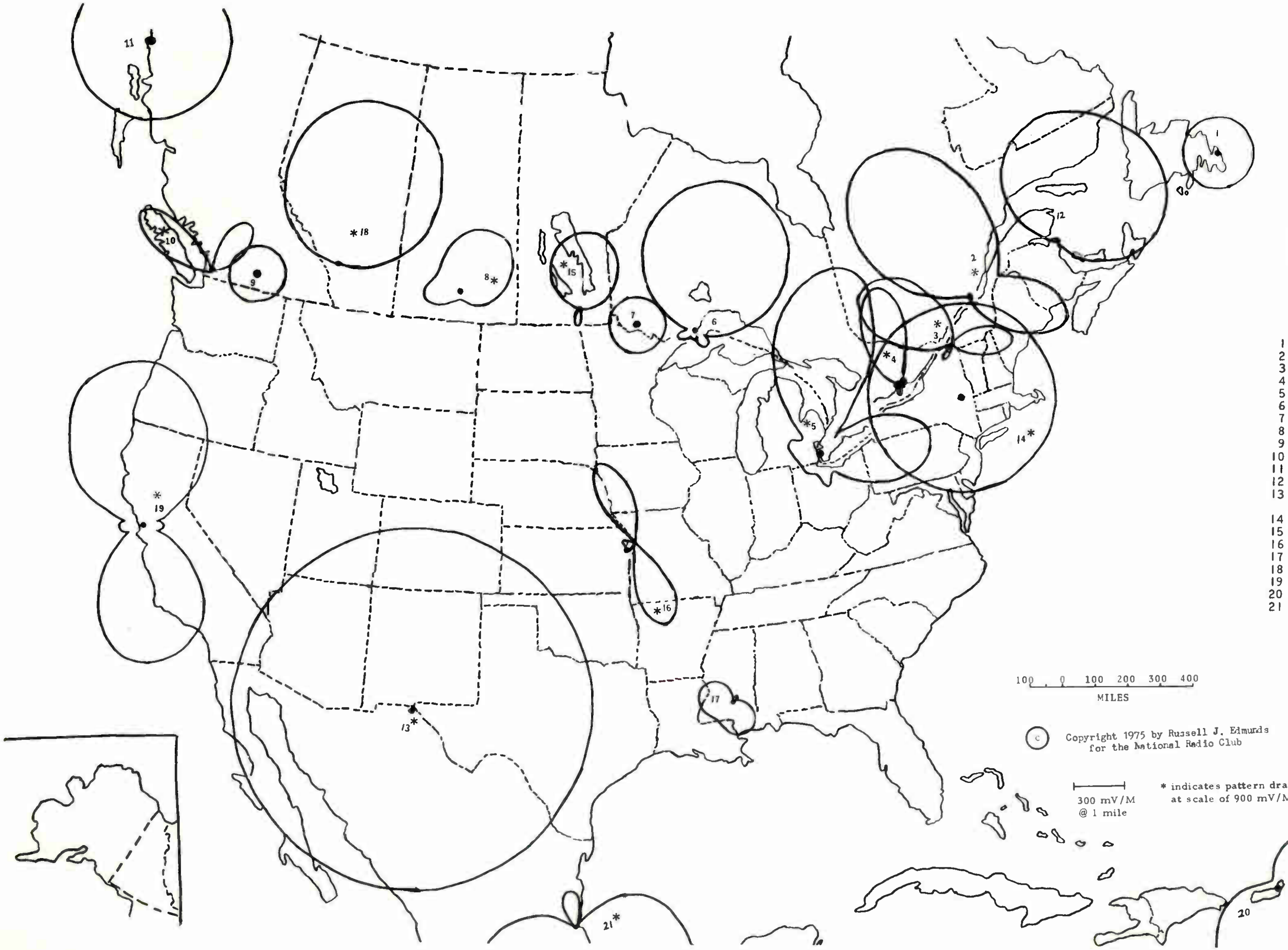
# 790 KHZ

# REGIONAL

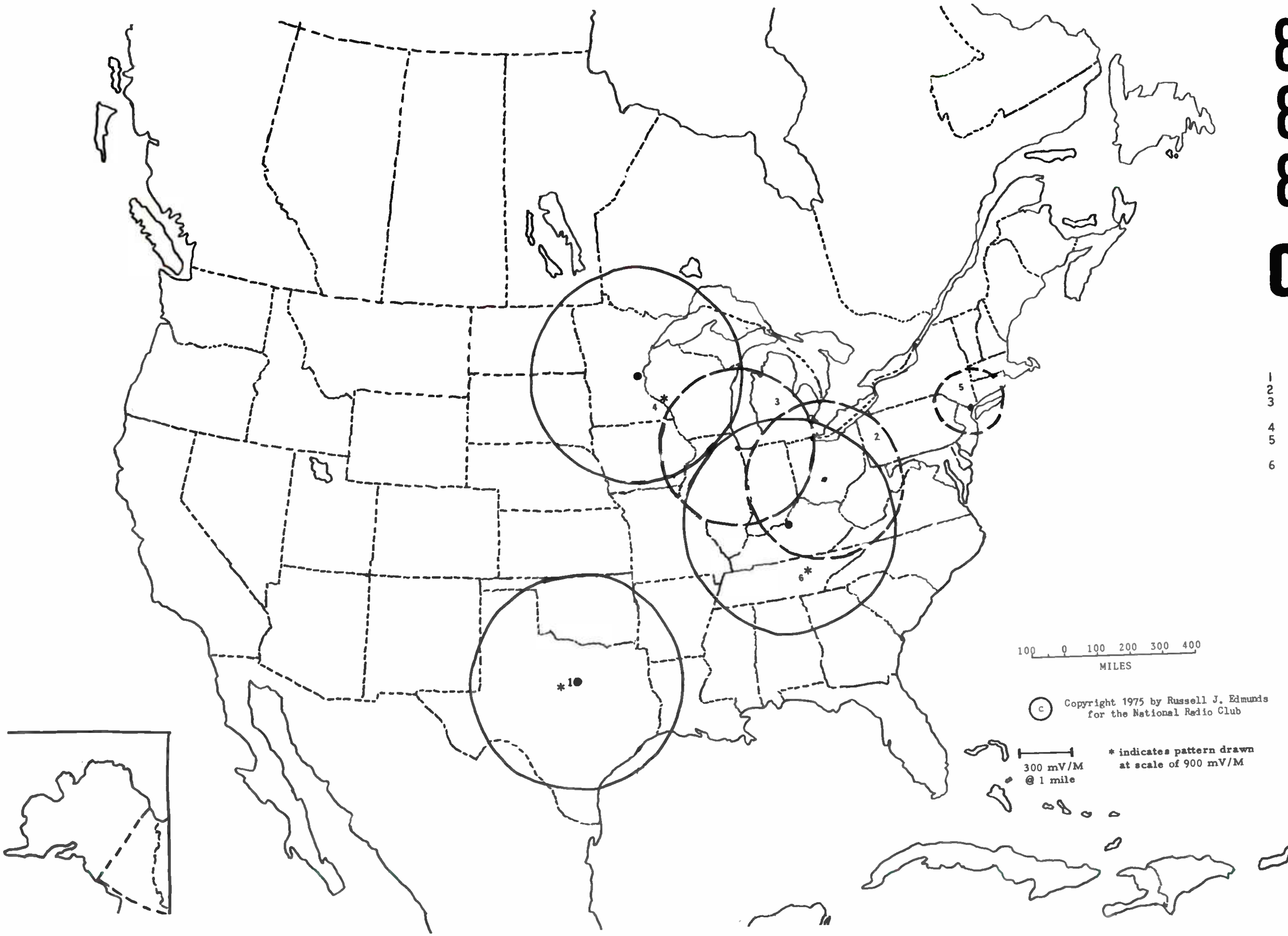



| | call | class | location |
|---|---|---|---|
| 1 | CFNW | DA-1 | PORT-AUX-CHOIX |
| 2 | CFAN | DA-1 | NEWCASTLE |
| 3 | CFDR | DA-1 | DARTMOUTH |
| 4 | WEAN | DA-2 | PROVIDENCE |
| 5 | WAEB | DA-2 | ALLENTOWN |
| 6 | WTAR | DA-N | NORFOLK |
| 7 | WQXI | DA-N | ATLANTA |
| 8 | WLBE | DA-N | LEESBURG-EUSTIS |
| 9 | WFUN | DA-2 | S.MIAMI-MIAMI |
| 10 | WWNY | DA-N | WATERTOWN |
| 11 | CHIC | DA-2 | BRAMPTON |
| 12 | CKSO | DA-2 | SUDBURY |
| 13 | WAKY | DA-2 | LOUISVILLE |
| 14 | WMC | DA-N | MEMPHIS |
| 15 | KOSY | DA-N | TEXARKANA |
| 16 | KULF | DA-2 | HOUSTON |
| 17 | WSGW | DA-2 | SAGINAW |
| 18 | WEAQ | DA-N | EAU CLAIRE |
| 19 | KFGO | DA-N | FARGO |
| 20 | KFYO | DA-2 | LUBBOCK |
| 21 | KCEE | DA-1 | TUCSON |
| 22 | KGHL | DA-N | BILLINGS |
| 23 | CFCW | DA-2 | CAMROSE |
| 24 | KJRB | DA-N | SPOKANE |
| 25 | KGMI | DA-N | BELLINGHAM |
| 26 | KWIL | DA-2 | ALBANY |
| 27 | KABC | DA-N | LOS ANGELES |
| 28 | KCAM | ND | GLENNALLEN |

# 800 810 KHZ CLEAR




| | call | class | location |
|---|---|---|---|
| | 800 | | |
| 1 | VOWR | ND | ST. JOHN'S |
| 2 | CHRC | DA-1 | QUEBEC |
| 3 | CJAD | DA-2 | MONTREAL |
| 4 | CJBQ | DA-2 | BELLEVILLE |
| 5 | CKLW | DA-2 | WINDSOR |
| 6 | CBQ | DA-1 | THUNDER BAY |
| 7 | CFOB | ND | FORT FRANCIS |
| 8 | CHAB | DA-N | MOOSE JAW |
| 9 | CKOK | ND | PENTICTON |
| 10 | CJJC | DA-2 | LANGLEY |
| 11 | KINY | ND | JUNEAU |
| 12 | CJVA | DA-N | CARAQUET |
| 13 | XEROK | ND | CD.JUAREZ |
| | 810 | | |
| 14 | WGY | ND | SCHENECTADY |
| 15 | CKJS | DA-1 | WINNIPEG |
| 16 | KCMO | DA-N | KANSAS CITY |
| 17 | WSJC | DA-N | MAGEE |
| 18 | CHQR | DA-1 | CALGARY |
| 19 | KGO | DA-1 | SAN FRANCISCO |
| 20 | WKVM | DA-1 | SAN JUAN |
| 21 | XEFW | DA-N | TAMPICO |



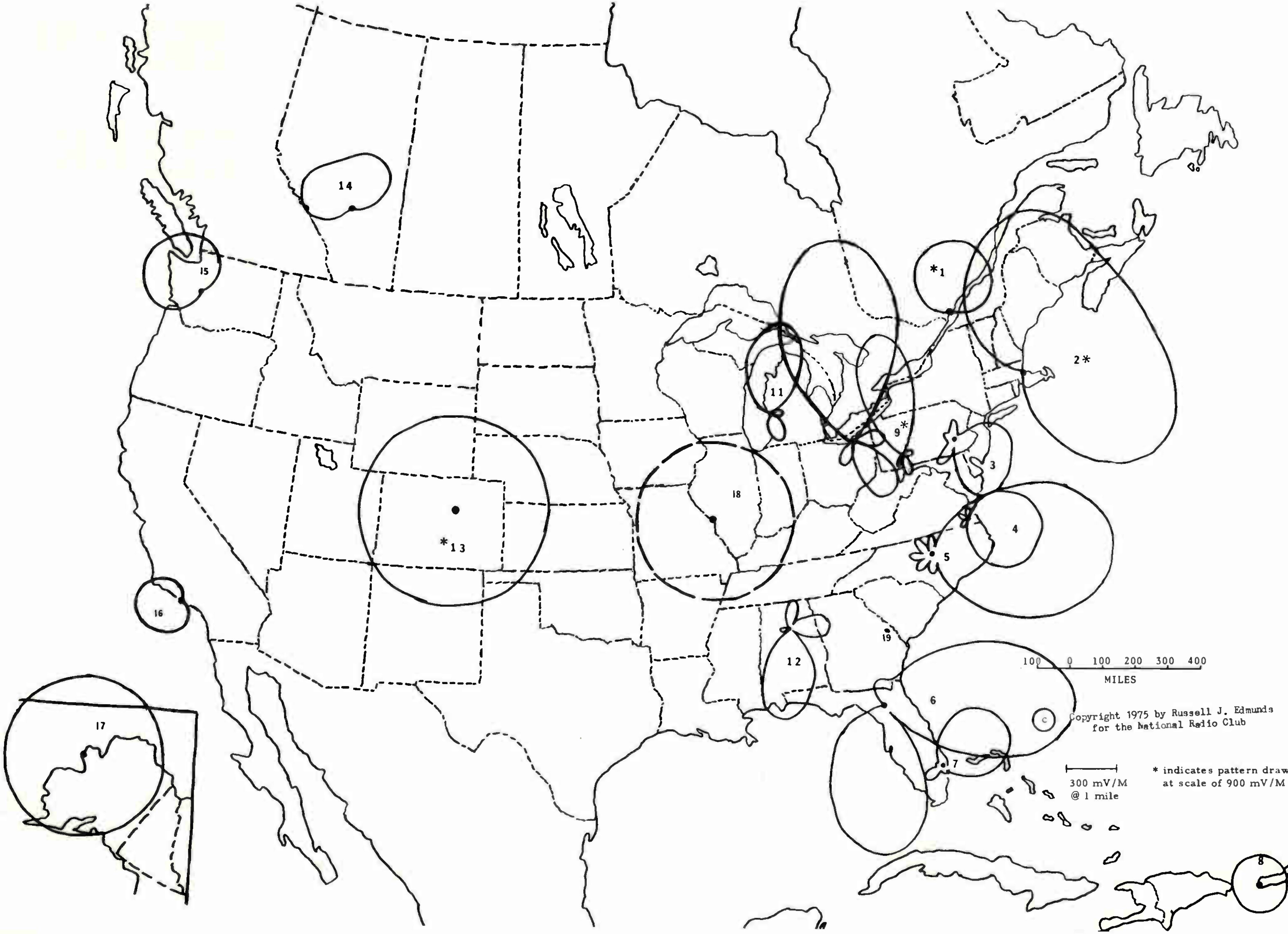

# 820 830 840 CLEAR

| | call | class | location |
|---|---|---|---|
| | 820 | | |
| 1 | WBAP | ND | FORT WORTH |
| 2 | WOSU | ND | COLUMBUS (L) |
| 3 | WAIT | ND | CHICAGO (L) |
| | 830 | | |
| 4 | WCCO | ND | MINNEAPOLIS |
| 5 | WNYC | DA-1 | NEW YORK (L) |
| | 840 | | |
| 6 | WHAS | ND | LOUISVILLE |

# 850 KHZ

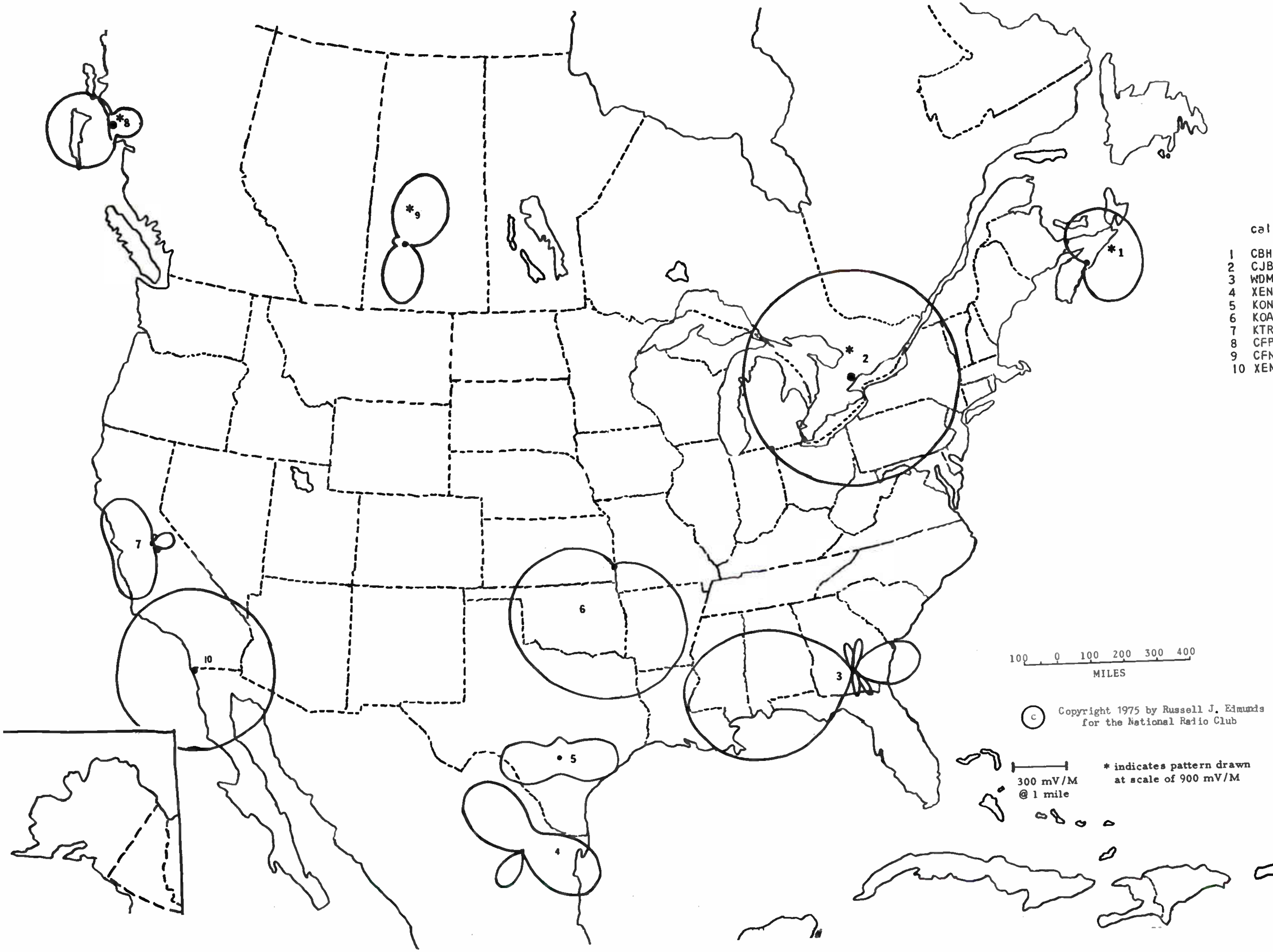
# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | CKVL | DA-2 | VERDUN |
| 2 | WHDH | DA-2 | BOSTON |
| 3 | WEEU | DA-N | READING |
| 4 | WRAP | DA-2 | NORFOLK |
| 5 | WKIX | DA-N | RALEIGH |
| 6 | WRUF | DA-N | GAINESVILLE |
| 7 | WEAT | DA-1 | W.PALM BEACH |
| 8 | WABA | ND | AGUADILLA |
| 9 | WJAC | DA-1 | JOHNSTOWN |
| 10 | WJW | DA-2 | CLEVELAND |
| 11 | WKBZ | DA-1 | MUSKEGON |
| 12 | WYDE | DA-2 | BIRMINGHAM |
| 13 | KOA | ND | DENVER |
| 14 | CKRD | DA-N | RED DEER |
| 15 | KTAC | DA-2 | TACOMA |
| 16 | KGOE | DA-2 | THOUSAND OAKS |
| 17 | KICY | ND | NOME |
| 18 | KFUO | ND | CLAYTON (L) |
| 19 | W___ | DA-N | STATESBORO |



# 860 KHZ

# CLEAR

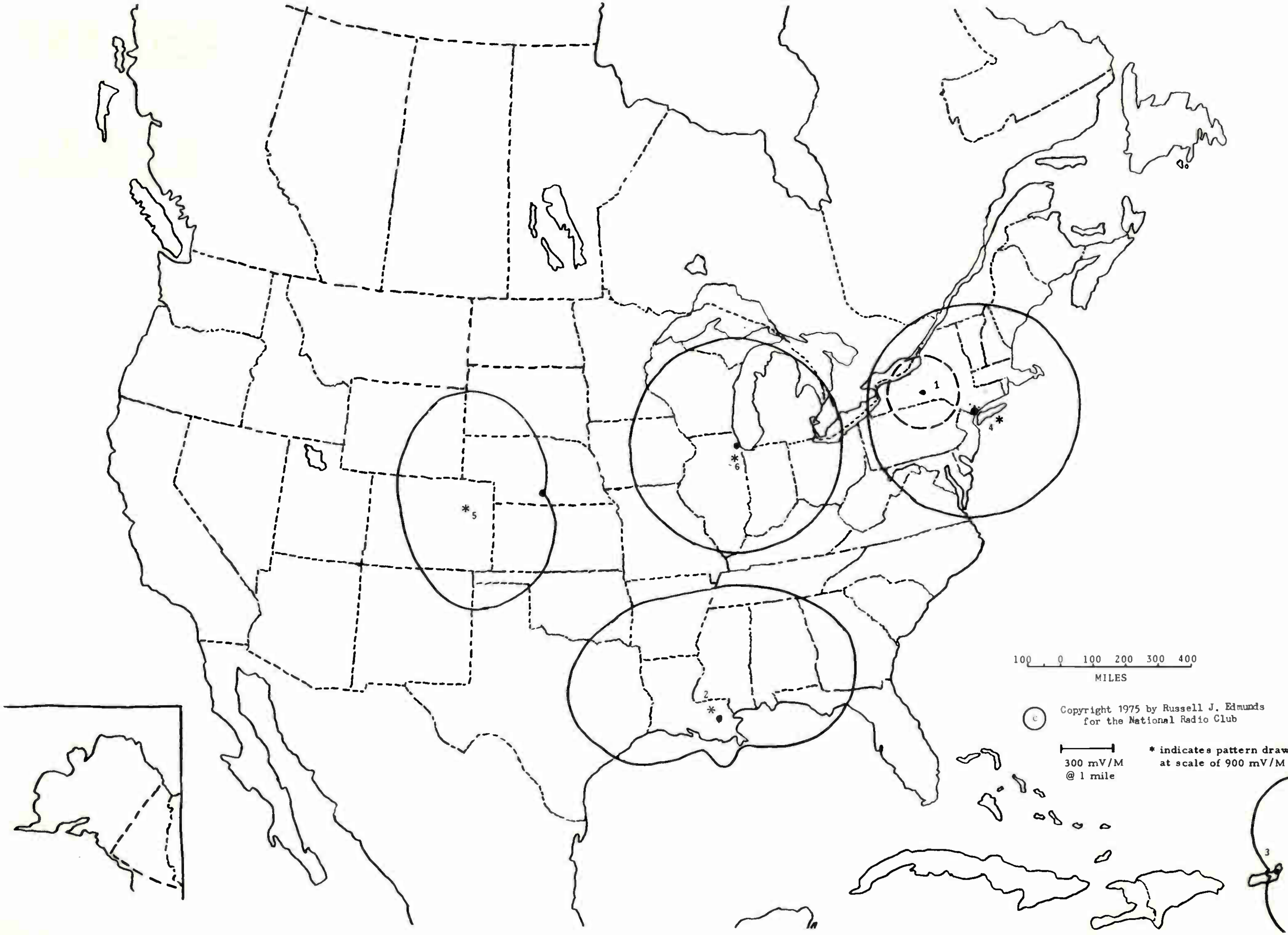



| | call | class | location |
|---|---|---|---|
| 1 | CBH | DA-N | HALIFAX |
| 2 | CJBC | ND | TORONTO |
| 3 | WDMG | DA-N | DOUGLAS |
| 4 | XENL | DA-2 | MONTERREY |
| 5 | KONO | DA-N | SAN ANTONIO |
| 6 | KOAM | DA-N | PITTSGURG |
| 7 | KTRB | DA-2 | MODESTO |
| 8 | CFPR | DA-1 | PRINCE RUPERT |
| 9 | CFNS | DA-2 | SASKATOON (po 1170) |
| 10 | XEMO | ND | TIJUANA |

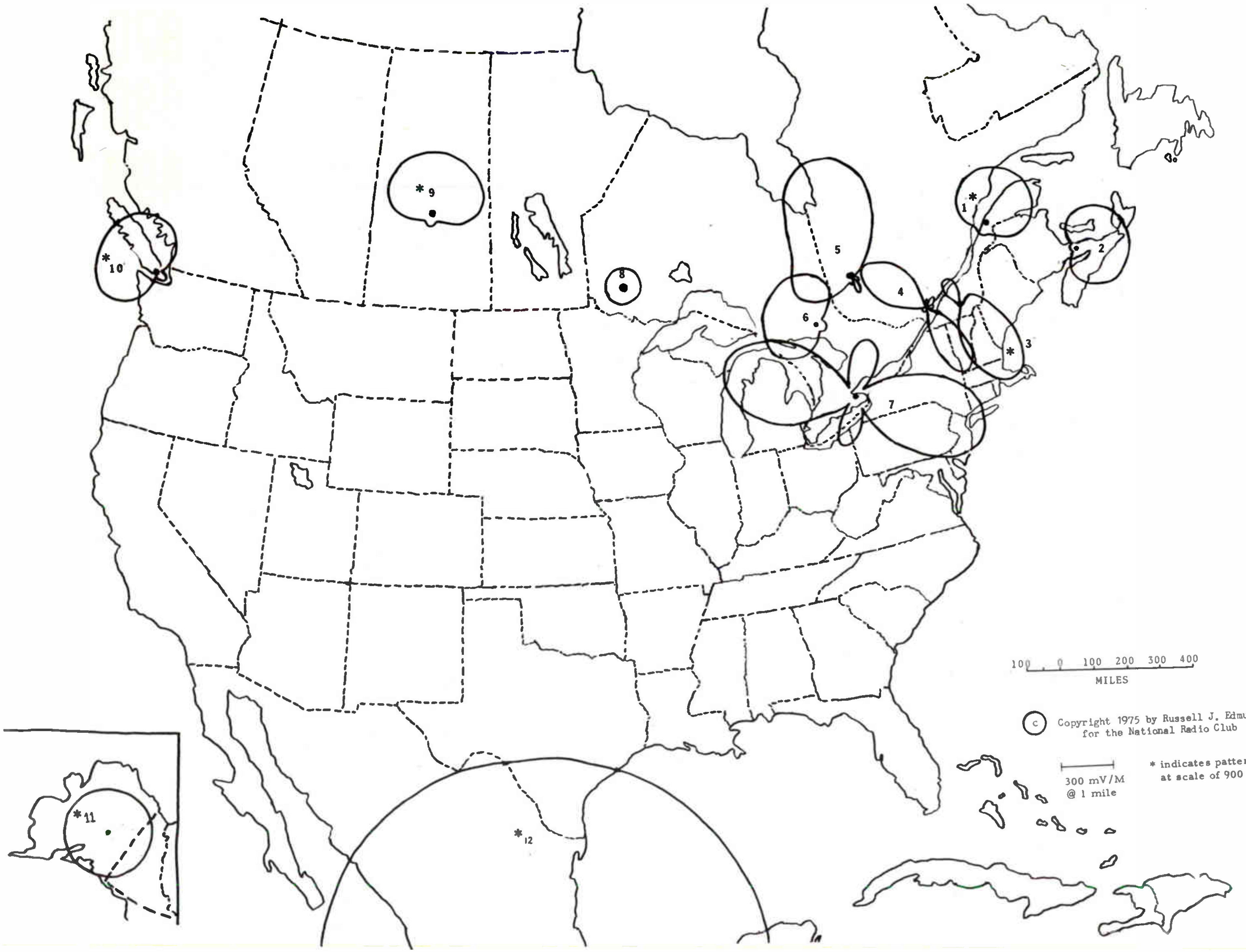
# 870 880 890 KHZ

# CLEAR

| | | | |
|---|---|---|---|
| | 870 | | |
| 1 | WHCU | ND | ITHACA (L) |
| 2 | WWL | DA-1 | NEW ORLEANS |
| 3 | WHOA | DA-1 | SAN JUAN |
| | 880 | | |
| 4 | WCBS | ND | NEW YORK |
| 5 | KRVN | DA-1 | LEXINGTON |
| | 890 | | |
| 6 | WLS | ND | CHICAGO |



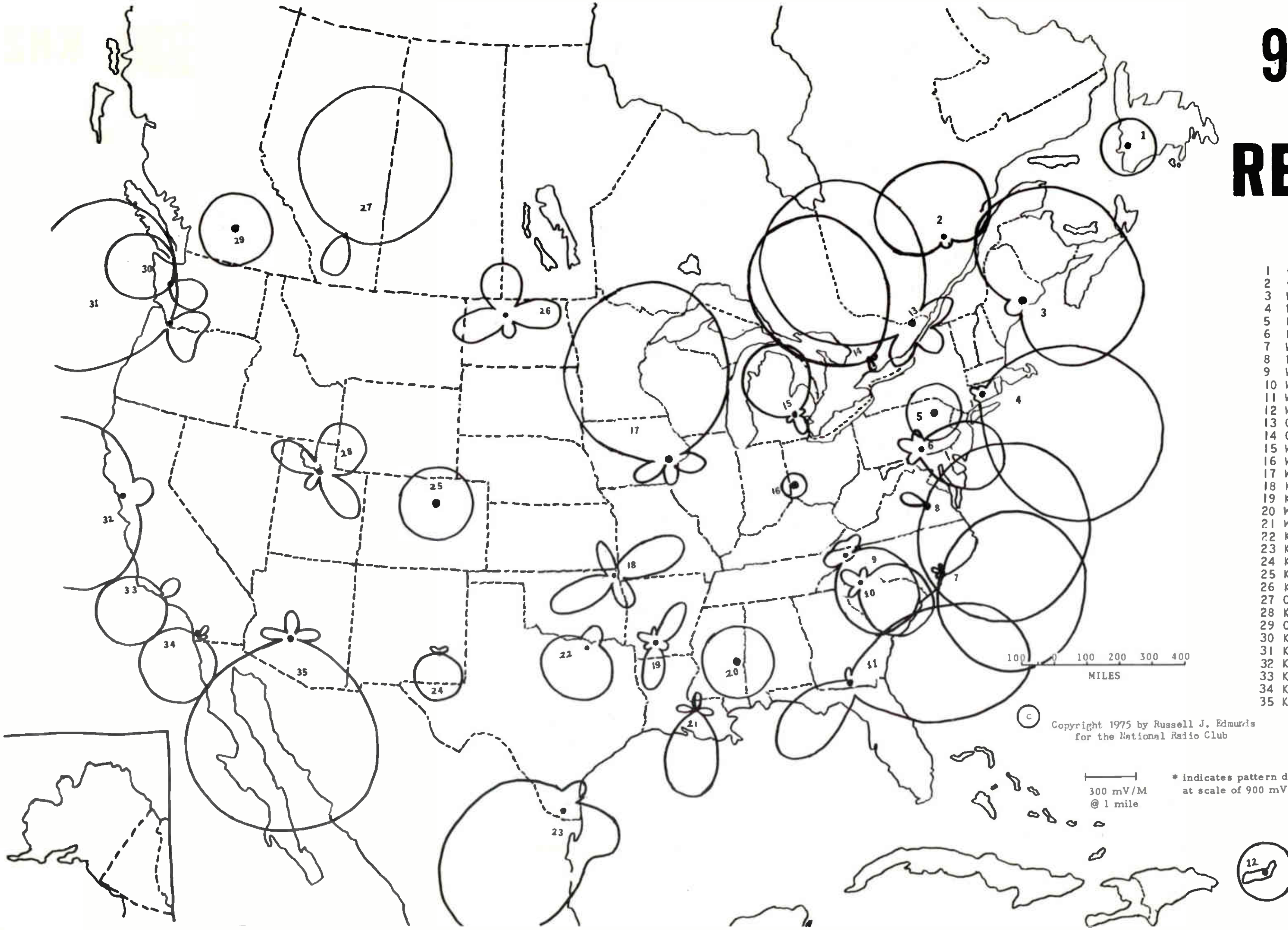
# 900 KHZ CLEAR




| | call | class | location |
|---|---|---|---|
| 1 | CJBR | DA-N | RIMOUSKI |
| 2 | CKDH | DA-2 | AMHERST |
| 3 | CKTS | DA-2 | SHERBROOKE |
| 4 | CKJL | DA-1 | ST. JEROME |
| 5 | CKVD | DA-1 | VAL D'OR |
| 6 | CFBR | DA-2 | SUDBURY |
| 7 | CHML | DA-1 | HAMILTON |
| 8 | CKDR | ND | CRYDEN |
| 9 | CKBI | DA-2 | PRINCE ALBERT |
| 10 | CJVI | DA-1 | VICTORIA |
| 11 | KFRB | ND | FAIRBANKS |
| 12 | XEW | ND | MEXICO, DF |

# 910 KHZ

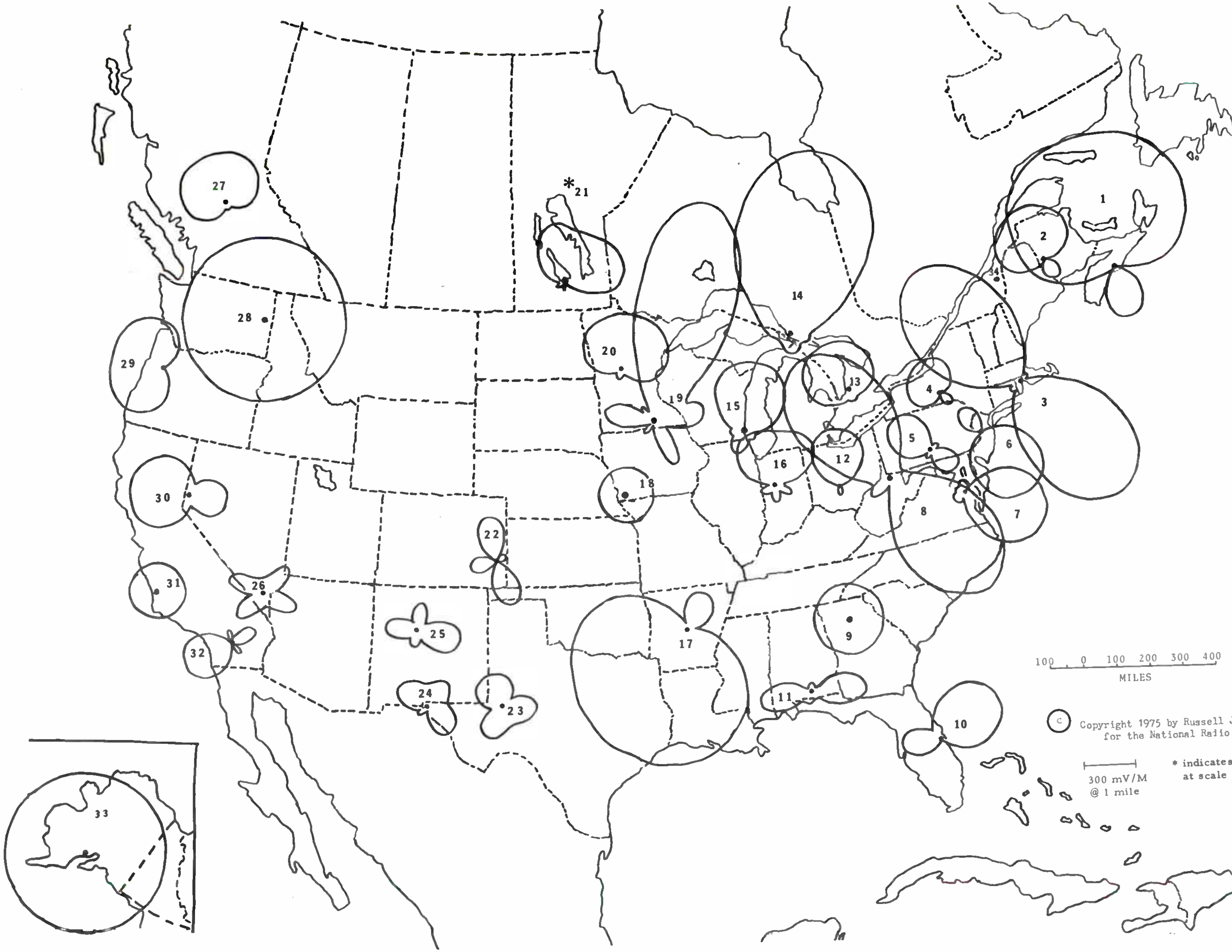
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CFSX | ND | STEPHENVILLE |
| 2 | CHRL | DA-N | ROBERVAL |
| 3 | WABI | DA-N | BANGOR |
| 4 | WKHQ | DA-2 | NEW BRITAIN |
| 5 | WGBI | ND | SCRANTON |
| 6 | WSBA | DA-2 | YORK |
| 7 | WLAS | DA-N | JACKSONVILLE |
| 8 | WRNL | DA-N | RICHMOND |
| 9 | WJRC | DA-N | JOHNSON CITY |
| 10 | WORD | DA-2 | SPARTANBURG |
| 11 | WGAF | DA-N | VALDOSTA |
| 12 | WPRP | ND | PONCE |
| 13 | CBO | DA-1 | OTTAWA |
| 14 | CKLY | DA-2 | LINDSAY |
| 15 | WFDF | DA-1 | FLINT |
| 16 | WPFB | ND | MIDDLETOWN |
| 17 | WSUI | DA-2 | IOWA CITY |
| 18 | KGLC | DA-1 | MIAMI |
| 19 | KAMD | DA-2 | CAMDEN |
| 20 | WOKK | ND | MERIDIAN |
| 21 | WLCS | DA-1 | BATON ROUGE |
| 22 | KIKM | DA-1 | SHERMAN |
| 23 | KRIO | DA-2 | McALLEN |
| 24 | KBIM | DA-N | ROSWELL |
| 25 | KPOF | ND | DENVER |
| 26 | KCJB | DA-2 | MINOT |
| 27 | CJDV | DA-2 | DRUMHELLER |
| 28 | KALL | DA-N | SALT LAKE CITY |
| 29 | CFJC | ND | KAMLOOPS |
| 30 | KIXI | DA-1 | SEATTLE |
| 31 | KISN | DA-2 | VANCOUVER |
| 32 | KNEW | DA-N | OAKLAND |
| 33 | KOXR | DA-2 | OXNARD |
| 34 | KDEO | DA-2 | EL CAJON |
| 35 | KPHO | DA-N | PHOENIX |

