~~CVB 30P~~ ~~CVB-29B~~

(+)

(previous job) yes!!!

Why did you leave Telesystems? Mad at people there?

[redacted]

Why did you go to work for JFD?

When did JFD approach you for a job?

Was there a gap in employment between BT + JFD?

Joint appearances with JFD at sales promotions?

What is JFD's position in Antenna mfg.? #1?

Not true!

We held regular meetings on new designs with engineering + marketing

All specification are labeled Company confidental.

JFD hired him to break into the distributor products business.

John [illegible] advise
RBH

TO: R. B. HELHOSKI **SUBJECT:** SPIFF PAYMENTS

FROM: JERRY BALASH **DATE:** JUNE 15, 1966

INTEROFFICE MEMORANDUM

Spoke with Dan Levine of Leader Electronics Tuesday. He informs me that he received a letter from Jack Loog advising him that we would no longer allow spiff payments since the spiff program had been discontinued.

I personally feel this was a poor way to handle this, especially in view of the fact that this customer is a local phone call away. The spiff monies he requested have already been paid to his people. He advises me that there is little chance of selling the antenna without the spiff program since JFD is offering a salesman spiff program.

I suggest that somebody contact Dan and attempt to work this out with him.

Jerry Balash
JERRY BALASH
[illegible]

JNB:dd

May 10, 1966

Mr. Dick Moulthrop
Moulthrop & Hunter
165 Eleventh Street
San Francisco, California

Dear Dick:

Will you be good enough to contact Station KLOC in Ceres, California to determine possible on air plans.

The station is owned by KLOC Broadcasting Company, Box #338, Ceres, California. Mr. Chester Smith and Mr. Corbett Pierce are the owners and also partners in Radio Station KLOC also in Ceres. The consulting engineer is Cecil Lynch in Modesto.

Please get this information back to me as soon as possible so that we can begin to plan for this station should their air time be any time in the near future.

Sincerely,

Blonder-Tongue Laboratories, Inc.

Jerry Balash
Distributor Products Manager

JB:MD

CC: R. Helnoski
J. Loog
G. Sisson

customer LST

▽ Thruway Electronics

White Plains NY

[redacted]

owned

Univ of SC

USPD circuits

File
AWT, Field Reports

MEMO TO: JERRY BALASH

FROM: JOE DOLAN

DATE: FEBRUARY 23, 1966

SUBJECT: CONVERTER & ANTENNA DEMONSTRATIONS [FLORIDA AREA]

ARRIVED JACKSONVILLE AREA FEBRUARY 8 WITH ANTENNA TRUCK. MET WITH REGIONAL REPRESENTATIVES AND SOUTHEASTERN REGIONAL SALES MANAGER TO PROMOTE THE SALE OF CONVERTERS IN CONNECTION WITH THE OPENING OF A NEW UHF STATION, CHANNEL 17. WHILE WORKING ALONG WITH THE AREA DISTRIBUTOR, MEETINGS WERE HELD AT VARIOUS DEALERS TO EXPLAIN AND SHOW HOW B-T CONVERTERS WERE MORE SUPERIOR IN EVERY DAY USE IN COMPARISON TO OTHER COMPETITIVE PRODUCTS. ON FEBRUARY 9, A JOINT MEETING WITH JFD ELECTRONICS, ALLIANCE AND B-T WAS HELD WITH THE AREA DISTRIBUTOR AND HIS DEALERS AT CHANNEL 17 TO FULLY EXPLAIN OUR PRODUCTS, AND THE NECESSITY OF THEM IN ORDER TO RECEIVE CHANNEL 17 INTO THE AREA HOMES. AFTER A VERY SUCCESSFUL MEETING, WE HEADED TO FORT PIERCE TO HOLD A SIMILAR MEETING WITH FLORIDA ELECTRONICS AND ITS DEALERS ON FEBRUARY 10.

ON MONDAY, FEBRUARY 14, I MET ERNIE SISSON IN SARASOTA TO DEMONSTRATE ANTENNAS FOR DOW ELECTRONICS TO HIS DEALERS. DEMONSTRATIONS WERE HELD FOR DEALERS IN THE POOR SIGNAL AREAS OF SARASOTA, AND B-T ANTENNAS WERE TESTED AGAINST OTHER MAKES FOR THE DEALERS BENEFIT. USING THE FIELD STRENGTH METER, WE SHOWED THAT THE B-T ANTENNA COULD OBTAIN A HIGHER SIGNAL ON ALL CHANNELS OVER THE OTHER ANTENNAS TESTED. AFTER EXPLAINING ALL THE FIVE POINTS, AND THE RECEPTION THAT WOULD BE OBTAINED BY USING A B-T ANTENNA RATHER THAN OTHER PRODUCTS, WE HAD THE DEALERS INTERESTED IN TRYING OUR ANTENNA. A MEETING WAS THEN HELD WITH DOW ELECTRONICS, AND THE ANTENNA ORDER WAS SIGNED.

DEPARTING FROM SARASOTA, WE HEADED FOR CYPRESS GARDENS. WEDNESDAY MORNING WE TOOK FIELD STRENGTH READINGS ON ALL AVAILABLE CHANNELS FOR A NEW MOTEL MATV SYSTEM. THAT AFTERNOON WE HAD A MEETING WITH BILL HOLBROOK OF HAMMOND ELECTRONICS TO DISCUSS DISTRIBUTOR PRODUCTS. DUE TO A LACK OF TIME ON HIS PART, WE PROMISED TO SEND HIM A DISTRIBUTOR PRODUCTS CATALOG FOR HIS USE. WE THEN DEPARTED WITH THE TRUCK FOR JACKSONVILLE TO HAVE A MEETING WITH JIM BRYAN. AFTER DISCUSSING THE HANDLING OF MORE B-T PRODUCTS, AND THE CURRENT SALES OF B-T CONVERTERS IN THE AREA, WE HEADED FOR ATLANTA. ERNIE SISSON THEN TOOK THE TRUCK FOR USE IN HIS AREA AND FURTHER DELIVERY TO NEW ORLEANS AND TEXAS. I THEN PROCEEDED TO RETURN TO THE HOME OFFICE.

Joe Dolan
JOE DOLAN
FIELD REPRESENTATIVE

JD:MED

Oct. 5, 1965 **D. E. ISBELL** 3,210,767

FREQUENCY INDEPENDENT UNIDIRECTIONAL ANTENNAS

Filed May 3, 1960 2 Sheets-Sheet 1

Fig. 1

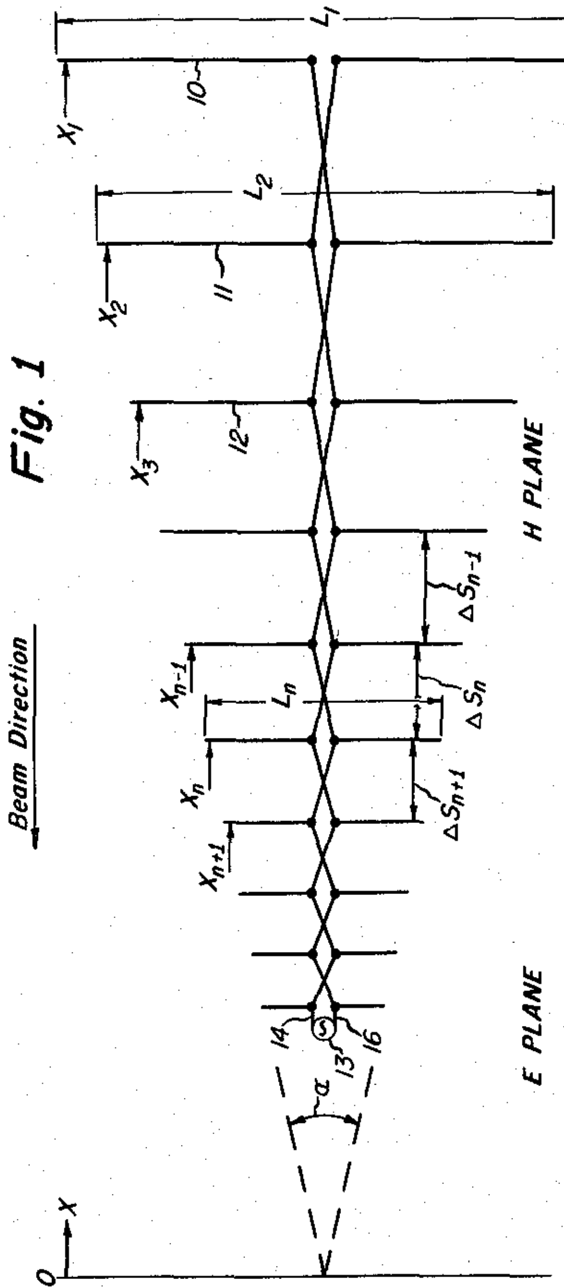


Fig. 4

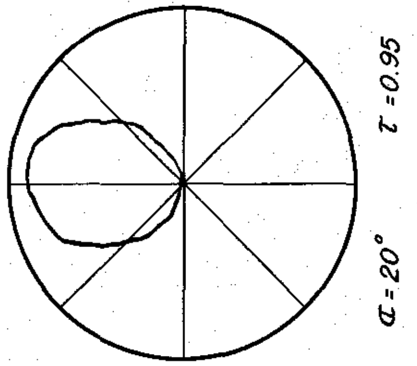
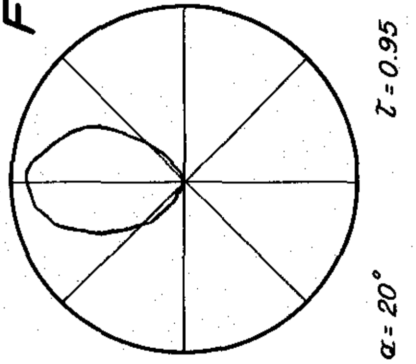


Fig. 3



INVENTOR.
Dwight E. Isbell

BY

Merriam, Smith & Marshall
ATTORNEYS

Oct. 5, 1965 **D. E. ISBELL** 3,210,767

FREQUENCY INDEPENDENT UNIDIRECTIONAL ANTENNAS

Filed May 3, 1960 2 Sheets-Sheet 2

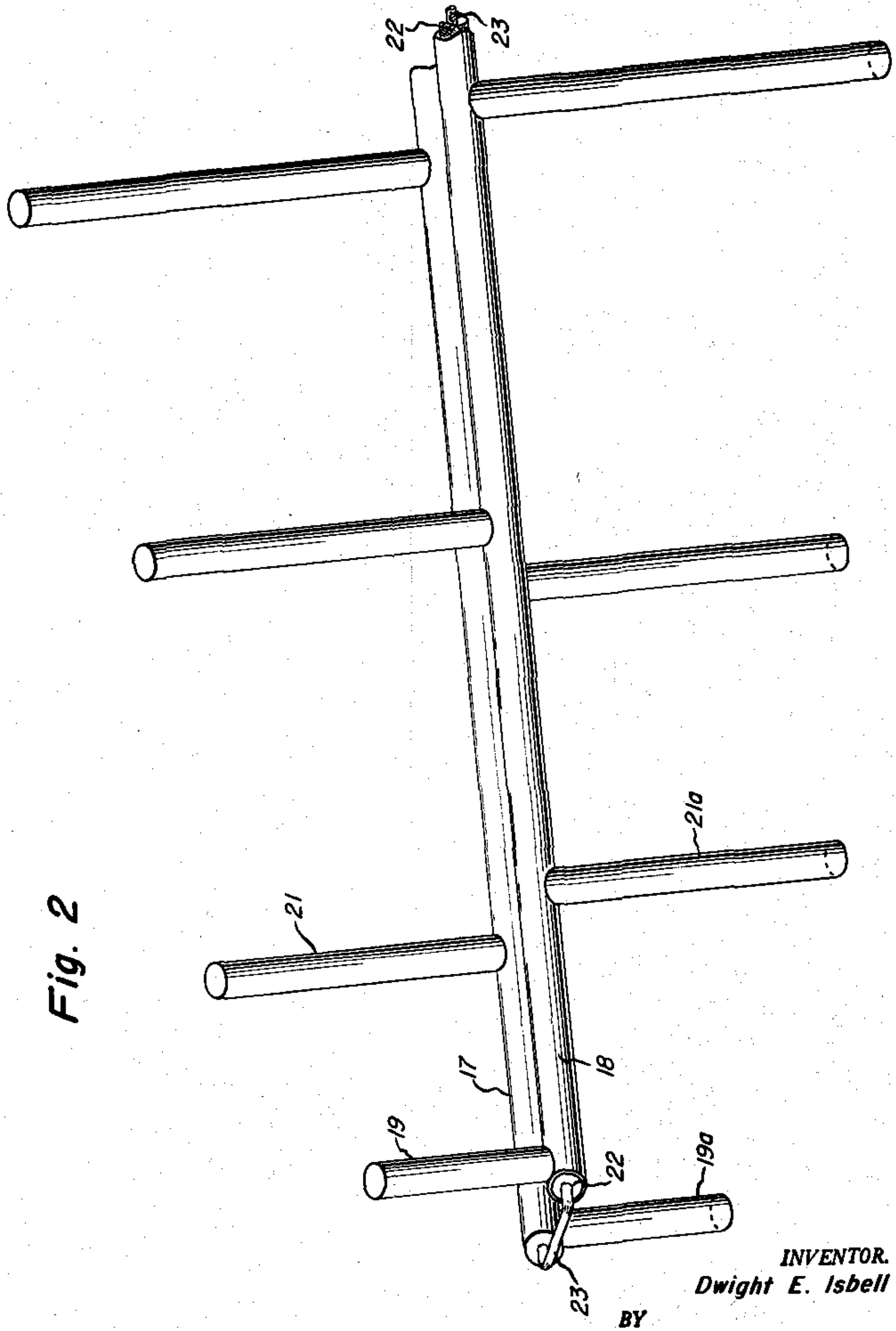


Fig. 2

INVENTOR.
Dwight E. Isbell

BY

Merriam, Smith & Marshall
ATTORNEYS

United States Patent Office

3,210,767
Patented Oct. 5, 1965

3,210,767

FREQUENCY INDEPENDENT UNIDIRECTIONAL ANTENNAS

Dwight E. Isbell, Seattle, Wash., assignor to The University of Illinois Foundation, a non-profit corporation of Illinois

Filed May 3, 1960, Ser. No. 26,589
15 Claims. (Cl. 343—792.5)

This invention relates to antennas, and more particularly, it relates to antennas having unidirectional radiation patterns that are essentially independent of frequency over wide bandwidths.

The antennas of the invention are coplanar dipole arrays consisting of a number of dipoles arranged in side-by-side relationship in a plane, the length and the spacing between successive dipoles varying according to a definite mathematical formula, each of the dipoles being fed by a common feeder which introduces a phase reversal of 180° between connections to successive dipoles. The antennas of the invention provide unidirectional radiation patterns of constant beamwidth and nearly constant input impedances over any desired bandwidth.

The invention will be better understood from the following detailed description thereof taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a schematic plan view of an antenna made in accordance with the principles of the invention;

FIGURE 2 is an isometric view of a practical antenna embodying the invention; and

FIGURES 3 and 4 are radiation patterns of a typical antenna, in the E plane and H plane, respectively.

Referring to FIGURE 1, it will be seen that the antenna of the invention was composed of a plurality of dipoles **10, 11, 12,** etc., which are coplanar and in parallel, side-by-side relationship. It will be noted that the lengths of the successive dipoles and the spacing between these dipoles is such that the ends of the dipoles fall on a pair of straight lines which intersect and form an angle α. In the preferred embodiment the antenna is symmetrical about a line passing through the midpoints of the dipoles, as shown.

The antenna is fed at its narrow end from a conventional source of energy, depicted in FIGURE 1 by alternator **13,** by means of a balanced feeder line consisting of conductors **14** and **16.** It will be seen that the feeder lines **14** and **16** are alternated between connections to consecutive dipoles, thereby producing a phase reversal between such connections.

The lengths of the dipoles and the spacing between dipoles are related by a constant scale factor τ defined by the following equations:

$$\tau = \frac{L_{(n+1)}}{L_n} = \frac{\Delta S_{(n+1)}}{\Delta S_n}$$

where τ is a constant having a value less than 1, L_n is the length of any intermediate dipole in the array, $L_{(n+1)}$ is the length of the adjacent smaller dipole, ΔS_n is the spacing between the dipole having the length L_n and the adjacent larger dipole, and $\Delta S_{(n+1)}$ is the spacing between the dipole having the length L_n and the adjacent smaller dipole.

It will be seen from the geometry of the antennas, as given above, that the distance from the base line 0 at the vertex of the angle α to the dipoles forming the array are defined by the equation:

$$\tau = \frac{X_{(n+1)}}{X_n}$$

where X_n is the distance from the base line 0 to the dipole having the length L_n, $X_{(n+1)}$ is the corresponding distance

from the base line to the adjacent smaller dipole, and τ has the significance previously given.

The radiation pattern of the antennas of the invention, having the geometrical relationship among the several parts as defined above, is unidirectional in the negative X direction, i.e., extending to the left from the narrow end of the antenna of FIGURE 1.

The construction of an actual antenna made in accordance with the invention is shown in FIGURE 2. In this antenna the balanced line consists of two closely-spaced and parallel electrically conducting small diameter tubes **17** and **18** to which are attached the dipoles, each of which consists of two individual dipole elements, e.g., **19** and **19*a*, 21** and **21*a*,** etc. It will be noted that each of the two elements making up one dipole is connected to a different one of said conductors **17** and **18,** in a direction perpendicular to the plane determined by said conductors **17** and **18.** Moreover, considering either one of the conductors **17** and **18,** consecutive dipole elements along the length thereof extend in opposite directions. It will be seen that this construction has the effect of alternating the phase of the connection between successive dipoles, as depicted schematically in FIGURE 1. Although the dipoles of FIGURE 2 are not precisely coplanar, differing therefrom by the distance between the parallel conductors, in practice this distance is very small so that the dipole elements are substantially coplanar and the advantages of the invention are maintained. The antenna of FIGURE 2 may be conveniently fed by means of a coaxial cable **22** positioned within conductor **18,** the central conductor **23** thereof extending to and making electrical connection with conductor **17** as shown.

As an example of the invention, an antenna of the type shown in FIGURE 2 was constructed using 0.125 inch diameter tubing for the balanced line and 0.050 inch diameter wire for the elements. The elements were attached to the feeder line with soft solder, and the array was fed with miniature coaxial cable inserted through one of the balanced line conductors. The antenna was defined by the parameters τ=0.95 and α=20°. The antenna had a total of 15 dipoles, with the longest dipole element being 2½" long, while the shortest element was one-half of this length, or 1¼". The array was 7½" long.

Typical radiation patterns for the above-described antenna in the E plane and the H plane are shown in FIGURES 3 and 4, respectively. These patterns were found to remain essentially constant over the band of about 1100 to 1800 mc./sec. The minimum front-to-back ratio over this band was 17 db and the directivity over the range from about 1130 to 1750 mc./sec. was better than 9 db over isotropic.

The performance of the above-described antenna clearly indicates that the antennas of the invention provide excellent rotatable beams for use particularly in the HF to UHF spectrum. In comparison to the well-known parasitic types of antennas which bear some resemblance to those of the invention, such as the Yagi array, the antennas of the invention provide a much wider bandwidth with essentially comparable directivity. Advantageously, however, the antennas of the invention need no adjusting for their performance over a wide bandwidth, compared to the parasitic types which must be adjusted by cut-and-try procedures for each frequency. Further experimental work with other antennas similar to that described above has indicated that the preferred values for the parameters which define the antennas of the invention include a range of values for angle α between about 20° and 100°, with τ having a value between about 0.8 and about 0.95. When these parameters have values within the preferred ranges the antennas were found to have essentially frequency independent performance over any desired bandwidth. The upper and lower limits of the bandwidths may be adjusted as desired by fixing the lengths of the longest dipole and the shortest dipole, respectively. It has been determined experimentally that the longest dipole element should be approximately 0.47 wavelength long at the lower limit and the shortest element should be about 0.38 wavelength long at the upper limit. Moreover, in order to provide a suitable front-to-back ratio at the low frequency limit, there should be at least 3 dipoles in the array and preferably about 10 to 30 dipoles.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A broadband unidirectional antenna comprising an array of substantially coplanar and parallel dipoles of progressively increasing length and spacing in side-by-side relationship, the ratio of the lengths of any two adjacent dipoles being given by the formula

$$\frac{L_{(n+1)}}{L_n}=\tau$$

where L_n is the length of any intermediate dipole in the array, $L_{(n+1)}$ is the length of the adjacent smaller dipole and τ is a constant having a value less than 1, the spacing between said dipoles being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}=\tau$$

where ΔS_n is the spacing between the dipole having the length L_n and the adjacent larger dipole, $\Delta S_{(n+1)}$ is the spacing between the dipole having the length L_n and the adjacent smaller dipole, and τ has the significance previously assigned, said dipoles being fed in series by a common feeder which alternates in phase between successive dipoles.

2. The array of claim **1** which is symmetrical about a line passing through the midpoint of each dipole in the array.

3. A broadband unidirectional antenna comprising an array of a plurality of substantially coplanar and parallel dipoles of progressively increasing length in side-by-side relationship, the ends of said dipoles falling on a V-shaped line forming an angle α at its vertex, the ratio of the lengths of any pair of adjacent dipoles being given by the formula

$$\frac{L_{(n+1)}}{L_n}=\tau$$

where L_n is the length of the longer dipole of the pair, $L_{(n+1)}$ is the length of the shorter dipole, and τ is a constant having a value less than 1, the dipoles in said array being fed in series by a common feeder which alternates 180° in phase between successive dipoles.

4. The antenna of claim **3** in which the angle α has a value between about 20° and 100° and the constant τ has a value between about 0.8 and 0.95.

5. The antenna of claim **3** in which said feeder is a balanced line which twists 180° between the connections to successive dipoles.

6. A broadband unidirectional antenna comprising a balanced feeder line consisting of two closely spaced, straight and parallel conductors, a plurality of dipoles each consisting of two dipole elements, one of which elements is connected to one of said conductors, the other element being connected directly opposite the first to the other of said conductors, the elements of any dipole extending in opposite directions perpendicular to the plane determined by said conductors, consecutive dipole elements on each of said conductors extending in opposite directions, the ratio of the lengths of the elements in any two adjacent dipoles being given by the formula

$$\frac{l_{(n+1)}}{l_n}=\tau$$

where l_n is the length of an element of any dipole in the antenna, $l_{(n+1)}$ is the length of an element in the adjacent smaller dipole and τ is a constant having a value less than l, the spacing between said dipoles being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}=\tau$$

where ΔS_n is the spacing between the dipole having the element length l_n and the adjacent larger dipole, $\Delta S_{(n+1)}$ is the spacing between the dipole having the element length l_n and the adjacent smaller dipole, and τ has the significance previously assigned.

7. The antenna of claim **6** wherein τ has a value of about 0.8 to 0.95.

8. The antenna of claim **6** wherein said feeder line conductors are tubular.

9. An aerial system including at least one set of parallel dipoles spaced along and substantially perpendicular to the longitudinal axis of a two-conductor balanced feeder to which the halves of the dipoles are connected at their inner ends, said dipoles being of different electrical lengths increasing substantially logarithmically from the connected end of the feeder to the other end and the dipole feeder connections being crossed over one another between adjacent dipoles, the spacings between which also increase substantially logarithmically from said connected end to the other end.

10. An antenna system for wide-band use comprising a plurality of substantially parallel conducting dipole elements arranged in substantially collinear pairs, the opposite dipole elements of each pair constituting dipole halves, a two-conductor balanced feeder having one conductor connected to each of said elements at substantially the inner end thereof, each of said dipole halves in a pair being connected to a different feeder conductor, adjacent dipole elements being reversely connected to different conductors of the feeder, said dipole elements being selectively spaced along and substantially perpendicular to said feeder, the elements of each pair being of substantially equal length, adjacent dipole elements of different pairs differing in length with respect to each other by a substantially constant scale factor, the selective spacings between adjacent dipoles generally decreasing from one end of the feeder to the other with the greatest spacing being between the longest dipoles, and means to connect the feeder to an external circuit at substantially the location of the smallest of the dipole elements.

11. An antenna system for wide-band use comprising a plurality of substantially parallel conducting dipole elements arranged in substantially collinear pairs, the opposite dipole elements of each pair constituting dipole halves, a two-conductor balanced feeder having one conductor connected to each of said elements at substantially the inner end thereof, each of said dipole halves in a pair being connected to a different feeder conductor, adjacent dipole elements being reversely connected to different conductors of the feeder, said dipole elements being selectively spaced along and substantially perpendicular to said feeder, the elements of each pair being of substantially equal length, adjacent dipole elements of different pairs differing in length with respect to each other by a substantially constant scale factor, the selective spacings between the dipoles along the feeder differing from each other also by a substantially constant scale factor, the greatest spacing being between the longest dipoles, and means to connect the feeder to an external circuit at substantially the location of the smallest of the dipoles.

12. The aerial system of claim **11** in which said scale factors have values within the range from about 0.8 to about 0.95.

13. An antenna system for wide-band use comprising an array of at least three linear substantially parallel conducting dipoles, each dipole being composed of two opposite substantially collinear conducting elements, a two-conductor balanced feeder having one conductor connected to each of said elements at substantially the inner end thereof, adjacent parallel dipole elements being reversely connected to a different conductor of the feeder, the two elements of each dipole being of substantially equal length and successive elements being of lengths which differ from one dipole to the next by a substantially constant scale factor within the range from about 0.8 to about 0.95, the dipoles being spaced from each other in a generally decreasing manner in the direction of decreasing element length, and means to connect the feeder conductors to an external circuit at substantially the location of the smallest dipole elements.

14. An antenna system for wide-band use comprising a minimum of three pairs of linear substantially parallel conducting elements arranged substantially coplanarly, each pair being substantially collinear and comprising the halves of a dipole, a two-conductor feeder connected to the inner ends of said collinear pairs of elements, adjacent parallel elements being connected to different conductors of the feeder so that the halves of the dipoles connect to different conductors of the feeder and adjacent dipoles are reversely connected, the halves of each dipole being substantially the same length, adjacent dipole elements being selectively spaced from each other along the feeder, the length of the successive dipole elements along the feeder decreasing in accordance with a substantially constant scale factor, each dipole and the feeder between it and the adjacent dipole constituting a cell, the dimension of the several cells measured from the point of connection of one dipole and the feeder to the outer end of the next smaller adjacent dipole also decreasing from one cell to the next in the direction of decreasing dipole length according to a substantially constant scale factor so that the combination of cells provides a substantially uniform wide-band response, and means to connect an external circuit to the feeder elements at substantially the location of the shortest of the dipoles.

15. An antenna system for wide-band use comprising a minimum of three pairs of substantially parallel and coplanar linear conducting elements arranged in substantially collinear pairs, each pair of elements comprising the halves of a dipole, a two-conductor feeder, one conductor of which is connected to each of said elements substantially at the inner end thereof, adjacent parallel elements being connected to different conductors of the feeder so that the halves of the dipoles connect to different conductors of the feeder and adjacent dipoles are reversely connected, the halves of each dipole being substantially the same length, adjacent dipole elements being selectively spaced from each other along the feeder, the lengths of the elements decreasing from one end of the feeder to the other substantially in accordance with a substantially constant scale factor within the range from about 0.8 to 0.95, each dipole and the feeder between it and the adjacent dipole constituting a cell, the cell dimension from the inner end of one dipole to the outer end of the next smaller adjacent dipole also generally decreasing from one cell to the next in the direction from the longer to the shorter dipoles so that the combination of cells provides a substantially uniform wide-band response, and means to connect an external circuit to the feeder elements at substantially the location of the shortest of the dipoles.