# 920 KHZ

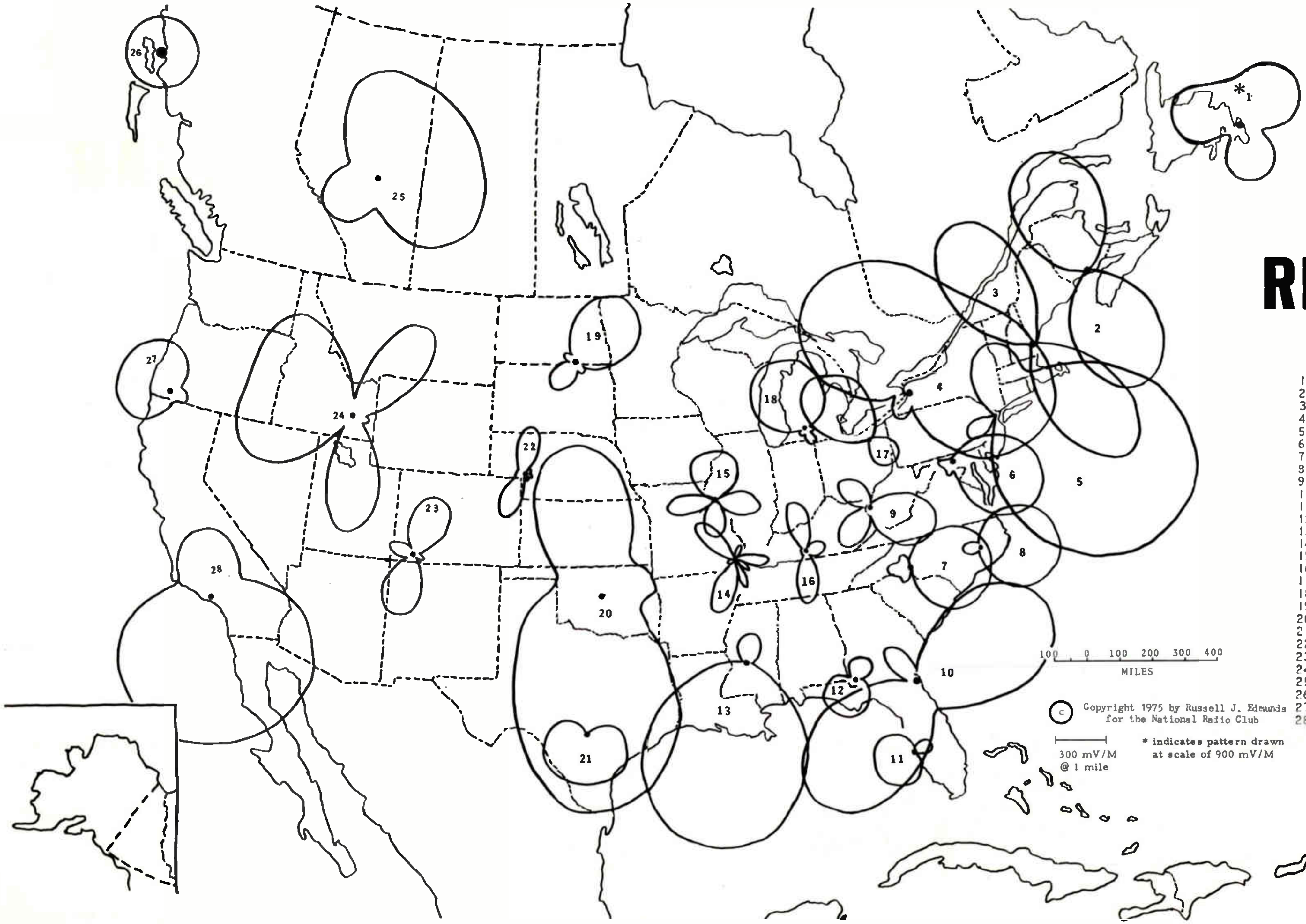
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CJCH | DA-N | HALIFAX |
| 2 | CJCJ | DA-1 | WOODSTOCK |
| 3 | WJAR | DA-N | PROVIDENCE |
| 4 | WKRT | DA-N | CORTLAND |
| 5 | WKVA | DA-N | LEWISTON |
| 6 | WTTM | DA-1 | TRENTON |
| 7 | WPTX | DA-2 | LEXINGTON PARK |
| 8 | WMMN | DA-N | FAIRMONT |
| 9 | WGST | ND | ATLANTA |
| 10 | WMEL | DA-N | MELBOURNE |
| 11 | WCTA | DA-N | ANDALUSIA |
| 12 | WMNI | DA-2 | COLUMBUS |
| 13 | CKNX | DA-2 | WINGHAM |
| 14 | CKCY | DA-2 | SAULT STE. MARIE |
| 15 | WOKY | DA-2 | MILWAUKEE |
| 16 | WBAA | DA-N | W. LAFAYETTE |
| 17 | KARN | DA-N | LITTLE ROCK |
| 18 | KFNF | ND | SHENANDOAH |
| 19 | KDHL | DA-2 | FARIBAULT |
| 20 | KWAD | DA-N | WADENA |
| 21 | CFRY | DA-2 | PORTAGE LA PRAIRIE |
| 22 | KLMR | DA-N | LAMAR |
| 23 | KBZB | DA-N | ODESSA |
| 24 | KELP | DA-N | EL PASO |
| 25 | KQEO | DA-N | ALBUQUERQUE |
| 26 | KORK | DA-2 | LAS VEGAS |
| 27 | CKWL | DA-N | WILLIAMS LAKE |
| 28 | KXLY | ND | SPOKANE |
| 29 | KGAL | DA-1 | LEBANON |
| 30 | KOLO | DA-N | RENO |
| 31 | KVEC | ND | SAN LUIS OBISPO |
| 32 | KDES | DA-N | PALM SPRINGS |
| 33 | KSRM | ND | SOLDATNA |
| 34 | C____ | | LAC ETCHEMIN (CP) |

# 930 KHZ

# REGIONAL



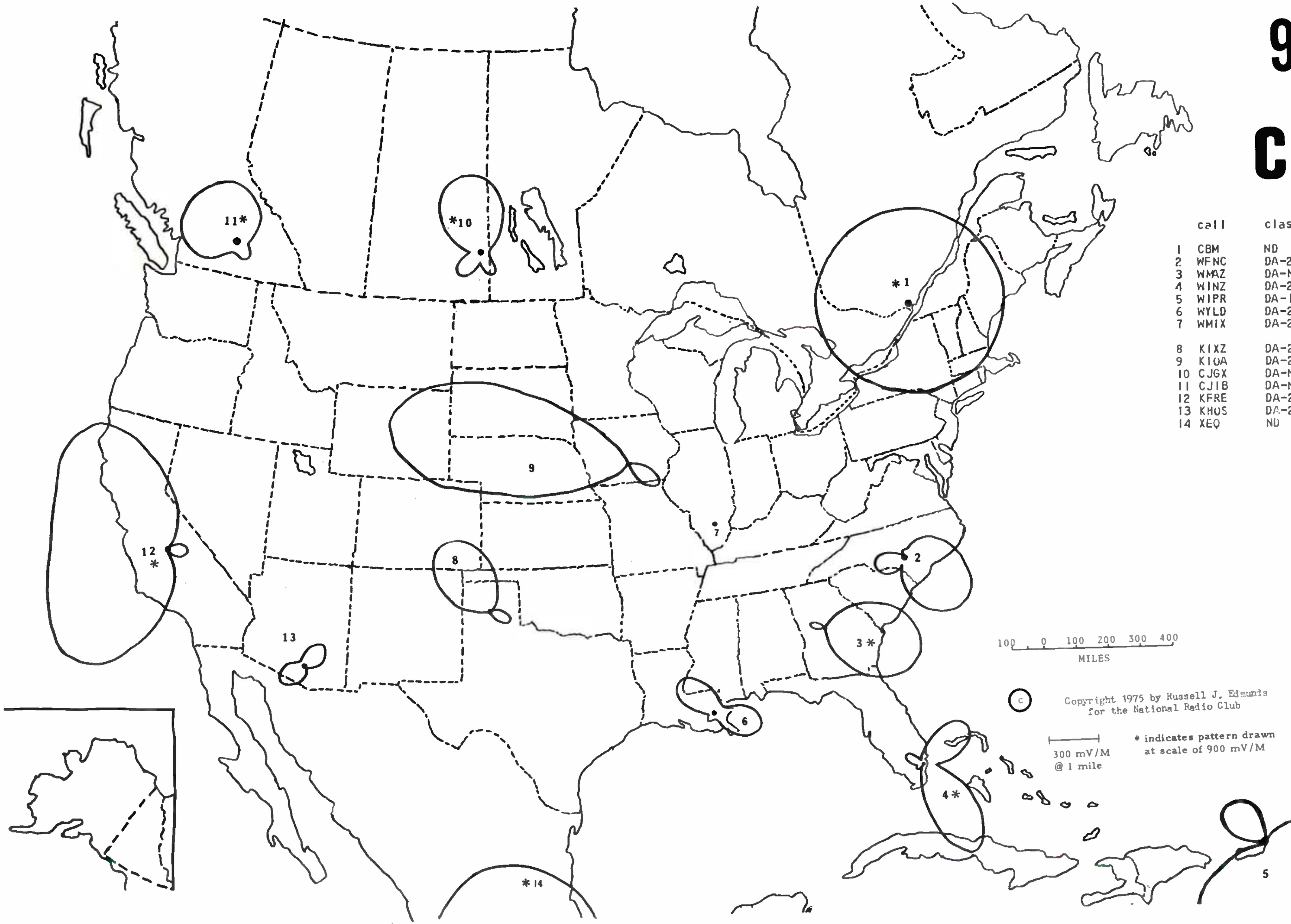



| | call | class | location |
|---|---|---|---|
| 1 | CJON | DA-2 | ST. JOHN'S |
| 2 | CFBC | DA-2 | ST. JOHN |
| 3 | WWNH | DA-N | ROCHESTER |
| 4 | WBEN | DA-N | BUFFALO |
| 5 | WPAT | DA-2 | PATERSON |
| 6 | WFMD | DA-2 | FREDERICK |
| 7 | WSOC | DA-N | CHARLOTTE |
| 8 | WITN | DA-N | WASHINGTON |
| 9 | WGNT | DA-N | HUNTINGTON |
| 10 | WJAX | DA-N | JACKSONVILLE |
| 11 | WKXY | DA-2 | SARASOTA |
| 12 | WMGR | DA-N | BAINBRIDGE |
| 13 | WSLI | DA-N | JACKSON |
| 14 | KWOC | DA-N | POPLAR BLUFF |
| 15 | WTAD | DA-N | QUINCY |
| 16 | WKCT | DA-N | BOWLING GREEN |
| 17 | WEOL | DA-2 | ELYRIA |
| 18 | WBCK | DA-2 | BATTLE CREEK |
| 19 | KSDN | DA-N | ABERDEEN |
| 20 | WKY | DA-N | OKLAHOMA CITY |
| 21 | KITE | DA-N | TERRELL HILLS |
| 22 | KOGA | DA-N | OGALLALA |
| 23 | KIUP | DA-N | DURANGO |
| 24 | KSEI | DA-N | POCATELLO |
| 25 | CJCA | DA-N | EDMONTON |
| 26 | KTKN | ND | KETCHIKAN |
| 27 | KAGI | DA-N | GRANTS PASS |
| 28 | KHJ | DA-N | LOS ANGELES |

# 940 KHZ

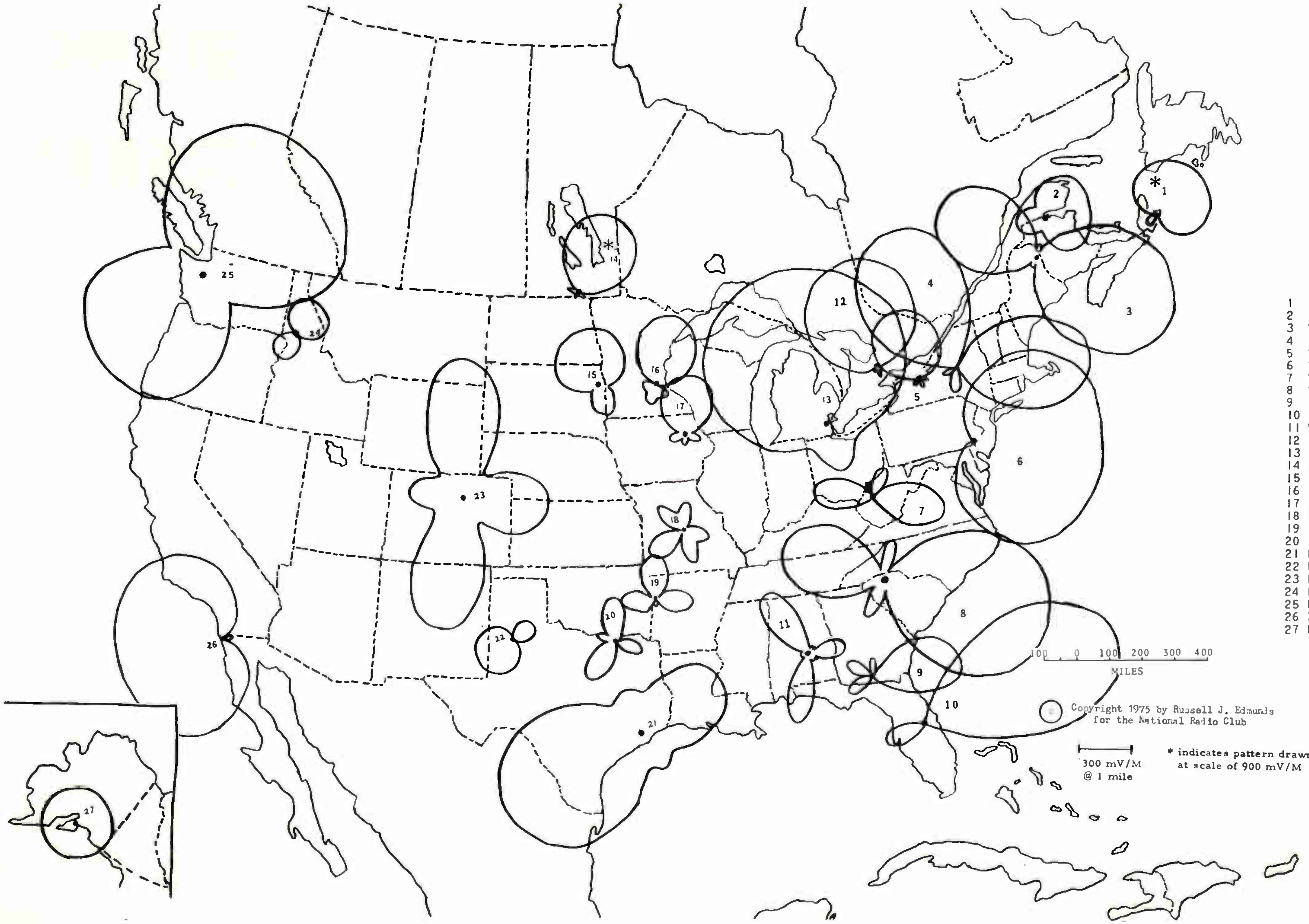
# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | CBM | ND | MONTREAL |
| 2 | WFNC | DA-2 | FAYETTEVILLE |
| 3 | WMAZ | DA-N | MACON |
| 4 | WINZ | DA-2 | MIAMI |
| 5 | WIPR | DA-1 | SAN JUAN |
| 6 | WYLD | DA-2 | NEW ORLEANS |
| 7 | WMIX | DA-2 | MOUNT VERNON (pattern not available) |
| 8 | KIXZ | DA-2 | AMARILLO |
| 9 | KIOA | DA-2 | DES MOINES |
| 10 | CJGX | DA-N | YORKTON |
| 11 | CJIB | DA-N | VERNON |
| 12 | KFRE | DA-2 | FRESNO |
| 13 | KHOS | DA-2 | TUSCON |
| 14 | XEQ | ND | MEXICO, DF |



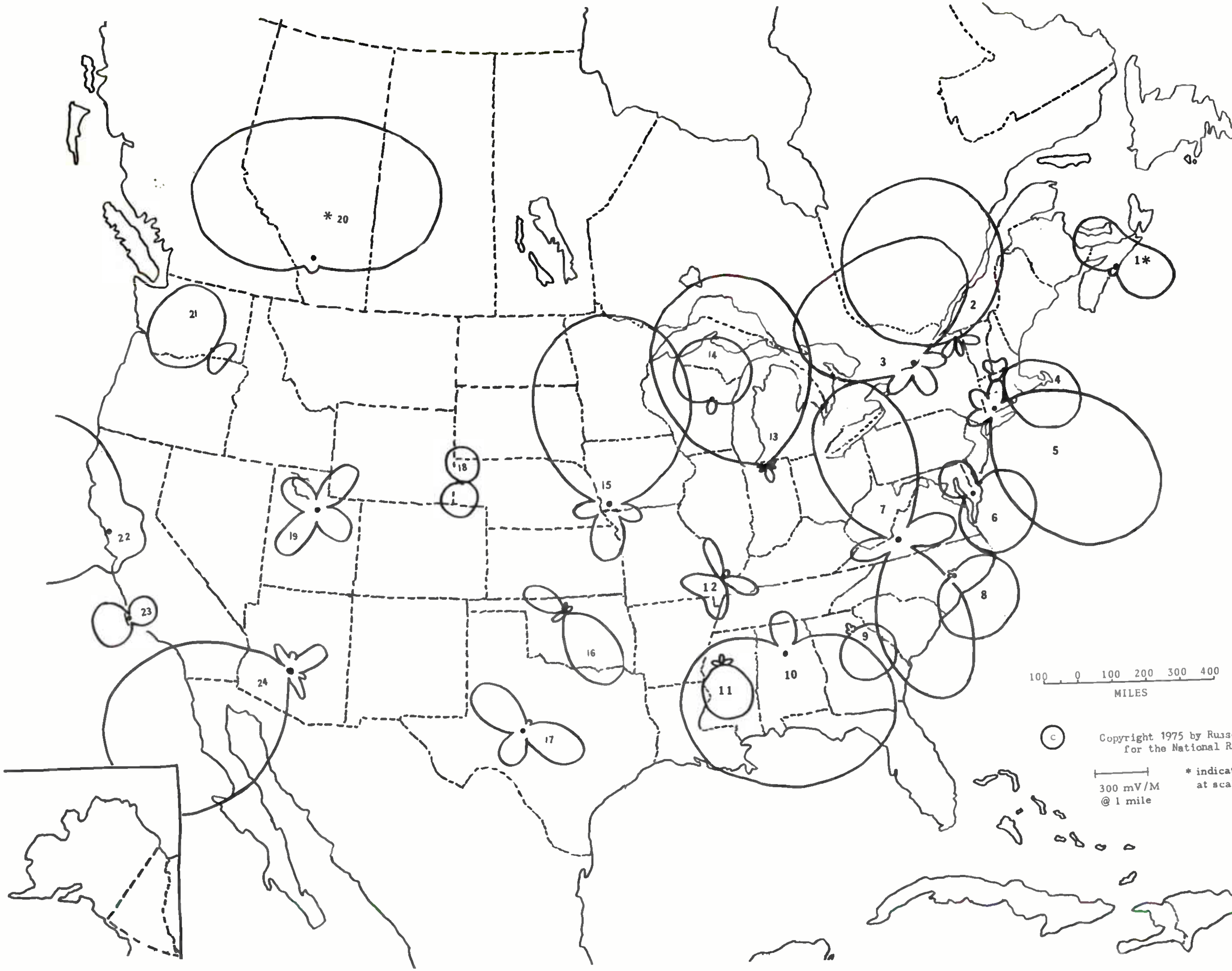
# 950 KHZ

# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CHER | DA-1 | SIDNEY |
| 2 | CKNB | DA-2 | CAMPBELLTON |
| 3 | WAGM | DA-2 | PRESQUE ISLE |
| 4 | WIBX | DA-1 | UTICA |
| 5 | WBBF | DA-2 | ROCHESTER |
| 6 | WPEN | DA-N | PHILADELPHIA |
| 7 | WKAZ | DA-N | CHARLESTON |
| 8 | WSPA | DA-N | SPARTANBURG |
| 9 | WGOV | DA-N | VALDOSTA |
| 10 | WLOF | DA-N | ORLANDO |
| 11 | WRMA | DA-N | MONTGOMERY |
| 12 | CKBB | DA-2 | BARRIE |
| 13 | WWJ | DA-N | DETROIT |
| 14 | CFAM | DA-2 | ALTONA |
| 15 | KWAT | DA-N | WATERTOWN |
| 16 | KRSI | DA-2 | ST. LOUIS PARK |
| 17 | KOEL | DA-2 | OELWEIN |
| 18 | KLIK | DA-N | JEFFERSON CITY |
| 19 | KFSA | DA-N | FORT SMITH |
| 20 | KDSX | DA-2 | DENISON-SHERMAN |
| 21 | KPRC | DA-N | HOUSTON |
| 22 | KSEL | DA-2 | LUBBOCK |
| 23 | KIMN | DA-1 | DENVER |
| 24 | KLER | DA-N | OROFINO |
| 25 | KJR | DA-N | SEATTLE |
| 26 | XEGM | DA-2 | TIJUANA |
| 27 | KRXA | ND | SEWARD |

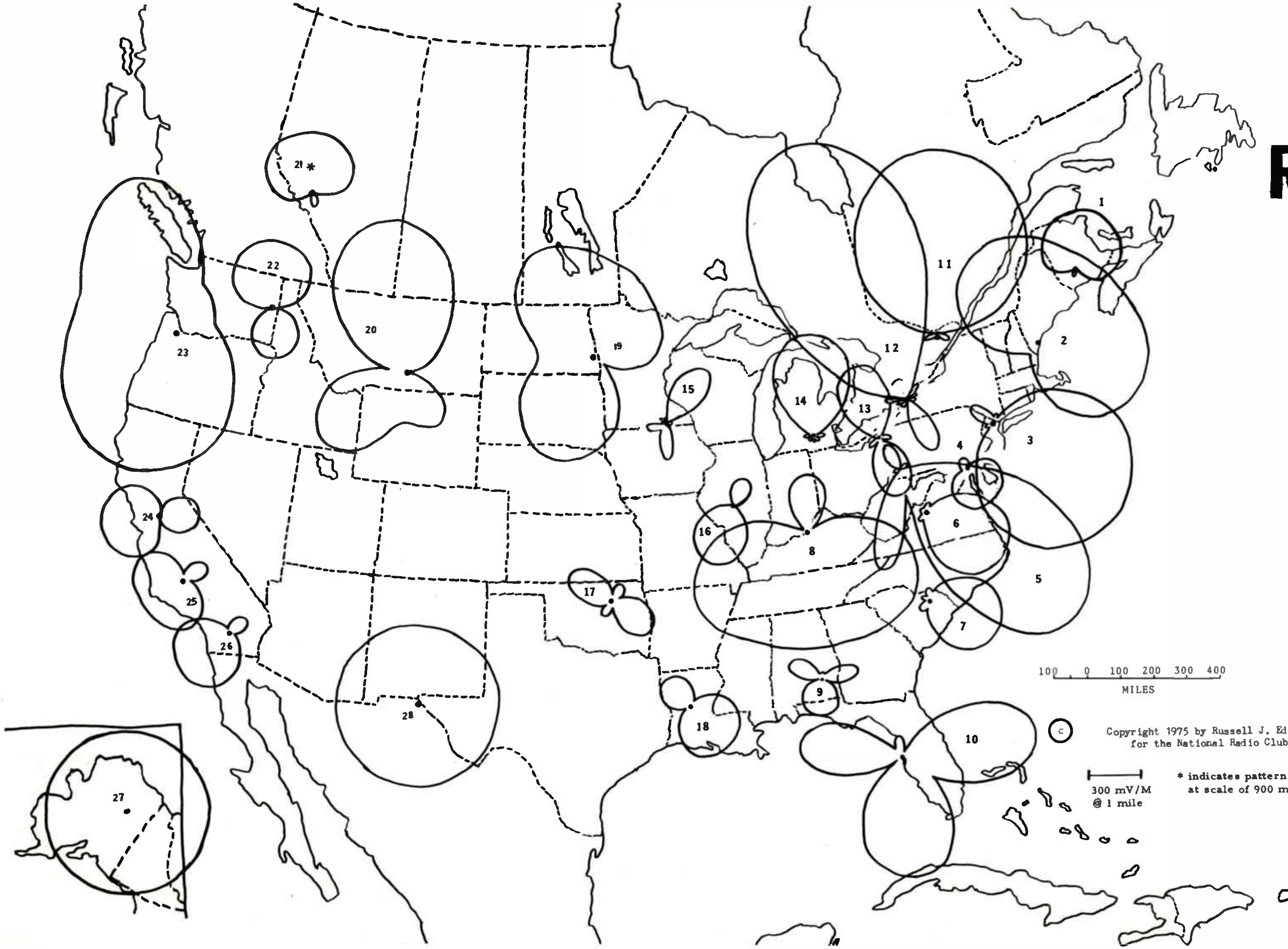
# 960 KHZ REGIONAL




| | CALL | CLASS | LOCATION |
|---|---|---|---|
| 1 | CHNS | DA-N | HALIFAX |
| 2 | WEAV | DA-2 | PLATTSBURG |
| 3 | CKWS | DA-2 | KINGSTON |
| 4 | WFGL | DA-2 | FITCHBURG |
| 5 | WELI | DA-N | NEW HAVEN |
| 6 | WBOC | DA-2 | SALISBURY |
| 7 | WFIR | DA-N | ROANOKE |
| 8 | WFTC | DA-N | KINSTON |
| 9 | WRFC | DA-N | ATHENS |
| 10 | WERC | DA-N | BIRMINGHAM |
| 11 | WABG | DA-N | GREENWOOD |
| 12 | KFVS | DA-N | CAPE GIRARDEAU |
| 13 | WSBT | DA-2 | SOUTH BEND |
| 14 | WTCH | DA-N | SHAWANO |
| 15 | KMA | DA-N | SHENANDOAH |
| 16 | KGWA | DA-1 | ENID |
| 17 | KGKL | DA-N | SAN ANGELO |
| 18 | KNED | DA-2 | SCOTTSBLUFF |
| 19 | KOVO | DA-N | PROVO |
| 20 | CFAC | DA-N | CALGARY |
| 21 | KALE | DA-N | RICHLAND |
| 22 | KABL | DA-1 | OAKLAND |
| 23 | KNEZ | DA-N | LOMPOC |
| 24 | KOOL | DA-N | PHOENIX |

# 970 KHZ

# REGIONAL



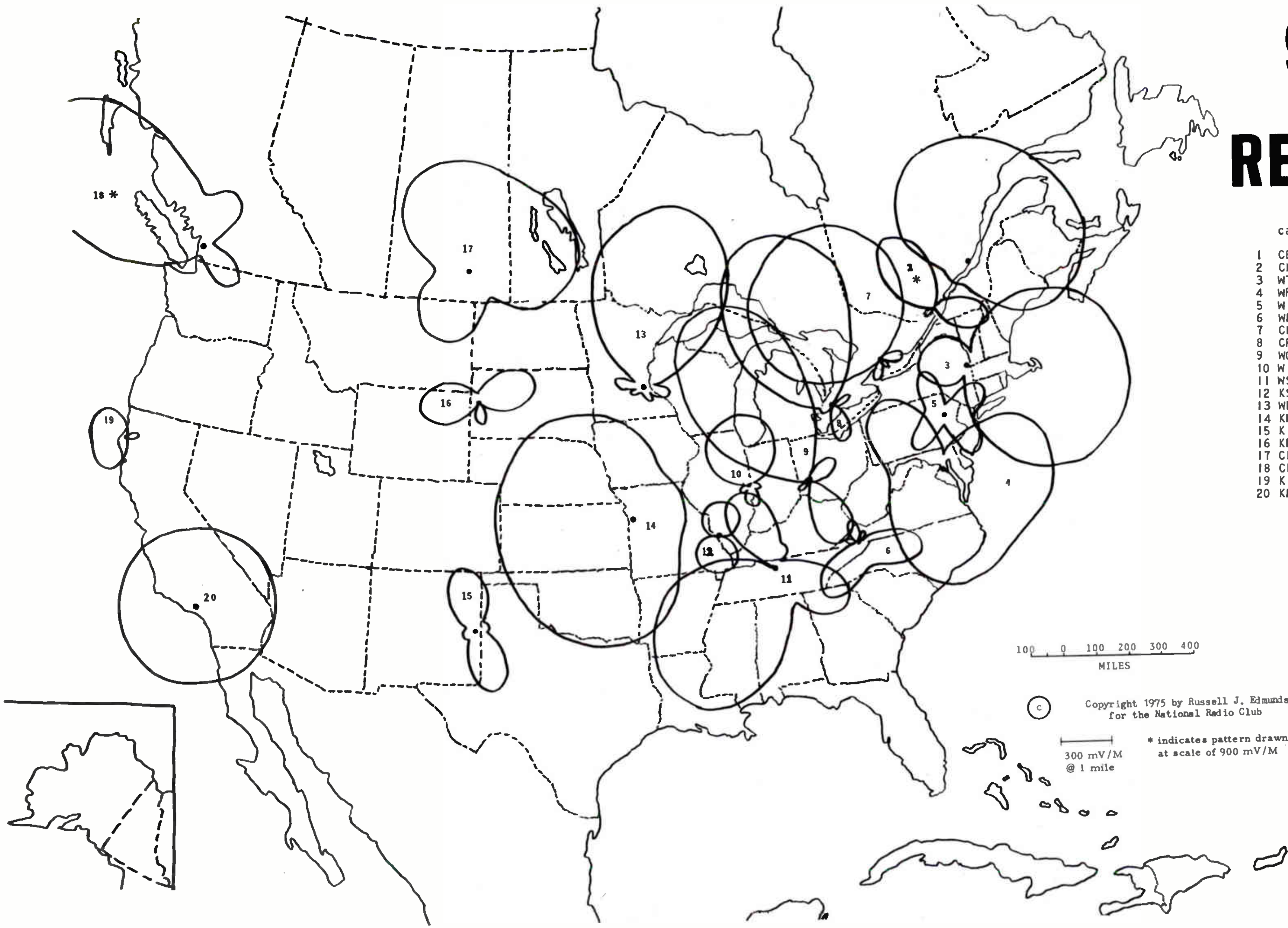



| | call | class | location |
|---|---|---|---|
| 1 | CBZ | DA-N | FREDERICKTON |
| 2 | WCHS | DA-N | PORTLAND |
| 3 | WWDJ | DA-2 | HACKENSACK |
| 4 | WAMD | DA-2 | ABERDEEN |
| 5 | WWSW | DA-2 | PITTSBURGH |
| 6 | WANV | DA-2 | WAYNESBORO |
| 7 | WJMX | DA-n | FLORENCE |
| 8 | WAVE | DA-2 | LOUISVILLE |
| 9 | WTBF | DA-N | TROY |
| 10 | WFLA | DA-N | TAMPA |
| 11 | CKCH | DA-1 | HULL |
| 12 | WEBR | DA-1 | BUFFALO |
| 13 | WREO | DA-2 | ASHTABULA |
| 14 | WKHM | DA-2 | JACKSON |
| 15 | KQAQ | DA-2 | AUSTIN |
| 16 | WMAY | DA-2 | SPRINGFIELD |
| 17 | KAKC | DA-2 | TULSA |
| 18 | KSYL | DA-N | ALEXANDRIA |
| 19 | WDAY | DA-N | FARGO |
| 20 | KOOK | DA-N | BULLINGS |
| 21 | CJYR | DA-1 | EDSON |
| 22 | KREM | DA-N | SPOKANE |
| 23 | KOIN | DA-N | PORTLAND |
| 24 | XBEE | DA-2 | MODESTO |
| 25 | KBIS | DA-2 | BAKERSFIELD |
| 26 | KCHV | DA-2 | COACHELLA |
| 27 | KIAK | ND | FAIRBANKS |
| 28 | XEJ | ND | CD. JUAREZ |

# 980 KHZ

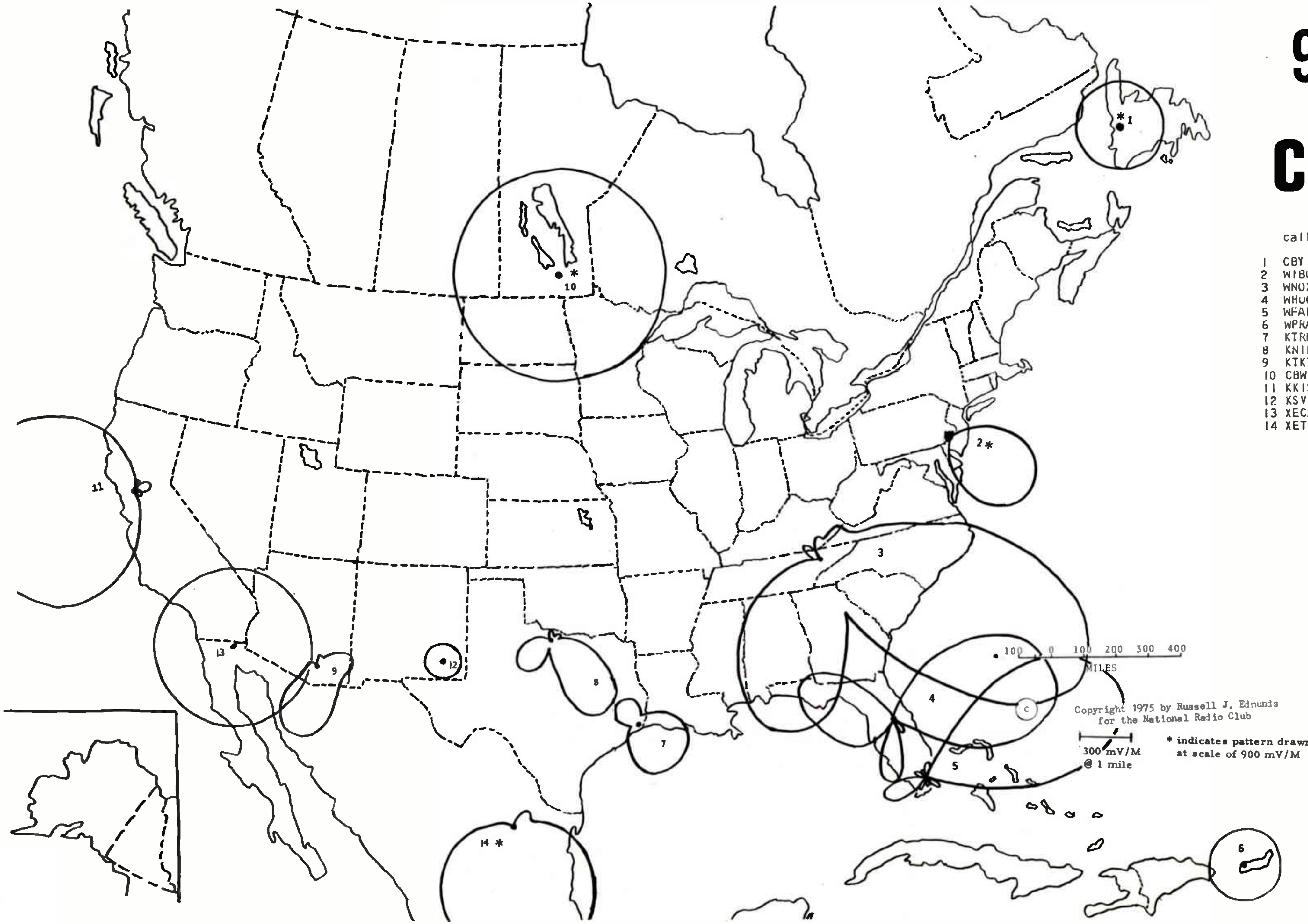
# REGIONAL

| | call | class | location |
|---|---|---|---|
| 1 | CBV | DA-1 | QUEBEC |
| 2 | CKGM | DA-1 | MONTREAL |
| 3 | WTRY | DA-1 | TROY |
| 4 | WRC | DA-N | WASHINGTON |
| 5 | WILK | DA-N | WILKES-BARRE |
| 6 | WFHG | DA-N | BRISTOL |
| 7 | CHEX | DA-2 | PETERBOROUGH |
| 8 | CFPL | DA-2 | LONDON |
| 9 | WONE | DA-N | DAYTON |
| 10 | WITY | DA-2 | DANVILLE |
| 11 | WSIX | DA-N | NASHVILLE |
| 12 | KSGM | DA-N | CHESTER |
| 13 | WPBC | DA-1 | RICHFIELD |
| 14 | KMBZ | DA-N | KANSAS CITY |
| 15 | KICA | DA-N | CLOVIS |
| 16 | KDSJ | DA-N | DEADWOOD |
| 17 | CKRM | DA-2 | REGINA |
| 18 | CKNW | DA-1 | NEW WESTMINSTER |
| 19 | KINS | DA-N | EUREKA |
| 20 | KFWB | ND | LOS ANGELES |



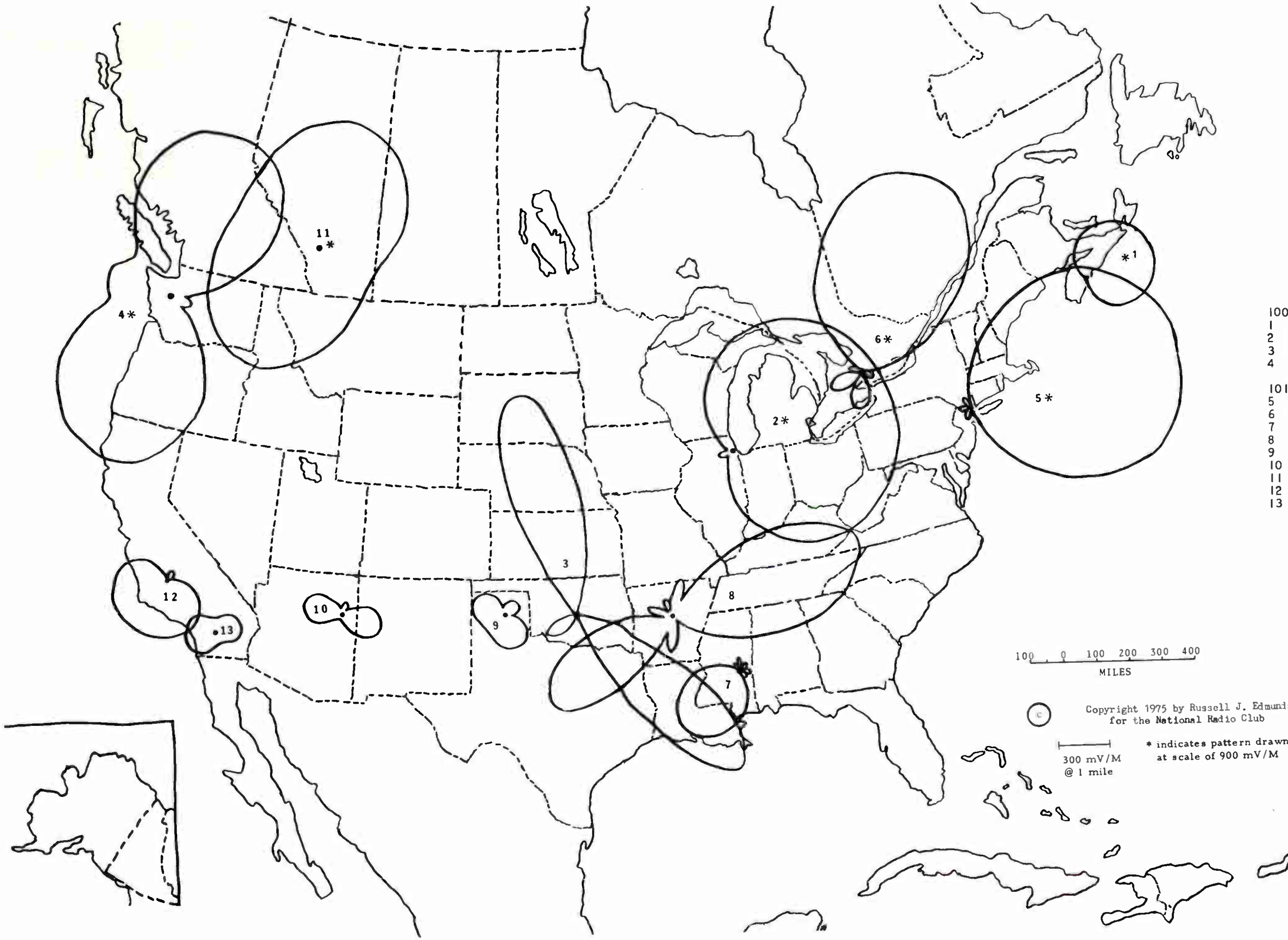
# 990 KHZ

# CLEAR




| | call | class | location |
|---|---|---|---|
| 1 | CBY | ND | CORNERBROOK |
| 2 | WIBG | DA-2 | PHILADELPHIA |
| 3 | WNOX | DA-N | KNOXVILLE |
| 4 | WHOO | DA-2 | ORLANDO |
| 5 | WFAB | DA-1 | MIAMI |
| 6 | WPRA | ND | MAYAGUEZ |
| 7 | KTRM | DA-1 | BEAUMONT |
| 8 | KNIN | DA-2 | WICHITA FALLS |
| 9 | KTKT | DA-2 | TUCSON |
| 10 | CBW | ND | WINNIPEG |
| 11 | KKIS | DA-2 | PITTSBURG |
| 12 | KSVP | ND | ARTESIA |
| 13 | XECL | ND | MEXICALI |
| 14 | XET | DA-N | MONTERREY |

# 1000 1010 KHZ CLEAR



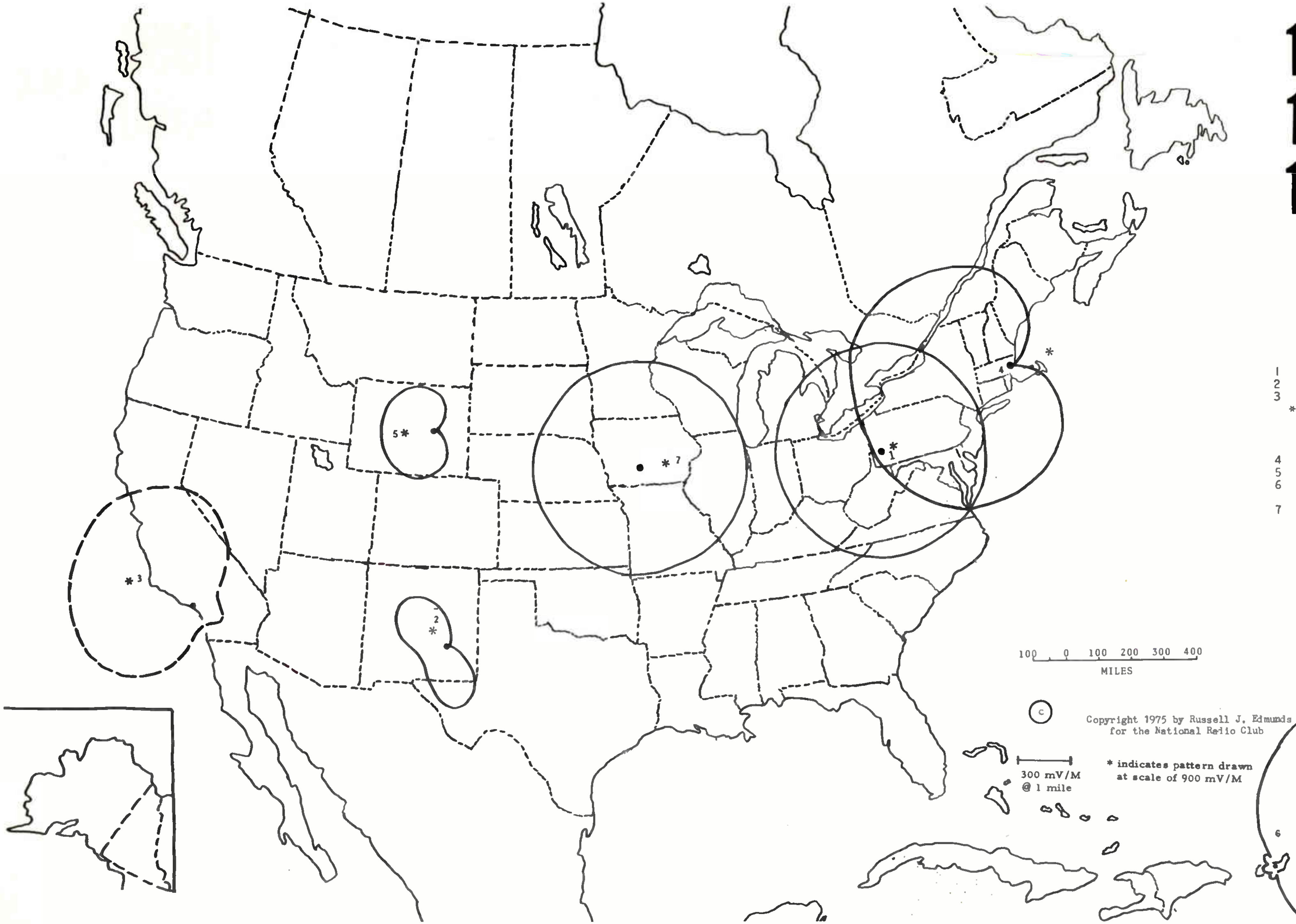

| | CALL | CLASS | LOCATION |
|---|---|---|---|
| 1000: | | | |
| 1 | CKBW | DA-N | BRIDGEWATER |
| 2 | WCFL | DA-2 | CHICAGO |
| 3 | KTOK | DA-2 | OKLAHOMA CITY |
| 4 | KOMO | DA-N | SEATTLE |
| 1010: | | | |
| 5 | WINS | DA-1 | NEW YORK |
| 6 | CFRB | DA-2 | TORONTO |
| 7 | WMOX | DA-2 | MERIDIAN |
| 8 | KLRA | DA-N | LITTLE ROCK |
| 9 | KDJW | DA-1 | AMARILLO |
| 10 | KVNC | DA-1 | WINSLOW |
| 11 | CBR | DA-2 | CALGARY |
| 12 | KCHJ | DA-2 | DELANO |
| 13 | KCMJ | DA-2 | PALM SPRINGS |

# 1020 1030 1040 KHZ CLEAR

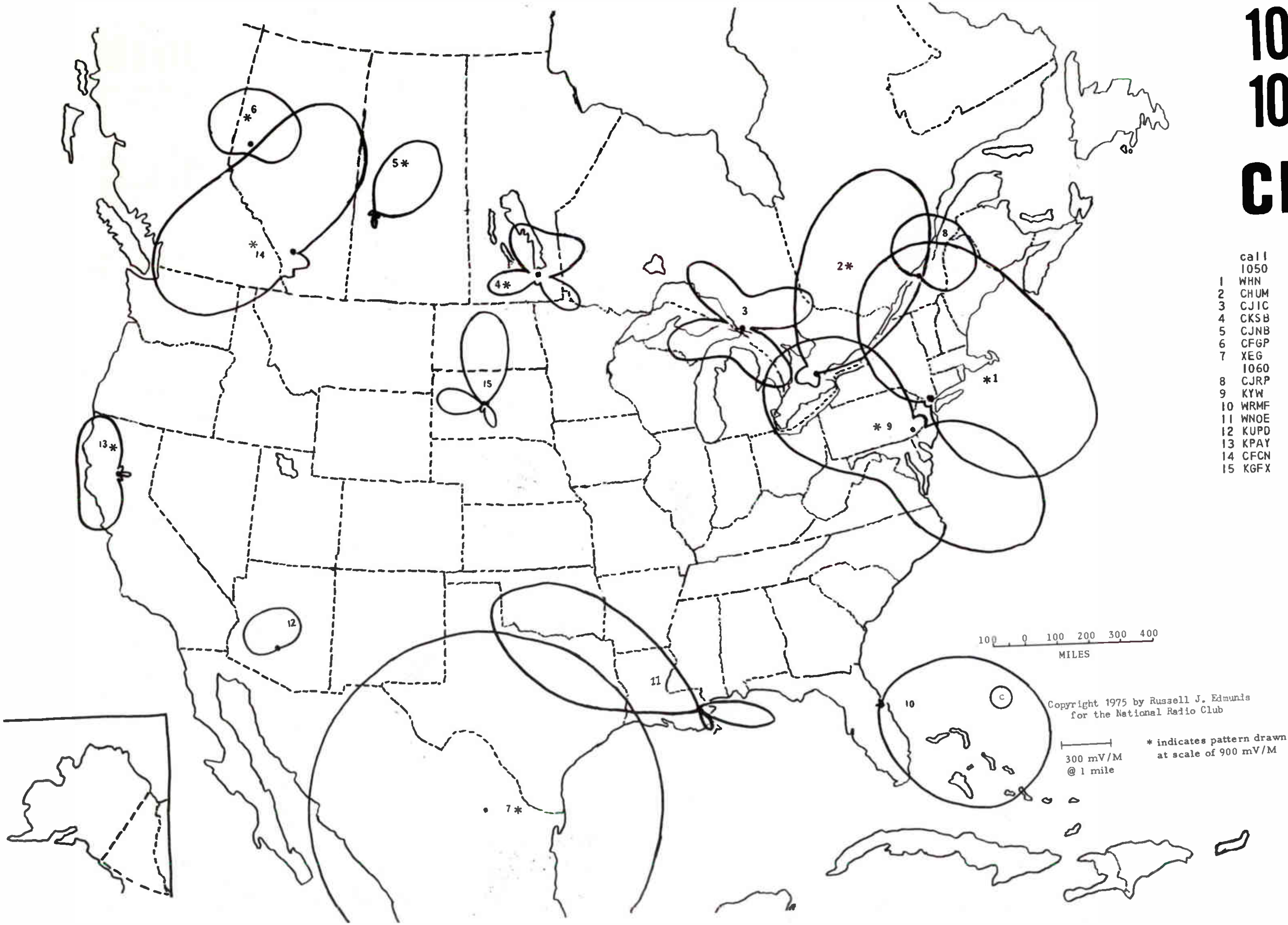
| | call | class | location |
|---|---|---|---|
| | 1020 | | |
| 1 | KDKA | ND | PITTSBURGH |
| 2 | KBCQ | DA-2 | ROSWELL |
| 3 | KGBS | DA-1 | LOS ANGELES (L*) |

*(KGBS granted full time when KBCQ changed night DA. oresent patterns shown)

| | call | class | location |
|---|---|---|---|
| | 1030 | | |
| 4 | WBZ | DA-1 | BOSTON |
| 5 | KTWO | DA-N | CASPER |
| 6 | W___ | DA-1 | SAN JUAN |
| | 1040 | | |
| 7 | WHO | ND | DES MOINES |



# 1050 1060 KHZ CLEAR

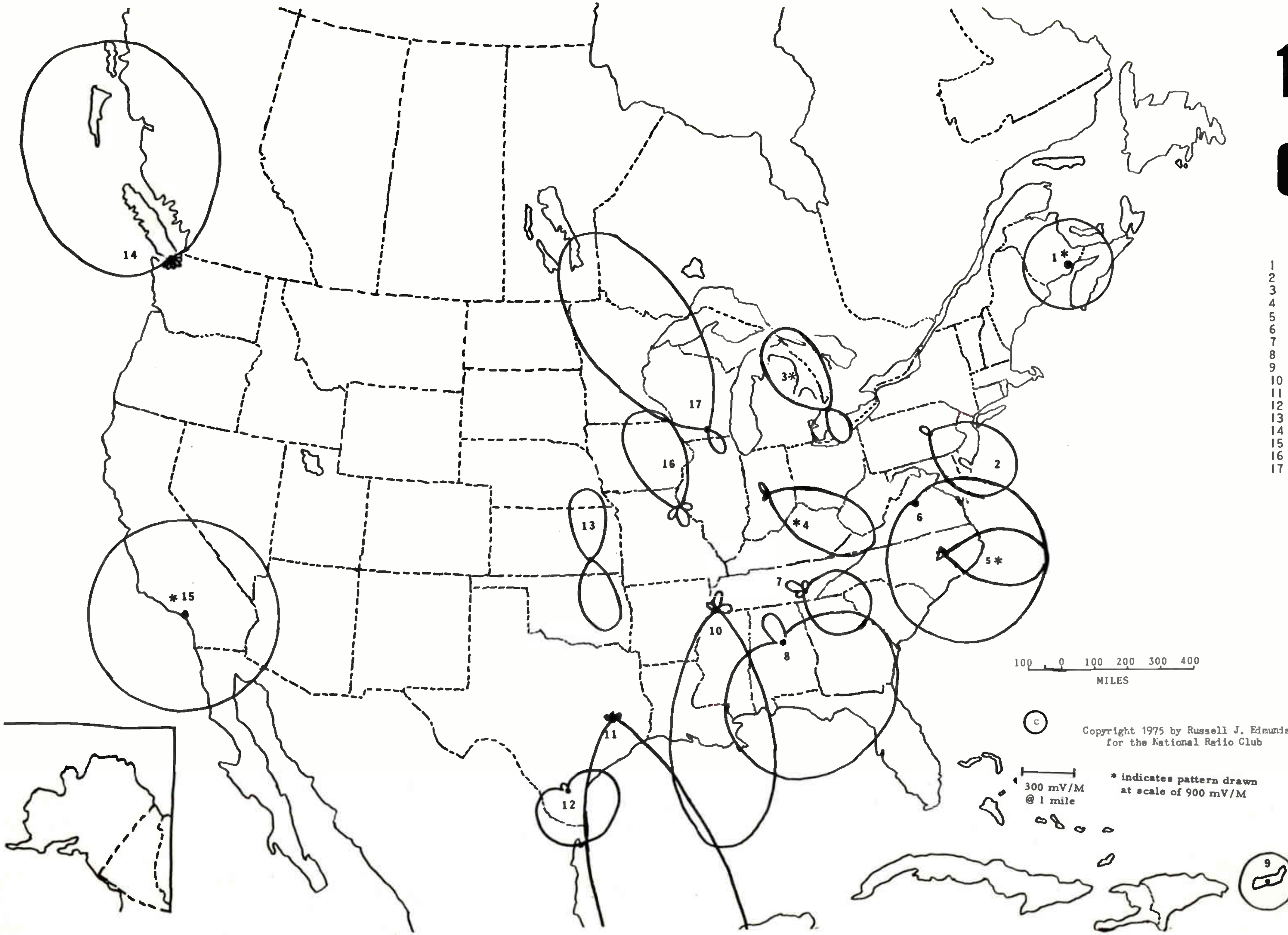




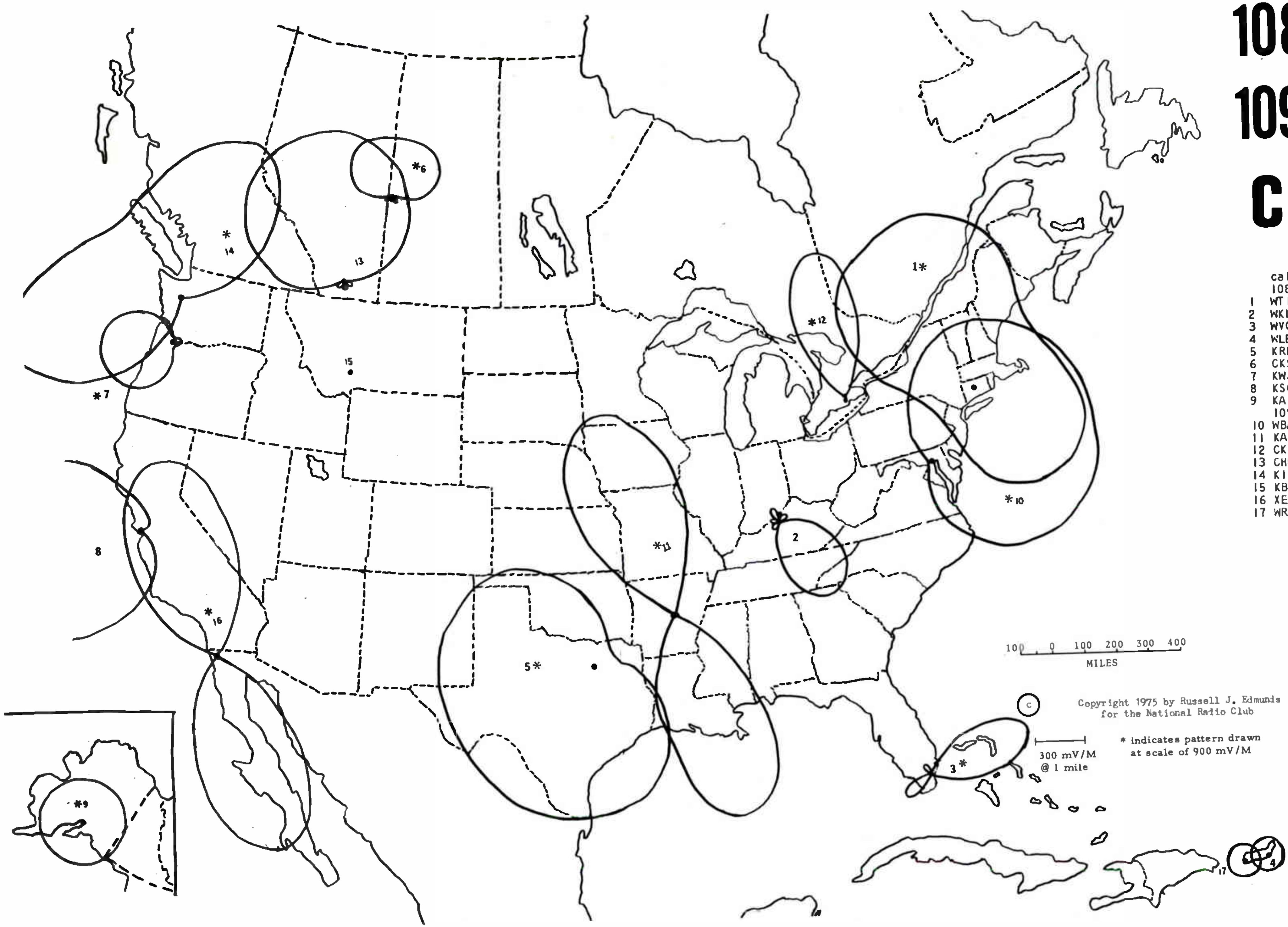
| | call | class | location |
|---|---|---|---|
| | 1050 | | |
| 1 | WHN | DA-1 | NEW YORK |
| 2 | CHUM | DA-2 | TORONTO |
| 3 | CJIC | DA-N | SAULT STE. MARIE |
| 4 | CKSB | DA-N | WINNIPEG |
| 5 | CJNB | DA-N | N. BATTLEFORD |
| 6 | CFGP | DA-1 | GRANDE PRAIRIE |
| 7 | XEG | ND | MONTERREY |
| | 1060 | | |
| 8 | CJRP | DA-2 | QUEBEC |
| 9 | KYW | DA-1 | PHILADELPHIA |
| 10 | WRMF | DA-2 | TITUSVILLE |
| 11 | WNOE | DA-2 | NEW ORLEANS |
| 12 | KUPD | DA-1 | TEMPE |
| 13 | KPAY | DA-N | CHICO |
| 14 | CFCN | DA-2 | CALGARY |
| 15 | KGFX | DA-2 | PIERRE |

# 1070 KHZ
# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | CBA | ND | MONCTON |
| 2 | WKOK | DA-N | SUNBURY |
| 3 | CHOK | DA-2 | SARNIA |
| 4 | WIBC | DA-2 | INDIANAPOLIS |
| 5 | WNCT | DA-2 | GREENVILLE |
| 6 | WINA | DA-N | CHARLOTTESVILLE |
| 7 | WFLI | DA-2 | LOOKOUT MOUNTAIN |
| 8 | WAPI | DA-N | BIRMINGHAM |
| 9 | WMIA | ND | ARECIBO |
| 10 | WDIA | DA-2 | MEMPHIS |
| 11 | KENR | DA-2 | HOUSTON |
| 12 | KOPY | DA-N | ALICE |
| 13 | KFDI | DA-n | WICHITA |
| 14 | CFAX | DA-1 | VICTORIA |
| 15 | KNX | ND | LOS ANGELES |
| 16 | KHMO | DA-2 | HANNIBAL |
| 17 | WTSO | DA-2 | MADISON |



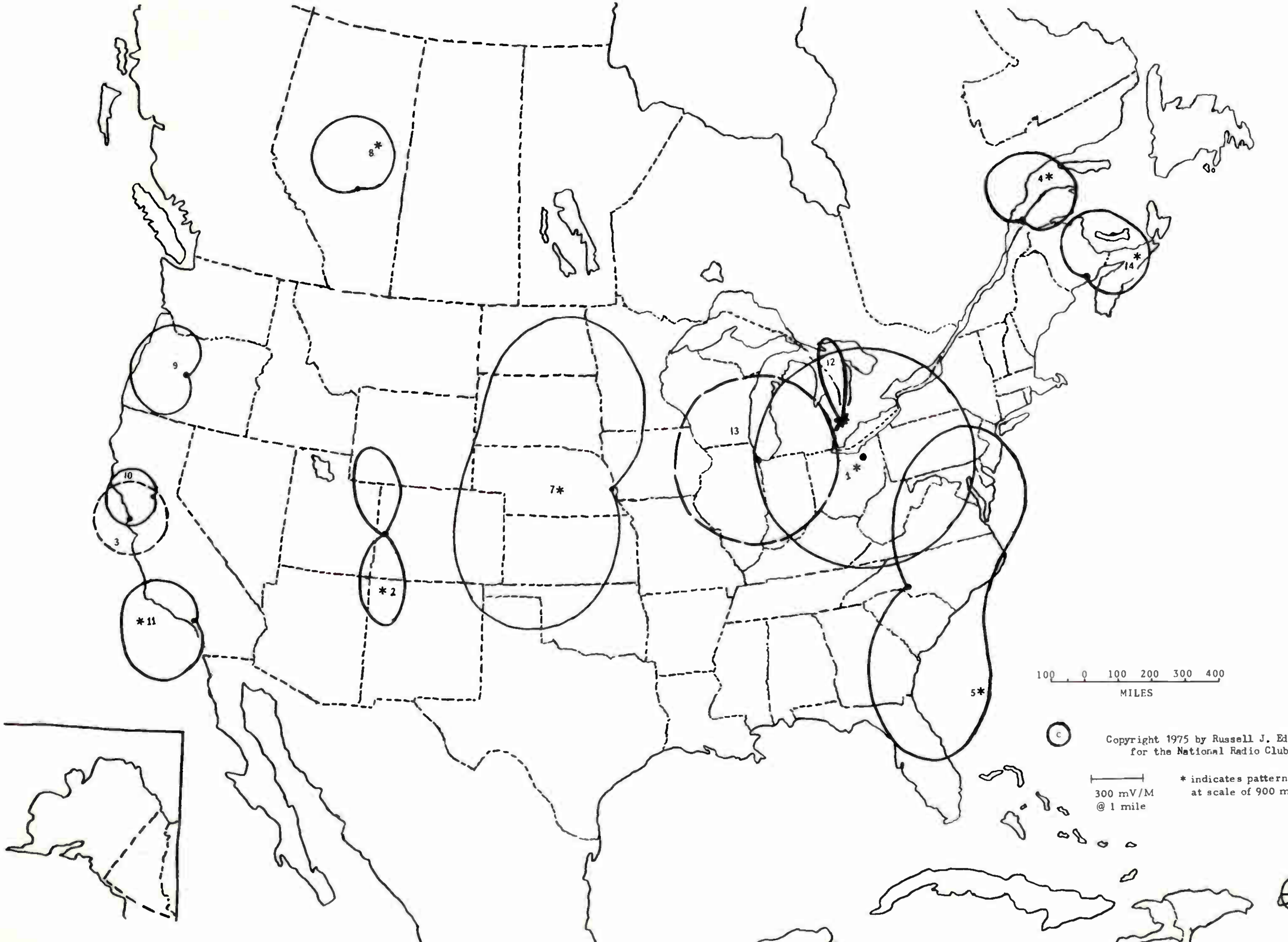
# 1080 1090 KHZ CLEAR




| | call | class | location |
|---|---|---|---|
| | 1080 | | |
| 1 | WTIC | DA-N | HARTFORD |
| 2 | WKLO | DA-2 | LOUISVILLE |
| 3 | WVCG | DA-2 | CORAL GABLES |
| 4 | WLEY | ND | CAYEY |
| 5 | KRLD | DA-N | DALLAS |
| 6 | CKSA | DA-N | LLOYDMINSTER |
| 7 | KWJJ | DA-1 | PORTLAND |
| 8 | KSCO | DA-N | SANTA CRUZ |
| 9 | KANC | ND | ANCHORAGE |
| | 1090 | | |
| 10 | WBAL | DA-N | BALTIMORE |
| 11 | KAAY | DA-N | LITTLE ROCK |
| 12 | CKKW | DA-2 | KITCHENER |
| 13 | CHEC | DA-2 | LETHBRIDGE |
| 14 | KING | DA-2 | SEATTLE |
| 15 | KBOZ | DA-2 | BOZEMAN |
| 16 | XEPRS | DA-N | ROSARITA BEACH |
| 17 | WRSG | ND | SAN GERMAN |

# 1100 1110 KHZ

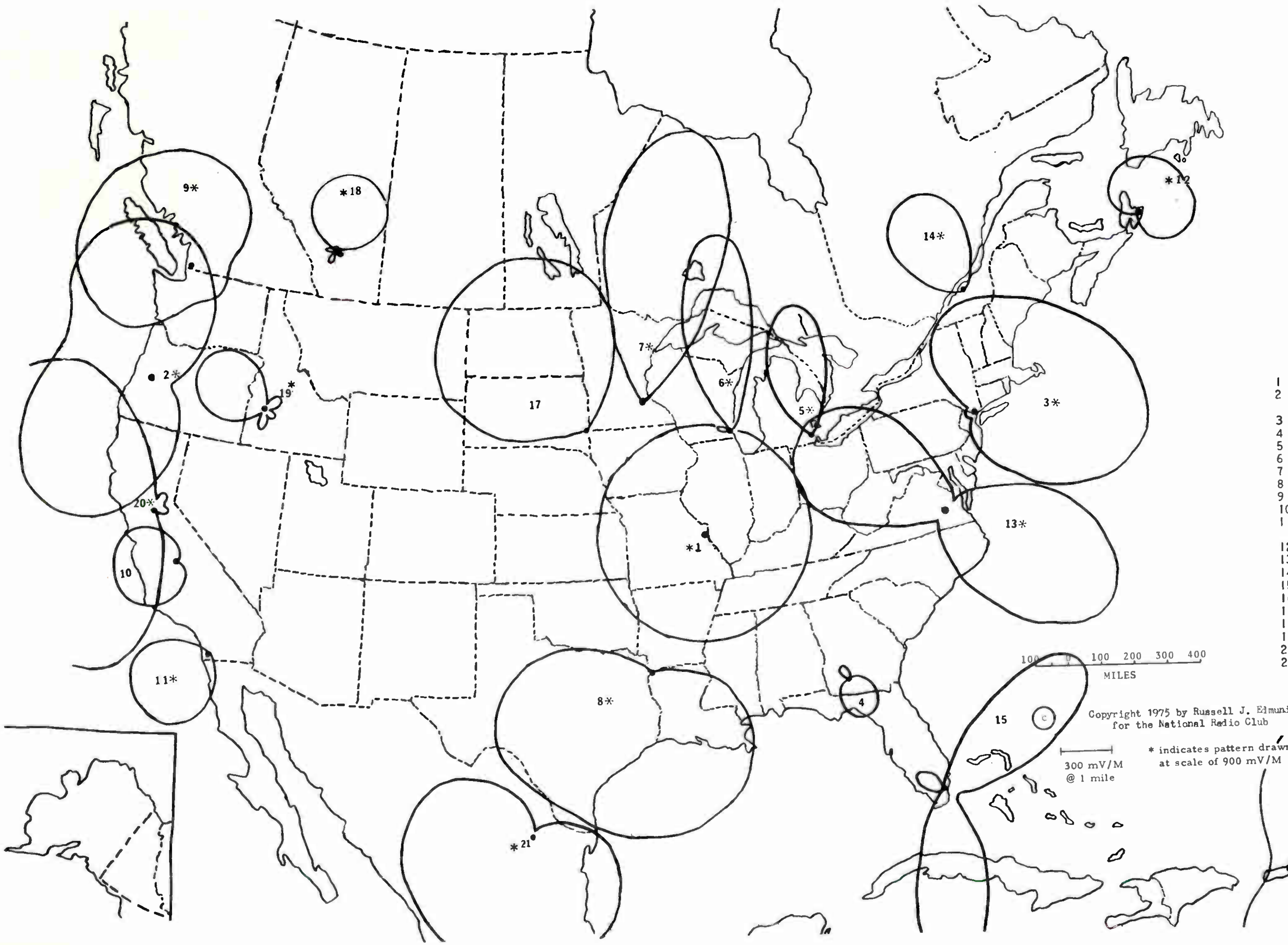
# CLEAR






| | call | class | location |
|---|---|---|---|
| | 1100 | | |
| 1 | WWWE | ND | CLEVELAND |
| 2 | KREX | DA-N | GRAND JUNCTION |
| 3 | KFAX | ND | SAN FRANCISCO (L) |
| | (KFAX operated 1000 watts ND during WWWE silent period) | | |
| | 1110 | | |
| 4 | C___ | DA-2 | RIMOUSKI |
| 5 | WBT | DA-N | CHARLOTTE |
| 6 | WVJP | ND | CAGUAS |
| 7 | KFAB | DA-N | OMAHA |
| 8 | CHQT | DA-N | EDMONTON |
| 9 | KBND | DA-2 | BEND |
| 10 | KPOP | DA-N | ROSEVILLE |
| 11 | KRLA | DA-2 | PASADENA |
| 12 | CKJD | DA-2 | SARNIA (po 1250) |
| 13 | WMBI | ND | CHICAGO (L) |
| 14 | CBD | DA-2 | ST. JOHN'S |