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HERMAN KARL SAALBACH, *Primary Examiner.*

GEORGE N. WESTBY, ELI LIEBERMAN, *Examiners.*

Oct. 22, 1963 P. E. MAYES ETAL 3,108,280

LOG PERIODIC BACKWARD WAVE ANTENNA ARRAY

Filed Sept. 30, 1960 2 Sheets-Sheet 1

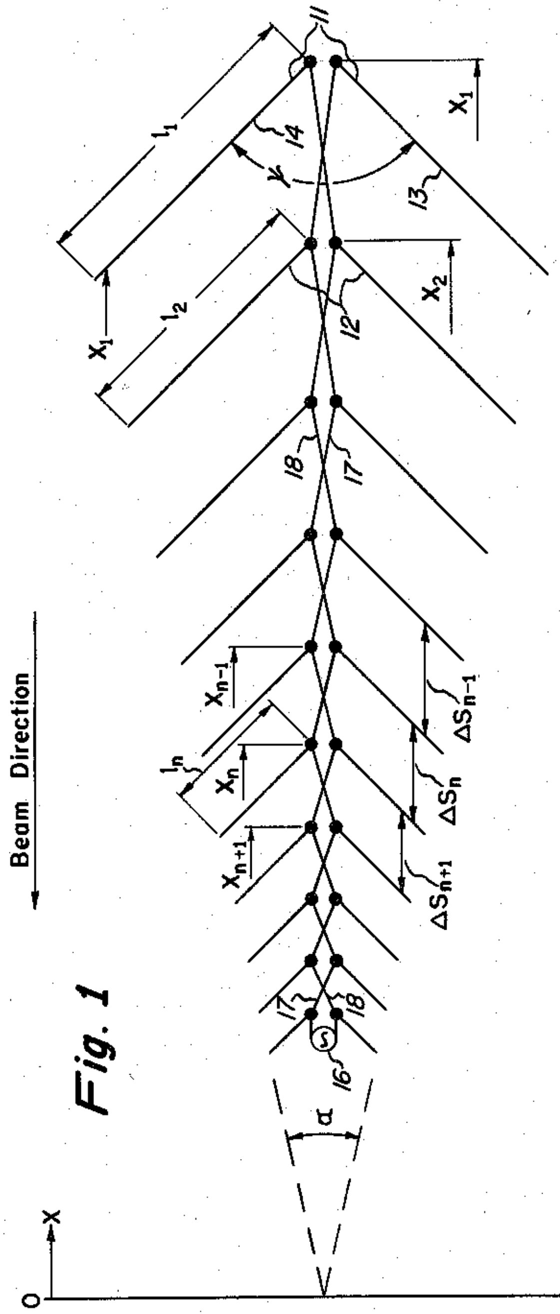
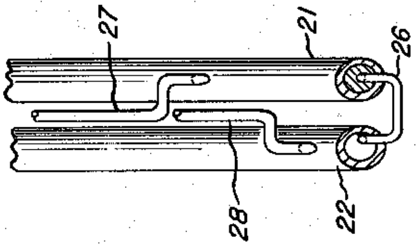


Fig. 1

Fig. 3



INVENTORS:
Paul E. Mayes
Robert L. Carrel
BY

Merriam, Smith & Marshall
ATTORNEYS

Oct. 22, 1963 P. E. MAYES ETAL **3,108,280**

LOG PERIODIC BACKWARD WAVE ANTENNA ARRAY

Filed Sept. 30, 1960 2 Sheets-Sheet 2

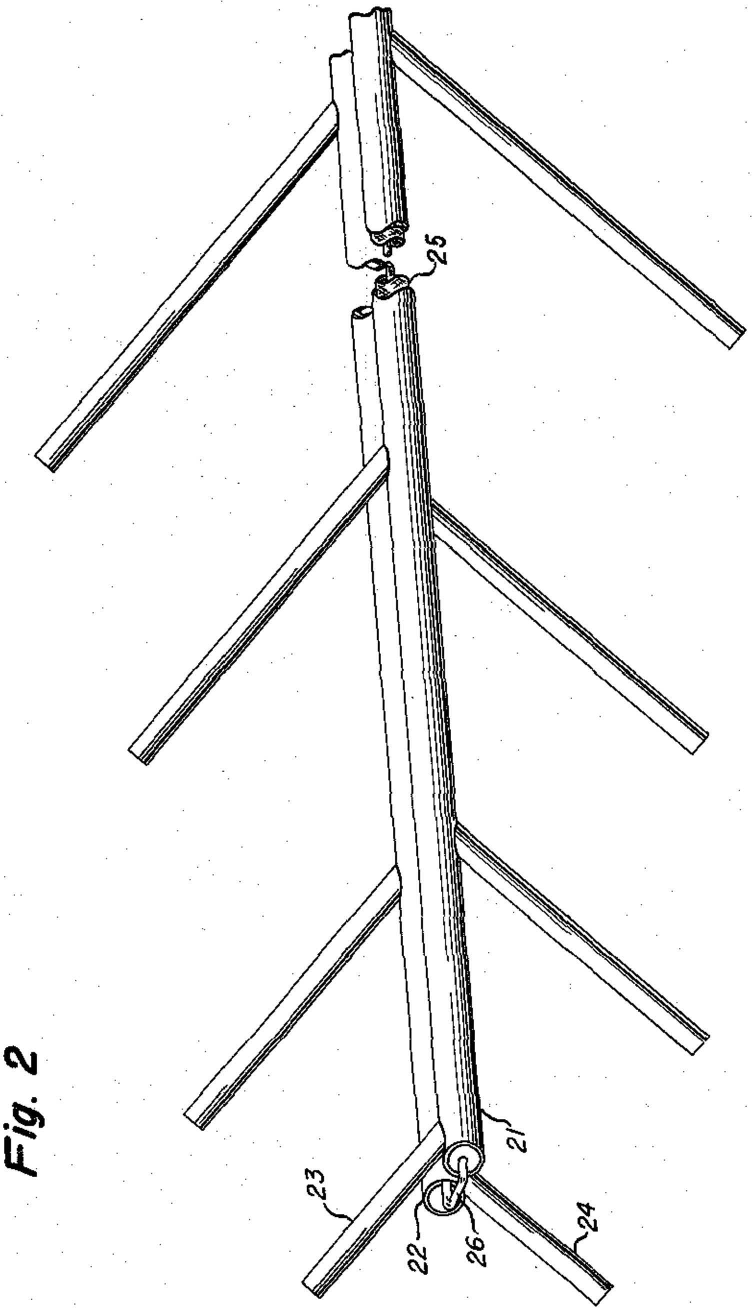


Fig. 2

INVENTORS:
Paul E. Mayes
Robert L. Carrel
BY

Merriam, Smith & Marshall
ATTORNEYS

United States Patent Office

3,108,280
Patented Oct. 22, 1963

3,108,280

LOG PERIODIC BACKWARD WAVE ANTENNA ARRAY

Paul E. Mayes, Champaign, and Robert L. Carrel, Urbana, Ill., assignors to The University of Illinois Foundation, a non-profit organization of Illinois

Filed Sept. 30, 1960, Ser. No. 59,671
10 Claims. (Cl. 343—792.5)

This invention relates to antennas and more particularly it relates to antennas having unidirectional radiation patterns that are essentially independent of frequency over wide bandwidths.

In the copending application of Dwight E. Isbell, Ser. No. 26,589, filed May 3, 1960, there are described certain antennas comprising coplanar dipole arrays which have an unusually wide bandwidth over which the performance of the antennas is essentially frequency independent and the input impedance nearly constant, the antennas also having a unidirectional pattern with a directivity comparable to a Yagi array. As described in the aforementioned application, these arrays comprise a number of dipoles arranged in side-by-side relationship in a plane, the length of the dipoles and the spacing between adjacent dipoles varying according to a definite mathematical formula, with each of the dipoles being fed at its midpoint by a common feeder which introduces an added phase shift of 180° between connections to successive dipoles. The dipoles which are used to make up the array vary progressively in length, the longest dipole element being about ½ wavelength long at the low frequency limit of a given antenna's effective range and the shortest element being about ⅜ wavelength long at the upper frequency limit.

In accordance with the present invention, it has been found that the directivity of an antenna of the type described in the aforementioned application may be increased and the effective frequency range of an antenna of fixed size may be extended by inclining the dipoles of Isbell to form V-elements, each of which consists of two straight arms of equal length defining an apex which points away from the direction of radiation of the antenna which is also the direction in which the element size decreases. The modification of the straight dipoles of Isbell to V-shaped elements permits the antenna to be operated over bands of frequencies higher than those established, as described above, by the length of the shortest dipole in the antenna, with increased directivity, thus obviously increasing the effective frequency range of a given antenna.

The invention will be better understood from the following detailed description thereof taken in conjunction with the accompanying drawings, in which the same numbers are used to denote corresponding elements in the several views and in which:

FIGURE 1 is a schematic plan view of an antenna made in accordance with the principles of the invention;

FIGURE 2 is a perspective view of a practical antenna embodying the invention; and

FIGURE 3 is a fragmentary view of an improved and preferred form of an antenna similar to that shown in FIGURE 2, as seen from a point directly in front of and above the narrow end of the antenna.

Referring to FIGURE 1, it will be seen that the antennas of the invention are composed of a plurality of V-elements, e.g., **11** and **12**, each of which consists of a pair of arms, e.g., **13** and **14**, defining an apex in the middle of the V-elements, said V-elements being arranged in a herringbonelike pattern. The arms of a given V-element are equal in length and corresponding arms of the several V-elements, i.e., the arms on the same side of a line passing through the apexes of the V-elements, are substantially parallel to each other. It will be noted that the lengths of the arms of successive V-elements and the spacing between the apexes of the elements are such that the extremities of the elements fall on a pair of straight lines which intersect to form an angle α. In the preferred embodiment of the invention the antenna is symmetrical about a line passing through the apexes of the V-elements, as shown.

The antenna is fed at its narrow end from a conventional source of energy, depicted in FIGURE 1 by alternator **16**, by means of a balanced feeder line consisting of conductors **17** and **18**. It will be seen that the feeder lines **17** and **18** are alternated between connections to consecutive V-elements, thereby producing a phase reversal between such connections.

The lengths of the arms in the antenna, and the spacing between the V-elements, are related by a constant scale factor τ defined by the following equations:

$$\tau=\frac{l_{(n+1)}}{l_n}=\frac{\Delta S_{(n+1)}}{\Delta S_n}$$

where τ is a constant having a value less than 1, l_n is the length of an arm in any intermediate V-element in the array, $l_{(n+1)}$ is the length of an arm in the adjacent smaller V-element, the subscript n designating the nth arm running in an order from larger to smaller, ΔS_n is the spacing between the apex of the V-element having the arm length l_n and the apex of the adjacent larger V-element, and $\Delta S_{(n+1)}$ is the spacing between the apex of the V-element having the arm length l_n and the apex of the adjacent smaller V-element.

The arms of the individual V-elements forming the antenna array are inclined to point in the direction of decreasing V-element size so that the apex of each of the elements points in a direction away from the angle α formed by the lines passing through the extremities of the individual V-elements.

The angle formed by the arms of a V-element is designated as ψ. It will be seen that when the angle ψ is equal to 180°, the antennas of the invention are identical with those described by Isbell in the application mentioned above. In the instant invention, however, the angle ψ preferably has a value between about 50° and 150°.

It will be seen from the geometry of the invention as given above that the distances from the base line O at the vertex of the angle α to the apexes of the V-elements forming the array are defined by the equation:

$$\tau=\frac{X_{(n+1)}}{X_n}$$

where X_n is the distance from the base line O to the apex of the V-element having the arm length l_n, $X_{(n+1)}$ is the corresponding distance from the base line to the apex of the adjacent smaller V-element, the τ has the significance previously given.

The radiation pattern of the antennas of the invention having the geometrical relationship among the several parts, as defined above, is unidirectional in the negative X direction, i.e., extending to the left from the narrow end of the antenna of FIGURE 1.

The use of V-elements in the antennas of the invention, rather than dipoles, increases the directivity of the invention and also permits more effective utilization of a given antenna since the same structure can be used in several frequency modes to achieve coverage of different frequency bands. In the special case of an antenna having straight dipoles rather than V-elements (i.e., when $\psi=180°$), the effective frequency range is that in which the low limit corresponds to that frequency in which the largest dipole in the antenna is about ½ wavelength long and the upper frequency limit to that frequency in which the smallest dipole in the antenna is about ⅜ wavelength long. In general, therefore, it may be said that the frequency range of the straight dipole array corresponds to the mode of operation in which the lengths of the dipoles in the array are about ½ wavelength long. As the frequency is raised above the upper limit of the ½ wavelength mode in the dipole array, the antenna will also be found to radiate effectively at frequencies in which the dipoles are about 3/2 wavelengths long (the 3/2 wavelengths mode), 5/2 wavelengths long (the 5/2 wavelengths mode) and so on. At frequencies above the half-wavelength mode, however, the radiation pattern of the dipole array becomes multilobed and is, therefore, of limited usefulness. By including the arms of the dipole to form the V-elements of the instant invention, it has been found that a single lobe of improved directivity may be obtained as the frequency is raised from the half-wavelength mode through the intervening ranges to the 9/2 wavelengths mode and beyond. For each mode of operation there exists an optimum value for the angle ψ, ranging from about 114° for the half-wavelength mode to about 62° for the 9/2 wavelengths mode. By using a compromise value for ψ within this range, however, a practical antenna can be made to achieve acceptable performance over several modes of operation, thereby increasing its effective range without increasing the number of elements therein. This result is possible since many of the elements forming the antenna array are used at more than one frequency.

The construction of an actual antenna made in accordance with the invention is shown in FIGURE 2. In this antenna the balanced line consists of two closely-spaced and parallel electrically conducting small diameter tubes **21** and **22** which also act as a mechanical support for the dipole elements and to which are attached the arms which form the V-elements of the invention. It will be noted that each of the two arms, e.g., **23** and **24**, making up one V-element is connected to a different one of said conductors **21** and **22**. Moreover, considering either one of the conductors **21** and **22**, consecutive arms along the length thereof extend in opposite directions. It will be seen that this construction has the effect of alternating the phase of the connections between successive V-elements, as depicted schematically in FIGURE 1. Although the V-elements of FIGURE 2 are not precisely coplanar, differing therefrom by the distance between the parallel conductors **21** and **22**, in practice this distance is usually small so that the arms of the V-elements are substantially coplanar and the advantages of the invention are maintained. In some instances, however, it may be advantageous to bend the individual arms, e.g., **27** and **28**, close to the point of attachment to the feeder line, as shown in FIGURE 3, so as to position all the arms in the same plane. The antennas of FIGURES 2 and 3 may be conveniently fed by means of a coaxial cable **25** positioned within conductor **21**, the outer conductor of the cable making electrical contact with conductor **21** and the central conductor **26** of the cable extending to and making electrical connection with conductor **22**, as shown.

The antennas of the invention may also be fed by a balanced two wire line which is twisted between elements to achieve the desired phase reversal. Other methods of achieving the desired phasing may be employed, e.g., transmission line loops or stubs.