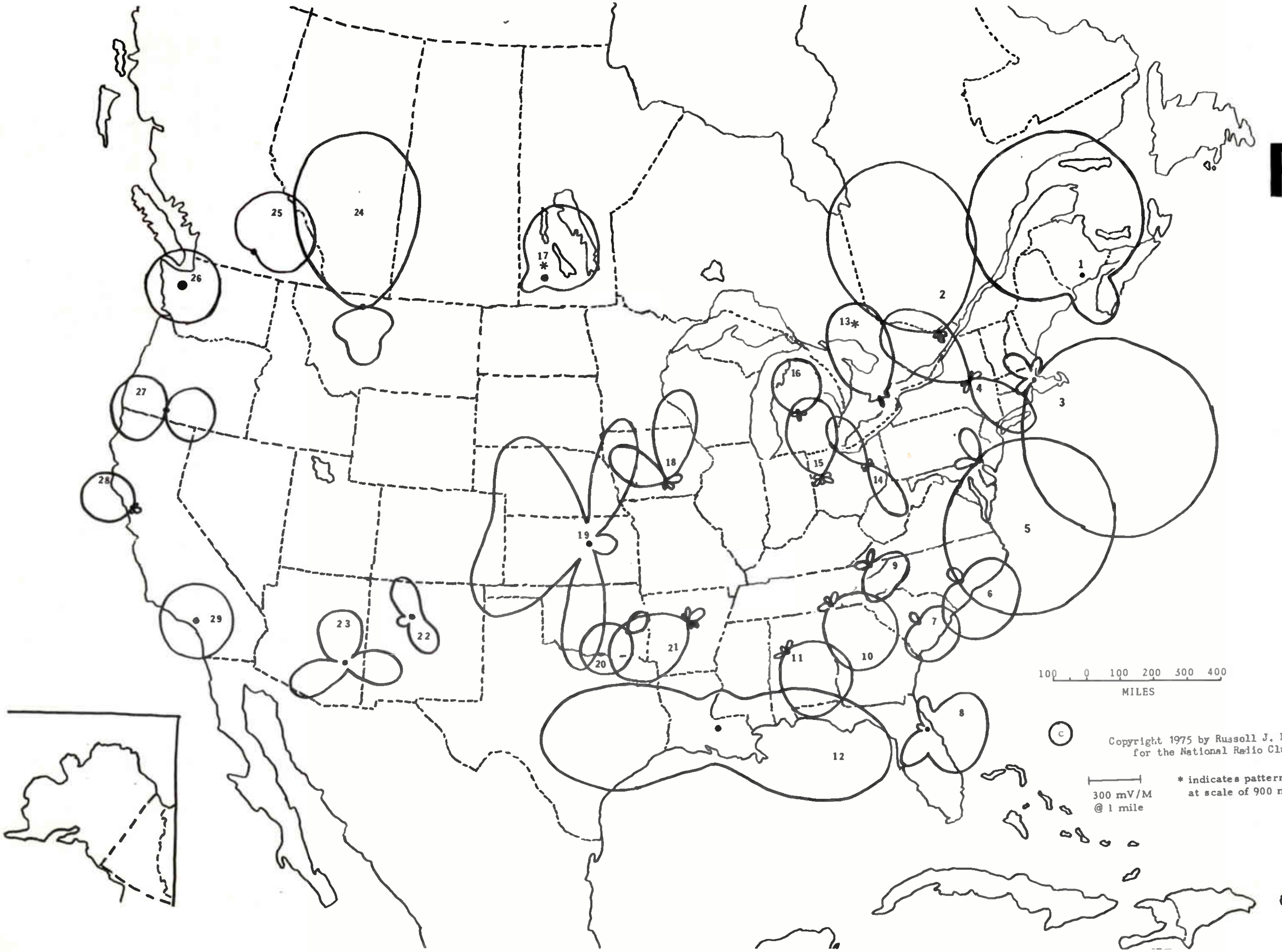
# 1120 1130 1140 KHZ CLEAR




| | call | class | location |
|---|---|---|---|
| | 1120 | | |
| 1 | KMOX | ND | ST. LOUIS |
| 2 | KPNW | DA-2 | EUGENE |
| | 1130 | | |
| 3 | WNEW | DA-N | NEW YORK |
| 4 | WMGA | DA-N | MOULTRIE |
| 5 | WCAR | DA-2 | DETROIT |
| 6 | WISN | DA-2 | MILWAUKEE |
| 7 | WDGY | DA-2 | MINNEAPOLIS |
| 8 | KWKH | DA-N | SHREVEPORT |
| 9 | CKWX | DA-N | VANCOUVER |
| 10 | KRDU | DA-1 | DINUBA |
| 11 | KSDO | DA-2 | SAN DIEGO |
| | 1140 | | |
| 12 | CBI | DA-N | SIDNEY |
| 13 | WRVA | DA-1 | RICHMOND |
| 14 | CJTR | DA-2 | THREE RIVERS |
| 15 | WQBA | DA-2 | MIAMI |
| 16 | WQII | DA-1 | SAN JUAN |
| 17 | KSOO | DA-N | SIOUX FALLS |
| 18 | CKXL | DA-2 | CALGARY |
| 19 | KGEM | DA-1 | BOISE |
| 20 | KRAK | DA-1 | SACRAMENTO |
| 21 | XEMR | DA-N | MONTERREY |

# 1150 KHZ

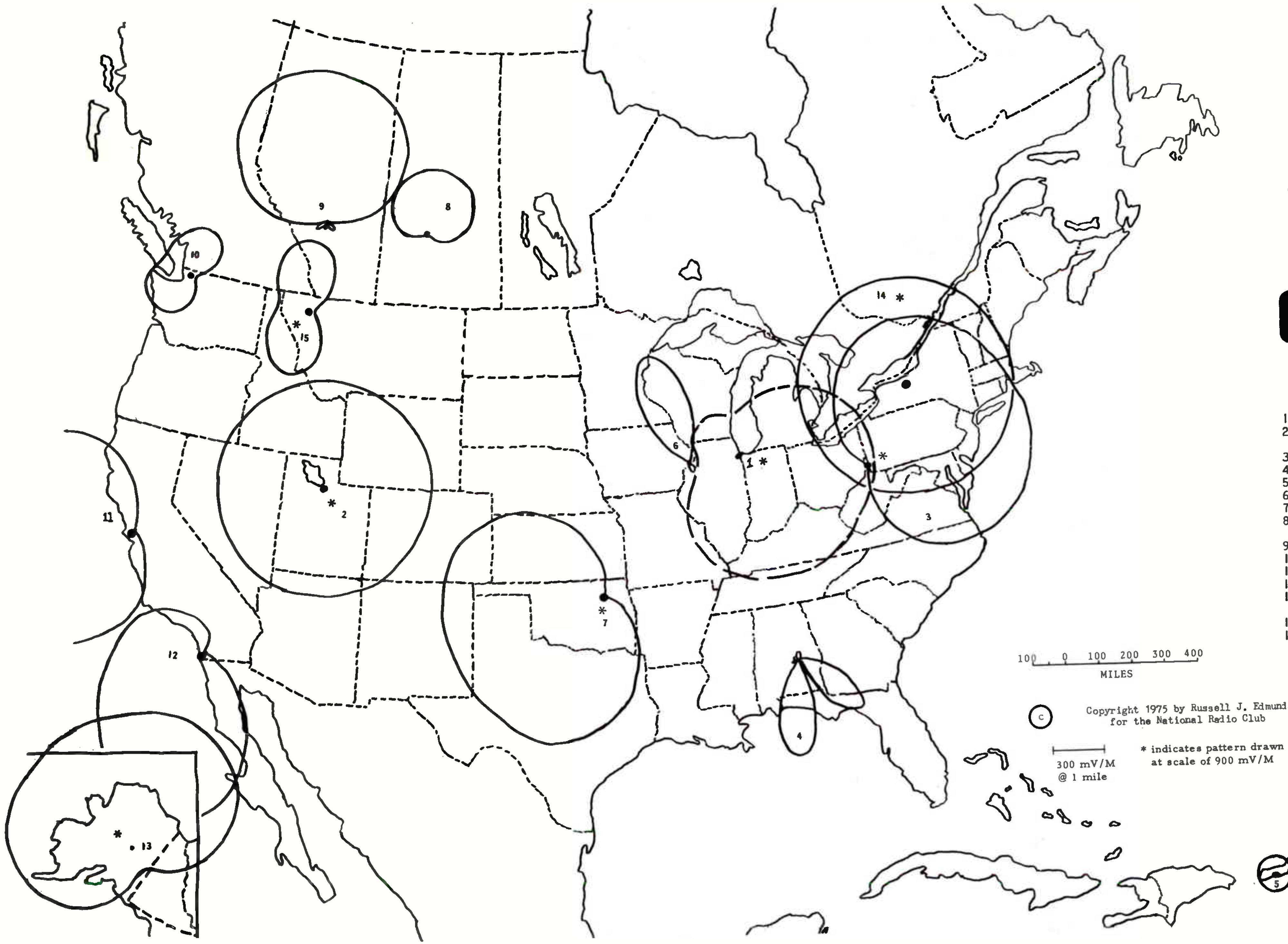
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CHSJ | DA-2 | ST. JOHN |
| 2 | CJRC | DA-2 | OTTAWA |
| 3 | WCOP | DA-2 | BOSTON |
| 4 | WRUN | DA-2 | UTICA |
| 5 | WDEL | DA-2 | WILMINGTON |
| 6 | WGBR | DA-2 | GOLDSBORO |
| 7 | WDIX | DA-2 | ORANGEBURG |
| 8 | WNDB | DA-N | DAYTONA BEACH |
| 9 | WCRK | DA-N | MORRISTOWN |
| 10 | WGOW | DA-N | CHATTANOOGA |
| 11 | WJRD | DA-N | TUSCALOOSA |
| 12 | WJBO | DA-1 | BATON ROUGE |
| 13 | CKOC | DA-2 | HAMILTON |
| 14 | WCUE | DA-2 | CUYAHOGA FALLS |
| 15 | WIMA | DA-N | LIMA |
| 16 | WCEN | DA-N | MOUNT PLEASANT |
| 17 | CKX | DA-N | BRANDON |
| 18 | KWKY | DA-2 | DES MOINES |
| 19 | KSAL | DA-N | SALINA |
| 20 | KNED | DA-N | McALESTER |
| 21 | KXLR | DA-N | N.LITTLE ROCK |
| 22 | KDEF | DA-N | ALBUQUERQUE |
| 23 | KCKY | DA-N | COOLIDGE |
| 24 | KSEN | DA-2 | SHELBY |
| 25 | CKIQ | DA-1 | KELOWNA |
| 26 | KAYO | ND | SEATTLE |
| 27 | KAGO | DA-N | KLAMATH FALLS |
| 28 | KPLS | DA-2 | SANTA ROSA |
| 29 | KIIS | ND | LOS ANGELES |

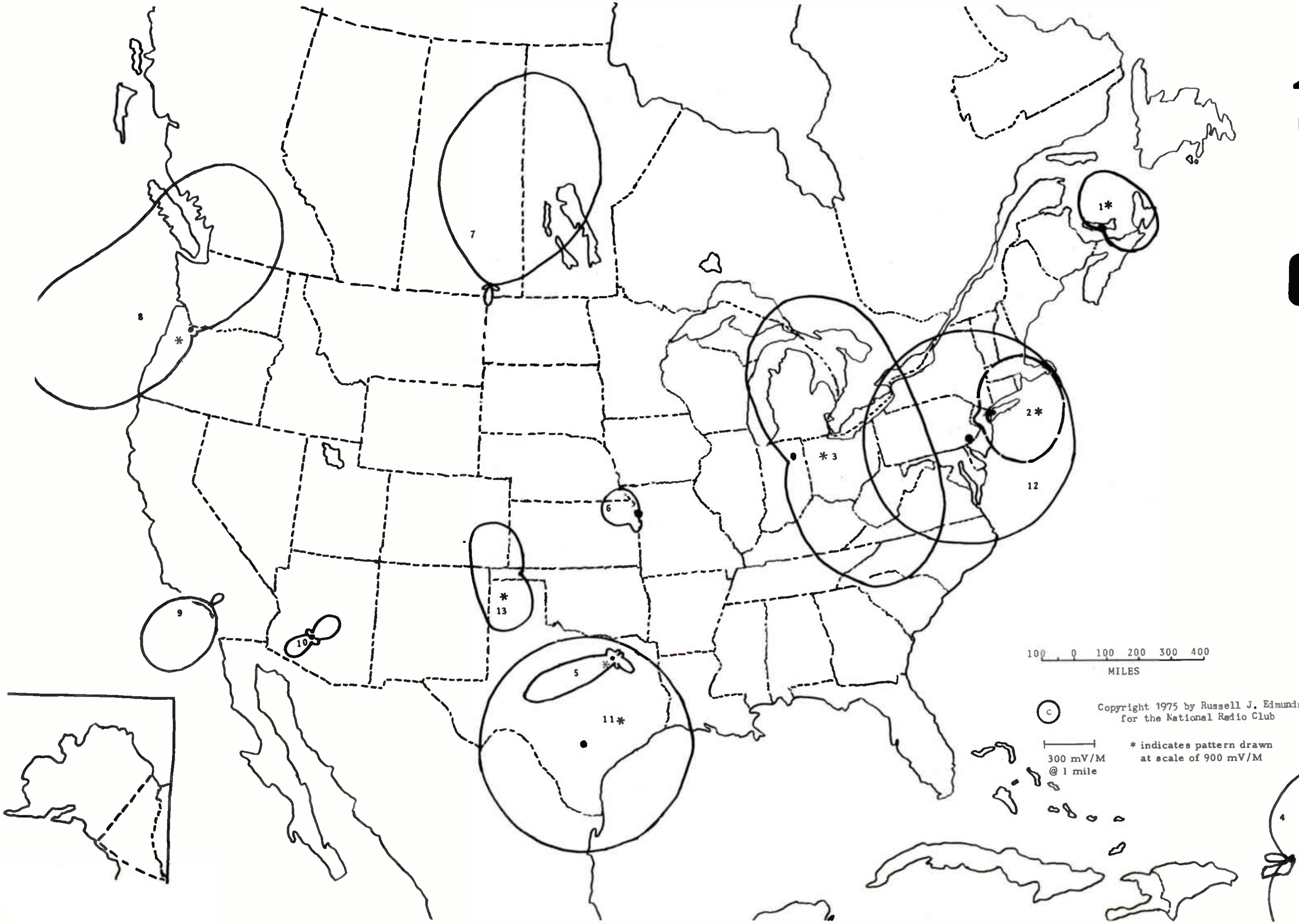
# 1160 1170 KHZ 1180

# CLEAR




| | call | class | location |
|---|---|---|---|
| | 1160 | | |
| 1 | WJJD | DA-1 | CHICAGO (L) |
| 2 | KSL | ND | SALT LAKE CITY |
| | 1170 | | |
| 3 | WWVA | DA-N | WHEELING |
| 4 | WCOV | DA-2 | MONTGOMERY |
| 5 | WLEO | ND | PONCE |
| 6 | KSTT | DA-2 | DAVENPORT |
| 7 | KVOO | DA-N | TULSA |
| 8 | CFNS | DA-1 | SASKATOON |
| | (has CP for 10KW on 860) | | |
| 9 | CKGY | DA-N | RED DEER |
| 10 | KPUG | DA-2 | BELLINGHAM |
| 11 | KLOK | DA-2 | SAN JOSE |
| 12 | KCBQ | DA-2 | SAN DIEGO |
| 13 | KRKM | DA-N | NORTH POLE |
| | 1180 | | |
| 14 | WHAM | ND | ROCHESTER |
| 15 | KOFI | DA-N | KALISPELL |

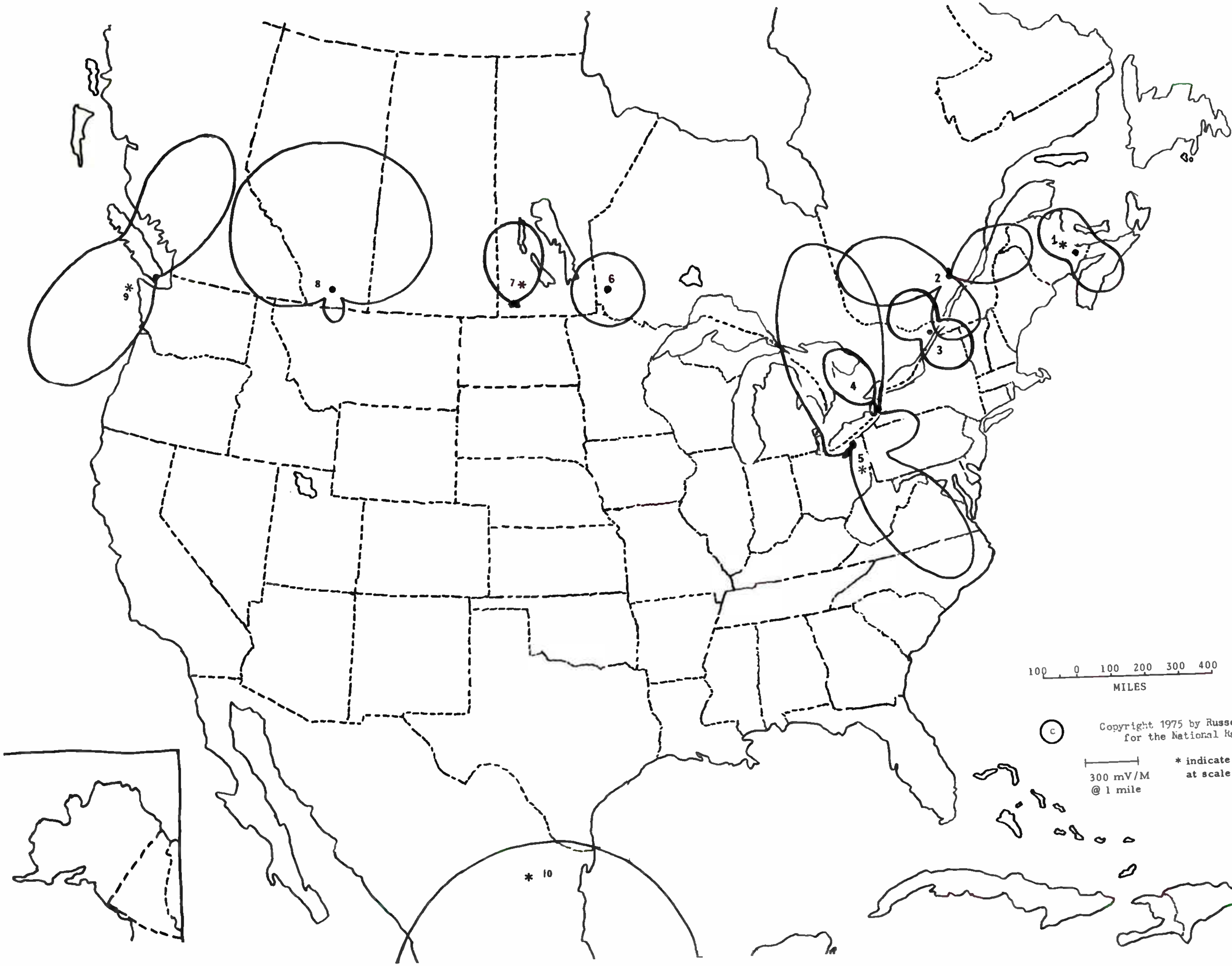
# 1190 1200 1210 KHZ CLEAR




| | call | class | location |
|---|---|---|---|
| | 1190 | | |
| 1 | CHTN | DA-N | CHARLOTTOWN |
| 2 | WLIB | DA-1 | NEW YORK (L) |
| 3 | WOWO | DA-N | FORT WAYNE |
| 4 | WBMJ | DA-1 | SAN JUAN |
| 5 | KLIF | DA-2 | DALLAS |
| 6 | KAYQ | DA-N | KANSAS CITY |
| 7 | CFSL | DA-N | WEYBURN |
| 8 | KEX | DA-1 | PORTLAND |
| 9 | KEZY | DA-N | ANAHEIM |
| 10 | KRDS | DA-1 | TOLLESON |
| | 1200 | | |
| 11 | WOAI | ND | SAN ANTONIO |
| | 1210 | | |
| 12 | WCAU | ND | PHILADELPHIA |
| 13 | KGYN | DA-N | GUYMON |

# 1220 KHZ

# CLEAR

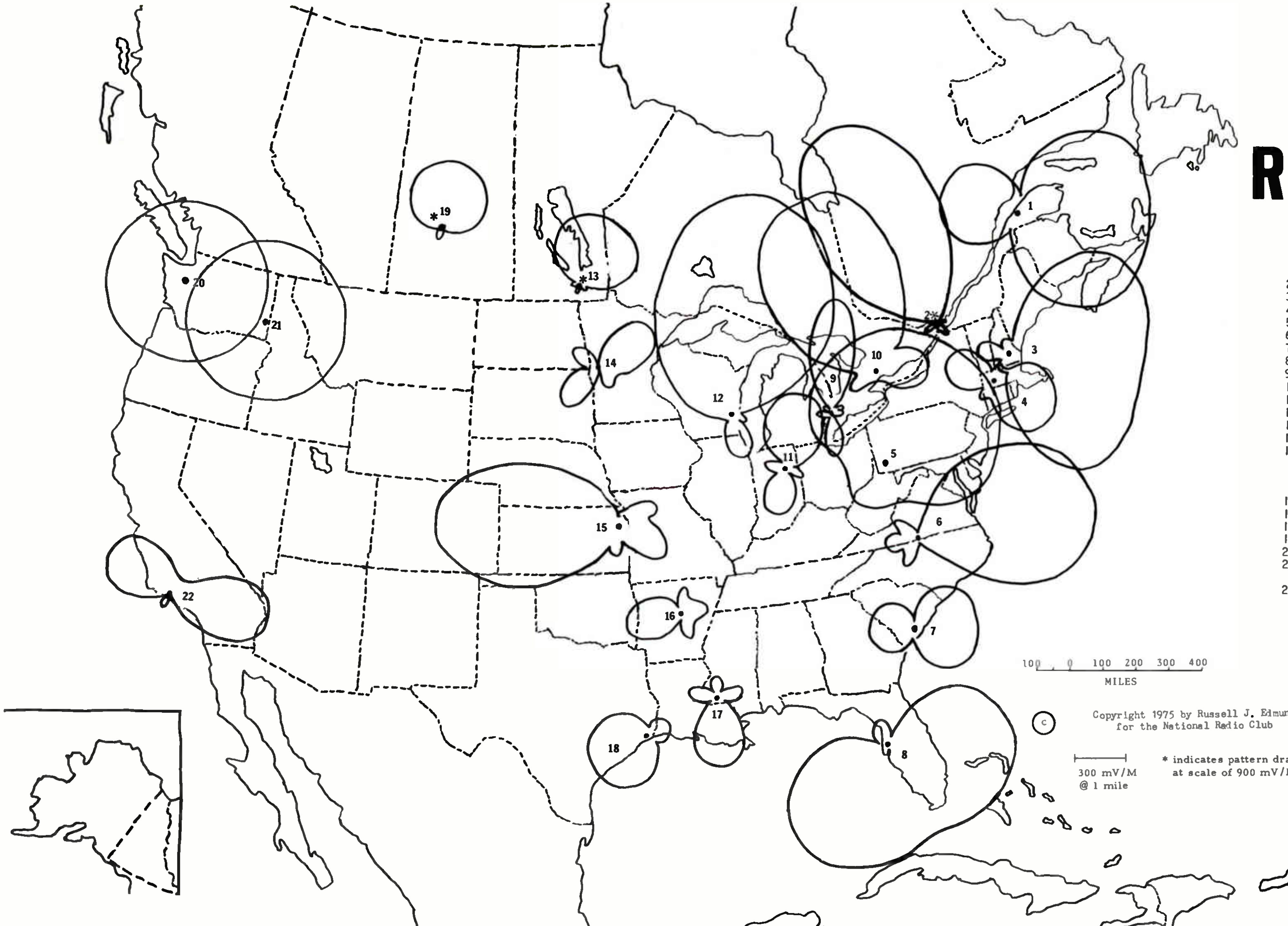



| | call | class | location |
|---|---|---|---|
| 1 | CKCW | DA-N | MONCTON |
| 2 | CKSM | DA-2 | SHAWINIGAN FALLS |
| 3 | CJSS | DA-2 | CORNWALL |
| 4 | CHSC | DA-1 | ST. CATHARINES |
| 5 | WGAR | DA-1 | CLEVELAND |
| 6 | CJRL | ND | KENORA |
| 7 | CJRB | DA-2 | BOISSEVAIN |
| 8 | CJOC | DA-N | LETHBRIDGE |
| 9 | CKDA | DA-1 | VICTORIA |
| 10 | XEB | ND | MEXICO, DF |

* indicates pattern drawn at scale of 900 mV/M

# 1250 KHZ

# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CKBL | DA-N | MATANE |
| 2 | CBOF | DA-1 | OTTAWA |
| 3 | WKBR | DA-2 | MANCHESTER |
| 4 | WARE | DA-N | WARE |
| 5 | WTAE | DA-N | PITTSBURGH |
| 6 | WDVA | DA-N | DANVILLE |
| 7 | WTMA | DA-N | CHARLESTON |
| 8 | WDAE | DA-1 | TAMPA |
| 9 | CKJD | DA-2 | SARNIA (CP:1110) |
| 10 | CHWO | DA-2 | OAKVILLE |
| 11 | WGL | DA-2 | FORT WAYNE |
| 12 | WEMP | DA-2 | MILWAUKEE |
| 13 | CHSM | DA-2 | STEINBACH |
| 14 | KBRF | DA-N | FERGUS FALLS |
| 15 | WREN | DA-N | TOPEKA |
| | KFKU | DA-N | LAWRENCE |
| | (WREN & KFKU share time and use same transmitter & ant) | | |
| 16 | KALO | DA-N | LITTLE ROCK |
| 17 | WHNY | DA-N | McCOMB |
| 18 | KPAC | DA-N | PORT ARTHUR |
| 19 | CKOM | DA-N | SASKATOON |
| 20 | KYAC | ND | SEATTLE |
| 21 | KWSU | ND | PULLMAN |
| | (KYAC & KWSU share time) | | |
| 22 | KTMS | DA-1 | SANTA BARBARA |

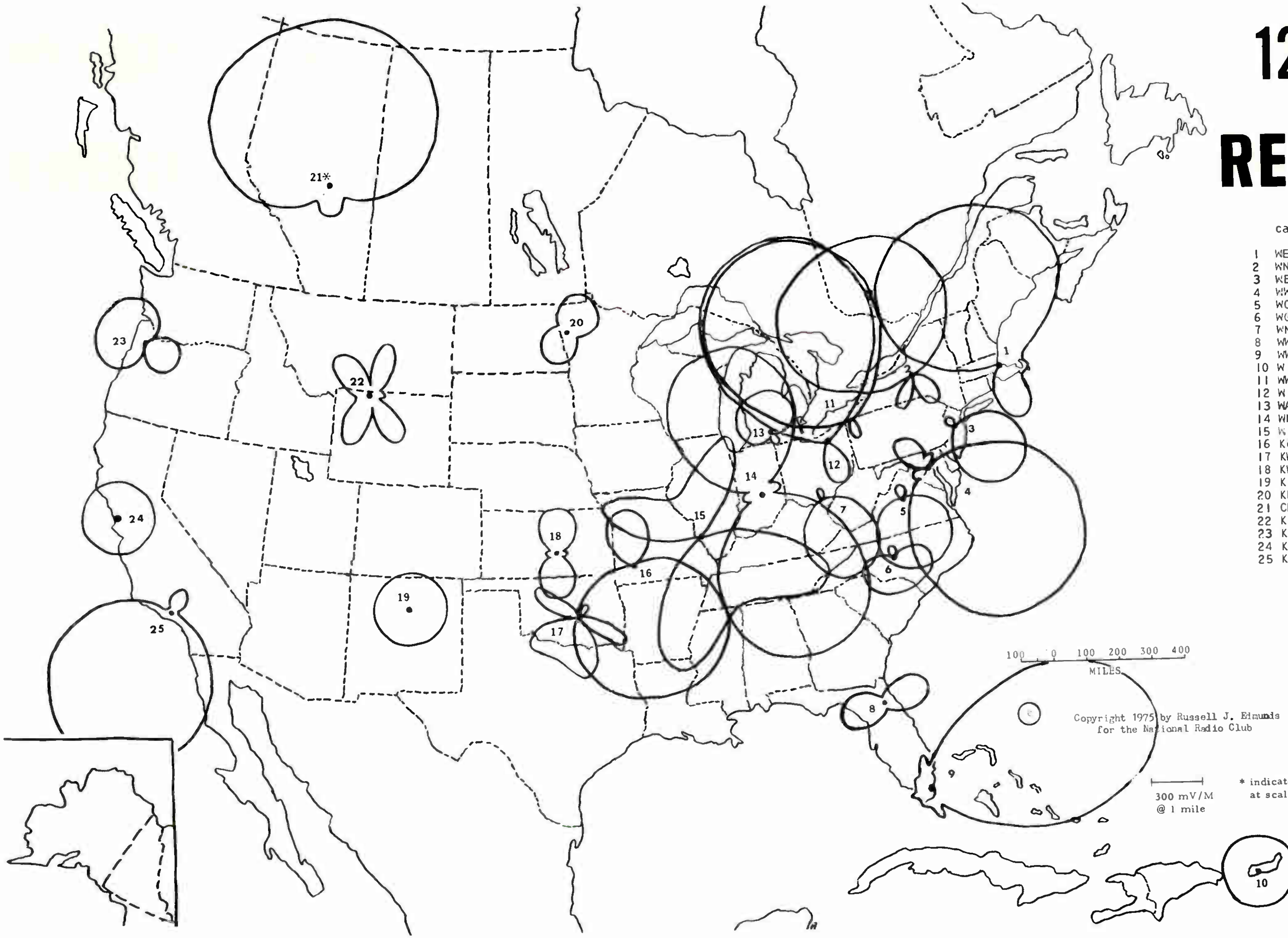


300 mV/M
@ 1 mile

* indicates pattern drawn
at scale of 900 mV/M

# 1260 KHZ

# REGIONAL



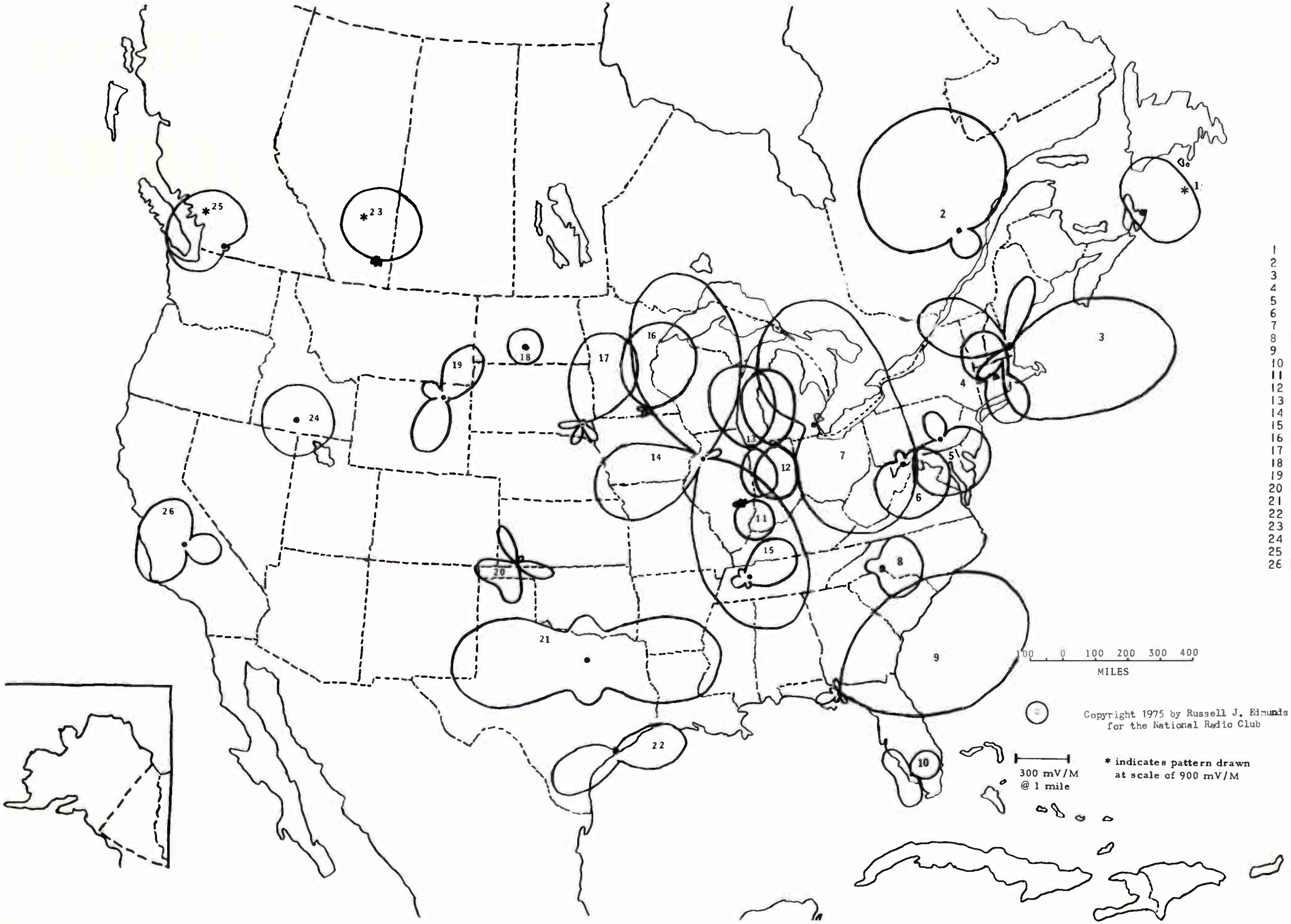



| | call | class | location |
|---|---|---|---|
| 1 | WEZE | DA-N | BOSTON |
| 2 | WNDR | DA-N | SYRACUSE |
| 3 | WBUD | DA-2 | TRENTON |
| 4 | WWDC | DA-2 | WASHINGTON |
| 5 | WCHV | DA-2 | CHARLOTTESVILLE |
| 6 | WGWR | DA-2 | ASHEBORO |
| 7 | WNXT | DA-2 | PORTSMOUTH |
| 8 | WWPF | DA-N | PALATKA |
| 9 | WWOK | DA-2 | MIAMI |
| 10 | WISO | ND | PONCE |
| 11 | WWYN | DA-2 | ERIE |
| 12 | WIXY | DA-2 | CLEVELAND |
| 13 | WALM | DA-N | ALBION |
| 14 | WNDE | DA-N | INDIANAPOLIS |
| 15 | WIBV | DA-2 | BELLEVILLE |
| 16 | KGBX | DA-N | SPRINGFIELD |
| 17 | KWSH | DA-N | WEWOKA |
| 18 | KWHK | DA-2 | HUTCHINSON |
| 19 | KVSF | ND | SANTE FE |
| 20 | KROX | DA-N | CROOKSTON |
| 21 | CFRN | DA-N | EDMONTON |
| 22 | KPOW | DA-N | POWELL |
| 23 | KMCM | DA-N | McMINNVILLE |
| 24 | KYA | ND | SAN FRANCISCO |
| 25 | KGIL | DA-2 | SAN FERNANDO |

# 1270 KHZ

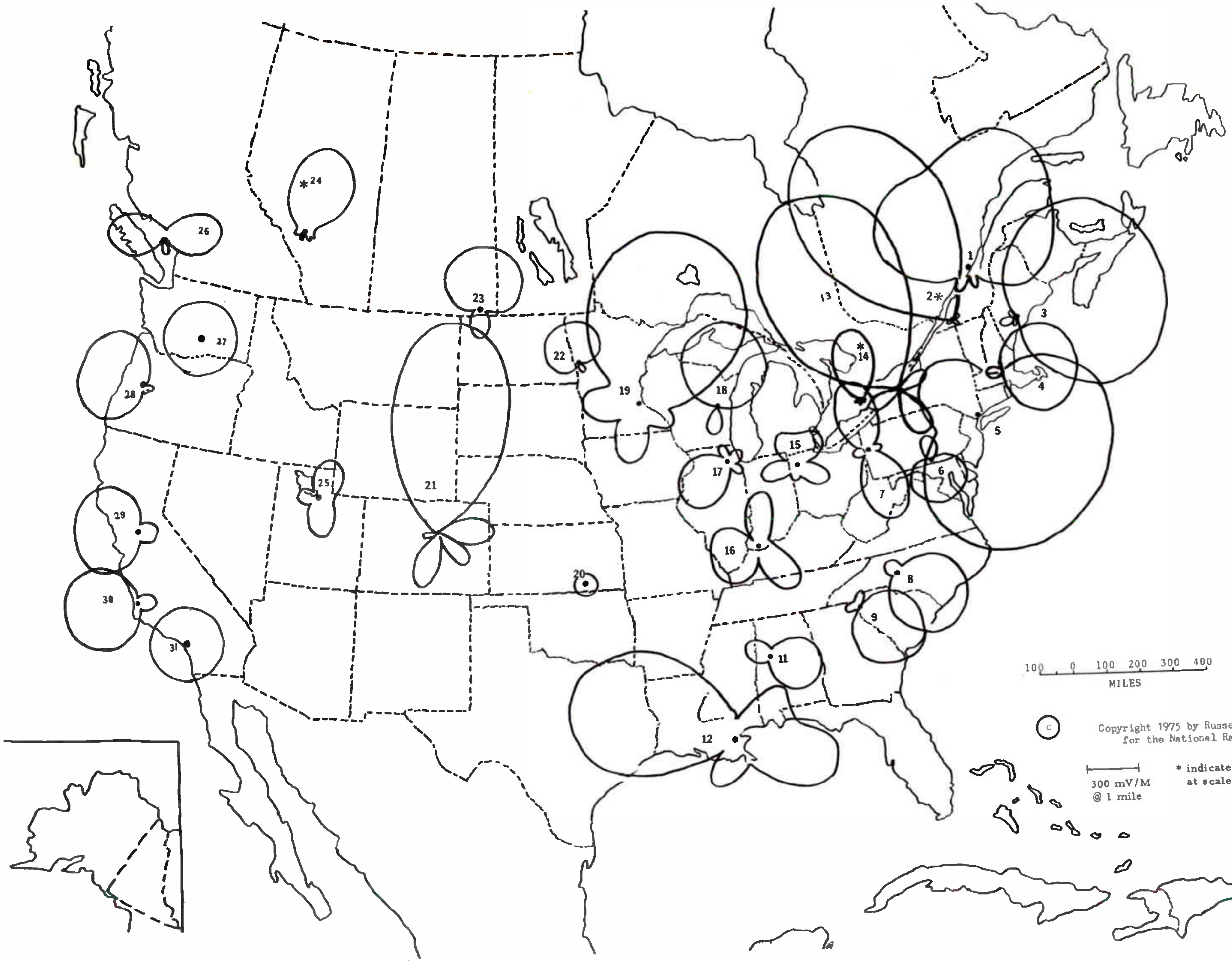
# REGIONAL

| | call | class | location |
|---|---|---|---|
| 1 | CJCB | DA-N | SYDNEY |
| 2 | CFGT | DA-N | ALMA |
| 3 | WTSN | DA-2 | DOVER |
| 4 | WSPR | DA-1 | SPRINGFIELD |
| 5 | WLBR | DA-2 | LEBANON |
| 6 | WUOK | DA-2 | CUMBERLAND |
| 7 | WXYZ | DA-N | DETROIT |
| 8 | WCGC | DA-N | BELMONT |
| 9 | WTNT | DA-N | TALLAHASSEE |
| 10 | WNOG | DA-N | NAPLES |
| 11 | WEIC | DA-2 | CHARLESTON |
| 12 | WCMR | DA-2 | ELKHART |
| 13 | WWCA | DA-1 | GARY |
| 14 | WHBF | DA-N | ROCK ISLAND |
| 15 | WLIK | DA-N | NEWPORT |
| 16 | KWEB | DA-2 | ROCHESTER |
| 17 | KNWC | DA-N | SIOUX FALLS |
| 18 | KBOM | ND | BISMARK-MANDAN |
| 19 | KIML | DA-N | GILLETTE |
| 20 | KSCB | DA-N | LIBERAL |
| 21 | KFJZ | DA-1 | FORT WORTH |
| 22 | KIOX | DA-N | BAY CITY |
| 23 | CHAT | DA-N | MEDICINE HAT |
| 24 | KTFI | ND | TWIN FALLS |
| 25 | CHWK | DA-N | CHILLIWACK |
| 26 | KCOK | DA-N | TULARE |



# 1280 KHZ

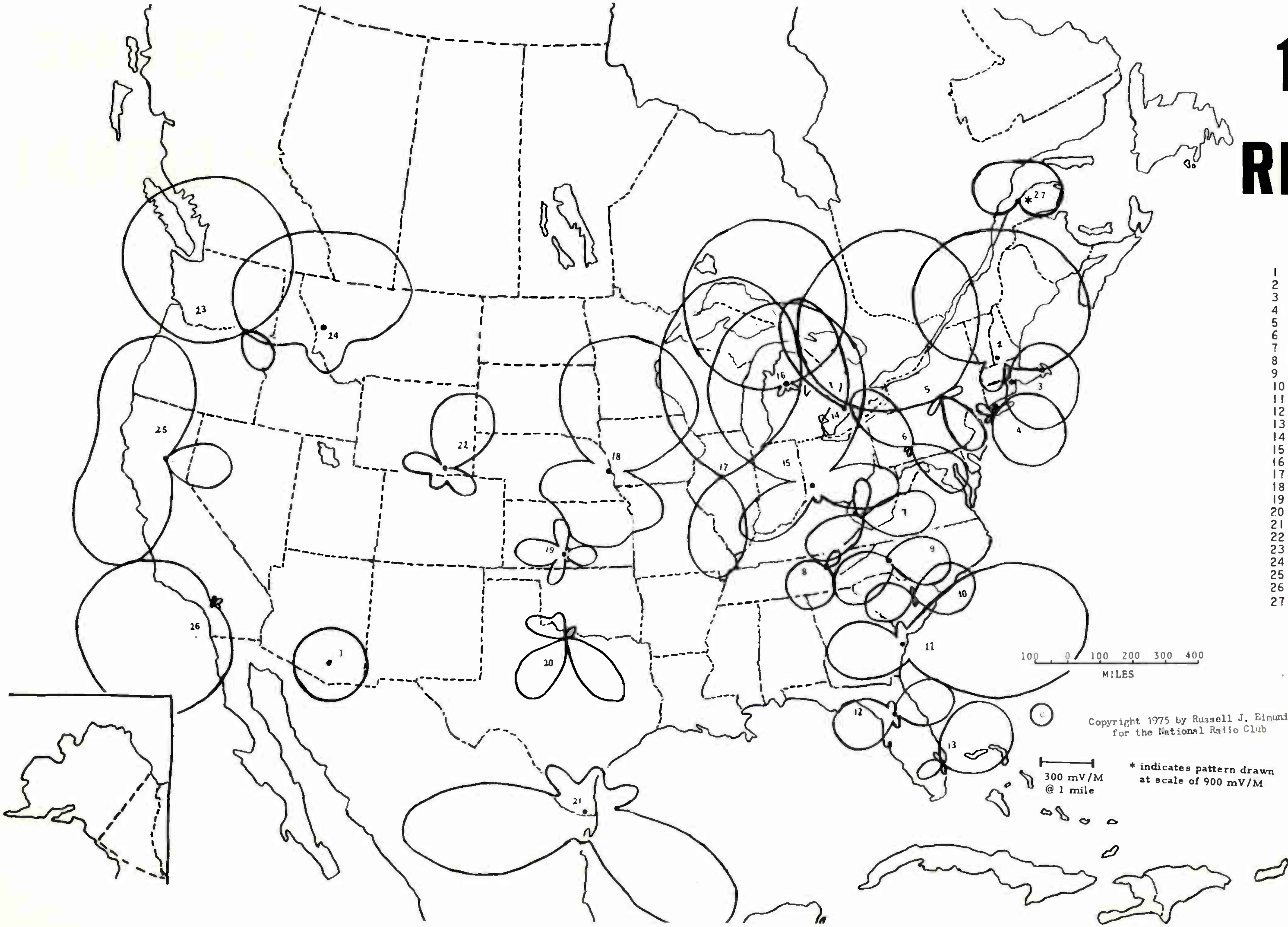
# REGIONAL




1280

| | call | class | location |
|---|---|---|---|
| 1 | CKCV | DA-2 | QUEBEC |
| 2 | CJMS | DA-2 | MONTREAL |
| 3 | WABK | DA-N | GARDINER |
| 4 | WEIM | DA-N | FITCHBURG |
| 5 | WADO | DA-1 | NEW YORK |
| 6 | WHVR | DA-2 | HANOVER |
| 7 | WKST | DA-N | NEW CASTLE |
| 8 | WSAT | DA-N | SALISBURY |
| 9 | WANS | DA-N | ANDERSON |
| 10 | WCMN | ND | ARECIBO |
| 11 | WNPT | DA-N | TUSCALOOSA |
| 12 | WSGO | DA-1 | NEW ORLEANS |
| 13 | WROC | DA-N | ROCHESTER |
| 14 | CHAM | DA-2 | HAMILTON |
| 15 | WONW | DA-N | DEFIANCE |
| 16 | WGBF | DA-N | EVANSVILLE |
| 17 | WMRO | DA-2 | AURORA |
| 18 | WNAM | DA-2 | NEENAH-MENASHA |
| 19 | WWTC | DA-N | MINNEAPOLIS |
| 20 | KSOK | ND | ARKANSAS CITY |
| 21 | KTLK | DA-2 | DENVER |
| 22 | KVOX | DA-N | MOORHEAD |
| 23 | CJSL | DA-1 | ESTEVAN |
| 24 | C____ | DA-1 | CALGARY |
| 25 | KNAK | DA-1 | SALT LAKE CITY |
| 26 | CHQB | DA-1 | POWELL RIVER |
| 27 | KIT | ND | YAKIMA |
| 28 | KBDF | DA-N | EUGENE |
| 29 | KJOY | DA-N | STOCKTON |
| 30 | KFYN | DA-N | ARROYO GRANDE |
| 31 | KFOX | ND | LONG BEACH |

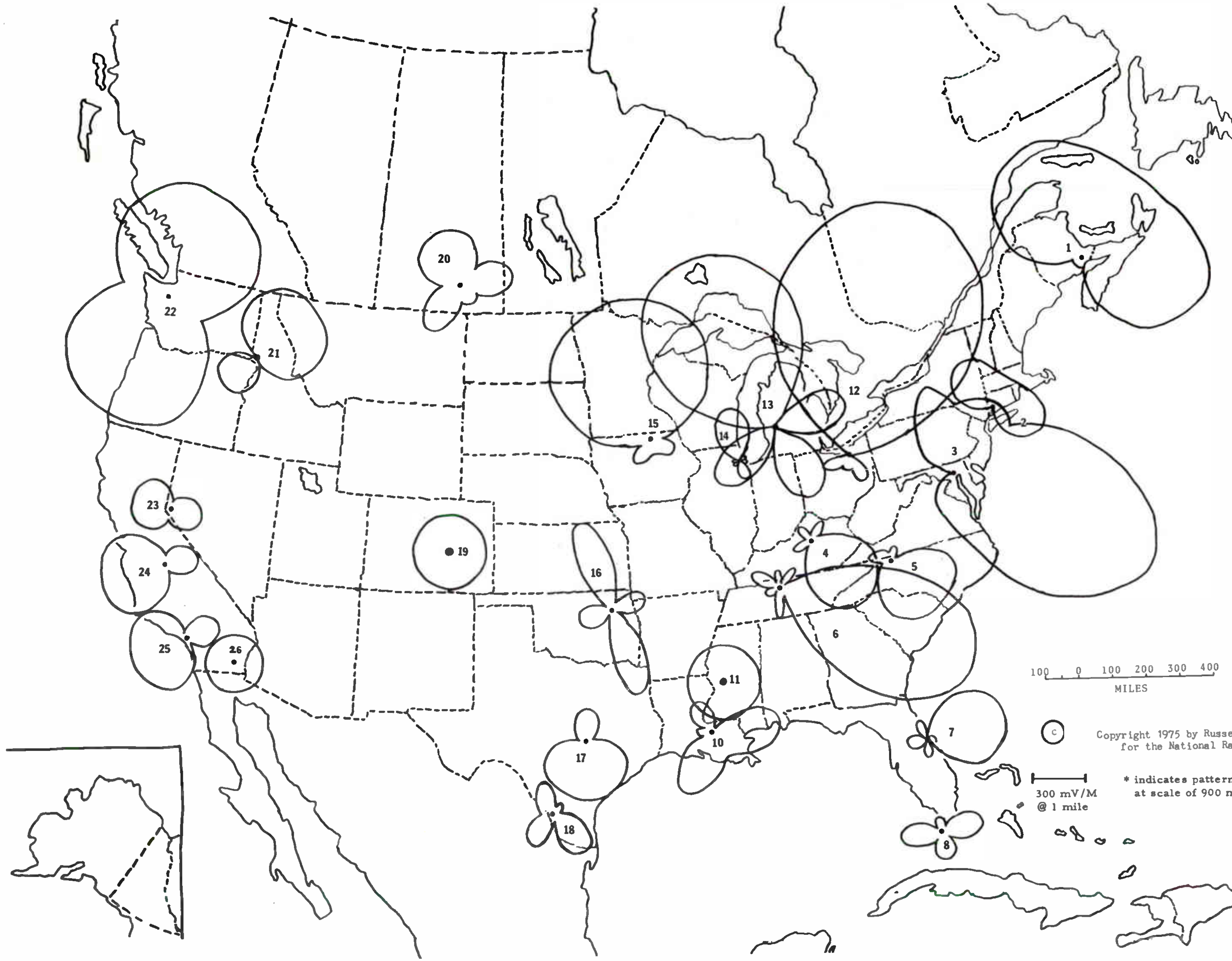
# 1290 KHZ
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | KCUB | ND | TUCSON |
| 2 | WKNE | DA-1 | KEENE |
| 3 | WICE | DA-2 | PROVIDENCE |
| 4 | WGLI | DA-2 | BABYLON |
| 5 | WNBF | DA-N | BINGHAMTON |
| 6 | WFBG | DA-N | ALTOONA |
| 7 | WVOW | DA-N | LOGAN |
| 8 | WATO | DA-2 | OAK RIDGE |
| 9 | WHKY | DA-N | HICKORY |
| 10 | WFIG | DA-N | SUMTER |
| 11 | WTOC | DA-N | SAVANNAH |
| 12 | WTMC | DA-N | OCALA |
| 13 | WIRK | DA-N | WEST PALM BEACH |
| 14 | CJOE | DA-1 | LONDON |
| 15 | WHIO | DA-N | DAYTON |
| 16 | WHGR | DA-N | HOUGHTON LAKE |
| 17 | WIRL | DA-2 | PEORIA |
| 18 | KOIL | DA-N | OMAHA |
| 19 | KWNS | DA-2 | PRATT |
| 20 | KTRN | DA-N | WICHITA FALLS |
| 21 | KRGV | DA-N | WESLACO |
| 22 | KOWB | DA-2 | LARAMIE |
| 23 | KUMA | DA-N | PORTLAND |
| 24 | KVGO | DA-1 | MISSOULA |
| 25 | KHSL | DA-N | CHICO |
| 26 | KMEM | DA-2 | SAN BERNARDIN |
| 27 | C___ | DA-2 | MATANE |

# 1300 KHZ

# REGIONAL

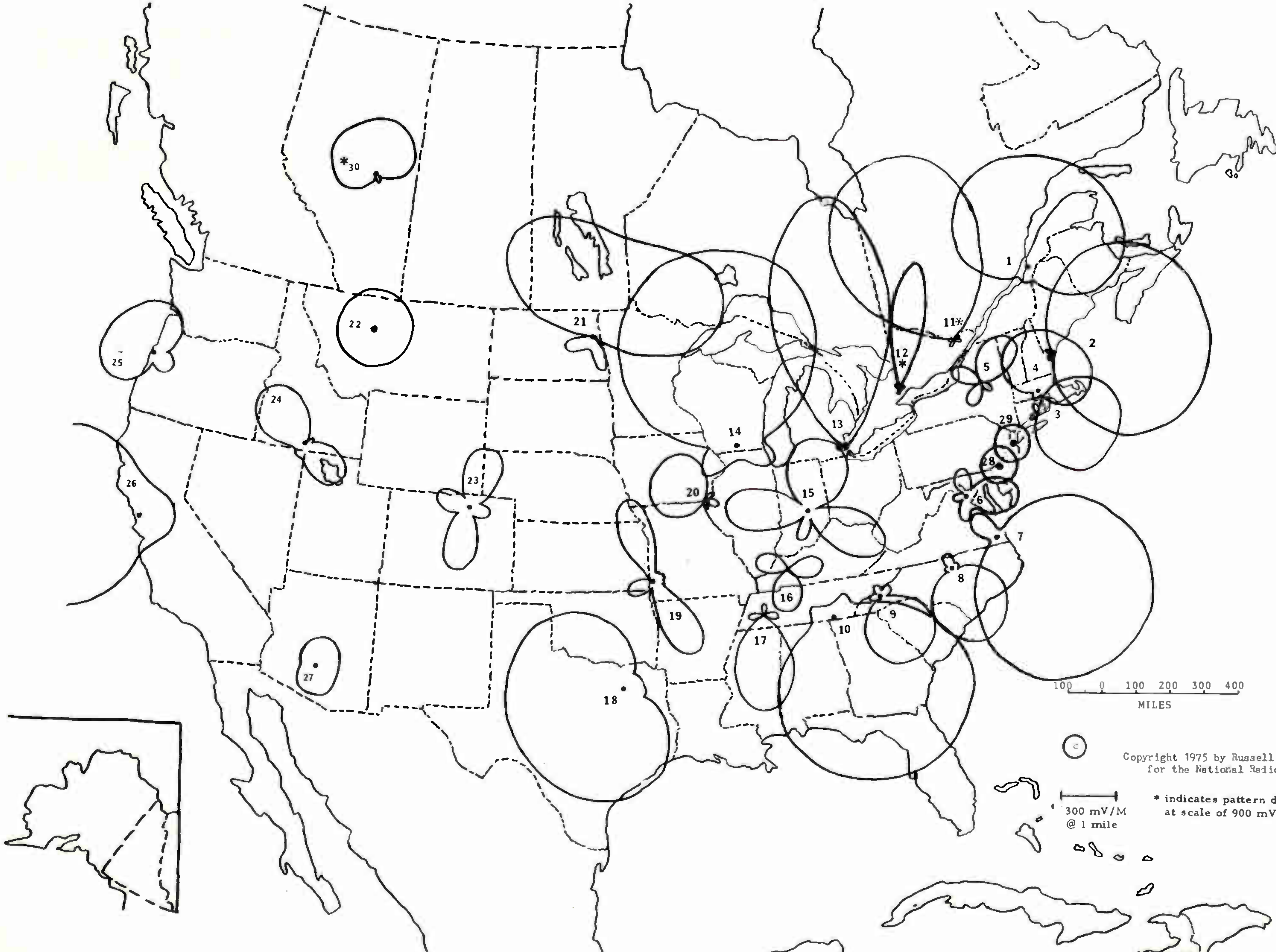





| | call | class | location |
|---|---|---|---|
| 1 | CBAF | DA-1 | MONCTON |
| 2 | WAVZ | DA-N | NEW HAVEN |
| 3 | WFBR | DA-2 | BALTIMORE |
| 4 | WBLG | DA-N | LEXINGTON |
| 5 | WSYD | DA-N | MOUNT AIRY |
| 6 | WMAK | DA-N | NASHVILLE |
| 7 | WRKT | DA-2 | COCOA BEACH |
| 8 | WFFG | DA-2 | MARATHON |
| 9 | WTIL | ND | MAYAGUEZ |
| 10 | WIBR | DA-2 | BATON ROUGE |
| 11 | WRBC | ND | JACKSON |
| 12 | WERE | DA-1 | CLEVELAND |
| 13 | WOOD | DA-N | GRAND RAPIDS |
| 14 | WTAQ | DA-2 | LA GRANGE |
| 15 | KGLO | DA-N | MASON CITY |
| 16 | KXXO | DA-2 | TULSA |
| 17 | KVET | DA-2 | AUSTIN |
| 18 | KLAR | DA-N | LAREDO |
| 19 | KVOR | ND | COLORADO SPRINGS |
| 20 | CJME | DA-1 | REGINA |
| 21 | KOZE | DA-N | LEWISTON |
| 22 | KMPS | DA-N | SEATTLE |
| 23 | KPTL | DA-N | CARSON CITY |
| 24 | KYNO | DA-N | FRESNO |
| 25 | KWKW | DA-2 | PASADENA |
| 26 | KROP | ND | BRAWLEY |

# 1310 KHZ

# REGIONAL

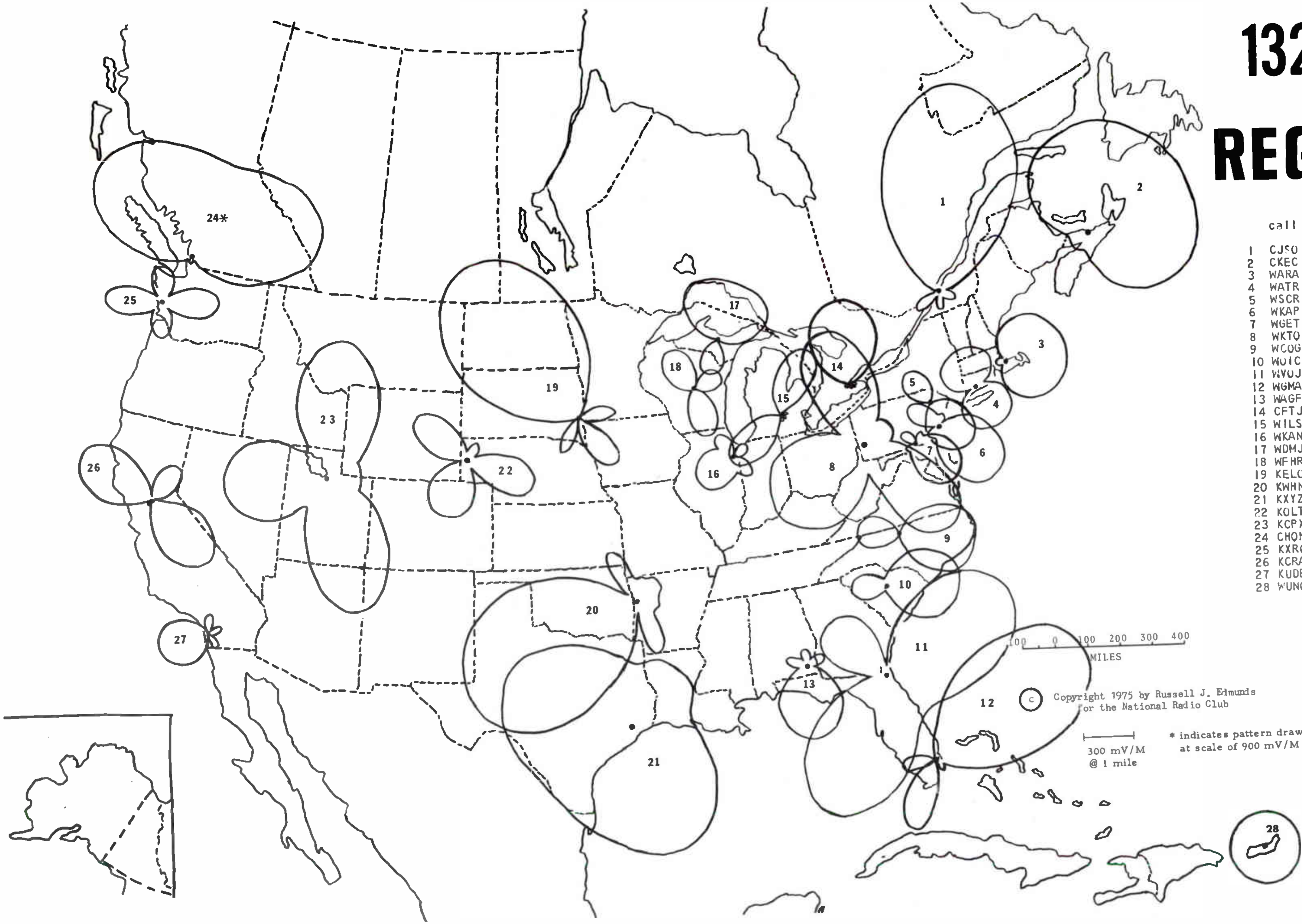





| | call | class | location |
|---|---|---|---|
| 1 | CHGB | DA-N | LA POCATIERE |
| 2 | WLOB | DA-2 | PORTLAND |
| 3 | WICH | DA-2 | NORWICH |
| 4 | WORC | DA-2 | WORCESTER |
| 5 | WTLB | DA-N | UTICA |
| 6 | WEEL | DA-2 | FAIRFAX |
| 7 | WGH | DA-N | NEWPORT NEWS |
| 8 | WTIK | DA-2 | DURHAM |
| 9 | WISE | DA-N | ASHEVILLE |
| 10 | WDOD | DA-N | CHATTONOOGA |
| 11 | CKOY | DA-2 | OTTAWA |
| 12 | CFGM | DA-2 | RICHMOND HILL |
| 13 | WNIC | DA-2 | DEARBORN |
| 14 | WIBA | DA-N | MADISON |
| 15 | WIFE | DA-N | INDIANAPOLIS |
| 16 | WTTL | DA-N | MADISONVILLE |
| 17 | WDXI | DA-N | JACKSON |
| 18 | WRR | DA-N | DALLAS |
| 19 | KFSV | DA-2 | JOPLIN |
| 20 | KOKX | DA-N | KEOKUK |
| 21 | KNOX | DA-N | GRAND FORK |
| 22 | KEIN | ND | GREAT FALLS |
| 23 | KFKA | DA-N | GREENLEY |
| 24 | KLIX | DA-N | TWIN FALLS |
| 25 | KNPT | DA-N | NEWPORT |
| 26 | KDIA | DA-1 | OAKLAND |
| 27 | KBUZ | DA-N | MESA |
| 28 | WCAM | ND | CAMDEN |
| 29 | WJLK | ND | ASBURY PARK |
| 30 | CIOK | DA-N | ST. PAUL |

# 1320 KHZ

# REGIONAL

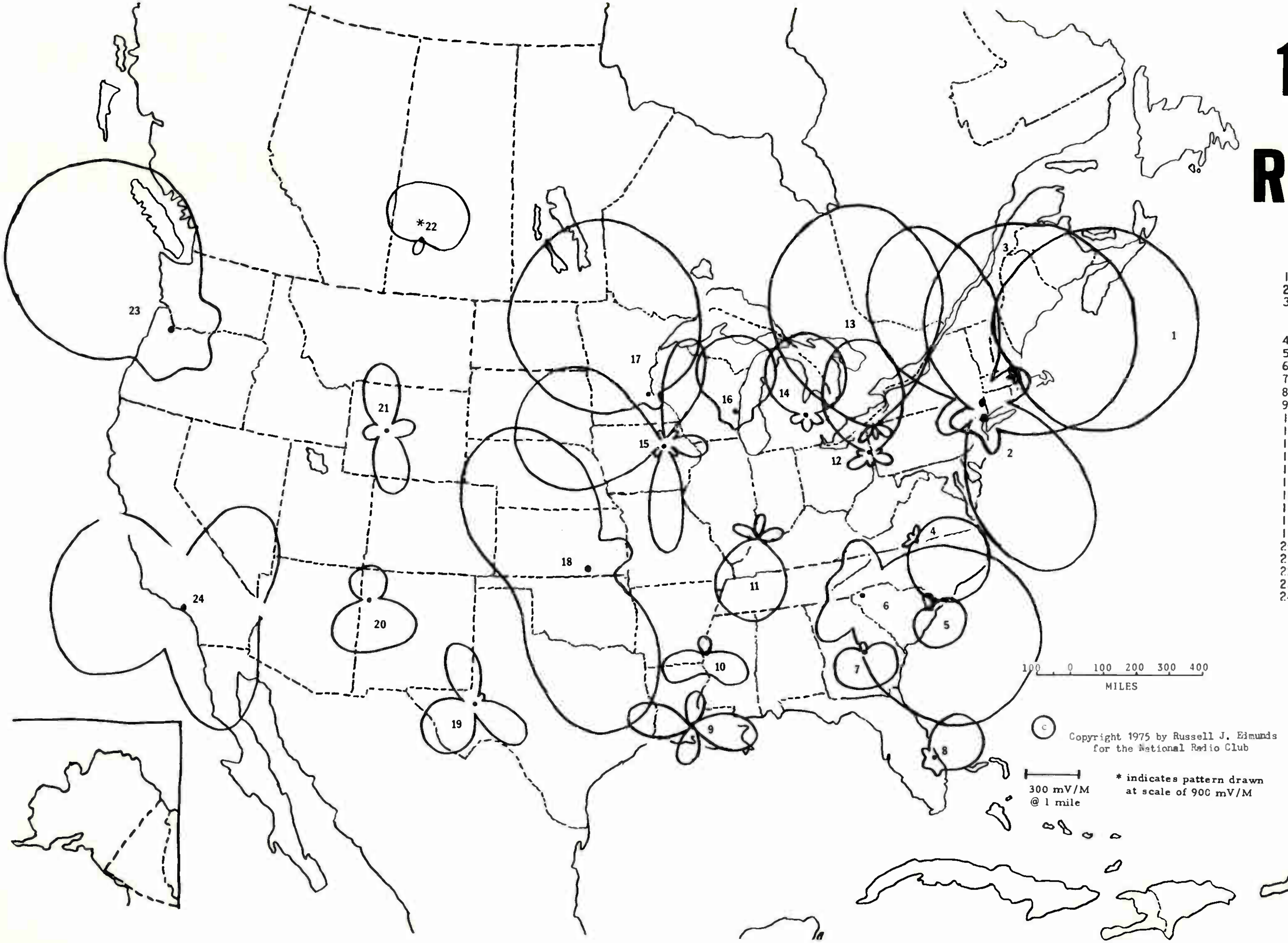





| | call | class | location |
|---|---|---|---|
| 1 | CJSO | DA-2 | SOREL |
| 2 | CKEC | DA-N | NEW GLASGOW |
| 3 | WARA | DA-2 | ATTLEBORO |
| 4 | WATR | DA-2 | WATERBURY |
| 5 | WSCR | DA-N | SCRANTON |
| 6 | WKAP | DA-2 | ALLENTOWN |
| 7 | WGET | DA-2 | GETTYSBURG |
| 8 | WKTQ | DA-N | PITTSBURGH |
| 9 | WCOG | DA-2 | GREENSBORO |
| 10 | WOIC | DA-N | COLUMBIA |
| 11 | WVOJ | DA-N | JACKSONVILLE |
| 12 | WGMA | DA-2 | HOLLYWOOD |
| 13 | WAGF | DA-N | DOTHAN |
| 14 | CFTJ | DA-2 | CAMBRIDGE |
| 15 | WILS | DA-2 | LANSING |
| 16 | WKAN | DA-N | KANKAKEE |
| 17 | WDMJ | DA-N | MARQUETTE |
| 18 | WFHR | DA-N | WISCONSIN RAPIDS |
| 19 | KELO | DA-N | SIOUX FALLS |
| 20 | KWHN | DA-N | FORT SMITH |
| 21 | KXYZ | DA-N | HOUSTON |
| 22 | KOLT | DA-N | SCOTTSBLUFF |
| 23 | KCPX | DA-1 | SALT LAKE CITY |
| 24 | CHQM | DA-2 | VANCOUVER |
| 25 | KXRO | DA-N | ABERDEEN |
| 26 | KCRA | DA-2 | SACRAMENTO |
| 27 | KUDE | DA-1 | OCEANSIDE |
| 28 | WUNO | ND | RIO PIEDRAS |

# 1330 KHZ

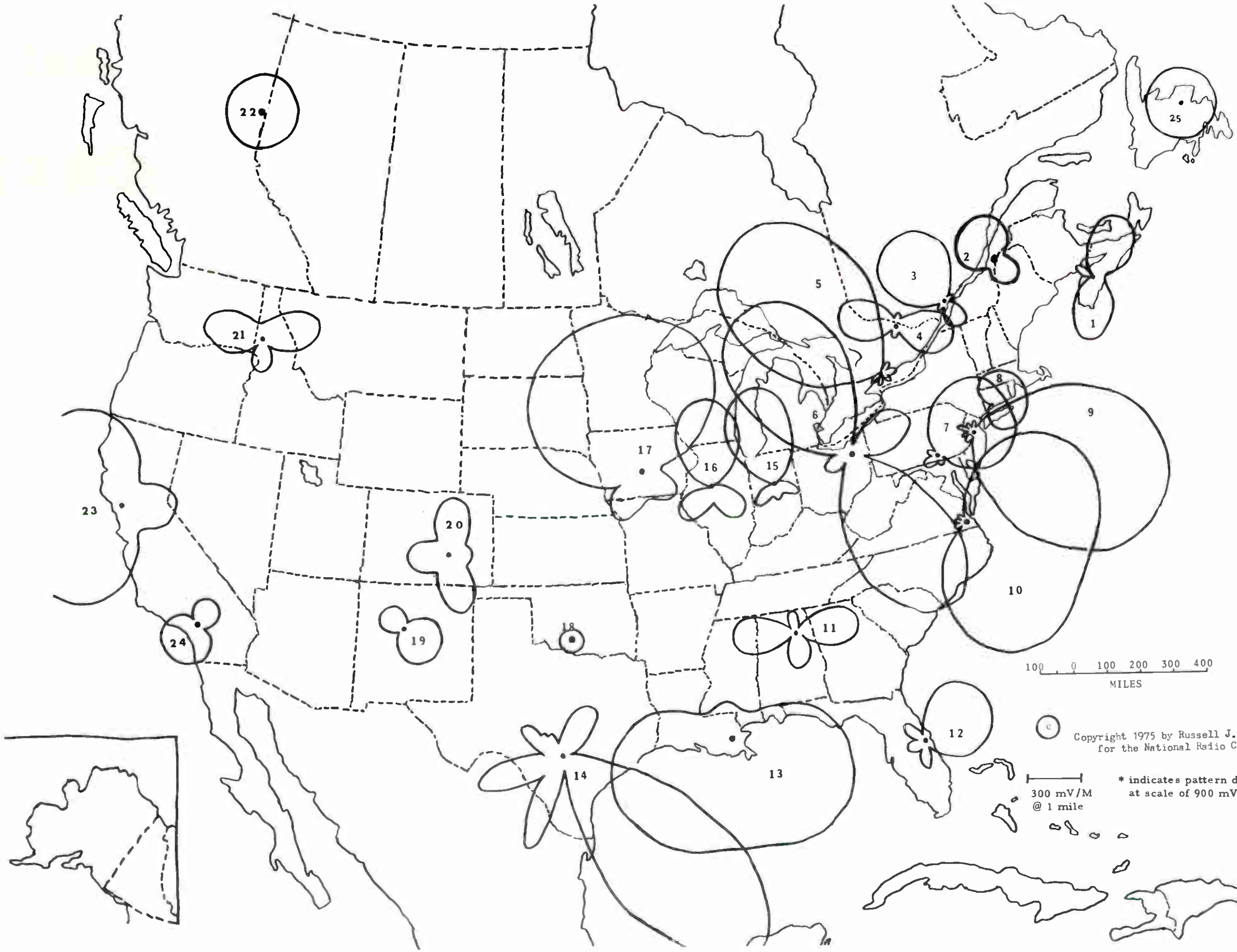
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | WCRB | DA-2 | WALTHAM |
| 2 | WEVD | DA-2 | NEW YORK |
| 3 | WPOW | DA-1 | NEW YORK |
| | (WEVD & WPOW share time. WEVD has requested to use WPOW DA) | | |
| 4 | WBTM | DA-N | DANVILLE |
| 5 | WLAT | DA-N | CONWAY |
| 6 | WFBC | DA-N | GREENVILLE |
| 7 | WMLT | DA-N | DUBLIN |
| 8 | WFTP | DA-N | FORT PIERCE |
| 9 | KVOL | DA-N | LAFAYETTE |
| 10 | WJPR | DA-N | GREENVILLE |
| 11 | WJPS | DA-N | EVANSVILLE |
| 12 | WHOT | DA-2 | CAMPBELL |
| 13 | WRIE | DA-2 | ERIE |
| 14 | WTRX | DA-2 | FLINT |
| 15 | KWWL | DA-2 | WATERLOO |
| 16 | WHBL | DA-2 | SHEBOYGAN |
| 17 | WLOL | DA-2 | MINNEAPOLIS |
| 18 | KFH | DA-N | WICHITA |
| 19 | KVKM | DA-N | MONAHANS |
| 20 | KGAK | DA-N | GALLUP |
| 21 | KOVE | DA-N | LANDER |
| 22 | CKKR | DA-1 | ROSETOWN |
| 23 | KPOJ | DA-1 | PORTLAND |
| 24 | KFAC | DA-N | LOS ANGELES |