As an example of the invention, an antenna of the type shown in FIGURE 3 was constructed using 0.125" diameter tubing for the balanced line and 0.050" diameter wire for the arms of the V-elements. The arms were soldered to the feeder line and the array was fed by a miniature coaxial cable inserted into one of the conductors of the balanced line. The antenna had 25 arms, the largest of which was 1 ft. long with the shortest being about 3½" long. The antenna was further defined by the parameters $\tau=0.95$ and $\psi=70°$. This antenna exhibited typical directivity gains ranging from 12 db over isotropic in the 3/2 wavelengths mode to 17 db in the 7/2 wavelengths mode, with essentially constant input impedance within each mode.

Except with respect to the angle of inclination of the arms of the V-elements, the parameters which define the antennas of the invention are essentially similar to those of the corresponding straight dipole arrays in which the arms extend at right angles from the feeder lines. Thus, the parameter τ preferably has a value betwen about 0.8 and 0.95 and the angle α suitably ranges between 20° and 100°. Moreover, the upper and lower limits of the bandwidth for the ½ wavelength mode of operation can be adjusted as desired by making the longest V-element correspond in length to about ½ wavelength at the lower limit and the shortest V-element to about ⅜ wavelength at the upper frequency limit.

In addition to its use as a direct radiator or receiver, the resonant-V array of the invention has several advantages over other antennas currently used as primary feeds for parabolic and other reflectors. Its independence of frequency in any single mode assures constant illumination of the reflector. Moreover, the input impedance remains essentially independent of frequency so that no tuning is required as the frequency is varied.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A broadband unidirectional antenna comprising an array of a plurality of V-elements in a planar herringbonelike arrangement, each of said elements having a pair of equal arms defining an apex, the apexes of said V-elements lying on a straight line, the corresponding arms of said elements progressively increasing in length and spacing, the extremities of the arms of said V-elements substantially falling on a V-shaped line forming an angle α at its vertex, the apexes of said V-elements pointing in a direction away from the vertex of said angle α, the ratio of the arm lengths of any pair of adjacent V-elements being given by the formula

$$\frac{l_{(n+1)}}{l_n}=\tau$$

where l_n is the length of an arm in the larger of said pair of V-elements, $l_{(n+1)}$ is the length of an arm in the adjacent smaller V-element of said pair, the subscript n designating the nth arm running in an order from larger to smaller, and τ is a constant having a value less than 1, the spacing between the apexes of said V-elements being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}=\tau$$

where ΔS_n is the spacing between the V-element having the arm length l_n and the adjacent larger V-element, $\Delta S_{(n+1)}$ is the spacing between the V-element having the arm length l_n and the adjacent smaller V-element, and τ has the significance previously assigned, said V-elements being adapted to be fed as a group from the small end of the individual V-elements fed at the apexes thereof by a common feeder which introduces an additional 180° phase shift between successive V-elements.

2. The antenna of claim 1 wherein the angle formed by the arms of any V-element at the apex thereof has a value within the range from about 50° to about 150°.

3. The antenna of claim 1 which is symmetrical about a line passing through the apex of each V-element therein, and in which the corresponding arms of the V-elements are parallel.

4. The antenna of claim 1 in which the angle α has a value between about 20° and 100° and the constant τ has a value between about 0.8 and 0.95.

5. A broadband unidirectional antenna comprising a balanced feeder line consisting of two closely spaced, straight and parallel conductors, a plurality of substan-

tially coplanar V-elements, each V-element comprising a pair of arms of equal length defining an apex, one of said arms of each V-element being connected at the apex of said V-element to one of said conductors, the other of said arms being connected directly opposite the first to the other of said conductors, the arms of any V-element extending in opposite directions at an acute angle to the plane determined by said conductors, consecutive arms on each of said conductors extending on opposite sides of said plane, the ratio of the lengths of the arms in adjacent V-elements being given by the formula

$$\frac{l_{(n+1)}}{l_n}=\tau$$

where l_n is the length of an arm of a V-element, $l_{(n+1)}$ is the length of an arm in the adjacent smaller V-element, the subscript n designating the nth arm running in an order from larger to smaller, and τ is a constant having a value less than 1, the spacing of the apexes of the V-elements along said feeder line being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}=\tau$$

where ΔS_n is the spacing between the V-element having the arm length l_n and the adjacent larger V-element, $\Delta S_{(n+1)}$ is the spacing between the V-element having the arm length l_n and the adjacent smaller V-element, and τ has the significance previously assigned.

6. The antenna of claim 5 in which the angle formed by said arms with the plane determined by said feeder line, measured in a plane perpendicular to said plane, has a value between about 25° and about 75°.

7. The antenna of claim 5 in which τ has a value of about 0.8 to 0.95.

8. An aerial system for wide-band use comprising a plurality of herringbone-like conducting V-elements planarly arranged, a two-conductor balanced feeder connected to each of said elements at substantially the inner end thereof, each two opposite V-elements forming a pair constituting dipole halves, the connection from each adjacent dipole section being to a different feeder, said V-elements being selectively spaced from each other, each V-element of each pair having arms of substantially equal length substantially defining an apex with the apexes of the plurality of V-elements all lying in substantially a straight line and terminating at the feeder, the said dipoles of each pair being of different electrical lengths with successive dipoles differing in electrical length with respect to each other by substantially the same scale factor, each dipole and the feeder between successive dipoles constituting a cell, and the selective spacings between adjacent dipoles decreasing from one end to the other with the greater spacing being between the longest dipoles and being such that the combination of dipole lengths and spacings provides a substantially uniform wide-band response over a plurality of frequency bands bearing substantially harmonic frequency relationships to each other, the connection between the dipoles and the feeder being made in such a manner that the directive gain of the antenna increases as operation shifts from one band to an adjacent band of higher frequencies, and means to connect the feeder to an external circuit at a location substantially removed from the longest of the V-elements and in the direction of the smallest of the V-elements.

9. An aerial system for wide-band use including a two-conductor balanced feeder extending in a selected plane, a plurality of herringbone-like conducting V-elements planarly arranged and spaced along the feeder, each of the elements having a pair of arms of substantially equal length defining substantially an apex with the apexes of the plurality of V-elements all lying in substantially a straight line and all terminating at the feeder, a connection between each of the V-elements and one of the feeders at the inner end of the elements, the two V-elements forming each pair constituting dipole halves, adjacent dipole sections being connected to different feeders, each of the pairs of dipoles being of different electrical lengths with successive dipoles differing in electrical length with respect to each other by substantially a common scale factor, each dipole and the feeder connected thereto in the region between one dipole pair and the next adjacent dipole pair constituting a cell, the spacings between the dipoles as connected to the feeders differing from each other also by substantially the same common scale factor, the scale factor being so chosen that the combination of dipole lengths and spacings providing the several cells have a substantially uniform wide-band response over several frequency bands bearing substantially harmonic frequency relationships to each other, the connection between the feeder and the dipoles being made in such a manner that the directive gain of the antenna increases with operational shift from one band to another band of higher frequency, and means to connect the feeder to an external circuit at a location substantially removed from the longest of the V-elements in the direction of the smallest of the V-elements.

10. An aerial system for wide-band use including an elongated two-conductor balanced feeder, a plurality of herringbone-like conducting V-elements planarly arranged and spaced along said feeder, each of the elements having a pair of arms of equal length defining substantially an apex with the apexes of the plurality of V-elements all lying in a substantially straight line, a connection between each of the V-elements and the feeder to terminate the elements substantially at the feeder, the two V-elements forming each pair constituting dipole halves, adjacent dipole sections of the plurality being connected to different feeders and the dipoles being relatively spaced so that the spacings between successive dipoles differ from each other by substantially a common scale factor, adjacent dipole sections having different electrical lengths, each dipole and the feeder connected between it and the adjacent dipole constituting a cell, the lengths of the dipoles increasing from end of array where spacings between adjacent dipoles is less to end of the array where adjacent dipoles are spaced the greatest distance, the spacings by the scale factor variation between adjacent dipoles being such that a combination of the various dipole lengths and spacings provides a substantially uniform wide-band response over several frequency bands bearing substantially harmonic frequency relationships to each other, the connection being made in such a manner that the directive gain of the antenna increases as the operation shifts from one band to another band of higher frequency, and means to connect the feeder to an external circuit at a location substantially removed from the longest of the V-elements in the direction of the smallest of the V-elements.

References Cited in the file of this patent

UNITED STATES PATENTS

2,192,532	Katzin	Mar. 5, 1940
2,429,629	Kandoian	Oct. 28, 1947
2,817,085	Schwartz et al.	Dec. 17, 1957

FOREIGN PATENTS

408,473	Great Britain	Apr. 12, 1934
574,323	Canada	Apr. 21, 1959

OTHER REFERENCES

IRE Transaction on Antennas and Propagation, May 1960; vol. AP-8, No. 3, pages 260–267.

Channel Master Corp., "K.O." Antenna, copyright 1955, 3 pages.

From

HARRY A. GILBERT
BLONDER-TONGUE LABORATORIES, INC.
9 ALLING STREET, NEWARK, NEW JERSEY 07102

PLEASE RETURN THIS
Speed Reply
◄ ◄ ◄ ◄ TO

May 23, 1966
DATE

To

Mr. Robert H. Rines
Rines & Rines
No. Ten Post Office Square
Boston, Mass.

SUBJECT

Univ. of Illinois
Allied Radio

Message

Hi Bob:

Enclosed are copies of correspondence received from Allied Radio today.

We have a call in to your office..to get your clearance re paying the enclosed bill. Will do so as soon as you give us the word.

Please advise.

Miller
Mildred Miller
SIGNED

enc.

ORIGINATOR — DO NOT WRITE BELOW THIS LINE

Reply

TO ____________________ DATE ____________

RECEIVED
MAY 24 1966
RINES AND RINES
NO. TEN POST OFFICE SQUARE, BOSTON

SIGNED

ORIGINATOR FOLD MARKS

ADDRESSEE FOLD MARKS

103 SR

ADDRESSEE — RETURN WHITE COPY

ALLIED RADIO CORPORATION

111 N. CAMPBELL AVE. · CHICAGO, ILL. 60680 · PHONE: HAYMARKET 1-6800

May 20, 1966

Blonder Tongue
9-25 Alling Street
Newark, New Jersey

Attn: Mr. Harry Gilbert

Dear Harry,

The attached statement represents initial legal costs of the University of Illinois suit against Allied Radio for selling Blonder Tongue Antennas.

Per your letter of April 5, 1966 please make a check for the amount shown payable to Allied Radio. Send this check to George Petitt who will in turn deliver it personally to me.

Kindest personal regards.

Sincerely,

ALLIED RADIO CORP.

F. Wilensky
Buyer
Marketing Division

FW/av

CC:
G. Petitt
D. Helhoski
R. Hinsch

Attached

RECEIVED
MAY 24 1966
RINES AND RINES
NO. TEN POST OFFICE SQUARE, BOSTON

JACK

TO HOFGREN, WEGNER, ALLEN, STELLMAN & McCORD DR
2200 OPERA BUILDING
20 NORTH WACKER DRIVE
TELEPHONE FINANCIAL 6-1630
CHICAGO 60606

April 30, 1966

Allied Radio Corporation
c/o Maurice L. Davis
33 South Clark Street
Chicago, Illinois 60603

FORM 24

Services - re University of Illinois Blonder Tongue and Allied Radio suit including negotiations, and preparing stipulation to extend time to answer, etc.	$145.00	
Outlay - miscellaneous expenses re above	4.40	$149.40

From

HARRY A. GILBERT
BLONDER-TONGUE LABORATORIES, INC.
9 ALLING STREET, NEWARK, NEW JERSEY 07102

PLEASE RETURN THIS
Speed Reply
◀ ◀ ◀ ◀ TO

May 3, 1966
DATE

To
Mr. Robert H. Rines
Rines & Rines
No. Ten Post Office Sq.
Boston, Mass.

SUBJECT

JFD Patent Infringement

Message

Dear Bob:

Harry Gilbert wanted you to have the enclosed copy of a conversation between Jerry Balash and Skip Womack of Sacramento Electronic Supply re patent infringement.

Millie
Mildred Miller
SIGNED

ORIGINATOR — DO NOT WRITE BELOW THIS LINE

Reply

TO
DATE

RECEIVED
MAY - 4 1966
RINES AND RINES
NO. TEN POST OFFICE SQUARE, BOSTON

53

SIGNED

ORIGINATOR FOLD MARKS

ADDRESSEE FOLD MARKS

103 SR

ADDRESSEE — *RETURN WHITE COPY*

INTEROFFICE MEMO

To: I. S. Blonder
B. H. Tongue

Date: November 4, 1965

Subject: Conversation with
Ed Finkel of J.F.D.

At breakfast, Sunday morning, October 31, 1965, at the Boca Raton Country Club, Boca Raton, Florida, I was invited by Ed Finkel to join him at his table for an [illegible] "impromptu" meeting.

Mr. Finkel opened the conversation with letting me know that he was aware that Blonder-Tongue Labs was entering the antenna field. He advised me that he knew of our sales policy of giving one antenna free with each twelve purchased plus advertising and promotion costs. Mr. Finkel then stated that the antenna industry used such promotional allowances only during the summer season and that when the height of the season was reached, this practice was suspended so that a full mark-up could be realized on the sale of antennas. He counseled that perhaps we were still too new in the industry to realize the effect of giving promotional allowances throughout the year.

I listened to what he had to say but did not agree or disagree with his comments. The impression I received was that this was a private discussion between manufacturers with an attempt to control the profit margins realized in the market place.

Harry A. Gilbert

HAG:dal

For Personnel Department Use Only

B-T LABS®

Type of Position Desired:

Salary Requested

Date Available

How Did You Hear of This Position?

Date of Application

PERSONAL

(Print) Name: Last BALASH First JEROME Middle (maiden name if married) NORMAN

Telephone Home: GR-3-6326 (215)

Address: Street and Number 7355 WOODCREST AVE. City PHILA. State PA

Business:

Date of Birth	Sex	Marital Status	No. of Dependents	No. of Children	Social Security No.
4-21-25	M	M	3	2	067-18-1893

Citizen of U.S.?	Do You Rent or Own Your Home?	Height	Weight	List any friends or relatives working here:
Yes	Rent	5-11½	160	

Have you ever been convicted of an offense? (Except for minor traffic violations) Yes ☐ No ☑

If yes, give details:

In Case Of Emergency Notify:	Relationship	Address	Telephone
MURIEL BALASH	WIFE	Same AS ABOVE	SAME

EDUCATION AND TRAINING

High School Attended: Name	Location	Course	Date Graduated
DE WITT CLINTON	N.Y.C.	ACADEMIC	1942

Colleges and other Schools Attended

Name	Location	Dates Attended From	To	Field of Specialization	Cert. or Degree	Year Conferred	Grade Average	Where Max. is
UNIV. OF MIAMI	FLA.	1942	1943	PRE-ENGINEERING				
C.C.N.Y.	N.Y.C.	1952	1953	GENERAL				
R.C.A. INSTITUTE	N.Y.C	1950	1951	TECHNICAL				

Scholastic Honors

Honorary Societies

Extent of self financing in college:

List Extra-curricular Activities:

Subjects of Theses Written:

OTHER TRAINING: (Apprenticeships, Technical & Trade Schools, Military & Service Schools, Special Courses Attended)

See ABOVE

Patents Issued: (Give dates and number of patents issued or pending)

Articles Published: (Titles, dates and names of publications)

Hobbies: PHOTOGRAPHY, SOUND ENGINEERING, MUSIC

Professional Licenses and Memberships in Professional Societies: AUDIO ENGINEERING SOCIETY

MILITARY

Present — Selective Service Classification: Veteran

Member of National Guard or Reserve Unit?

Give Details:

Past	Branch of Service	Dates of Service	Type of Discharge	Serial No.	Disabled Veteran
	ARMY	1943-1946	HONORABLE	12220146	Yes ☑ No ☐

Describe your duties in Service: INFANTRY

REFERENCES

Recent college graduates give names of faculty members.

Name	Address	Business or Profession	Phone

Name and Address of present or most recent Employer: TELESYSTEM SERVICES CORP. 113 SO. EASTON RD, Glenside PA

Name and Title of Supervisor: FRED LIEBERMAN - PRES

Date Started: 10/62

Starting Position: REGIONAL MANAGER

Starting Salary: $10,000 per YR.

Date Left: Aug. 63

Position on Leaving: SAME

Salary on Leaving: $ SAME per —

Reason for Leaving: Change of Company Direction

Division & Dept.: SALES

Phone No.: TU-4-6635

May we contact this employer? Yes ☑ No ☐

Description of Duties: Set up Regional SALES OFFICE. PROMOTION + TECHNICAL SALES TO CATV INDUSTRY.

Next Previous Employer — Name and Address: LCA SALES 76 MAIN ST. TUCKAHOE, N.Y.

Name and Title of Supervisor: PAUL NICHOLS, PARTNER

Date Started: 6/60

Starting Position: Regional SALES

Starting Salary: $ 125 per WK.

Date Left: 10/62

Position on Leaving: SAME

Salary on Leaving: $ 11,500 per YR.

Reason for Leaving: BETTER OPPORTUNITY ?

Division & Dept.:

Phone No.: WO-1-4700

Description of Duties: MANUFACTURERS REP

Next Previous Employer — Name and Address: AUSTIN ELECTRONICS - 1421 WALNUT ST. PHILA

Name and Title of Supervisor: AUSTIN GUTMAN

Date Started: 6/57

Starting Position: STORE MANAGER

Starting Salary: $ 150 per WK.

Date Left: 6/60

Position on Leaving: SAME

Salary on Leaving: $ 175 per WK

Reason for Leaving: POOR FINANCIAL CONDITION

Division & Dept.:

Phone No.:

Description of Duties: STORE MANAGER - SUPERVISOR. PURCHASING, PROMOTION.

Next Previous Employer — Name and Address: TENSOR ELECTRIC DEVELOPMENT BKLYN, N.Y.

Name and Title of Supervisor:

Date Started: 12/56

Starting Position: P.A.

Starting Salary: $ 150 per WK.

Date Left: 6/57

Position on Leaving: P.A.

Salary on Leaving: $ 150 per WK

Reason for Leaving: ELIMINATION OF POSITION

Division & Dept.:

Phone No.:

Description of Duties: PURCHASING FOR TRANSFORMER PLANT AND GOVERNMENT CONTRACTS

DITIONAL QUALIFICATIONS OR REMARKS:

ertify that the above answers are correct and that I authorize this organization to investigate any and all information given. Any misrepresentation may be use for my dismissal. I understand that the use of this blank does not indicate there are any positions open and does not in any way obligate this Company.

te 8/15/63

Signed ______ (Signature of Applicant)

INTERVIEWER'S COMMENTS

e Hired	Date to Report	Department	Position	Starting Salary	Special Reviews and Arrangements	Hired By
	8/5/63	mkt - UHF	Represent	9,000 P.W.	Incentive up to 2,000	Approvals

-210-117-2

B-T PERSONNEL RECORD

AME
Jerome N. Balash ~~GR 3-6226 (215~~

DDRESS CITY TELEPHONE NO.
~~7355 Woodcrest Ave., Phila. Pa.~~ → 762-1257
NEIGHBOR ☐ OWN ☐

DDRESS CITY
116 Oakland Rd. Maplewood NJ
NEIGHBOR ☐ OWN ☐

DDRESS CITY
NEIGHBOR ☐ OWN ☐

MERGENCY ADDRESS RELATIONSHIP TELEPHONE NO.
Muriel Balash Same Wife

SOCIAL SECURITY NO. DATE HIRED
067-18-1893 8-5-63

POSITION HIRED RATE CO. DEPT.
UHF Rep.Mkt. Mkt.

DATE OF BIRTH MARITAL STATUS CITIZEN HT. WT.
4-21-25 Married Yes

MEDICAL INFORMATION

EXPERIENCE

DATE OF EMPLOYMENT		COMPANY ADDRESS	TYPE OF WORK PERFORMED	FINAL SALARY
ROM	TO			
0/62	8/63	Telesystem Svces.Corp.113 S.EastonRd.,Glenside,PA.	Regional Manager	$10,000
/60	10/62	LCA Sales, 76 Main St.,Tuckahoe,NY	Regional Sales	11,500

PECIAL SKILLS

ILITARY SERVICE

EST SCORES

SURANCE RECORDS
1/26/63 BC/BS 0210042125 F

EDUCATION

GRAMMER NO. OF YEARS HIGH NO. OF YEARS GRAD
DeWitt Clinton,NYC 1942

TECHNICAL SCHOOL
RCA Institute,NYC 1950-51

COLLEGE NO. OF YEARS DEGREE DATE
Miami U. 1942-43

OTHER
CCNY NYC 1952-53

NAME	T.C. NO.	DEPT.	JOB TITLE	SAL.	STATUS	SENIORITY DATE	OUT
lash, Jerome N.	6054	Mkt.	UHF Representative			8-5-63	

INDUSTRIAL ACCIDENT RECORD

DATE OF ACCIDENT	DESCRIPTION	DATE RETURNED	AMOUNT LOST TIME

RATING

DATE	RATING	RATER	DATE	RATING	RATER

RECORD OF WARNINGS

DATE	REASON	REMARKS

SERVICE RECORD

DATE	DEPT.	CO.	JOB TITLE	RATE	REMARKS
8-5-63	Mkt.		UHF Representative	9,000.	yr. Hired
2/3/64	〃		〃 〃	10,500	YR (Next Review Feb 1965)
6/64				10,500	June increase A ($201.92)
~~7/19/65~~ 7/29/65				11,500	July 〃 - Sal. Rev. on 11/1/65 for a additional $1000 - 1966 Bo~~nus plan to be arranged~~ for top earnings to remain at $16,500.
11/1/65	〃	〃	〃	$12,500	Inc. salary & reduce incentive
7/19/66	〃		〃	13,000	Annual increase
7/29/66	〃	〃	〃	〃	Resigned - Felt unable to be Creative at B-T. too restricted by Co. management

	Quantity Work	Quality Work	Versatility	Job Knowledge	Attendance	Attitude
EXEC				X		
GOOD	X				X	X
FAIR		X	X			
POOR						

Rehire {Yes / No} Yes

TERMINATION

DATE	REASON	FINAL RATING	REHIRE

REMARKS

NAME	T.C. NO.	DEPT.	JOB TITLE	SAL. STATUS	SENIORITY DATE	OUT
Balash, Jerome N.	6054	Mkt.	UHF Representative		8-5-63	

From

MARKETING DEPARTMENT
BLONDER-TONGUE LABORATORIES, INC.
9 ALLING STREET, NEWARK, NEW JERSEY 07102

PLEASE RETURN THIS
Speed Reply
◀ ◀ ◀ ◀ TO

DATE 7/30/65

To Shel William

SUBJECT

Message

Again re Jerry Balish —

Please enact increase of $1000 retro-active to July 18th, 965. Jerry understands his top earning is $16500 (incentive plus new salary). Incentive will be reduced in Nov & Salary increased by at least $1000 per year. This is per ~~[illegible]~~ my discussion with Shel then Jerry B.

SIGNED

cc J. Balish

ORIGINATOR — DO NOT WRITE BELOW THIS LINE

Reply

TO

DATE

SIGNED

ADDRESSEE FOLD MARKS

TRAINING SERVICES

Leonard J. Smith - Executive Director
33 Lincoln Avenue, Rutherford, N. J.
Code 201 - WE 3-5880

August 6, 1963.

To: Blonder-Tongue Laboratories, Inc., Newark, New Jersey.

Re: Psychological Testing and Evaluation of Mr. Jerome Balash, 7355 Woodcrest Ave., Philadelphia 51, Pa. for position as UHF Sales Manager.

It is our understanding that Mr. Balash is a candidate for the position of UHF Sales Manager. In this position, he is to direct the efforts of several manufacturers' representatives and distributors, but have no direct supervision of a sales force. We were specicially requested to check for his creativity to set-up programs to meet the needs of individual markets, his social maturity, his ability to sustain interest, and his potential as a Product Sales Manager concerned with promotion and planning of a product line. In addition, we were to check for the traits and abilities associated with the position of Field Sales Manager.

In accordance with these instructions, we arranged for the psychological testing and depth interviewing of Mr. Balash on Thursday, August 1, 1963. The evaluating instruments used were: The Personality Inventory; The Henmon-Nelson Test of Mental Ability; The Watson-Glaser Critical Thinking Appraisal; How Supervise; and, the Sales Projection Inventory.

OUR FINDINGS:

1. Mr. Balash gives an excellent appearance. His physical structure, his dress, his personal cleanliness, and his poise all make for the proper impression on others. He appears in good health, with no visible defects or deformities. He wears glasses.

2. His voice and his speech are good, including his diction and his conversational tone. He has above average command of language and language usage.

3. His basic intellectual capacity is extremely high. He has mental depth which has not yet been tapped. He is aware of this capacity, although he has done little to develop it for personal growth and self-improvement.

4. He is well balanced emotionally and should experience no difficulty adjusting to new situations and new people. He does not display or indicate any tendenny to become easily irritated, frustrated, or repressed. However, he has had a record of failing to adjust to irritating human situations. This has been the basis for his participating in group therapy and private analysis during the past year and one-half. These sessions appear to have been successful in his making the proper adjustments at the present time. He understands and appreciates his past failings in this area.

5. Mr. Balash's educational background was limited to two years of college. He has not participated in any formal educational program since leaving school. He has participated in the educational programs of A.E.S.

6. He has a history of resisting authority. This appears to be the result of a poor home life - coming from a broken home. His Army service, his first unsuccessful marriage, and his early years of business life reflect this as a passive trait. At the present, this has been controlled by his present happy marriage and his sessions with the analyst.

11/6/65
DATE PREPARED

gtc

11/1/65
EFFECTIVE DATE

REQUEST FOR CHANGE OF STATUS

BALASH	JERRY	8-5-63	Home Product Mgr.	Pt Lab	Mktg
LAST NAME	FIRST NAME	DATE OF EMPLOYMENT	JOB TITLE	COMPANY	DEPT.

SFER AND/OR TITLE CHANGE ________ PROPOSED TITLE ________ DEP'T. ________ COMPANY

son/Remarks________

Y CHANGE Present Rate $11500/yr Proposed Rate $12500/yr

son/Remarks________

GE OF NAME, ADDRESS AND TELEPHONE NUMBER

w Name________ Telephone No.________

w Address________

nge in Insurance Coverage________

IONS

AVE OF ABSENCE: From________ To________

ason________

RMINATION ☐ Resignation ☐ Discharge ☐ Layoff Last Day Worked________

ason for Termination________

INAL RATING (hourly employees only)

QUANTITY OF WORK	QUALITY OF WORK	ADAPTABILITY	JOB KNOWLEDGE	ATTENDANCE	ATTITUDE

CLEARANCE:

Badge ☐ Tools ☐ Credit Cards ☐

Agency Fees ☐ Equipment ☐ Cash Advances ☐

Rehire ________Yes ________No

Reason________

R CHANGES AND EXPLANATIONS:________

To increase [illegible] rate & [illegible]

ALS ________ DEPARTMENTAL ________ PERSONNEL ________ WAGE COMMITTEE ________ MANAGEMENT ________ UNION

PERSONNEL RECORD COPY

7/29/65
DATE PREPARED

B-T LABS®

7/19/65
EFFECTIVE DATE

REQUEST FOR CHANGE OF STATUS

6057 Bachsh Jerry UHF Representative - NY

TC# LAST NAME FIRST NAME JOB TITLE DEP'T. COMPANY

TRANSFER AND/OR TITLE CHANGE ________ PROPOSED TITLE ________ DEP'T. ________ COMPANY

Reason/Remarks ________

SALARY CHANGE Present Rate $ Proposed Rate ________

Reason/Remarks Salary Increase $1,000

CHANGE OF NAME, ADDRESS AND TELEPHONE NUMBER

New Name ________ Telephone No. ________

New Address ________

Change in Insurance Coverage ________

SEPARATIONS

LEAVE OF ABSENCE: From ________ To ________

Reason ________

TERMINATION ☐ Resignation ☐ Discharge ☐ Layoff Last Day Worked ________

Reason for Termination ________

Clearance: ☐ Badge ☐ Equipment ☐ Agency Fees

☐ Tools ☐ Credit Cards ☐ Cash and Advances

Personnel Exit Interview Completed ________
(FINAL CHECK AUTHORIZED) SIGNATURE

FINAL RATING

	QUANTITY OF WORK	QUALITY OF WORK	ADAPTABILITY	JOB KNOWLEDGE	ATTENDANCE	ATTITUDE
EXCELLENT						
GOOD						
FAIR						
POOR						

Rehire: ☐ Yes ☐ No Reason ________

OTHER CHANGES AND EXPLANATIONS: Salary Review 11/1/65 for an additional $1000 - 1966 Bonus plan to be arranged for top earnings to remain at 16,800