# 1350 KHZ

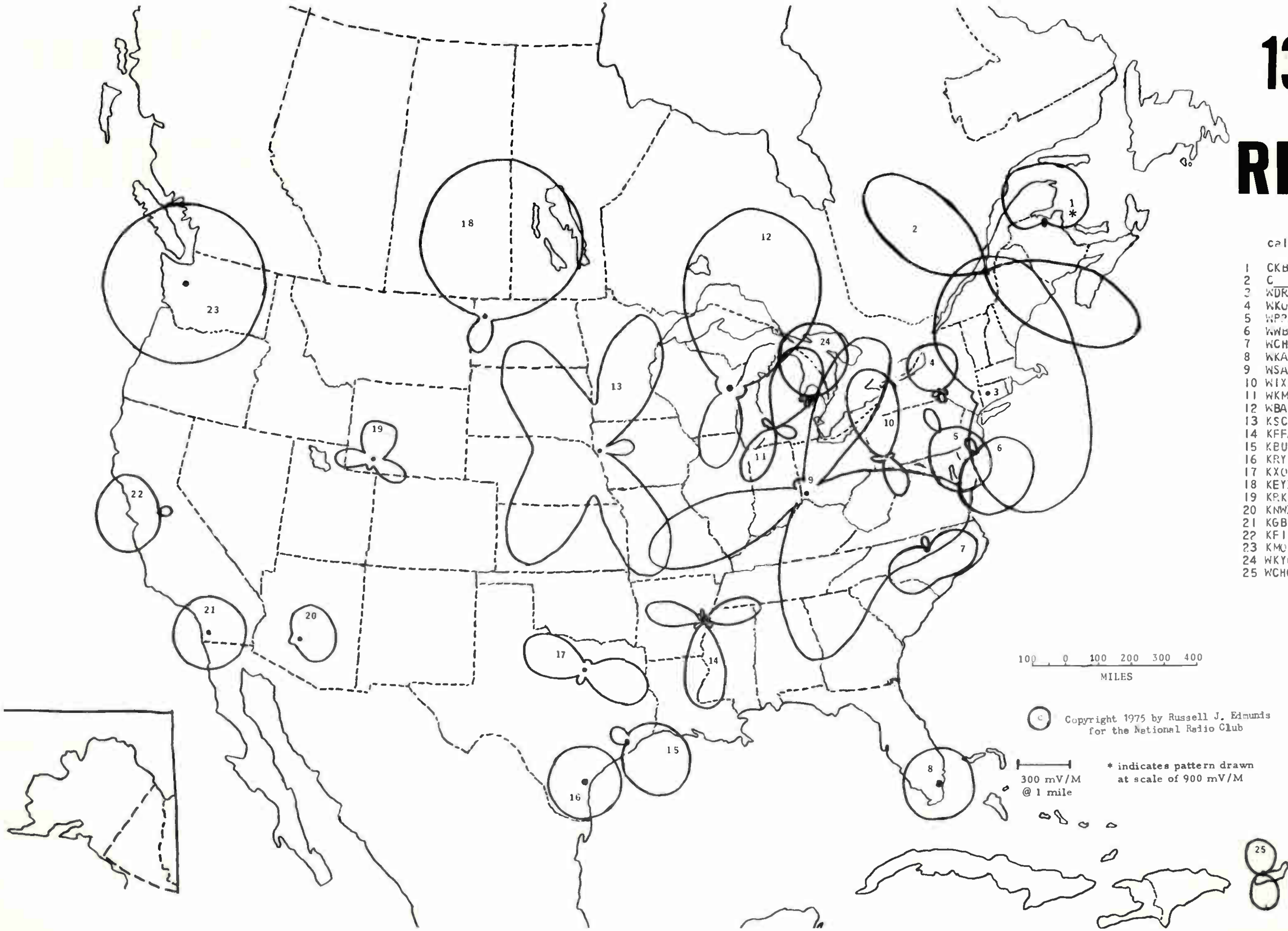
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CKAD | DA-1 | MIDDLETON |
| 2 | CHAL | DA-1 | ST. PAMPHILE |
| 3 | CJLM | DA-2 | JOLIETTE |
| 4 | CHOV | DA-1 | PEMBROKE |
| 5 | CKLB | DA-1 | OSHAWA |
| 6 | WSLR | DA-1 | AKRON |
| 7 | WZIX | DA-N | YORK |
| 8 | WNLK | DA-N | NORWALK |
| 9 | WHWH | DA-2 | PRINCETON |
| 10 | WKLX | DA-2 | PORTSMOUTH |
| 11 | WGAD | DA-N | GADSDEN |
| 12 | WEZY | DA-N | COCOA |
| 13 | WSMB | DA-N | NEW ORLEANS |
| 14 | KCOR | DA-N | SAN ANTONIO |
| 15 | WIOU | DA-2 | KOKOMO |
| 16 | WXCL | DA-2 | PEORIA |
| 17 | KRNT | DA-N | DES MOINES |
| 18 | KRHD | ND | DUNCAN |
| 19 | KABQ | DA-N | ALBUQUERQUE |
| 20 | KKAM | DA-N | PUEBLO |
| 21 | KRLC | DA-N | LEWISTON |
| 22 | CJDC | ND | DAWSON CREEK |
| 23 | KSRO | DA-N | SANTA ROSA |
| 24 | KCKC | DA-2 | SAN BERNARDINO |
| 25 | CJCR | ND | GANDER |

# 1360 KHZ

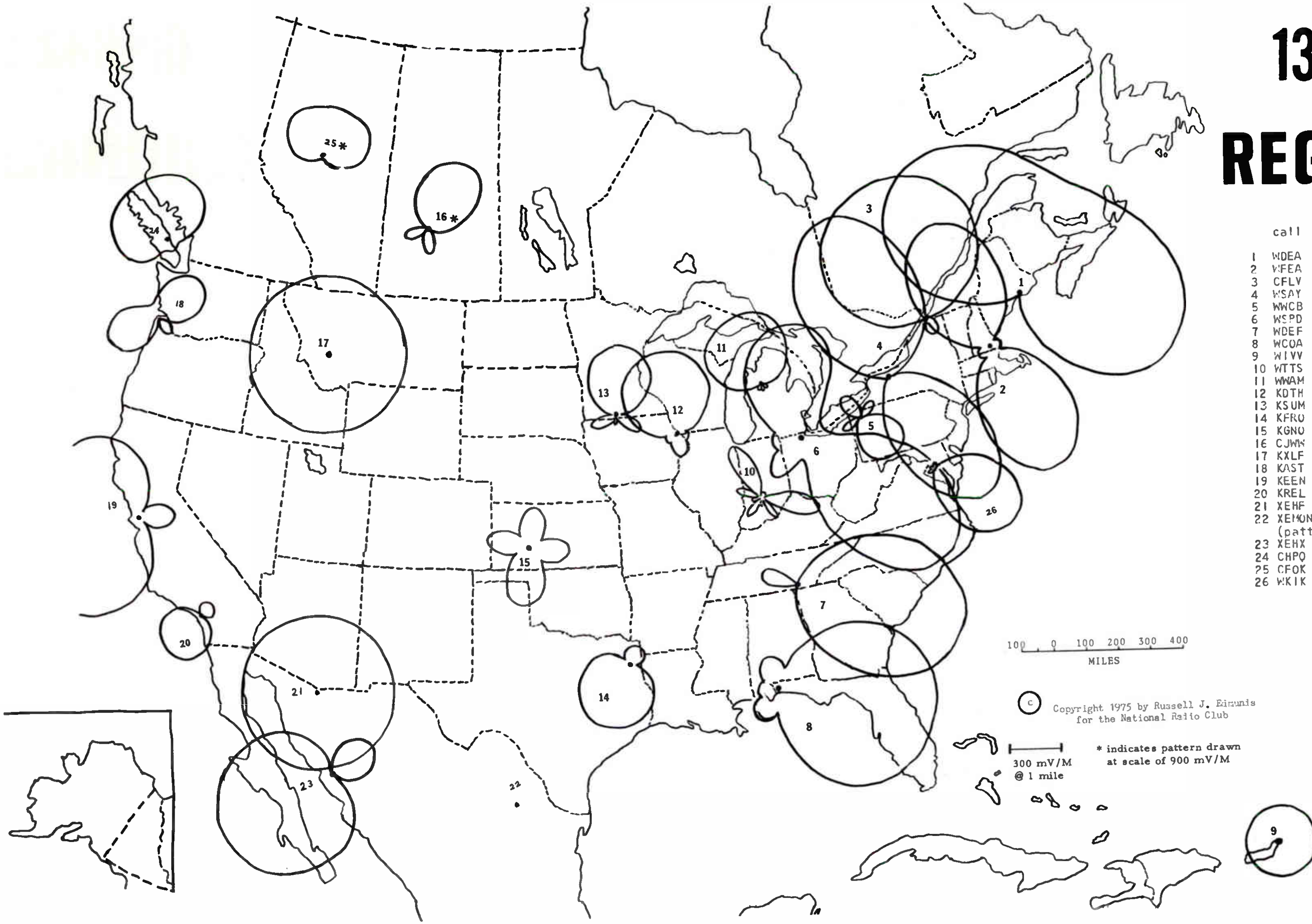
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CKBC | DA-N | BATHURST |
| 2 | C___ | DA-2 | STE-MARIE DE BEAUCE |
| 3 | WDRC | DA-N | HARTFORD |
| 4 | WKOP | DA-2 | BINGHAMTON |
| 5 | WPPA | DA-2 | POTTSVILLE |
| 6 | WWBZ | DA-N | VINELAND |
| 7 | WCHL | DA-N | CHAPEL HILL |
| 8 | WKAT | ND | MIAMI BEACH |
| 9 | WSAI | DA-N | CINCINNATI |
| 10 | WIXZ | DA-N | McKEESPORT |
| 11 | WKMI | DA-N | KALAMAZOO |
| 12 | WBAY | DA-N | GREEN BAY |
| 13 | KSCJ | DA-N | SIOUX CITY |
| 14 | KFFA | DA-N | HELENA |
| 15 | KBUK | DA-2 | BAYTOWN |
| 16 | KRYS | ND | CORPUS CHRISTI |
| 17 | KXOL | DA-N | FORT WORTH |
| 18 | KEYZ | DA-N | WILLISTON |
| 19 | KRKK | DA-N | ROCK SPRINGS |
| 20 | KNWZ | DA-N | GLENDALE |
| 21 | KGB | ND | SAN DIEGO |
| 22 | KFIV | DA-2 | MODESTO |
| 23 | KMO | ND | TACOMA |
| 24 | WKYO | DA-N | CARO |
| 25 | WCHQ | DA-2 | CAMUY |

# 1370 KHZ

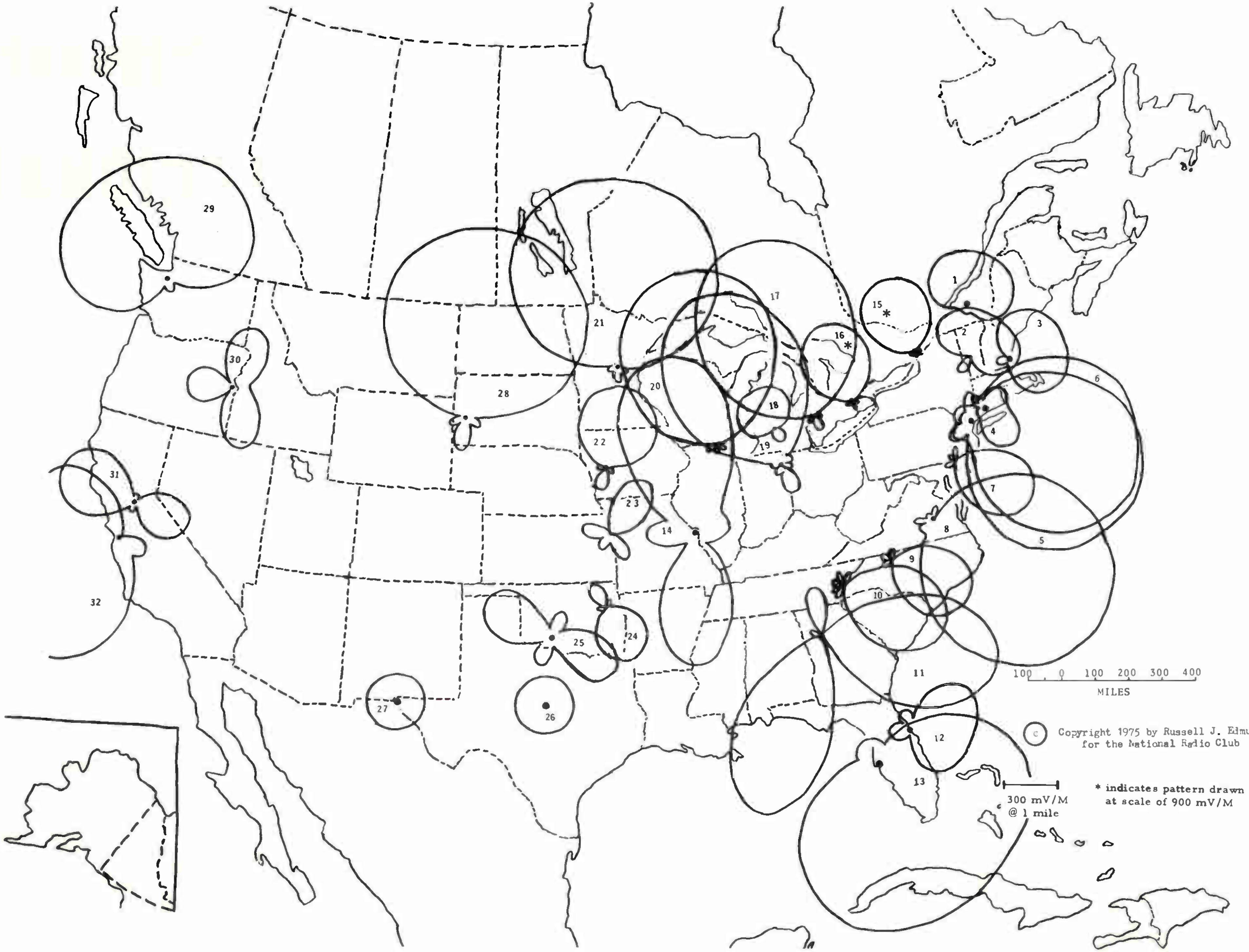
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | WDEA | DA-2 | ELLSWORTH |
| 2 | WFEA | DA-1 | MANCHESTER |
| 3 | CFLV | DA-1 | VALLEYFIELD |
| 4 | WSAY | DA-N | ROCHESTER |
| 5 | WWCB | DA-N | CORRY |
| 6 | WSPD | DA-N | TOLEDO |
| 7 | WDEF | DA-N | CHATTANOOGA |
| 8 | WCOA | DA-N | PENSACOLA |
| 9 | WIVV | ND | VIEQUES |
| 10 | WTTS | DA-2 | BLOOMINGTON |
| 11 | WWAM | DA-2 | CADILLAC |
| 12 | KDTH | DA-N | DUBUQUE |
| 13 | KSUM | DA-2 | FAIRMONT |
| 14 | KFRO | DA-N | LONGVIEW |
| 15 | KGNO | DA-N | DODGE CITY |
| 16 | CJWW | DA-2 | SASKATOON |
| 17 | KXLF | ND | BUTTE |
| 18 | KAST | DA-N | ASTORIA |
| 19 | KEEN | DA-2 | SAN JOSE |
| 20 | KREL | DA-2 | CORONA |
| 21 | XEHF | ND | NOGALES |
| 22 | XEMON | DA-N | MONTERREY |
| | (pattern not available) | | |
| 23 | XEHX | DA-N | CD. OBREGON |
| 24 | CHPQ | DA-1 | PARKSVILLE |
| 25 | CFOK | DA-N | WESTLOCK |
| 26 | WKIK | DA-N | LEONARDTOWN |

# 1380 KHZ

# REGIONAL

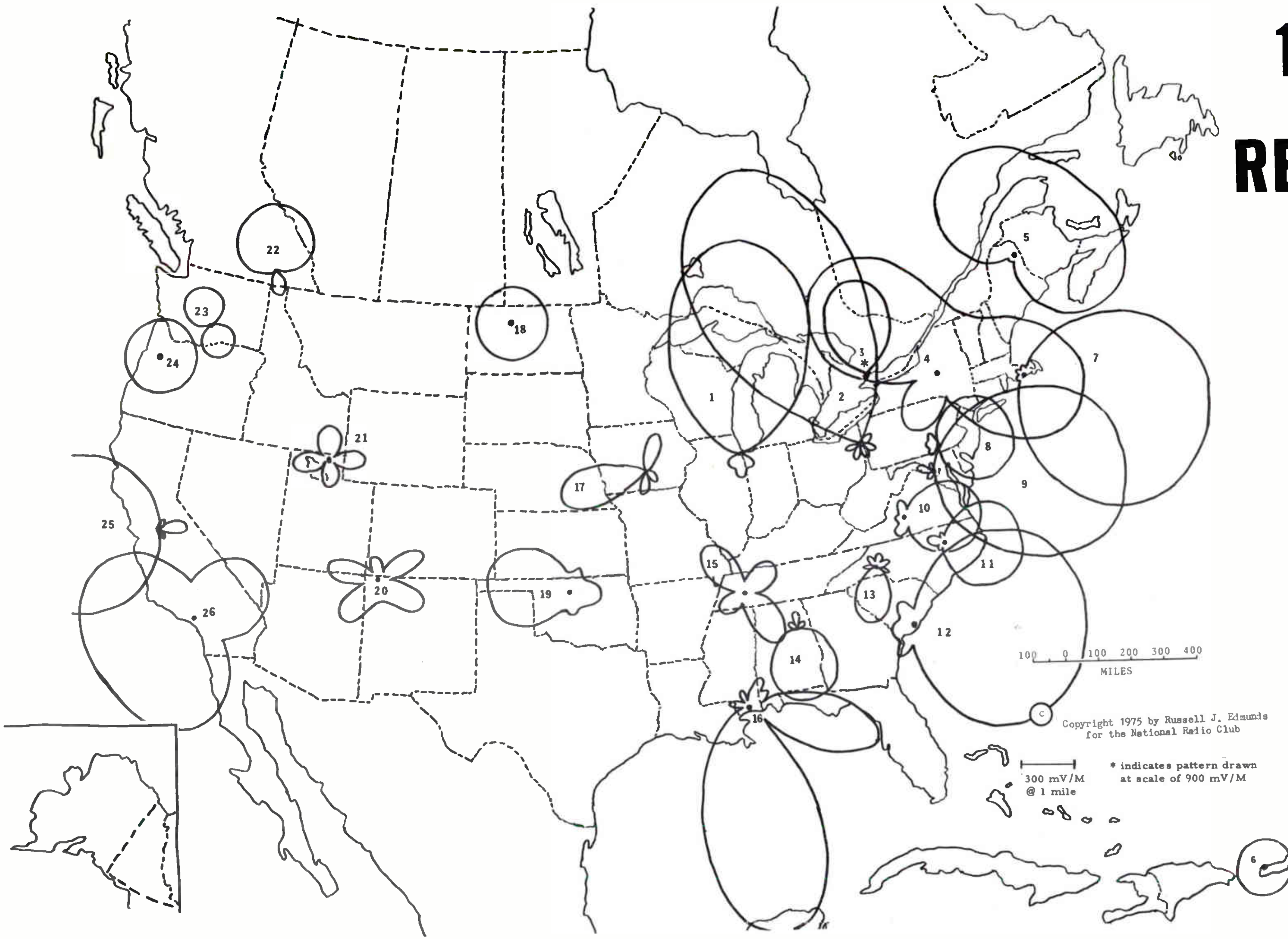



| | call | class | location |
|---|---|---|---|
| 1 | CFDA | DA-N | VICTORIAVILLE |
| 2 | WSYB | DA-N | RUTLAND |
| 3 | WBBX | DA-N | PORTSMOUTH |
| 4 | WOWW | DA-2 | NAUGATUCK |
| 5 | WBNX | DA-1 | NEW YORK |
| 6 | WAWZ | DA-2 | ZARAPHATH |
| | (WBNX & WAWZ share time) | | |
| 7 | WAMS | DA-3 | WILMINGTON |
| | (uses two daytime patterns) | | |
| 8 | WTVR | DA-N | RICHMOND |
| 9 | WTOB | DA-N | WINSTON-SALEM |
| 10 | WKKE | DA-N | ASHEVILLE |
| 11 | WAOK | DA-N | ATLANTA |
| 12 | WDAT | DA-N | ORMOND BEACH |
| 13 | WLCY | DA-N | ST. PETERSBURG |
| 14 | KWK | DA-N | ST. LOUIS |
| 15 | CKLC | DA-2 | KINGSTON |
| 16 | CKPC | DA-2 | BRANTFORD |
| 17 | WPHM | DA-2 | PORT HURON |
| 18 | WPLB | DA-N | GREENVILLE |
| 19 | WMEE | DA-2 | FORT WAYNE |
| 20 | WBEL | DA-N | BELOIT |
| 21 | KLIZ | DA-N | BRAINERD |
| 22 | KCIM | DA-2 | CARROLL |
| 23 | KUDL | DA-2 | FAIRWAY |
| 24 | KMUS | DA-N | MUSKOGEE |
| 25 | KSWO | DA-2 | LAWTON |
| 26 | KBWD | ND | BROWNWOOD |
| 27 | KTSM | ND | EL PASO |
| 28 | KOTA | DA-N | RAPID CITY |
| 29 | KRKO | DA-N | EVERETT |
| 30 | KSRV | DA-N | ONTARIO |
| 31 | KGMS | DA-2 | SACRAMENTO |
| 32 | KTOM | DA-2 | SALINAS |

# 1390 KHZ

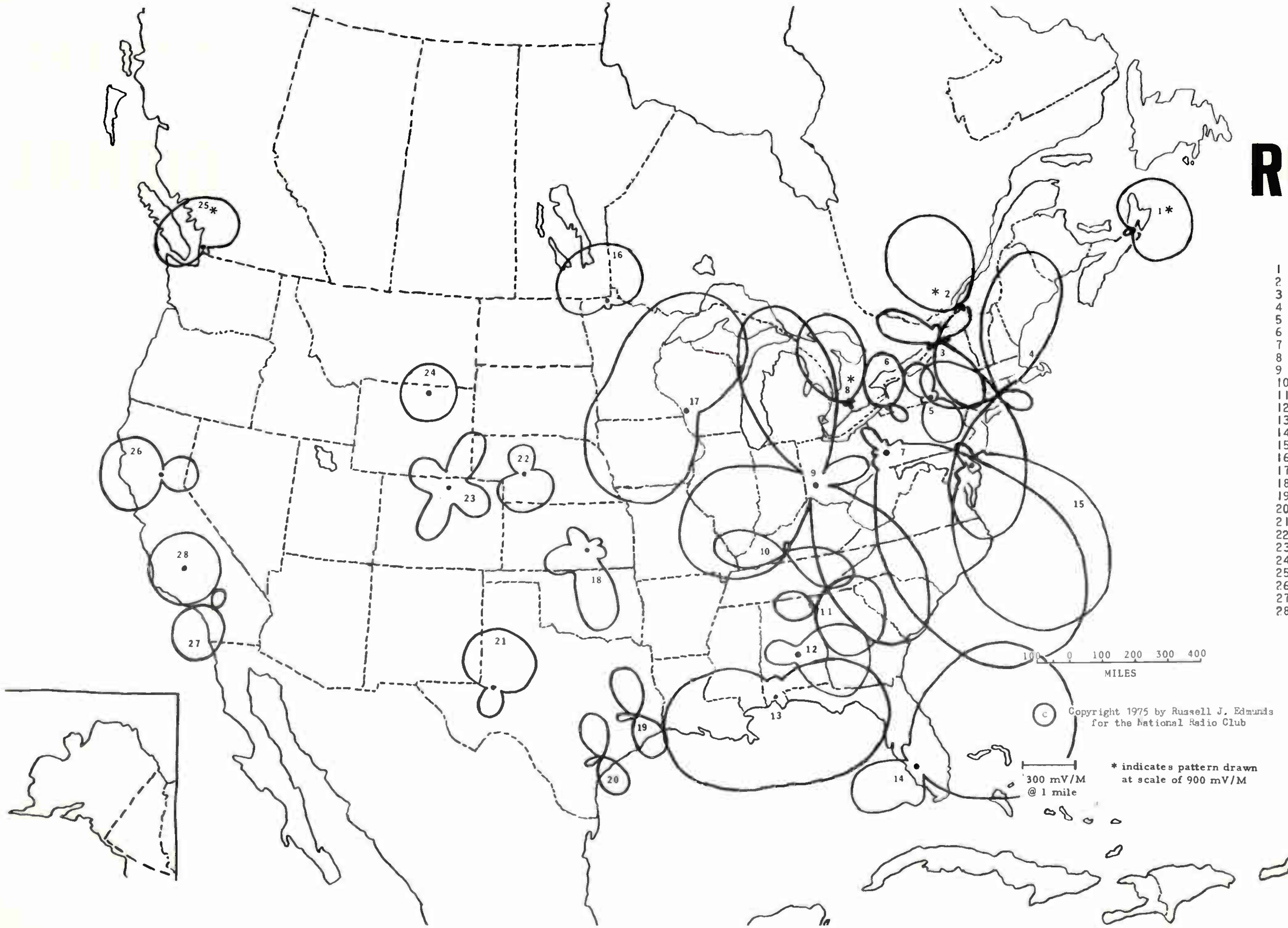
# REGIONAL

| | call | class | location |
|---|---|---|---|
| 1 | WVON | DA-2 | CHICAGO |
| 2 | WFMJ | DA-N | YOUNGSTOWN |
| 3 | CHOO | DA-1 | AJAX |
| 4 | WFBL | DA-N | SYRACUSE |
| 5 | WEGP | DA-N | PRESQUE ISLE |
| 6 | WISA | ND | ISABELA |
| 7 | WPLM | DA-2 | PLYMOUTH |
| 8 | WLAN | DA-2 | LANCASTER |
| 9 | WEAM | DA-2 | ARLINGTON |
| 10 | WWOD | DA-N | LYNCHBURG |
| 11 | WEED | DA-N | ROCKY MOUNT |
| 12 | WCSC | DA-N | CHARLESTON |
| 13 | WADA | DA-N | SHELBY |
| 14 | WHMA | DA-N | ANNISTON |
| 15 | WTJS | DA-N | JACKSON |
| 16 | WROA | DA-2 | GULFPORT |
| 17 | KCBC | DA-1 | DES MOINES |
| 18 | KLPM | ND | MINOT |
| 19 | KCRC | DA-1 | ENID |
| 20 | KENN | DA-N | FARMINGTON |
| 21 | KBLW | DA-N | LOGAN |
| 22 | CKKC | DA-1 | NELSON |
| 23 | KBBO | DA-N | YAKIMA |
| 24 | KSML | ND | SALEM |
| 25 | KCEY | DA-2 | TURLOCK |
| 26 | KGER | DA-N | LONG BEACH |



# 1410 KHZ

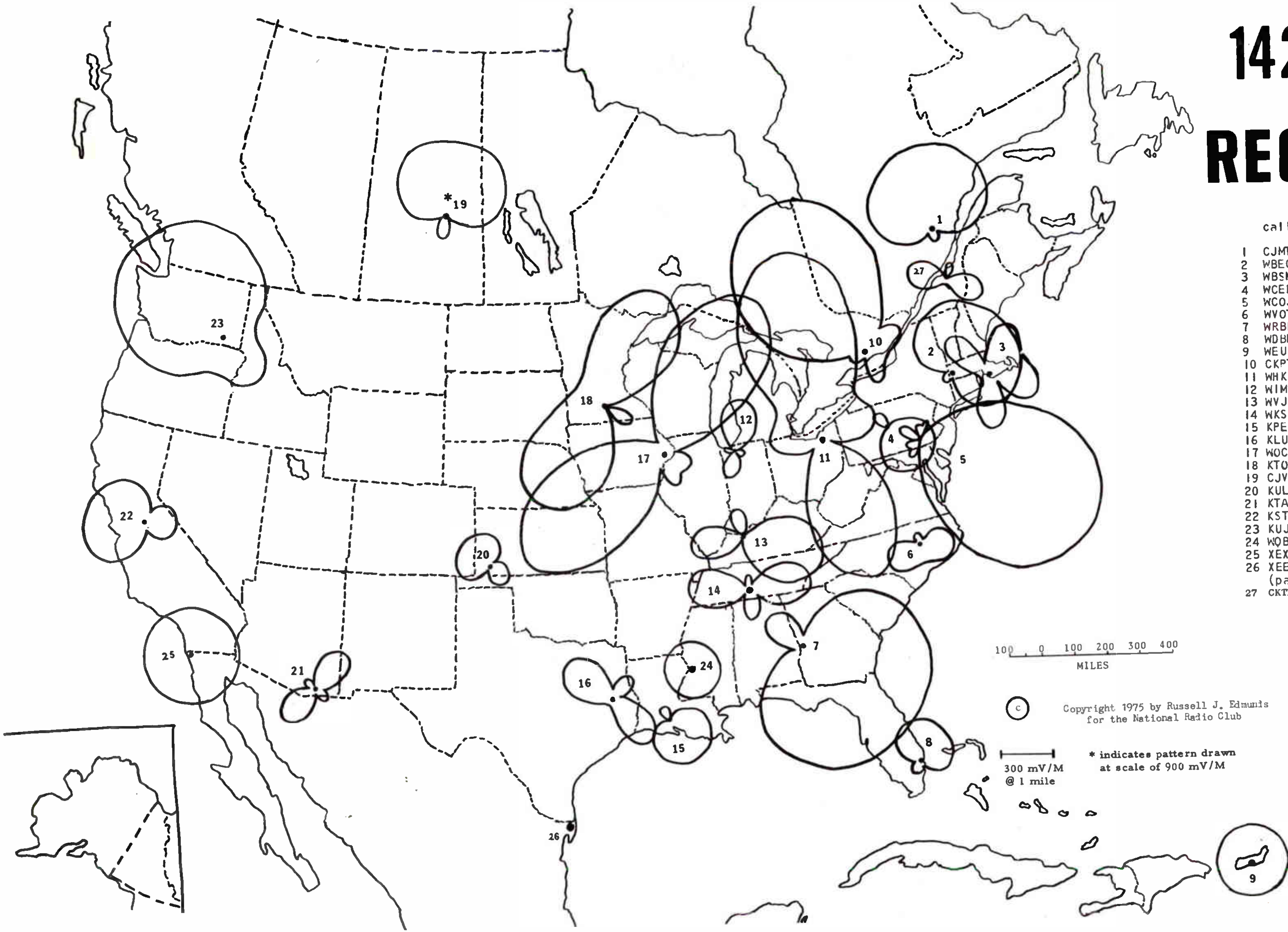
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | C___ | DA-2 | PORT HAWESBURY |
| 2 | CFMB | DA-1 | MONTREAL |
| 3 | WOTT | DA-N | WATERTOWN |
| 4 | WPOP | DA-2 | HARTFORD |
| 5 | WELM | DA-N | ELMIRA |
| 6 | WDOE | DA-N | DUNKIRK |
| 7 | KQV | DA-2 | PITTSBURGH |
| 8 | CKSL | DA-2 | LONDON |
| 9 | WING | DA-N | DAYTON |
| 10 | WLBJ | DA-N | BOWLING GREEN |
| 11 | WLAQ | DA-N | ROME |
| 12 | WPXC | DA-2 | PRATTVILLE |
| 13 | WUNI | DA-N | MOBILE |
| 14 | WMYR | DA-N | FORT MYERS |
| 15 | WDOV | DA-N | DOVER |
| 16 | KRWB | DA-N | ROSEAU |
| 17 | WIZM | DA-N | LA CROSSE |
| 18 | KWBB | DA-2 | WICHITA |
| 19 | KJCH | DA-2 | CLEVELAND |
| 20 | KNAL | DA-N | VICTORIA |
| 21 | KRIG | DA-N | ODESSA |
| 22 | KNOP | DA-N | NORTH PLATTE |
| 23 | KCOL | DA-N | FORT COLLINS |
| 24 | KWYO | ND | SHERIDAN |
| 25 | CFUN | DA-2 | VANCOUVER |
| 26 | KMYC | DA-2 | MARYSVILLE |
| 27 | KCAL | DA-N | REDLANDS |
| 28 | KERN | ND | BAKERSFIELD |

# 1420 KHZ

# REGIONAL

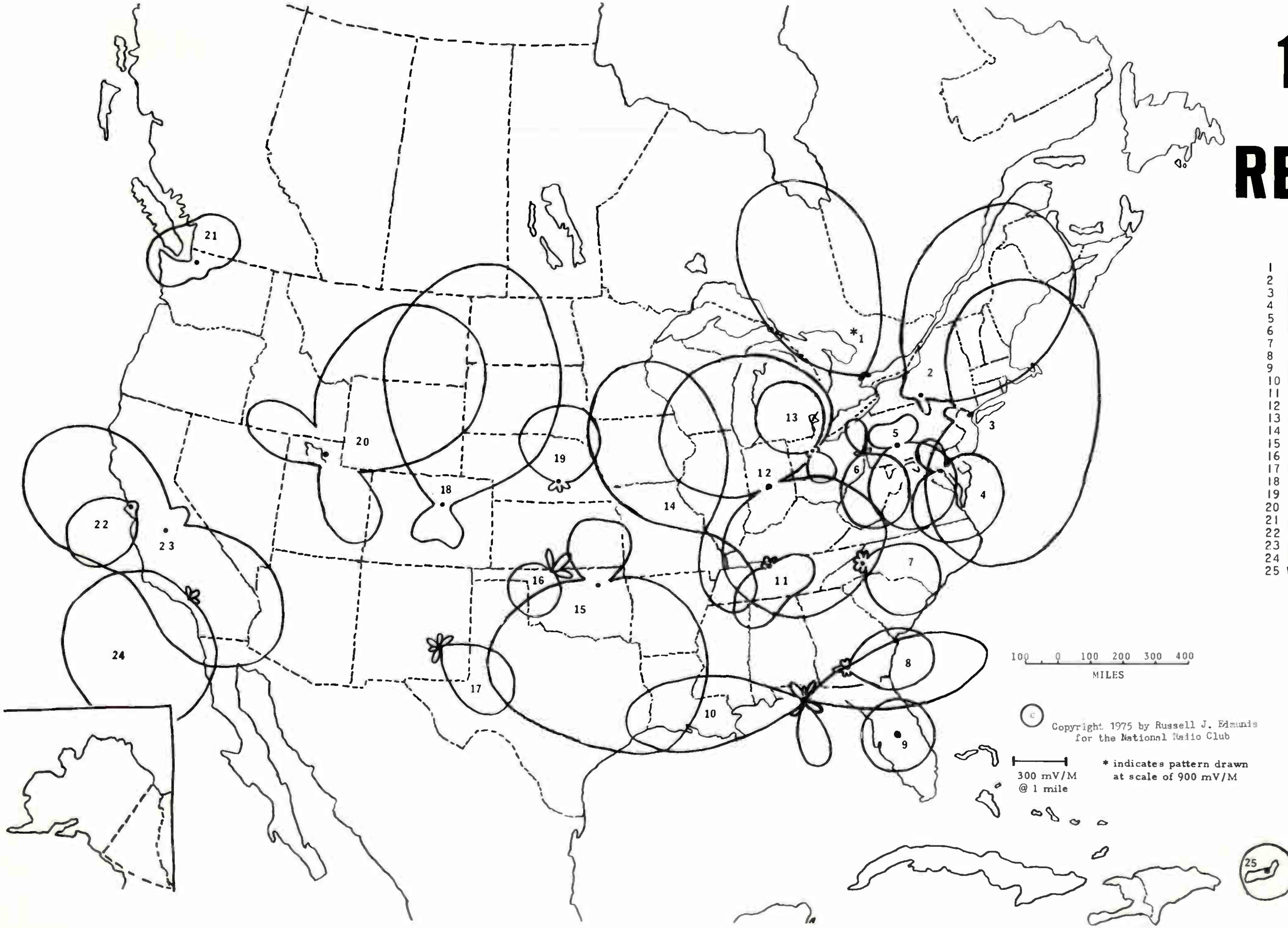



| | call | class | location |
|---|---|---|---|
| 1 | CJMT | DA-N | CHICOUTIMI |
| 2 | WBEC | DA-N | PITTSFIELD |
| 3 | WBSM | DA-1 | NEW BEDFORD |
| 4 | WCED | DA-N | DU BOISE |
| 5 | WCOJ | DA-N | COATESVILLE |
| 6 | WVOT | DA-N | WILSON |
| 7 | WRBL | DA-N | COLUMBUS |
| 8 | WDBF | DA-2 | DELRAY BEACH |
| 9 | WEUC | ND | PONCE |
| 10 | CKPT | DA-2 | PETERBOROUGH |
| 11 | WHK | DA-N | CLEVELAND |
| 12 | WIMS | DA-2 | MICHIGAN CITY |
| 13 | WVJS | DA-2 | OWENSBORO |
| 14 | WKSR | DA-N | PULASKI |
| 15 | KPEL | DA-N | LAFAYETTE |
| 16 | KLUF | DA-N | LUFKIN |
| 17 | WOC | DA-2 | DAVENPORT |
| 18 | KTOE | DA-N | MANKATO |
| 19 | CJVR | DA-N | MELFORT |
| 20 | KULY | DA-2 | ULYSSES |
| 21 | KTAN | DA-N | SIERRA VISTA |
| 22 | KSTN | DA-2 | STOCKTON |
| 23 | KUJ | DA-N | WALLA WALLA |
| 24 | WQBC | ND | VICKSBURG |
| 25 | XEXX | ND | TIJUANA |
| 26 | XEEW | DA-2 | MATAMOROS |
| | (pattern not available) | | |
| 27 | CKTL | DA-N | PLESSISVILLE |

# 1430 KHZ

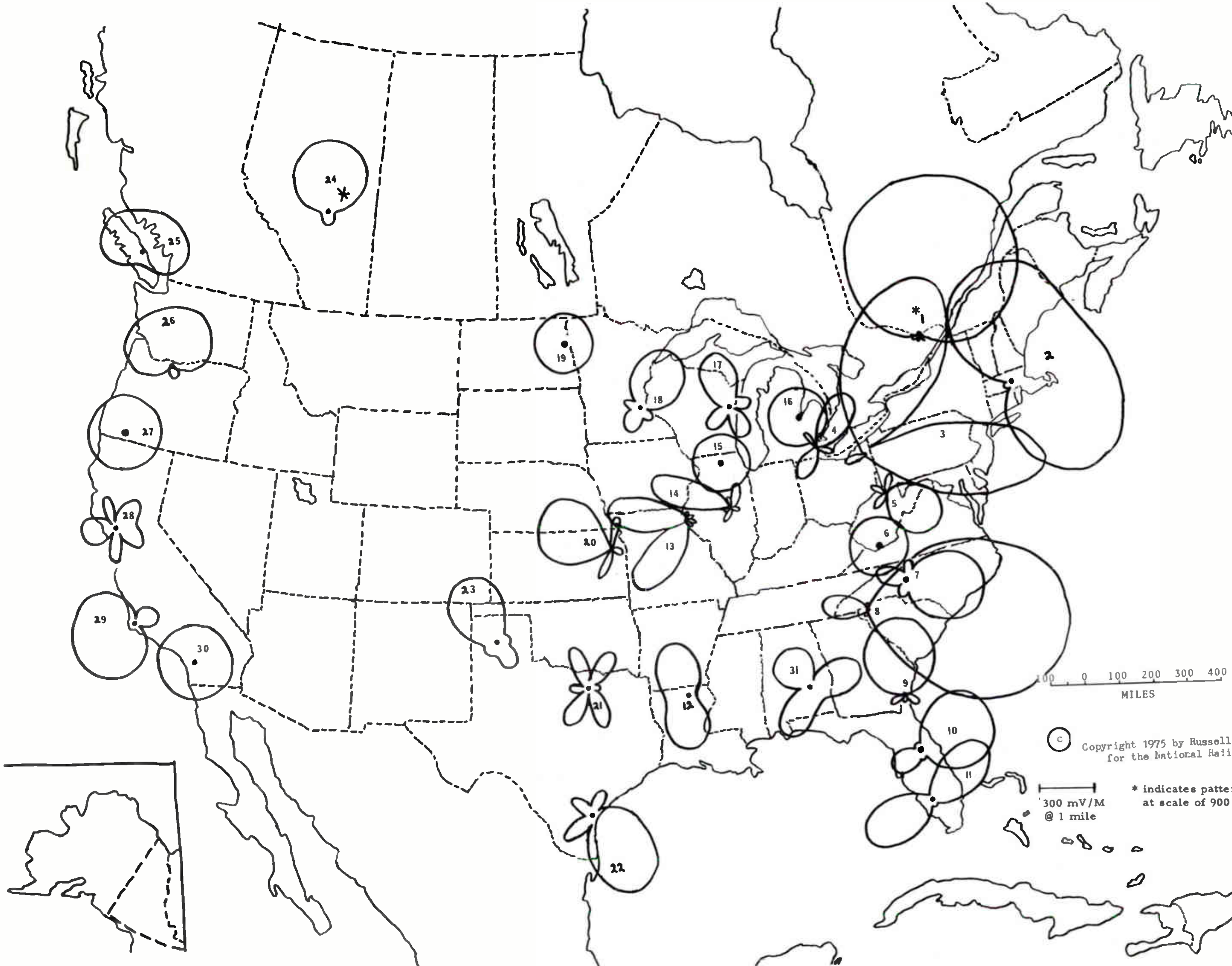
# REGIONAL

| | call | class | location |
|---|---|---|---|
| 1 | CKFH | DA-2 | TORONTO |
| 2 | WENE | DA-N | ENDICOTT |
| 3 | WNJR | DA-N | NEWARK |
| 4 | WNAV | DA-N | ANNAPOLIS |
| 5 | WVAM | DA-N | ALTOONA |
| 6 | WEIR | DA-2 | WEIRTON |
| 7 | WMNC | DA-N | MORGANTON |
| 8 | WWGS | DA-N | TIFTON |
| 9 | WQPD | ND | LAKELAND |
| 10 | WPFC | DA-2 | PANAMA CITY |
| 11 | WENO | DA-N | MADISON |
| 12 | WIRE | DA-N | INDIANAPOLIS |
| 13 | WFOB | DA-2 | FOSTORIA |
| 14 | WIL | DA-2 | ST. LOUIS |
| 15 | KELI | DA-N | TULSA |
| 16 | KALV | DA-1 | ALVA |
| 17 | KMGM | DA-N | ROSWELL |
| 18 | KOSI | DA-N | AURORA |
| 19 | KRGI | DA-N | GRAND ISLAND |
| 20 | KLO | DA-N | OGDEN |
| 21 | KBRC | DA-N | MOUNT VERNON |
| 22 | KEGL | DA-1 | SANTA CLARA |
| 23 | KARM | DA-2 | FRESNO |
| 24 | KALI | DA-2 | SAN GABRIEL |
| 25 | WNEL | ND | CAGUAS |



# 1440

# REGIONAL




* indicates pattern drawn at scale of 900 mV/M

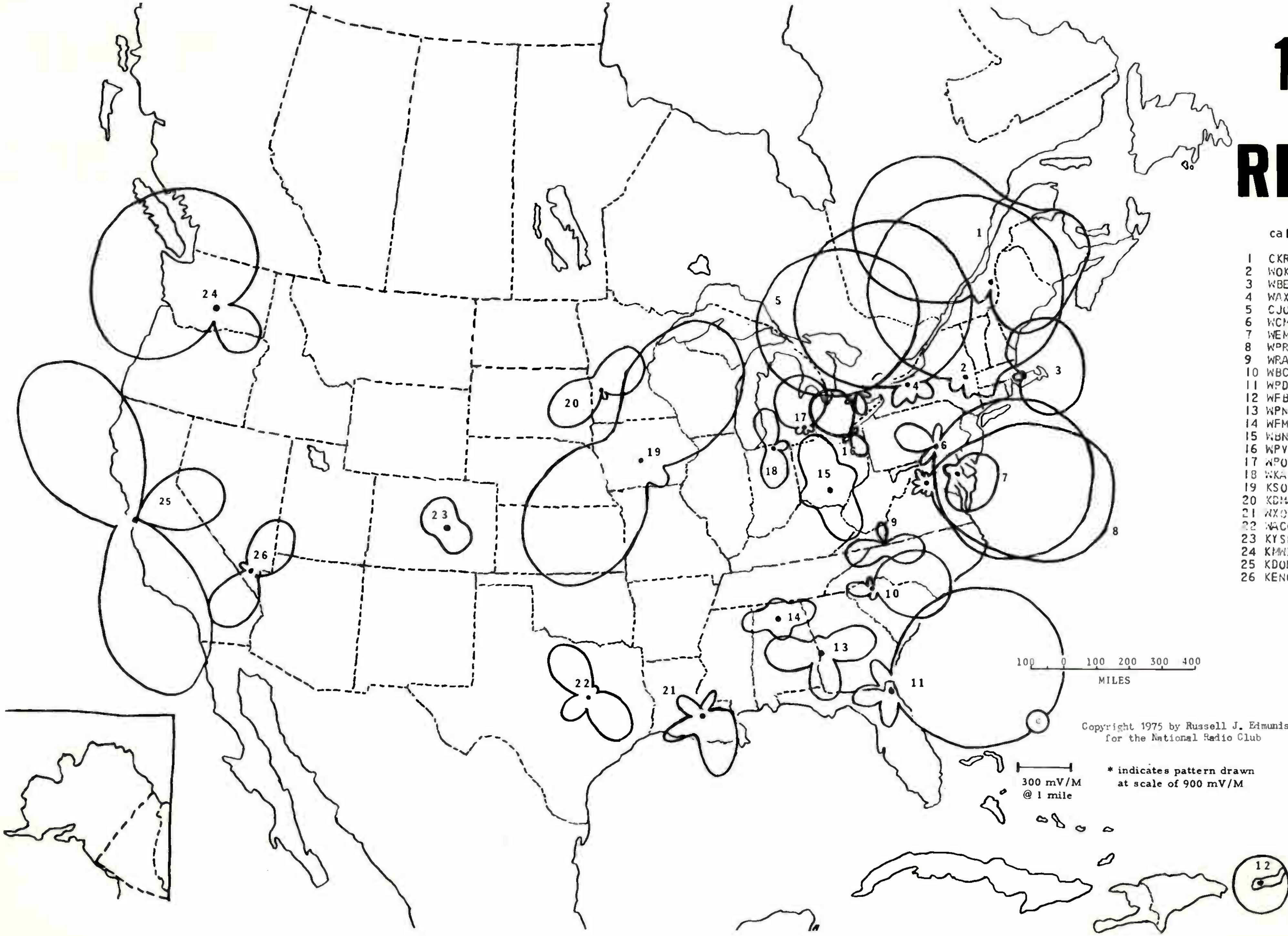


| | call | class | location |
|---|---|---|---|
| 1 | CKPM | DA-1 | OTTAWA |
| 2 | WAAB | DA-2 | WORCESTER |
| 3 | WHHH | DA-2 | WARREN |
| 4 | WCHB | DA-2 | INKSTER |
| 5 | WAJR | DA-2 | MORGANTOWN |
| 6 | WHIS | ND | BLUFFIELD |
| 7 | WBUY | DA-N | LEXINGTON |
| 8 | WQOK | DA-N | GREENVILLE |
| 9 | WGIG | DA-N | BRUNSWICK |
| 10 | WNBE | DA-N | WINTER PARK |
| 11 | WAYK | DA-2 | LEHIGH ACRES |
| 12 | KMLB | DA-N | MONROE |
| 13 | WGEM | DA-2 | QUINCY |
| 14 | WAKC | DA-2 | NORMAL |
| 15 | WROK | ND | ROCKFORD |
| 16 | WBCM | ND | BAY CITY |
| 17 | WNFL | DA-2 | GREEN BAY |
| 18 | KQRS | DA-N | GOLDEN VALLEY |
| 19 | KXXL | ND | GRAND FORKS |
| 20 | KEWI | DA-1 | TOPEKA |
| 21 | KDNT | DA-N | DENTON |
| 22 | KEYS | DA-N | CORPUS CHRISTI |
| 23 | KPUR | DA-N | AMARILLO |
| 24 | CJOI | DA-N | WETASKIWIN |
| 25 | CFCP | DA-N | COURTENAY-COMOX |
| 26 | KODL | DA-N | THE DALLES |
| 27 | KMED | ND | MEDFORD |
| 28 | KVON | DA-2 | NAPA |
| 29 | KUHL | DA-N | SANTA MARIA |
| 30 | KPRO | ND | RIVERSIDE |
| 31 | WHHY | DA-N | MONTGOMERY |

# 1460 KHZ

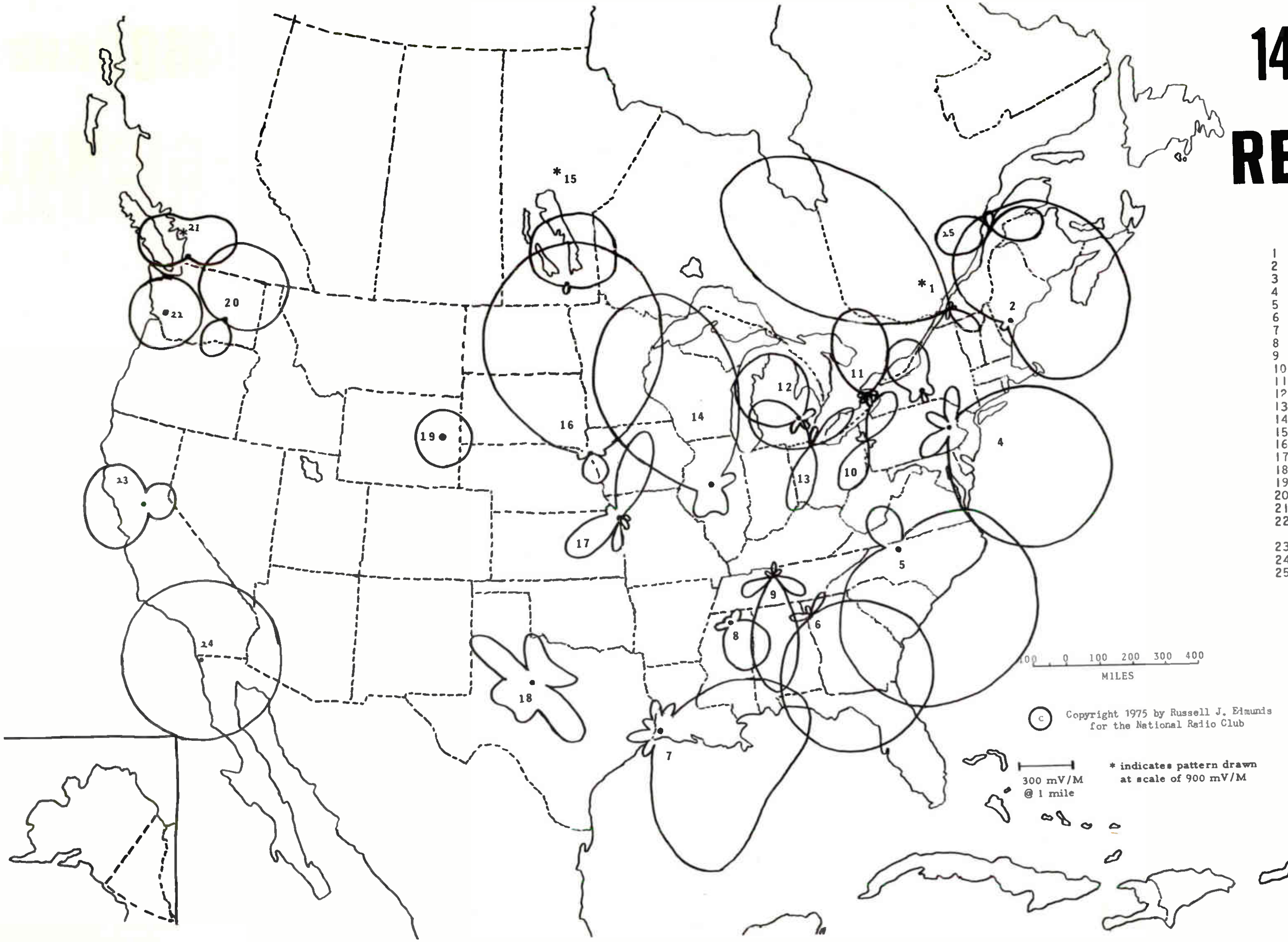
# REGIONAL

| | call | class | location |
|---|---|---|---|
| 1 | CKRB | DA-N | ST.GEORGES DE BEAUCE |
| 2 | WOKO | DA-N | ALBANY |
| 3 | WBET | DA-N | BROCKTON |
| 4 | WAXC | DA-N | ROCHESTER |
| 5 | CJOY | DA-2 | GUELPH |
| 6 | WCMB | DA-N | HARRISBURG |
| 7 | WEMD | DA-2 | EASTON |
| 8 | WPRW | DA-2 | MANASSAS |
| 9 | WRAD | DA-N | RADFORD |
| 10 | WBCU | DA-N | UNION |
| 11 | WPDQ | DA-N | JACKSONVILLE |
| 12 | WFBA | ND | SAN SEBASTIAN |
| 13 | WPNX | DA-N | PHENIX CITY |
| 14 | WFMH | DA-N | CULLMAN |
| 15 | WBNS | DA-1 | COLUMBUS |
| 16 | WPVL | DA-2 | PAINESVILLE |
| 17 | WPON | DA-N | PONTIAC |
| 18 | WKAM | DA-N | GOSHEN |
| 19 | KSO | DA-N | DES MOINES |
| 20 | KDMA | DA-N | MONTEVIDEO |
| 21 | WXOK | DA-N | BATON ROUGE |
| 22 | WACO | DA-N | WACO |
| 23 | KYSN | DA-N | COLORADO SPRINGS |
| 24 | KMWX | DA-N | YAKIMA |
| 25 | KDON | DA-1 | SALINAS |
| 26 | KENO | DA-N | LAS VEGAS |



# 1470 KHZ

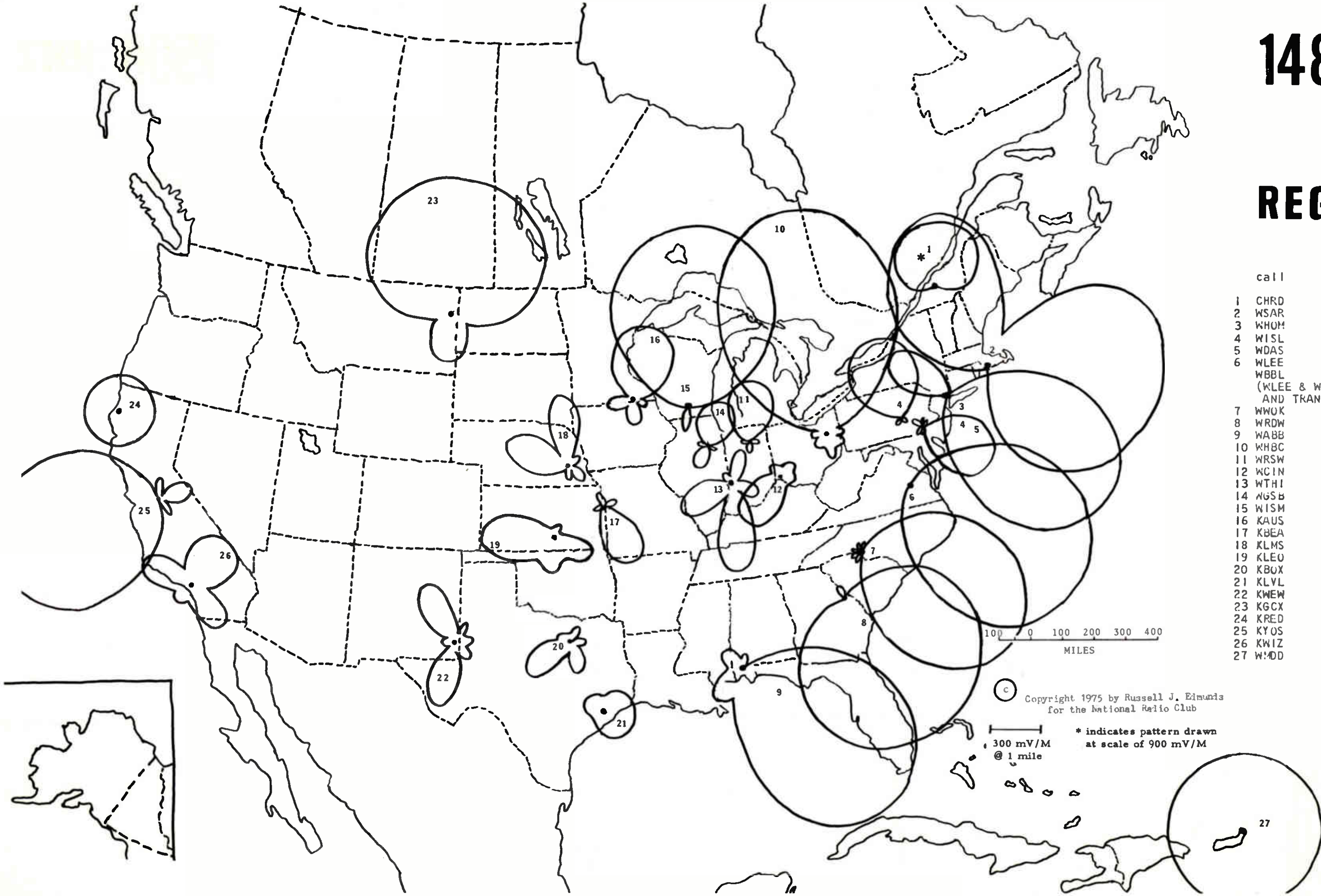
# REGIONAL




| | call | class | location |
|---|---|---|---|
| 1 | CFOX | DA-1 | POINTE CLAIRE |
| 2 | WLAM | DA-1 | LEWISTON |
| 3 | WTKO | DA-N | ITHICA |
| 4 | WSAN | DA-N | ALLENTOWN |
| 5 | WBIG | DA-N | GREENSBORO |
| 6 | WRGA | DA-N | ROME |
| 7 | KLCL | DA-N | LAKE CHARLES |
| 8 | WNAU | DA-N | NEW ALBANY |
| 9 | WVOL | DA-2 | BERRY HILL |
| 10 | WFAR | DA-N | FARRELL |
| 11 | CHOW | DA-2 | WELLAND |
| 12 | WFMF | DA-2 | FLINT |
| 13 | WOHO | DA-2 | TOLEDO |
| 14 | WMBD | DA-2 | PEORIA |
| 15 | CFRW | DA-1 | WINNIPEG |
| 16 | KWSL | DA-2 | SIOUX CITY |
| 17 | KARE | DA-1 | ATCHISON |
| 18 | KRBC | DA-N | ABILENE |
| 19 | KWIV | ND | DOUGLAS |
| 20 | KSEM | DA-2 | MOSES LAKE |
| 21 | CJVB | DA-2 | VANCOUVER |
| 22 | KELA | ND | CENTRALIA-CHEHALIS |
| 23 | KNDE | DA-2 | SACRAMENTO |
| 24 | XEABC | ND | TIJUANA |
| 25 | C___ | DA-1 | BAGOTVILLE |

# 1480

# REGIONAL

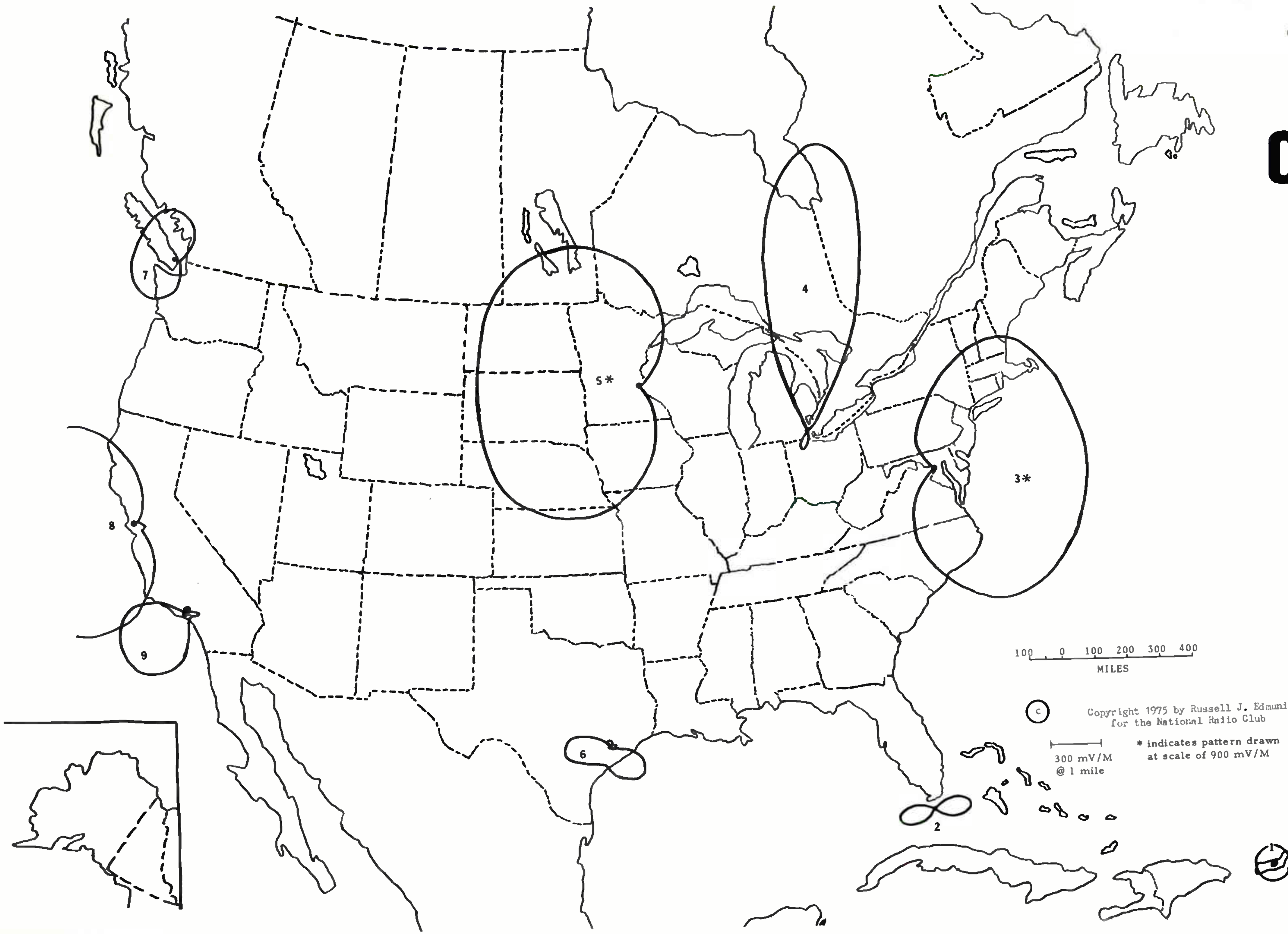



| | call | class | location |
|---|---|---|---|
| 1 | CHRD | DA-2 | DRUMMONDVILLE |
| 2 | WSAR | DA-2 | FALL RIVER |
| 3 | WHOM | DA-2 | NEW YORK |
| 4 | WISL | DA-N | SHAMOKIN |
| 5 | WDAS | DA-2 | PHILADELPHIA |
| 6 | WLEE | DA-2 | RICHMOND |
| | WBBL | DA-2 | RICHMOND |
| | (WLEE & WBBL SHARE TIME AND TRANSMITTER) | | |
| 7 | WWOK | DA-2 | CHARLOTTE |
| 8 | WRDW | DA-N | AUGUSTA |
| 9 | WABB | DA-N | MOBILE |
| 10 | WHBC | DA-N | CANTON |
| 11 | WRSW | DA-2 | WARSAW |
| 12 | WCIN | DA-2 | CINCINNATI |
| 13 | WTHI | DA-2 | TERRE HAUTE |
| 14 | WGSB | DA-2 | GENEVA |
| 15 | WISM | DA-2 | MADISON |
| 16 | KAUS | DA-2 | AUSTIN |
| 17 | KBEA | DA-2 | MISSION |
| 18 | KLMS | DA-2 | LINCOLN |
| 19 | KLEO | DA-2 | WICHITA |
| 20 | KBOX | DA-2 | DALLAS |
| 21 | KLVL | DA-N | PASADENA |
| 22 | KWEW | DA-N | HOBBS |
| 23 | KGCX | DA-1 | SIDNEY |
| 24 | KRED | ND | EUREKA |
| 25 | KYOS | DA-N | MERCED |
| 26 | KWIZ | DA-2 | SANTA ANA |
| 27 | WMDD | ND | FAJARDO |

# 1500 KHZ

# CLEAR

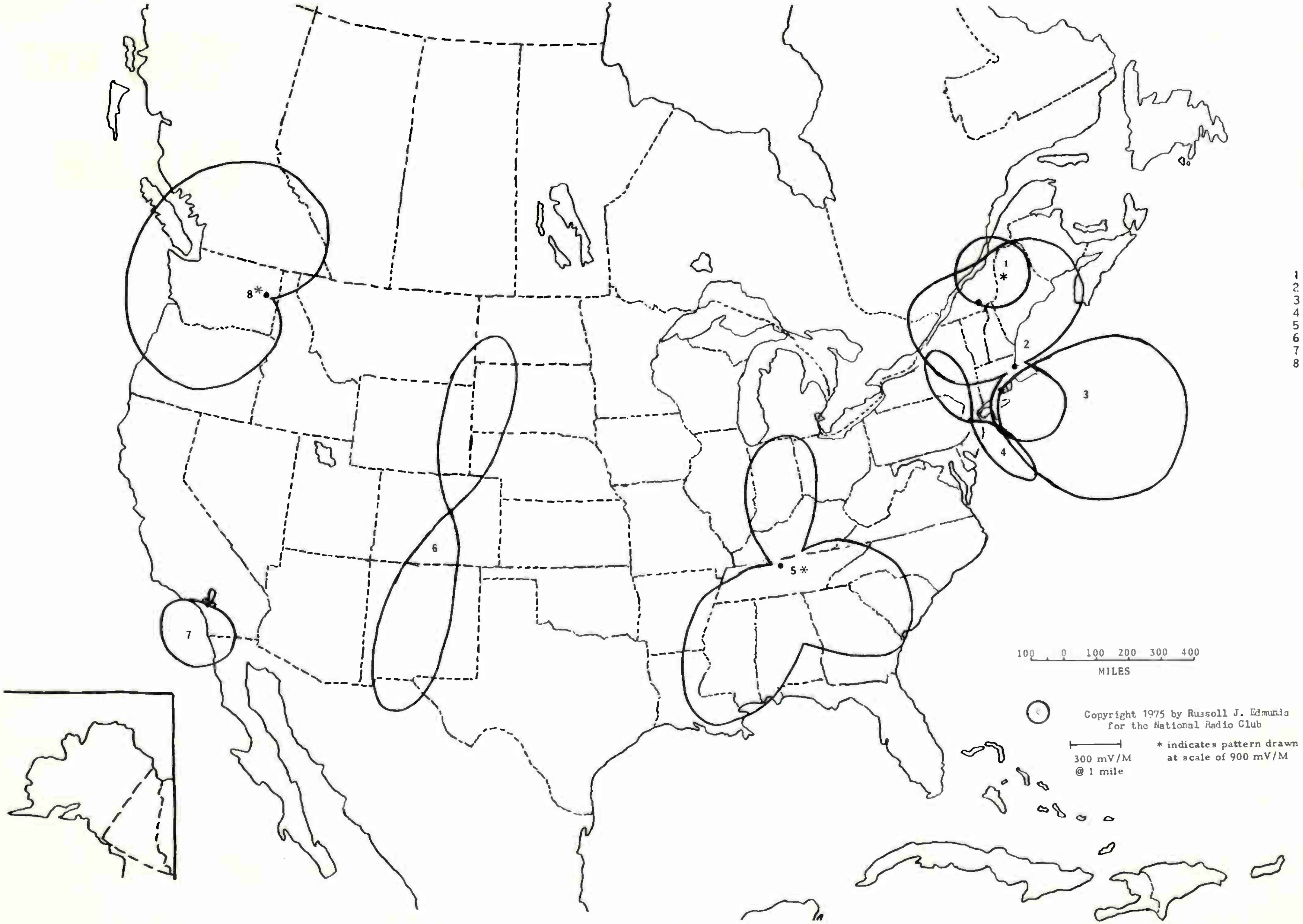
| | call | class | location |
|---|---|---|---|
| 1 | WMNT | ND | MANATI |
| 2 | WKIZ | DA-1 | KEY WEST |
| 3 | WTOP | DA-2 | WASHINGTON |
| 4 | WDEE | DA-2 | DETROIT |
| 5 | KSTP | DA-N | ST. PAUL |
| 6 | KANI | DA-1 | WHARTON |
| 7 | CKAY | DA-2 | DUNCAN |
| 8 | KXRX | DA-2 | SAN JOSE |
| 9 | KROQ | DA-2 | BURBANK |



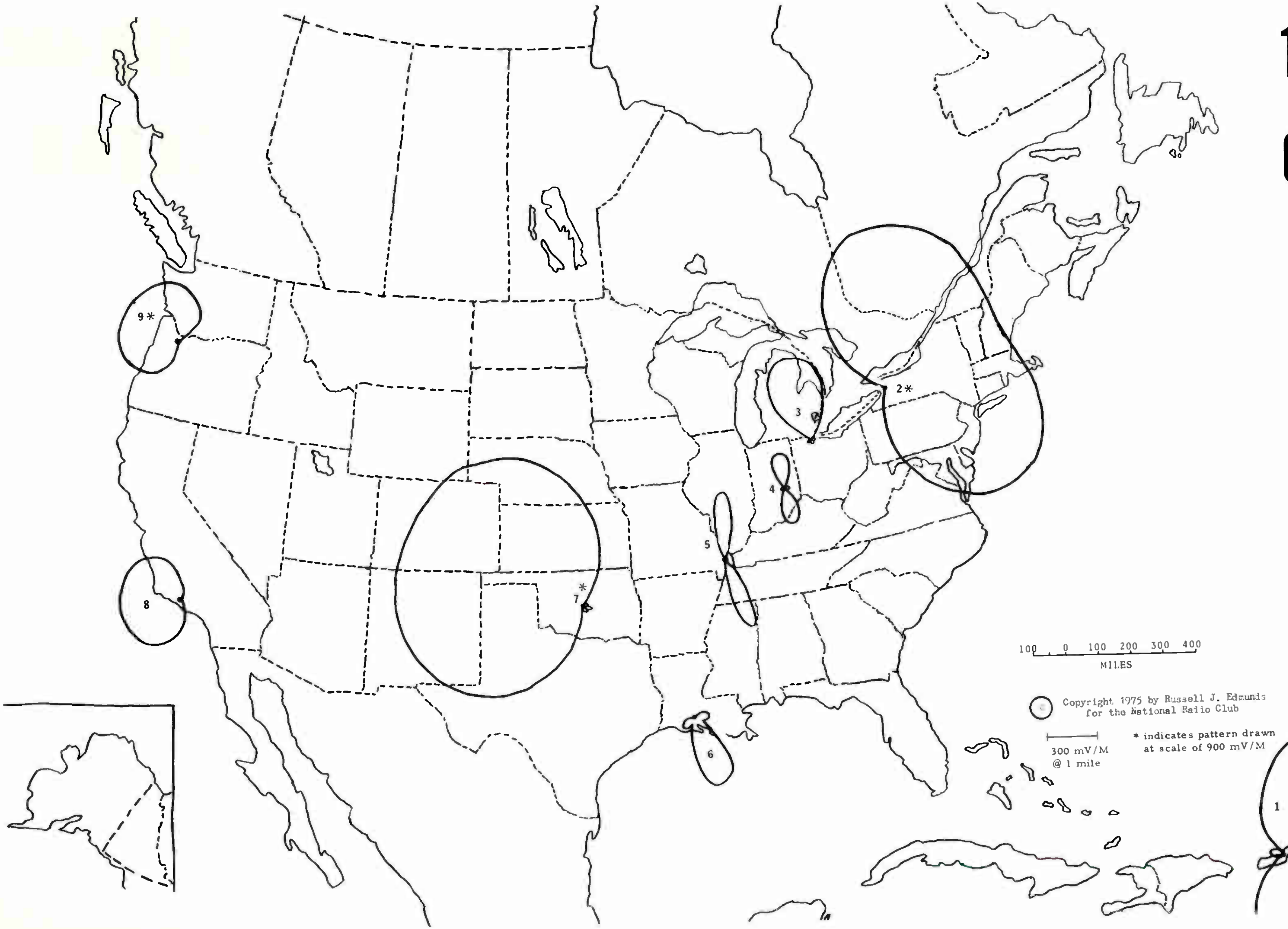
# 1510 KHZ

# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | CJRS | DA-2 | SHERBROOKE |
| 2 | WMEX | DA-2 | BOSTON |
| 3 | WNLC | DA-2 | NEW LONDON |
| 4 | WRAN | DA-2 | DOVER |
| 5 | WLAC | DA-N | NASHVILLE |
| 6 | KDKO | DA-2 | LITTLETON |
| 7 | KSOM | DA-2 | ONTARIO |
| 8 | KGA | DA-N | SPOKANE |