APPROVALS ________ DEPARTMENTAL ________ PERSONNEL ________ WAGE COMMITTEE ________ MANAGEMENT ________ UNION

E

B-T LABS®

DATE PREPARED:

EFFECTIVE DATE: 2/3/64

REQUEST FOR CHANGE OF STATUS

TC#:
LAST NAME: Balosh
FIRST NAME: Jerry
JOB TITLE:
DEP'T.:
COMPANY:

TRANSFER AND/OR TITLE CHANGE
PROPOSED TITLE:
DEP'T.:
COMPANY:

Reason/Remarks:

SALARY CHANGE Present Rate: $9,000 Proposed Rate: $10,500

Reason/Remarks: Next Review 2/65

CHANGE OF NAME, ADDRESS AND TELEPHONE NUMBER

New Name: Telephone No.:

New Address:

Change in Insurance Coverage:

SEPARATIONS

LEAVE OF ABSENCE: From: To:

Reason:

TERMINATION ☐ Resignation ☐ Discharge ☐ Layoff Last Day Worked:

Reason for Termination:

Clearance: ☐ Badge ☐ Equipment ☐ Agency Fees

☐ Tools ☐ Credit Cards ☐ Cash and Advances

Personnel Exit Interview Completed (FINAL CHECK AUTHORIZED):
SIGNATURE:

FINAL RATING

	QUANTITY OF WORK	QUALITY OF WORK	ADAPTABILITY	JOB KNOWLEDGE	ATTENDANCE	ATTITUDE
EXCELLENT						
GOOD						
FAIR						
POOR						

Rehire: ☐ Yes ☐ No Reason:

OTHER CHANGES AND EXPLANATIONS:

APPROVALS: DEPARTMENTAL: PERSONNEL: WAGE COMMITTEE: MANAGEMENT: UNION:

RINES AND RINES
ATTORNEYS AT LAW
NO. TEN POST OFFICE SQUARE
BOSTON, MASSACHUSETTS 02109

DAVID RINES
ROBERT H. RINES

CABLE SENIR
TELEPHONE HUBBARD 2-3289

Richard Phillips
AC 312
346-1630

December 6, 1966

RECEIVED
DEC 8 - 1966
HOFGREN, WEGNER, ALLEN, STELLMAN & McCORD

Richard S. Phillips, Esquire
Hofgren, Wegner, Allen, Stellman & McCord
20 No. Wacker Drive
Chicago, Illinois 60606

Re: Material To Be Supplied By Blonder-Tongue To Foundation and JFD

Dear Dick:

Referring to your list entitled "Blonder Tongue to get For U/I Foundation and JFD" (copy enclosed), we enclose material collected by our client and bearing the same numbers (1 thru' 31) that you have used in your list, as follows:

175 + 176 1 and 2. In addition to material previously supplied, enclosed sheets numbered "1 & 2" in red with circle.

3. Dwg M-1552-E, labeled "3" in red.

4. Our client could not locate the written data, nor could anything be found in notebook #3.

5. None found.

6 and 7. Early antenna #5 was found and we shall bring it with us.

8. See p. 85-86 of Finkel Deposition, November 1, 1966

178 9. 9/7/66. Purchase Requisition 33313, numbered "9".

10. Robert H. Rines will supply as much as proper in Chicago.

11. Already provided.

179 - 193 12. Enclosed papers ("Competitor Product Analysis") numbered "12". (14 graphs)

194 - 209 13. Enclosed papers ("Competitive Product Evaluation") numbered "13" (2 pages, 14 graphs)

14. 75 Park Terrace East, N.Y.C.

212 - 216 15. Prints C-1758-B, C-1757-C (numbered "15" in red) and technical reports ("15") of July 26, 1965 and August 16, 1965.

16. None found.

217 + 218 17. Documents bearing "17" in red.

18. 10/65

19. To come later (some records in dead storage).

221 - 225 20. Papers numbered "20".

21. None located.

22. None.

23. Jerome Cohn, 7 Osage Road, Rockaway, New Jersey
John A. Linnerman, 117 Fleming Court, Burlington, Iowa.

226 & 227 24. In addition to the material testified to by Mr. Blonder, ads such as "Assault on Perfection" (Electronic Service Dealer, Vol. 6, No. 7, 1966) Copy enclosed and numbered "24".

25. For example, in "Assault on Perfection" ad ("24") front end feed at 1'', 1''' (in red), "strain relief" so-called (actually transmission-line supporting member) at 2', and mast mounting at M . Similarly on others.

26 and 27. In addition to those identified during Blonder deposition, and those discussed commencing with page 23 of the Finkel deposition, those set forth in paragraph 18 of the answers to plaintiff's interrogatories.

228-255 28. Report Engineering Dept. Memo #178, June 30, 1965, numbered "28" (6 pages).

29. Robert H. Rines will supply as much as proper in Chicago.

30 and 31. Still being investigated.

We have correlated this with Mr. Cass' letter of November 21, as follows:

Cass Page Reference	Your List Number
154	9
201	10
234	12
236	13
273	14
278-	We find no such search was made.
293-	Still being investigated.
293-4	15
299	16
301	17
304	18
304 (2nd)	19
304 (3rd)	20
313-314	21
315	21 No documents found to support memory.
316	22
365	31 (Still being investigated)
376	23
377	23
382-3	31 (Still being investigated)

404-5	24, 25
405-6	26
406-7	27
408	28
411	29
425-6	30 (Still being investigated)
425-6 (2nd)	31 (" " ")

Very truly yours,

RINES AND RINES

By Robert H Rines n.

RHR/MN

P. S. Will you please make copies for our files and use any system (numbers) you desire for consistency.

RHR

The Following Pages Are Poor Quality

Prepared by:
Approved by:
Date: February 8, 1963

Project 1264

DESIGN SPECIFICATIONS

AMPLIFIED ANTENNA

1. Consumer product primarily consisting of a one tube VHF booster (BTA) and an antenna. Designed 40 stand on top of TV set or attached to wall near set.

2. Use light bulb (small 40 watt size) as filament dropping resistor. Use light shield to reduce light output. (Marketing request)

3. Plastic case (phenolic), black

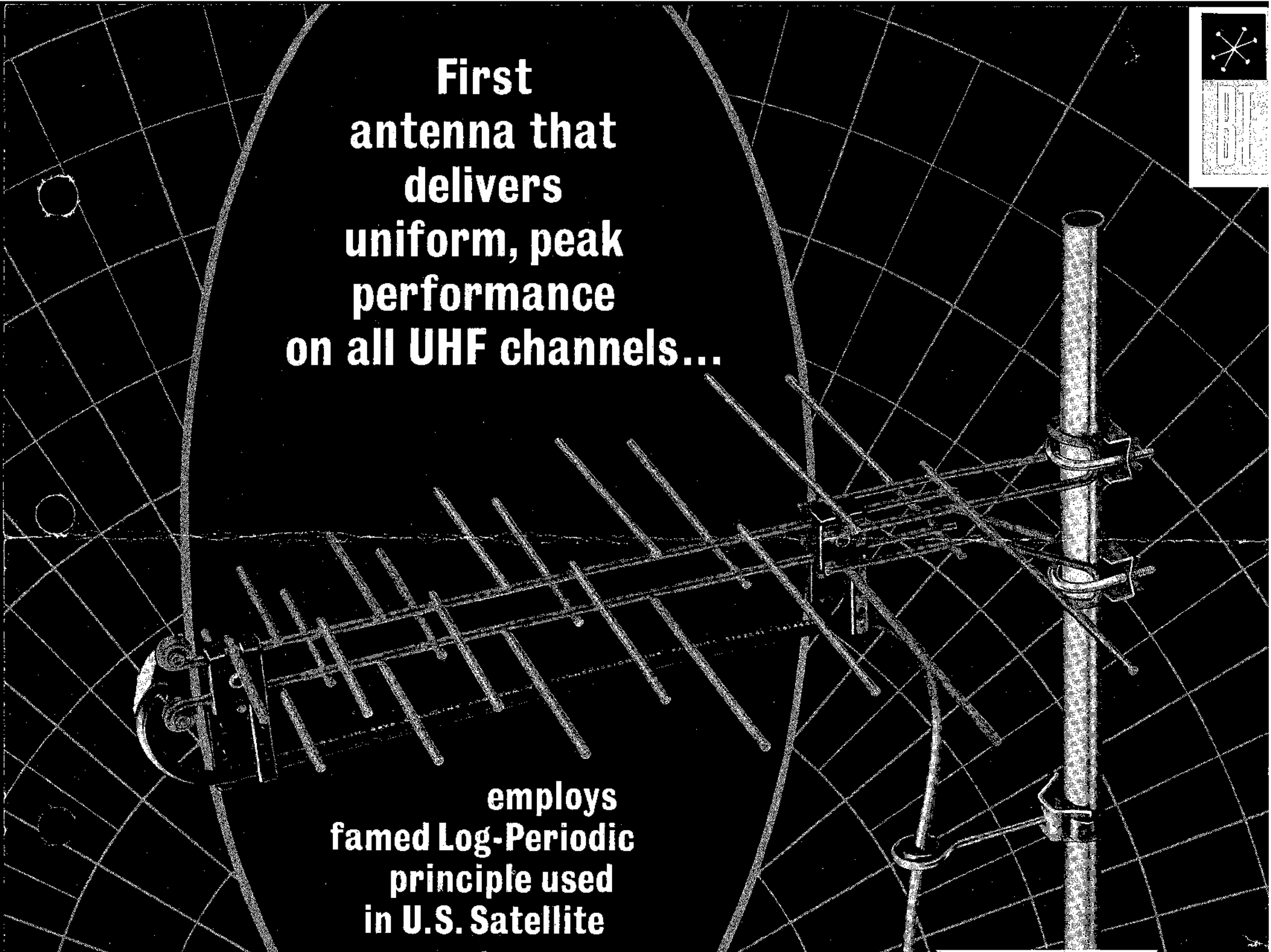
4. 3 position switch: UHF/VHF/OFF; bulb on in UHF and VHF positions.

5. Two models are anticipated:

    a. single rod antenna (collapsible)
    b. double rod antenna (collapsible)

6. Price goal $10. based on 1st year sales of 100,000 (80,000 2nd, 60,000 3rd).

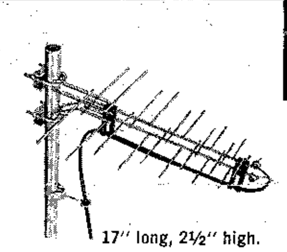
7. Fringe area performance on a good TV set must at least equal that of the best non powered indoor antenna.



First antenna that delivers uniform, peak performance on all UHF channels...

employs famed Log-Periodic principle used in U.S. Satellite program

BLONDER-TONGUE GOLDEN DART ALL-CHANNEL UHF ANTENNA



17″ long, 2½″ high.

The logarithmic-periodic principle is recognized as today's most modern approach to TV antenna design. The new Blonder-Tongue Dart takes full advantage of the inherent characteristics of the log-periodic design. Eleven elements are employed. The result: The Dart delivers constant high gain, matched impedance and a uniform polar pattern across the full UHF spectrum.

POLAR PATTERN & 10db GAIN UNIFORM ACROSS ENTIRE UHF SPECTRUM

No matter what UHF channels serve your area—from 14 to 83—the Dart delivers a sharp, clean pattern on every channel. The Dart maintains an excellent front-to-back ratio (more than 20 db)—equal or superior to a stacked bow-tie over the entire UHF range. The elements are arranged to provide a narrow forward beam for sharpest directivity, minimizing ghosts and other interference. An extremely low VSWR (2:1) prevents other causes of ghosts and smears. Finally, good impedance match on all channels—far superior to bow-ties—assures high uniform gain (±1 db across the entire band; ±½ db within any channel) on all channels.

FULL BANDWIDTH, FLAT RESPONSE (± ½ db) ON ALL UHF CHANNELS.

These requisites of good black & white and color reception are maintained. Result: black & white pictures are 'live' with a full tonal range of whites, greys, blacks; and color come through with true fidelity.

COMPLETELY PRE-ASSEMBLED—NOTHING TO SNAP-OUT, NO SCREWS TO TIGHTEN

Take it from the box—mount it—connect your lead, and it's ready to use. Patented stripless screw terminals make connection of twin lead more secure than with other antennas, because the teeth of the phosphor bronze washer grip *both* the insulation and the wire. And wire is fully protected at the point of contact. Polypropylene holders guide the lead-in, keeping the distance between the lead-in and the metal of the antenna uniform at all points to preserve the impedance match. The Dart is the most compact of all UHF antennas—only 17″ long. Its low vertical height displacement (2½″) makes it easy to piggyback with any VHF antenna. Complete with 2 U-bolts for secure mast mounting.

RUGGED, UNITIZED WELDED CONSTRUCTION FOR EXCELLENT, PERFORMANCE

Welded construction (no rivets, no soldering) mean no movable joints that can corrode and impair performance. Other features: sturdy zinc coated steel with long lasting mil spec iridite finish; heavy polypropylene insulators used instead of usual polystyrene which has a tendancy to crack. Another advantage is that the Dart is grounded to the mast. If the mast is grounded, *no lightning arrester is needed!*

ENGINEERED BY THE COMPANY WITH THE MOST UHF EXPERIENCE

The same know-how employed in designing and producing more than 2 million UHF converters . . . the experience of having worked in every part of the UHF spectrum . . . has gone into making the finest UHF antenna in the field.

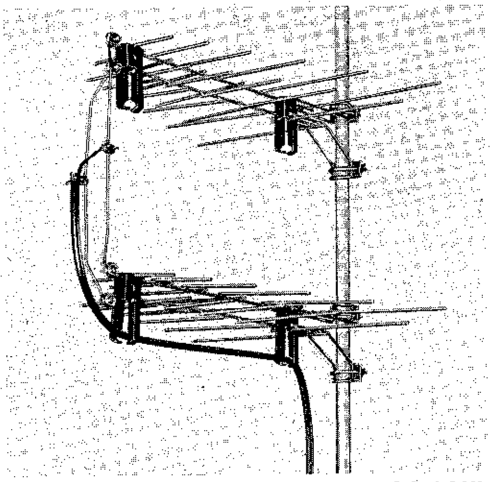
The Blonder-Tongue UHF Dart provides peak performance across the full UHF spectrum to match the high performance standards of Blonder-Tongue UHF converters.

YC-2015

BLONDER-TONGUE
CHANNEL 14 TO 83 TV ANTENNA–
GOLDEN DART

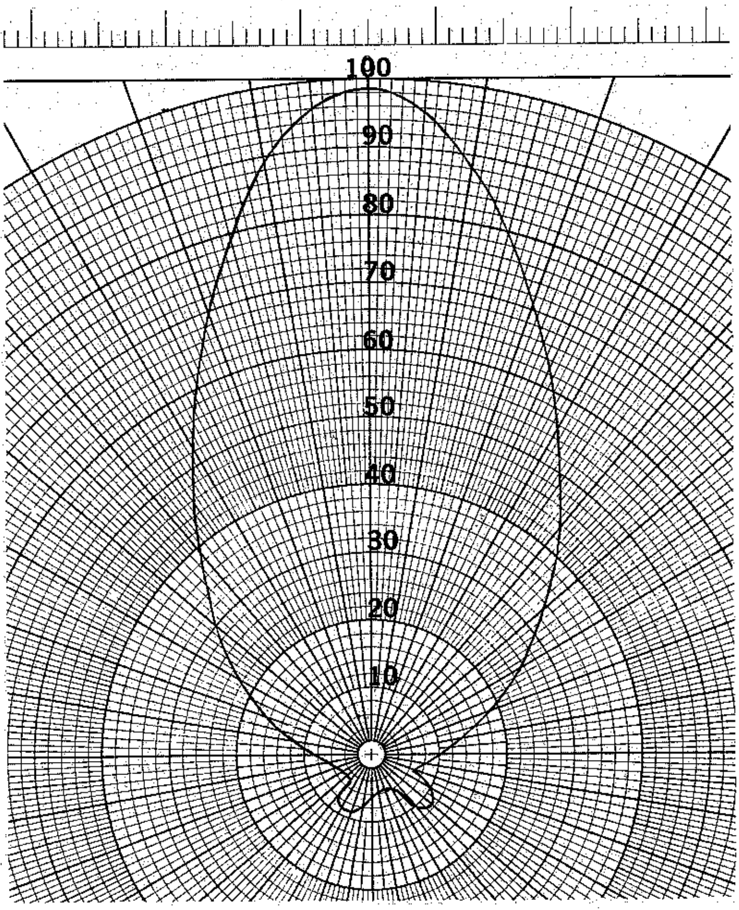
TABLE OF SPECIFICATIONS

FREQUENCY COVERAGE:	470 mc-890 mc
(Frequency coverage actually extends slightly below and above the above limits).	
INPUT MATCH:	2:1 or better over the entire UHF band.
GAIN OVER TUNED DIPOLE:	(9.2 db at 490 mc)
10.0 db average	(11.0 db at 700 mc)
	(10.5 db at 880 mc)
FRONT-TO-BACK RATIO:	20 db minimum (typical 24.0 db)
BEAM WIDTH HORIZONTAL:	(50° at 490 mc)
(half power points)	(53.5° at 700 mc)
	(41.0° at 880 mc)
POLARIZATION:	Horizontal
NUMBER OF ELEMENTS:	Eleven
MOUNTING:	Mast mounting (1″-2½″ mast)
Mounts with two clamps (supplied).	
TRANSMISSION LINE:	300 ohms balanced twinlead or tubular.
CONSTRUCTION:	steel with mil spec zinc plate iridite finish (silver color)
SIZE (HWL):	2½″ x 13⅞″ x 17″
ANTENNA WT.:	1 lb.
SHIPPING WEIGHT:	2 lbs.



STACKED GOLDEN DARTS FOR EXTRA GAIN

Two Golden Darts may be stacked easily for extra gain (3 db) and better impedance match (3:1). Order model3519 stacking bars.



Blonder-Tongue manufactures the world's only complete line of UHF products. All-channel UHF converters include the model BTC-99S for prime signal areas and the BTU-2T with 8 db gain. To improve reception in weak signal areas, where older TV sets or a non-amplified converter is used, the U-BOOST all-channel indoor UHF booster is the solution. For fringe areas, the mast-mounted ULTRABOOSTER is recommended.

DISTRIBUTED BY:

engineered and manufactured by

BLONDER✕TONGUE

9 Alling St., Newark, 2 N. J.

Canadian Div.: Benco Television Assoc., Ltd., Toronto, Ont.

home TV accessories • closed circuit TV

• community TV • UHF converters • master TV

Printed in U.S.A.

8

R+R

Oct. 5, 1965 **D. E. ISBELL** 3,210,767

FREQUENCY INDEPENDENT UNIDIRECTIONAL ANTENNAS

Filed May 3, 1960 2 Sheets-Sheet 1

Fig. 1

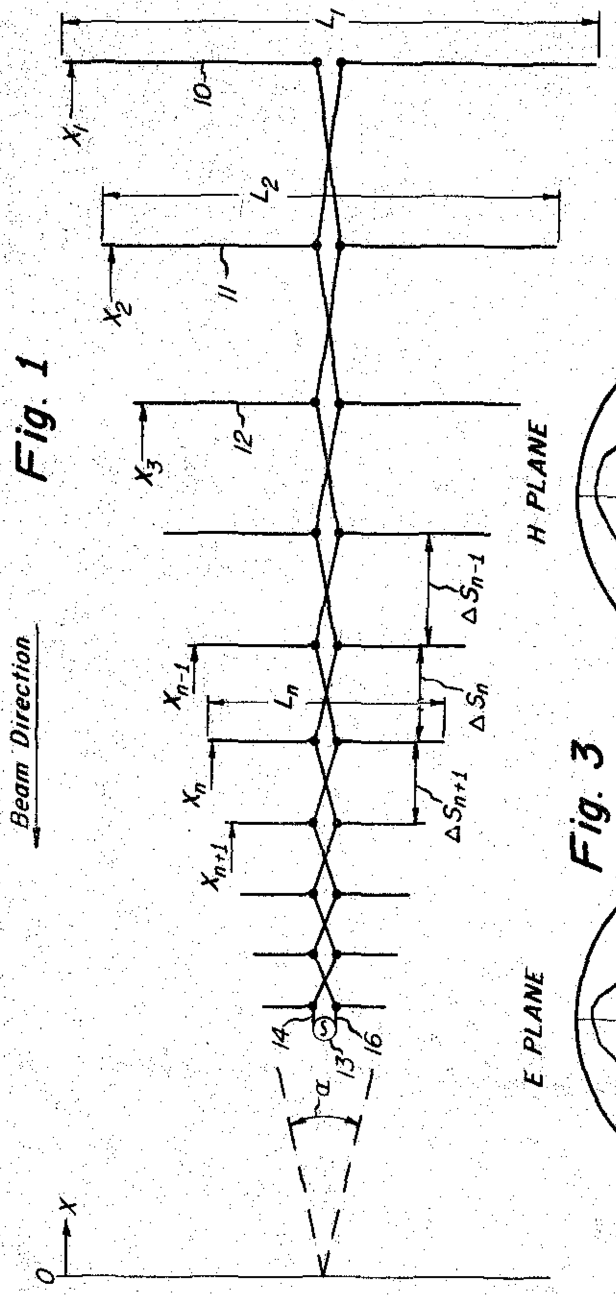


Fig. 4

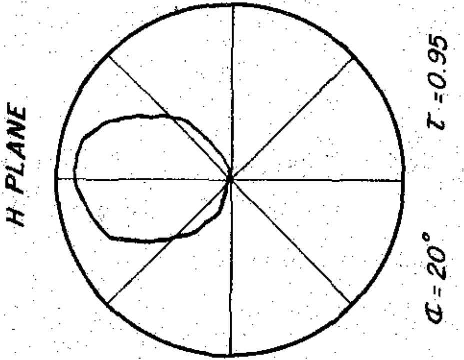
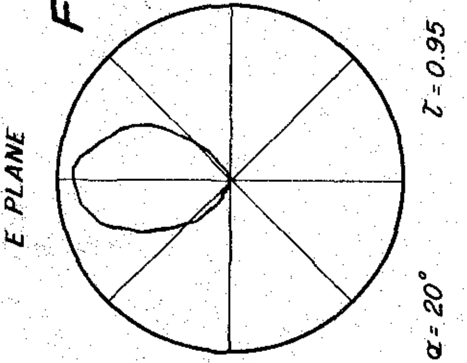


Fig. 3



INVENTOR.
Dwight E. Isbell
BY

Merriam, Smith & Marshall
ATTORNEYS

Oct. 5, 1965 **D. E. ISBELL** 3,210,767

FREQUENCY INDEPENDENT UNIDIRECTIONAL ANTENNAS

Filed May 3, 1960 2 Sheets-Sheet 2

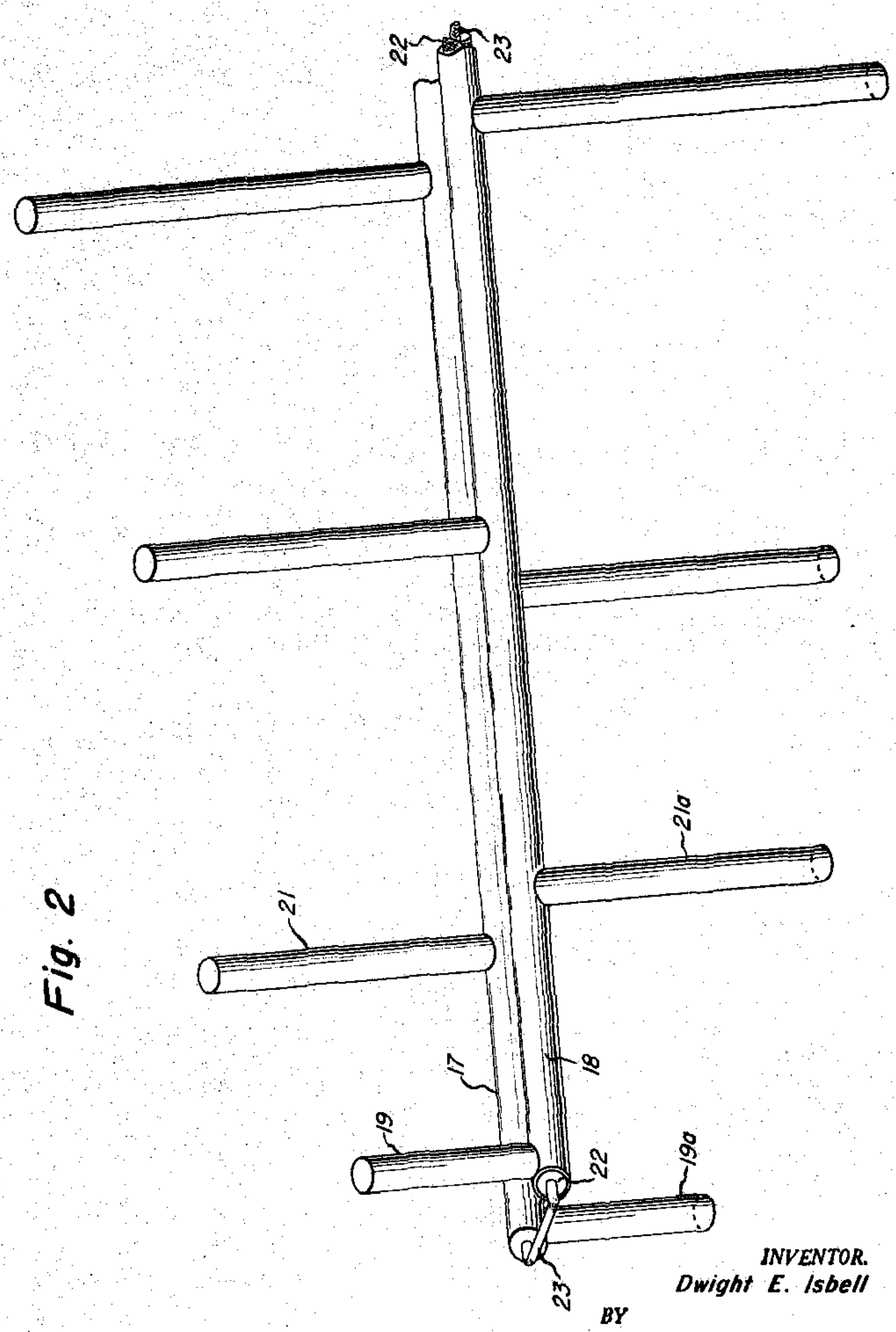


Fig. 2

INVENTOR.
Dwight E. Isbell

BY

Merriam, Smith & Marshall
ATTORNEYS

3,210,767
Patented Oct. 5, 1965

3,210,767

FREQUENCY INDEPENDENT UNIDIRECTIONAL ANTENNAS

Dwight E. Isbell, Seattle, Wash., assignor to The University of Illinois Foundation, a non-profit corporation of Illinois

Filed May 3, 1960, Ser. No. 26,589
15 Claims. (Cl. 343—792.5)

This invention relates to antennas, and more particularly, it relates to antennas having unidirectional radiation patterns that are essentially independent of frequency over wide bandwidths.

The antennas of the invention are coplanar dipole arrays consisting of a number of dipoles arranged in side-by-side relationship in a plane, the length and the spacing between successive dipoles varying according to a definite mathematical formula, each of the dipoles being fed by a common feeder which introduces a phase reversal of 180° between connections to successive dipoles. The antennas of the invention provide unidirectional radiation patterns of constant beamwidth and nearly constant input impedances over any desired bandwidth.

The invention will be better understood from the following detailed description thereof taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a schematic plan view of an antenna made in accordance with the principles of the invention;

FIGURE 2 is an isometric view of a practical antenna embodying the invention; and

FIGURES 3 and 4 are radiation patterns of a typical antenna, in the E plane and H plane, respectively.

Referring to FIGURE 1, it will be seen that the antenna of the invention was composed of a plurality of dipoles **10**, **11**, **12**, etc., which are coplanar and in parallel, side-by-side relationship. It will be noted that the lengths of the successive dipoles and the spacing between these dipoles is such that the ends of the dipoles fall on a pair of straight lines which intersect and form an angle α. In the preferred embodiment the antenna is symmetrical about a line passing through the midpoints of the dipoles, as shown.

The antenna is fed at its narrow end from a conventional source of energy, depicted in FIGURE 1 by alternator **13**, by means of a balanced feeder line consisting of conductors **14** and **16**. It will be seen that the feeder lines **14** and **16** are alternated between connections to consecutive dipoles, thereby producing a phase reversal between such connections.