# 1520 KHZ CLEAR

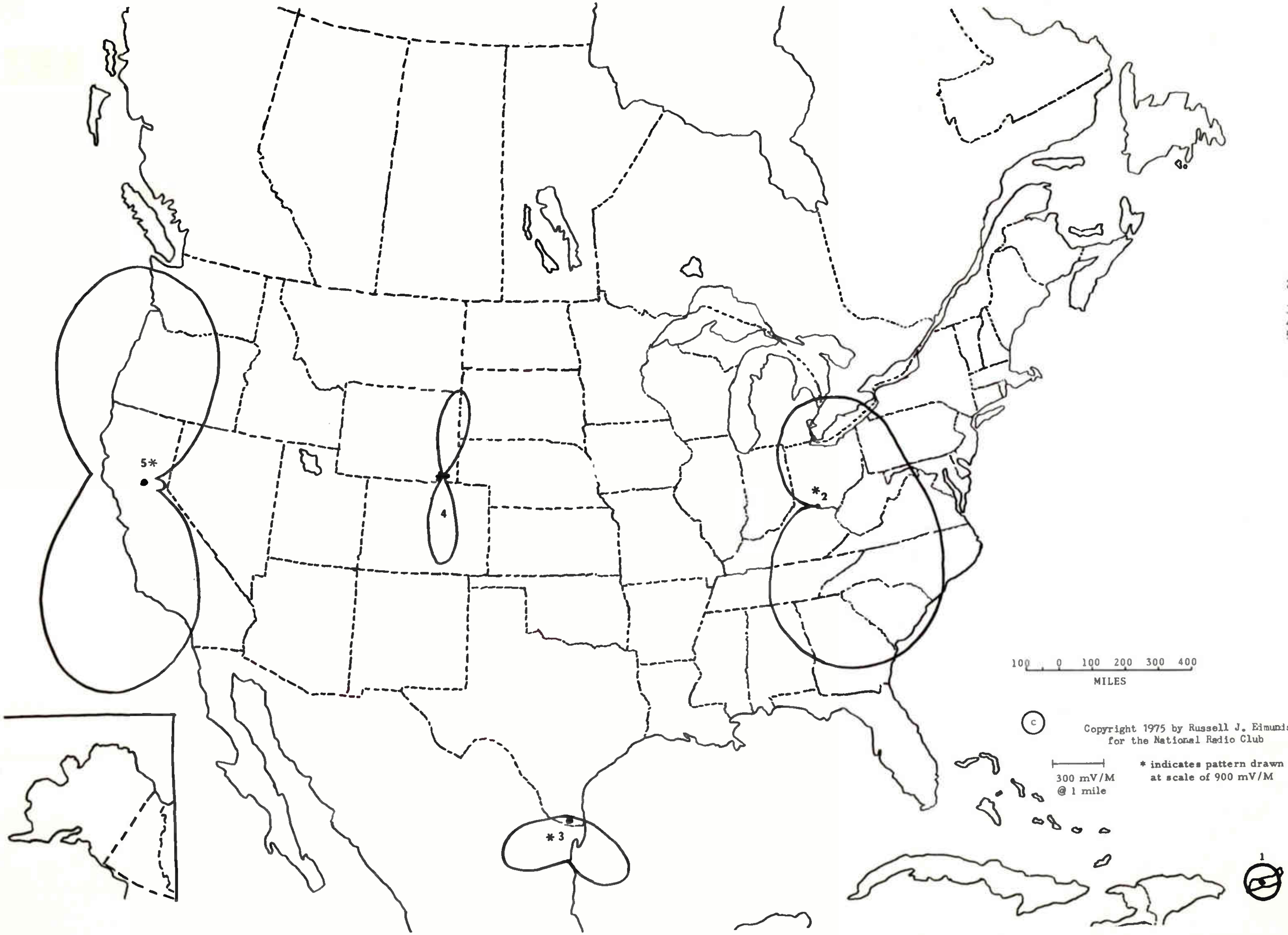


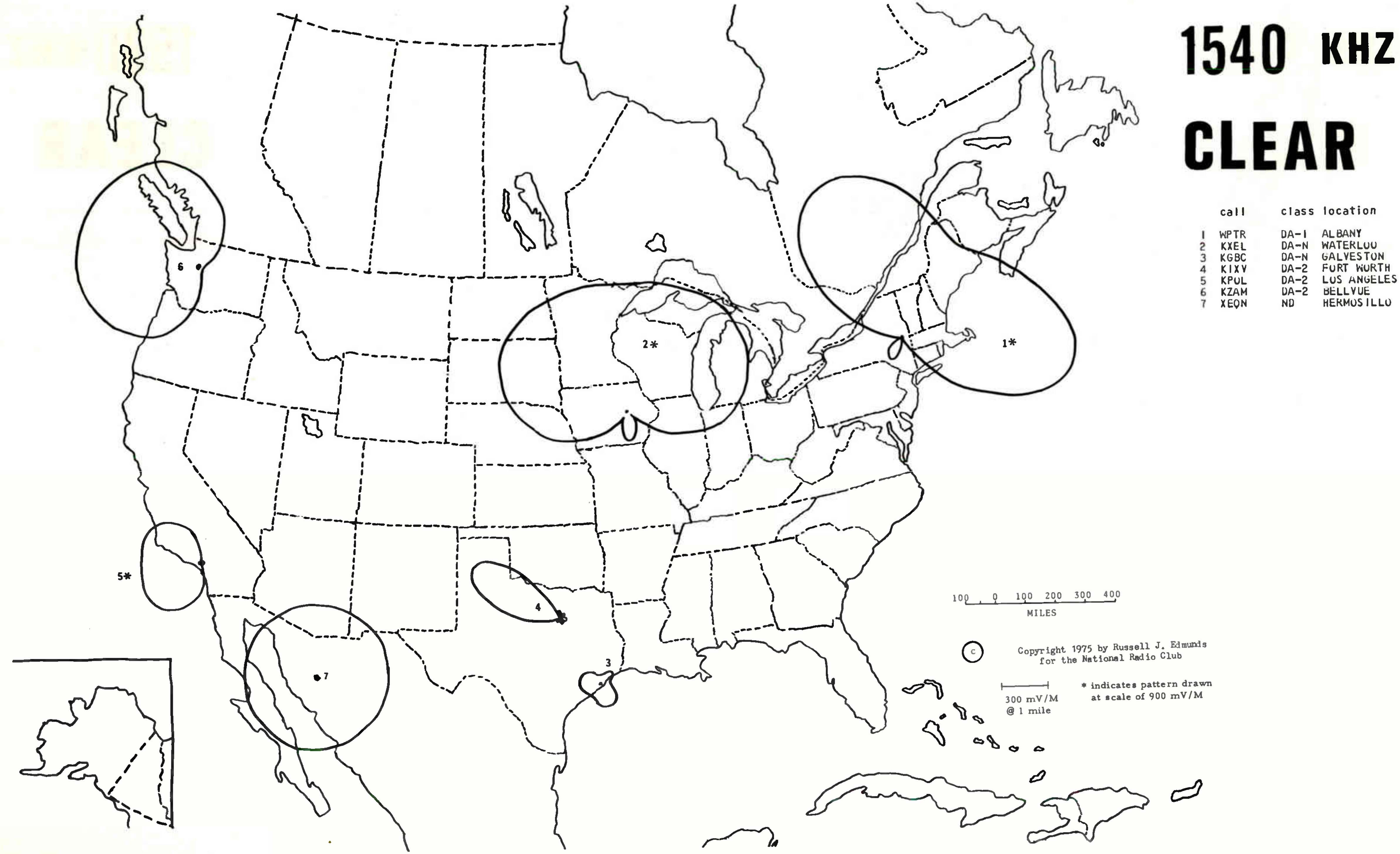

| | call | class | location |
|---|---|---|---|
| 1 | WRAI | DA-1 | SAN JUAN |
| 2 | WKBW | DA-1 | BUFFALO |
| 3 | WTUU | DA-2 | TOLEDO |
| 4 | WSVL | DA-2 | SHELBYVILLE |
| 5 | KMPL | DA-2 | SIKESTON |
| 6 | KXKW | DA-N | LAFAYETTE |
| 7 | KOMA | DA-N | OKLAHOMA CITY |
| 8 | KACY | DA-2 | PORT HUENEME |
| 9 | KYXI | DA-2 | OREGON CITY |

# 1530 KHZ

# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | WUPR | ND | UTUADO |
| 2 | WCKY | DA-N | CINCINNATI |
| | (DA after Sacramento sunset) | | |
| 3 | KGBT | DA-N | HARLINGEN |
| 4 | KNIE | DA-2 | CHEYENNE |
| 5 | KFBK | DA-1 | SACRAMENTO |

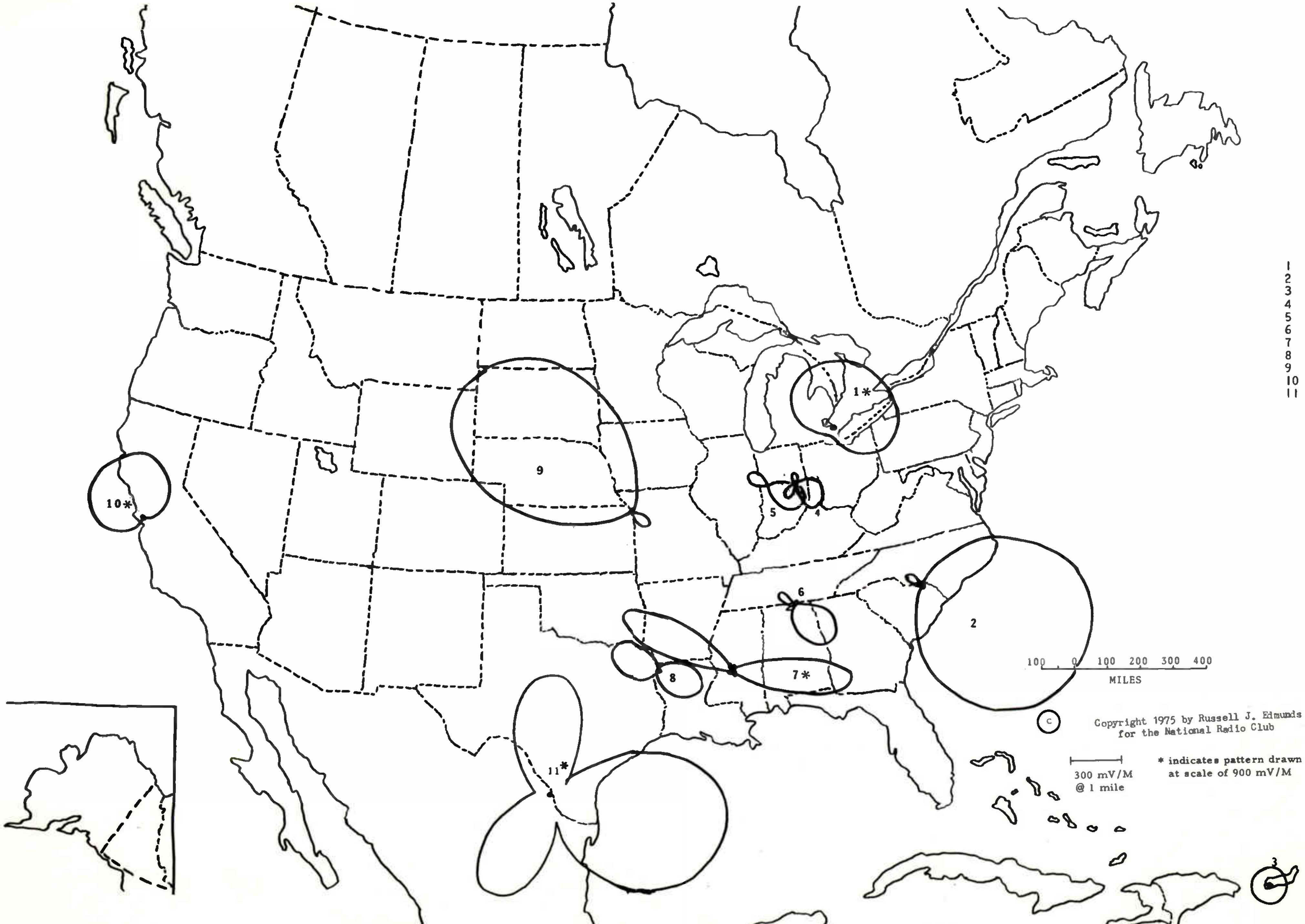



1540 KHZ
CLEAR
call class location
1 WPTR DA-1 ALBANY
2 KXEL DA-N WATERLOO
3 KGBC DA-N GALVESTON
4 KIXV DA-2 FORT WORTH
5 KPOL DA-2 LOS ANGELES
6 KZAM DA-2 BELLVUE
7 XEQN ND HERMOSILLO
100 0 100 200 300 400
MILES
Copyright 1975 by Russell J. Edmunds for the National Radio Club
300 mV/M @ 1 mile
* indicates pattern drawn at scale of 900 mV/M
1*
2*
3
4
5*
6
7

# 1550 KHZ

# CLEAR

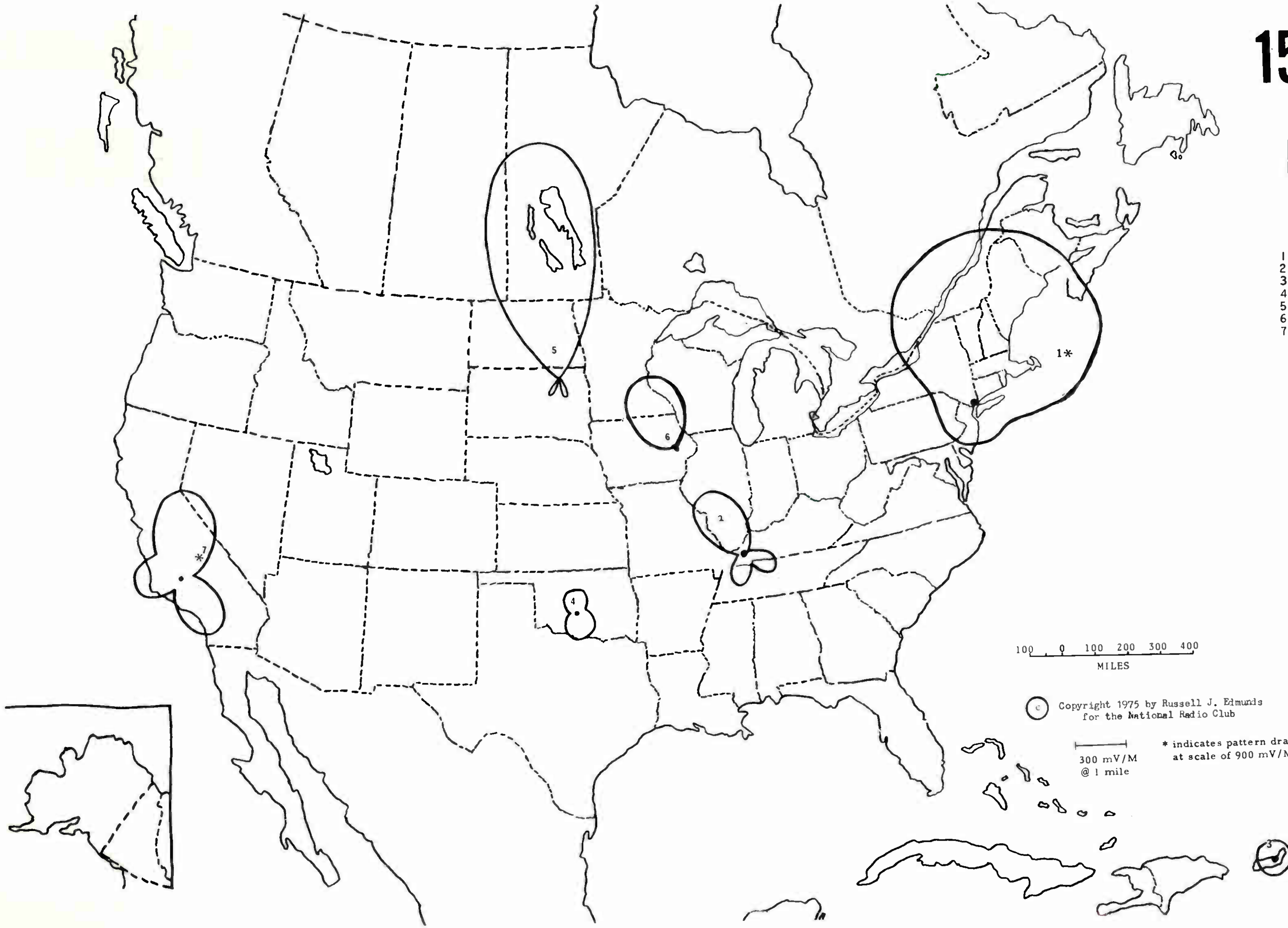
| call | | class | location |
|---|---|---|---|
| 1 | CBE | DA-1 | WINDSOR |
| 2 | WBSC | DA-N | BENNETTSVILLE |
| 3 | WKFE | ND | YAUCO |
| 4 | WCTW | DA-2 | NEW CASTLE |
| 5 | WCVL | DA-N | CRAWFORDSVILLE |
| 6 | WAAY | DA-N | HUNTSVILLE |
| 7 | WOKJ | DA-2 | JACKSON |
| 8 | KOKA | DA-N | SHREVEPORT |
| 9 | KKJO | DA-N | ST. JOSEPH |
| 10 | KKHI | DA-2 | SAN FRANCISCO |
| 11 | XENO | DA-N | NUEVO LAREDO |



# 1560 KHZ

# CLEAR

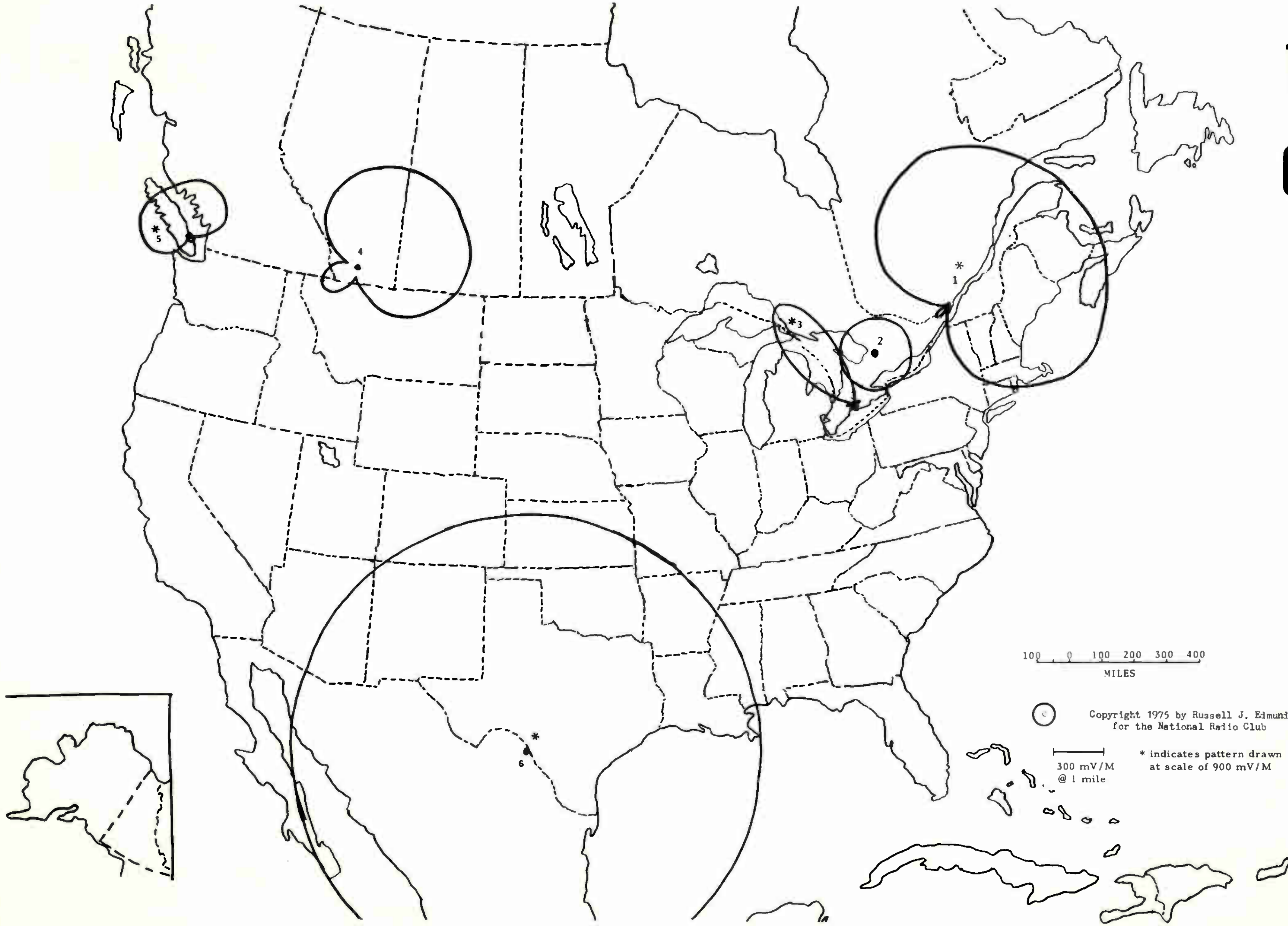
| | call | class | location |
|---|---|---|---|
| 1 | WQXR | DA-2 | NEW YORK |
| 2 | WDXR | DA-2 | PADUCAH |
| 3 | WRSJ | ND | BAYAMON |
| 4 | KWCO | DA-N | CHICKASHA |
| 5 | KKAA | DA-2 | ABERDEEN |
| 6 | K___ | DA-2 | IOWA CITY |
| 7 | KPMC | DA-1 | BAKERSFIELD |



# 1570 KHZ

# CLEAR

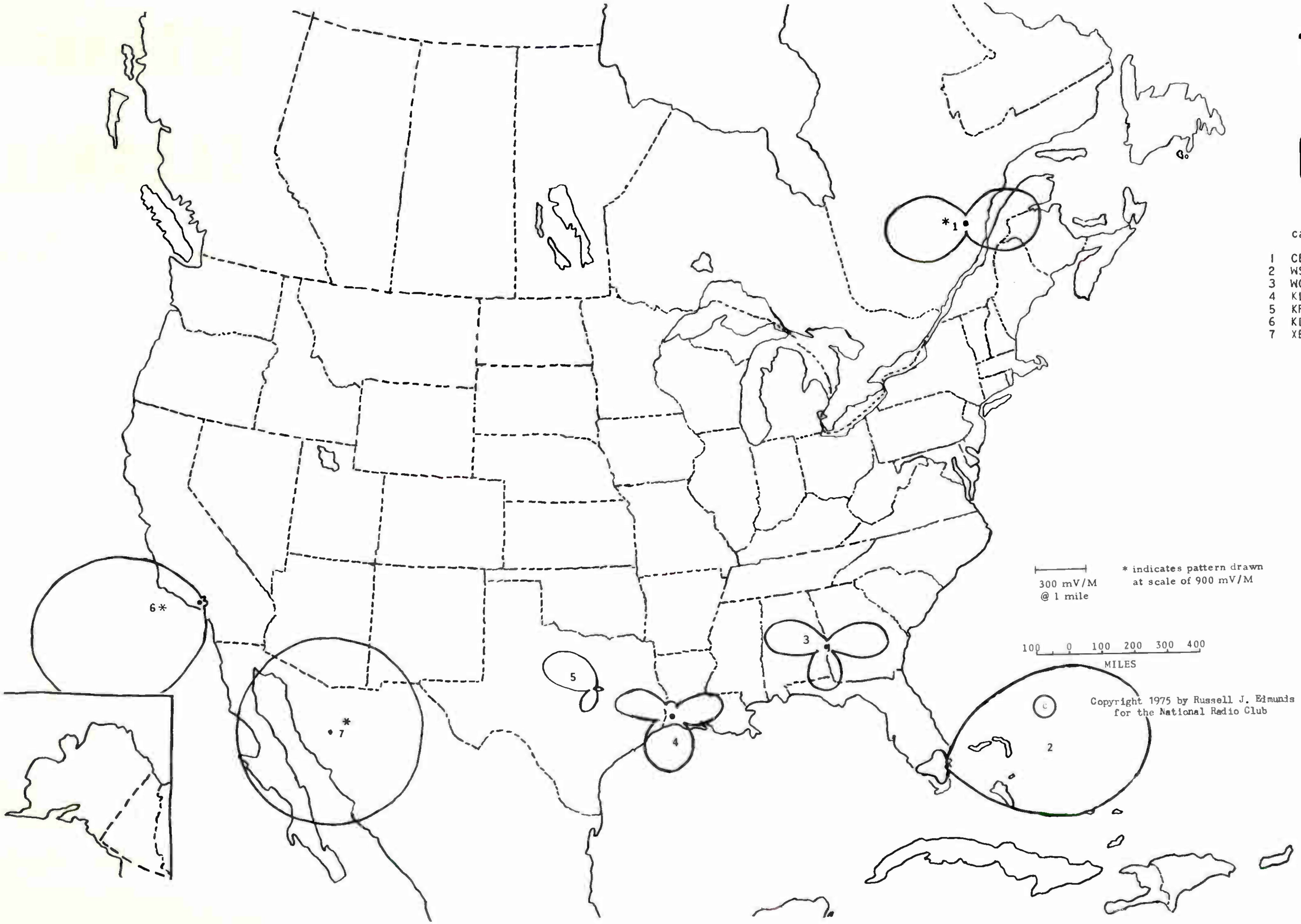
| | call | class | location |
|---|---|---|---|
| 1 | CKLM | DA-2 | MONTREAL |
| 2 | CFOR | ND | ORILLIA |
| 3 | CHLO | DA-2 | ST. THOMAS |
| 4 | CKTA | DA-N | TABER |
| 5 | CHUB | DA-2 | NANAIMO |
| 6 | XERF | ND | CU. ACUNA |



# 1580 KHZ

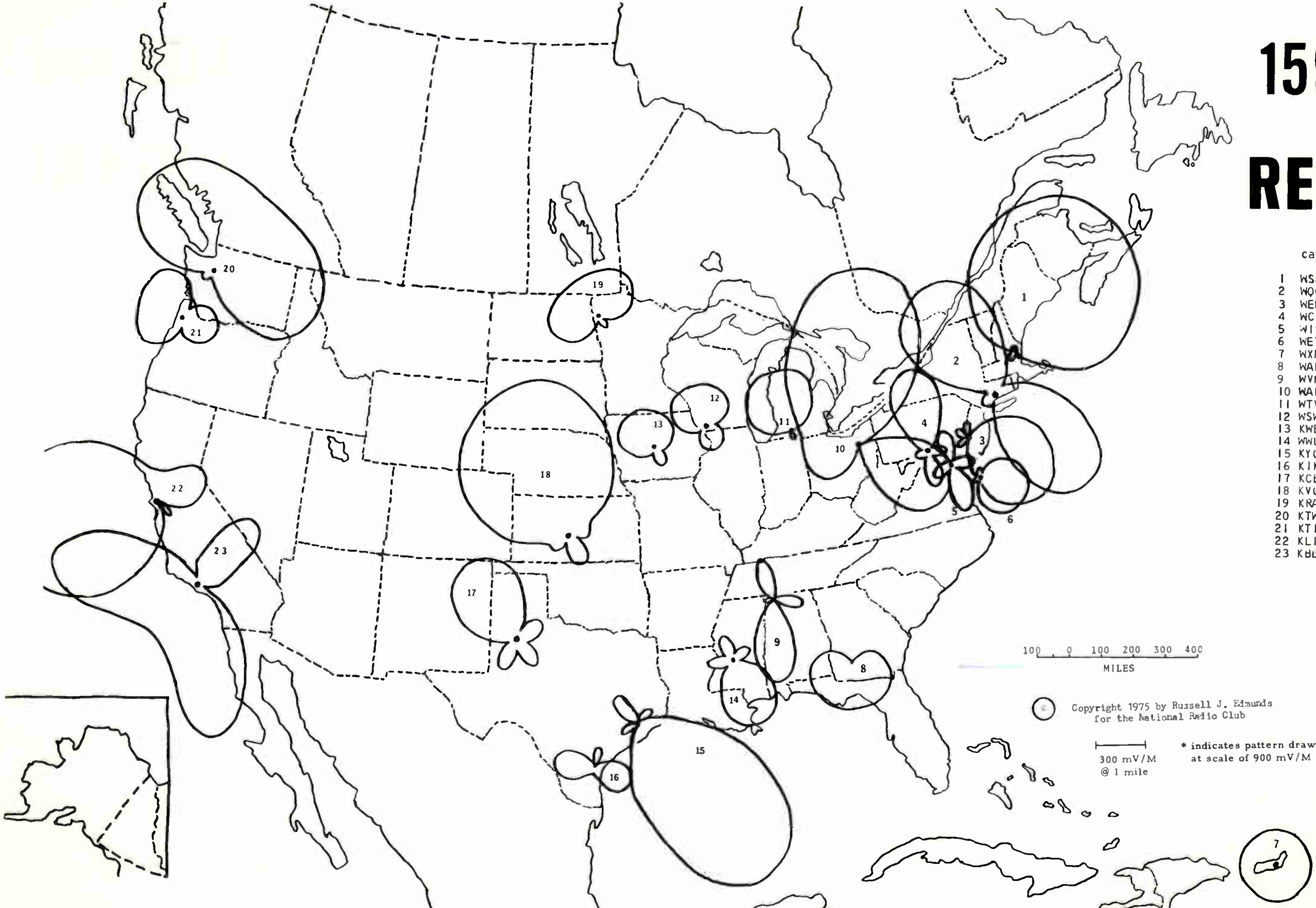
# CLEAR

| | call | class | location |
|---|---|---|---|
| 1 | CBJ | DA-1 | CHICOUTIMI |
| 2 | WSFR | DA-2 | FORT LAUDERDALE |
| 3 | WCLS | DA-N | COLUMBUS |
| 4 | KLOU | DA-N | LAKE CHARLES |
| 5 | KRZI | DA-2 | WACO |
| 6 | KDAY | DA-2 | SANTA MONICA |
| 7 | XEDM | ND | HERMOSILLO |



# 1590 KHZ

# REGIONAL

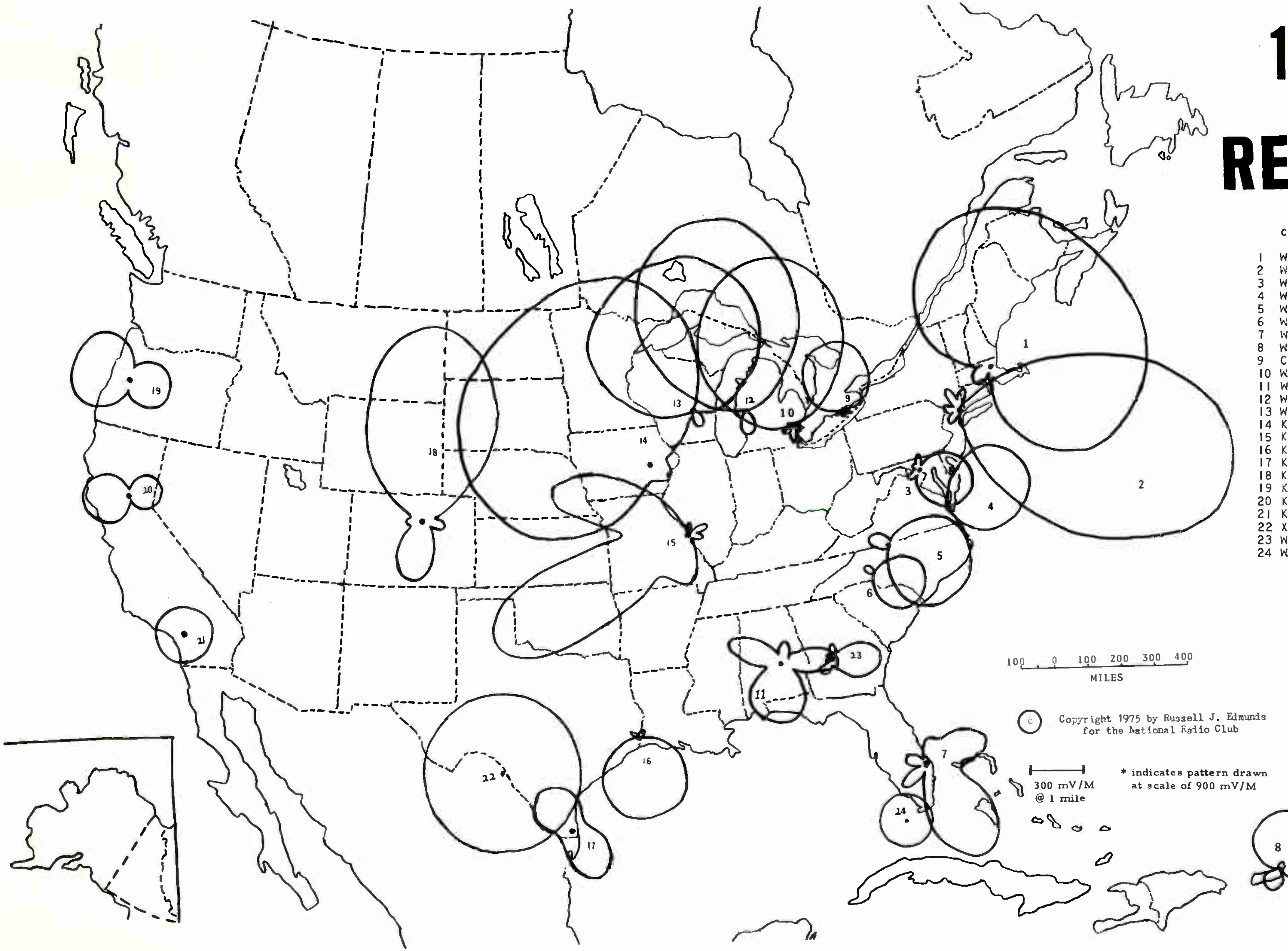



| | call | class | location |
|---|---|---|---|
| 1 | WSMN | DA-1 | NASHUA |
| 2 | WQQW | DA-1 | WATERBURY |
| 3 | WEEZ | DA-N | CHESTER |
| 4 | WCBG | DA-N | CHAMBERSBURG |
| 5 | WISZ | DA-2 | GLEN BURNIE |
| 6 | WETT | DA-2 | OCEAN CITY |
| 7 | WXRF | ND | GUAYAMA |
| 8 | WALG | DA-2 | ALBANY |
| 9 | WVNA | DA-N | TUSCUMBIA |
| 10 | WAKR | DA-N | AKRON |
| 11 | WTVB | DA-N | COLDWATER |
| 12 | WSWW | DA-N | PLATTEVILLE |
| 13 | KWBG | DA-N | BOONE |
| 14 | WWUN | DA-N | JACKSON |
| 15 | KYOK | DA-N | HOUSTON |
| 16 | KIKN | DA-2 | SINTON |
| 17 | KCBD | DA-2 | LUBBOCK |
| 18 | KVGB | DA-N | GREAT BEND |
| 19 | KRAD | DA-N | E.GRAND FORK |
| 20 | KTW | DA-N | SEATTLE |
| 21 | KTIL | DA-N | TILLAMOOK |
| 22 | KLIV | DA-N | SAN JOSE |
| 23 | KBBQ | DA-1 | VENTURA-OXNARD |

# 1600 KHZ

# REGIONAL

| | call | class | location |
|---|---|---|---|
| 1 | WUNR | DA-1 | BROOKLINE |
| 2 | WWRL | DA-2 | NEW YORK |
| 3 | WINX | DA-N | ROCKVILLE |
| 4 | WKEN | DA-N | DOVER |
| 5 | WFRC | DA-N | REIDSVILLE |
| 6 | WGIV | DA-N | CHARLOTTE |
| 7 | WPOM | DA-1 | RIVIERA BEACH |
| 8 | WLUZ | DA-1 | BAYAMON |
| 9 | CHNR | DA-2 | SIMCOE |
| 10 | WAAM | DA-2 | ANN ARBOR |
| 11 | WAPX | DA-N | MONTGOMERY |
| 12 | WTRU | DA-N | MUSKEGON |
| 13 | WCWC | DA-2 | RIPON |
| 14 | KCRG | DA-N | CEDAR RAPIDS |
| 15 | KATZ | DA-N | ST.LOUIS |
| 16 | KOGT | DA-N | ORANGE |
| 17 | KBOR | DA-2 | BROWNSVILLE |
| 18 | KLAK | DA-N | LAKEWOOD |
| 19 | KASH | DA-N | EUGENE |
| 20 | KUBA | DA-N | YUBA CITY |
| 21 | KWOW | ND | POMONA |
| 22 | XEAE | ND | CD. ACUNA |
| 23 | WRBN | DA-N | WARNER ROBINS |
| 24 | KKWF | ND | KEY WEST |



CANADIAN

# LOCAL

| call | | class | location |
|---|---|---|---|
| 1240 | | | |
| 1 | CFEK | DA-1 | FERNIE |
| 1340 | | | |
| 2 | CJLS | DA-2 | YARMOUTH |
| 1400 | | | |
| 3 | CJRP | DA-N | RIVIERE du LOUP |
| 4 | CKRV | DA-1 | DRUMMONDVILLE |
| 1450 | | | |
| 5 | CHEF | DA-2 | GRANBY |
| 6 | CHUC | DA-2 | PORT HOPE |
| 1490 | | | |
| 7 | CKEN | DA-1 | KENTVILLE |
| 8 | CHYM | DA-2 | KITCHENER |

300 mV/M @ 1 mile

* indicates pattern drawn at scale of 900 mV/M