The lengths of the dipoles and the spacing between dipoles are related by a constant scale factor τ defined by the following equations:

$$\tau=\frac{L_{(n+1)}}{L_n}=\frac{\Delta S_{(n+1)}}{\Delta S_n}$$

where τ is a constant having a value less than 1, L_n is the length of any intermediate dipole in the array, $L_{(n+1)}$ is the length of the adjacent smaller dipole, ΔS_n is the spacing between the dipole having the length L_n and the adjacent larger dipole, and $\Delta S_{(n+1)}$ is the spacing between the dipole having the length L_n and the adjacent smaller dipole.

It will be seen from the geometry of the antennas, as given above, that the distance from the base line 0 at the vertex of the angle α to the dipoles forming the array are defined by the equation:

$$\tau=\frac{X_{(n+1)}}{X_n}$$

where X_n is the distance from the base line 0 to the dipole having the length L_n, $X_{(n+1)}$ is the corresponding distance from the base line to the adjacent smaller dipole, and τ has the significance previously given.

The radiation pattern of the antennas of the invention, having the geometrical relationship among the several parts as defined above, is unidirectional in the negative X direction, i.e., extending to the left from the narrow end of the antenna of FIGURE 1.

The construction of an actual antenna made in accordance with the invention is shown in FIGURE 2. In this antenna the balanced line consists of two closely-spaced and parallel electrically conducting small diameter tubes **17** and **18** to which are attached the dipoles, each of which consists of two individual dipole elements, e.g., **19** and **19***a*, **21** and **21***a*, etc. It will be noted that each of the two elements making up one dipole is connected to a different one of said conductors 17 and 18, in a direction perpendicular to the plane determined by said conductors **17** and **18**. Moreover, considering either one of the conductors **17** and **18**, consecutive dipole elements along the length thereof extend in opposite directions. It will be seen that this construction has the effect of alternating the phase of the connection between successive dipoles, as depicted schematically in FIGURE 1. Although the dipoles of FIGURE 2 are not precisely coplanar, differing therefrom by the distance between the parallel conductors, in practice this distance is very small so that the dipole elements are substantially coplanar and the advantages of the invention are maintained. The antenna of FIGURE 2 may be conveniently fed by means of a coaxial cable **22** positioned within conductor **18**, the central conductor **23** thereof extending to and making electrical connection with conductor **17** as shown.

As an example of the invention, an antenna of the type shown in FIGURE 2 was constructed using 0.125 inch diameter tubing for the balanced line and 0.050 inch diameter wire for the elements. The elements were attached to the feeder line with soft solder, and the array was fed with miniature coaxial cable inserted through one of the balanced line conductors. The antenna was defined by the parameters τ=0.95 and α=20°. The antenna had a total of 15 dipoles, with the longest dipole element being 2½" long, while the shortest element was one-half of this length, or 1¼". The array was 7½" long.

Typical radiation patterns for the above-described antenna in the E plane and the H plane are shown in FIGURES 3 and 4, respectively. These patterns were found to remain essentially constant over the band of about 1100 to 1800 mc./sec. The minimum front-to-back ratio over this band was 17 db and the directivity over the range from about 1130 to 1750 mc./sec. was better than 9 db over isotropic.

The performance of the above-described antenna clearly indicates that the antennas of the invention provide excellent rotatable beams for use particularly in the HF to UHF spectrum. In comparison to the well-known parasitic types of antennas which bear some resemblance to those of the invention, such as the Yagi array, the antennas of the invention provide a much wider bandwidth with essentially comparable directivity. Advantageously, however, the antennas of the invention need no adjusting for their performance over a wide bandwidth compared to the parasitic types which must be adjusted by cut-and-try procedures for each frequency. Further experimental work with other antennas similar to that described above has indicated that the preferred values for the parameters which define the antennas of the invention include a range of values for angle α between about 20° and 100°, with τ having a value between about 0.8 and about 0.95. When these parameters have values within the preferred ranges the antennas were found to have essentially frequency independent performance over any desired bandwidth. The upper and lower limits of the bandwidths may be adjusted as desired by fixing the lengths of the longest dipole and the shortest dipole, respectively. It has been determined experimentally that the longest dipole element should be approximately 0.47 wavelength long at the lower limit and the shortest element should be about 0.38 wavelength long at the upper limit. Moreover, in order to provide a suitable front-to-back ratio at the low frequency limit, there should be at least 3 dipoles in the array and preferably about 10 to 30 dipoles.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A broadband unidirectional antenna comprising an array of [redacted] and parallel dipoles of progressively increasing length and spacing in side-by-side relationship, the ratio of the lengths of any two adjacent dipoles being given by the formula

$$\frac{L_{(n+1)}}{L_n}=\tau$$

where L_n is the length of any intermediate dipole in the array, [redacted] length of the adjacent smaller dipole and τ is a constant having a value less than 1, the spacing between [redacted] being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}$$ [redacted]

where ΔS_n is the spacing between the dipole having the length L_n and the adjacent larger dipole, $\Delta S_{(n+1)}$ is the spacing between the dipole having the length L_n and the adjacent smaller dipole, and τ has the significance previously assigned, said dipoles being fed in series by a common feeder which alternates in phase between successive dipoles.

2. The array of claim **1** which is symmetrical about a line passing through the midpoint of each dipole in the array.

3. A broadband unidirectional antenna comprising an array of a plurality of [redacted] and parallel dipoles of progressively increasing length in side-by-side relationship, the ends of said dipoles falling on a V-shaped line forming an angle α at its vertex, the ratio of the lengths of any pair of adjacent dipoles being given by the formula

$$\frac{L_{(n+1)}}{L_n}=\tau$$

where L_n is the length of the longer dipole of the pair, $L_{(n+1)}$ is the length of the shorter dipole, and τ is a constant having a value less than 1, the dipoles in said array being fed in series by a common feeder which alternates 180° in phase between successive dipoles.

4. The antenna of claim **3** in which the angle α has a value between about 20° and 100° and the constant τ has a value between about 0.8 and 0.95.

5. The antenna of claim **3** in which said feeder is a balanced line which twists 180° between the connections to successive dipoles.

6. A broadband unidirectional antenna comprising a balanced feeder line consisting of two [redacted], straight and parallel conductors, a plurality of dipoles each consisting of two dipole elements, one of which elements is connected to one of said conductors, the other element being connected directly opposite the first to the other of said conductors, the elements of any dipole extending in opposite directions perpendicular to the plane determined by said conductors, consecutive dipole elements on each of said conductors extending in opposite directions, the ratio of the lengths of the elements in any two adjacent dipoles being given by the formula

$$\frac{l_{(n+1)}}{l_n}=\tau$$

where l_n is the length of an element of any dipole in the antenna, $l_{(n+1)}$ is the length of an element in the adjacent smaller dipole and τ is a constant having a value less than *l*, the spacing between said dipoles being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}=\tau$$

where ΔS_n is the spacing between the dipole having the element length l_n and the adjacent larger dipole, $\Delta S_{(n+1)}$ is the spacing between the dipole having the element length l_n and the adjacent smaller dipole, and τ has the significance previously assigned.

7. The antenna of claim **6** wherein τ has a value of about 0.8 to 0.95.

8. The antenna of claim **6** wherein said feeder line conductors are tubular.

9. An aerial system including at least one set of parallel dipoles spaced along and substantially perpendicular to the longitudinal axis of a two-conductor balanced feeder to which the halves of the dipoles are connected at their inner ends, said dipoles being of different electrical lengths increasing substantially logarithmically from the connected end of the feeder to the other end and the dipole feeder connections being crossed over one another between adjacent dipoles, the spacings between which also increase substantially logarithmically from said connected end to the other end.

10. An antenna system for wide-band use comprising a plurality of substantially parallel conducting dipole elements arranged in substantially collinear pairs, the opposite dipole elements of each pair constituting dipole halves, a two-conductor balanced feeder having one conductor connected to each of said elements at substantially the inner end thereof, each of said dipole halves in a pair being connected to a different feeder conductor, adjacent dipole elements being reversely connected to different conductors of the feeder, said dipole elements being selectively spaced along and substantially perpendicular to said feeder, the elements of each pair being of substantially equal length, adjacent dipole elements of different pairs differing in length with respect to each other by a substantially constant scale factor, the selective spacings between adjacent dipoles generally decreasing from one end of the feeder to the other with the greatest spacing being between the longest dipoles, and means to connect the feeder to an external circuit at substantially the location of the smallest of the dipole elements.

11. An antenna system for wide-band use comprising a plurality of substantially parallel conducting dipole elements arranged in substantially collinear pairs, the opposite dipole elements of each pair constituting dipole halves, a two-conductor balanced feeder having one conductor connected to each of said elements at substantially the inner end thereof, each of said dipole halves in a pair being connected to a different feeder conductor, adjacent dipole elements being reversely connected to different conductors of the feeder, said dipole elements being selectively spaced along and substantially perpendicular to said feeder, the elements of each pair being of substantially equal length, adjacent dipole elements of different pairs differing in length with respect to each other by a substantially constant scale factor, the selective spacings between the dipoles along the feeder differing from each other also by a substantially constant scale factor, the greatest spacing being between the longest dipoles, and means to connect the feeder to an external circuit at substantially the location of the smallest of the dipoles.

12. The aerial system of claim **11** in which said scale factors have values within the range from about 0.8 to about 0.95.

13. An antenna system for wide-band use comprising an array of at least three linear substantially parallel conducting dipoles, each dipole being composed of two opposite substantially collinear conducting elements, a two-conductor balanced feeder having one conductor connected to each of said elements at substantially the inner end thereof, adjacent parallel dipole elements being reversely connected to a different conductor of the feeder, the two elements of each dipole being of substantially equal length and successive elements being of lengths which differ from one dipole to the next by a substantially constant scale factor within the range from about 0.8 to about 0.95, the dipoles being spaced from each other in a generally decreasing manner in the direction of decreasing element length, and means to connect the feeder conductors to an external circuit at substantially the location of the smallest dipole elements.

14. An antenna system for wide-band use comprising a minimum of three pairs of linear substantially parallel conducting elements arranged substantially coplanarly, each pair being substantially collinear and comprising the halves of a dipole, a two-conductor feeder connected to the inner ends of said collinear pairs of elements, adjacent parallel elements being connected to different conductors of the feeder so that the halves of the dipoles connect to different conductors of the feeder and adjacent dipoles are reversely connected, the halves of each dipole being substantially the same length, adjacent dipole elements being selectively spaced from each other along the feeder, the length of the successive dipole elements along the feeder decreasing in accordance with a substantially constant scale factor, each dipole and the feeder between it and the adjacent dipole constituting a cell, the dimension of the several cells measured from the point of connection of one dipole and the feeder to the outer end of the next smaller adjacent dipole also decreasing from one cell to the next in the direction of decreasing dipole length according to a substantially constant scale factor so that the combination of cells provides a substantially uniform wide-band response, and means to connect an external circuit to the feeder elements at substantially the location of the shortest of the dipoles.

15. An antenna system for wide-band use comprising a minimum of three pairs of substantially parallel and coplanar linear conducting elements arranged in substantially collinear pairs, each pair of elements comprising the halves of a dipole, a two-conductor feeder, one conductor of which is connected to each of said elements substantially at the inner end thereof, adjacent parallel elements being connected to different conductors of the feeder so that the halves of the dipoles connect to different conductors of the feeder and adjacent dipoles are reversely connected, the halves of each dipole being substantially the same length, adjacent dipole elements being selectively spaced from each other along the feeder, the lengths of the elements decreasing from one end of the feeder to the other substantially in accordance with a substantially constant scale factor within the range from about 0.8 to 0.95, each dipole and the feeder between it and the adjacent dipole constituting a cell, the cell dimension from the inner end of one dipole to the outer end of the next smaller adjacent dipole also generally decreasing from one cell to the next in the direction from the longer to the shorter dipoles so that the combination of cells provides a substantially uniform wide-band response, and means to connect an external circuit to the feeder elements at substantially the location of the shortest of the dipoles.

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CA 496-65
DC NJ
sanin
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DC SD NY
chemu matt,

CA Vitamins 662-64
DC 115

Oct. 22, 1963 **P. E. MAYES ETAL** 3,108,280

LOG PERIODIC BACKWARD WAVE ANTENNA ARRAY

Filed Sept. 30, 1960 2 Sheets-Sheet 1

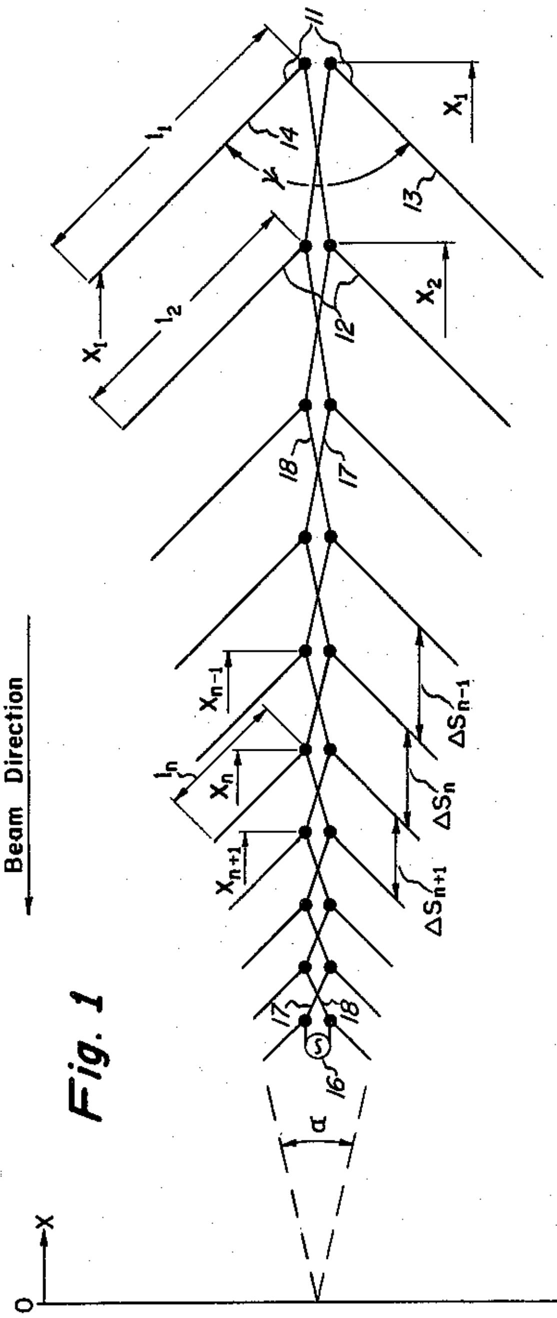
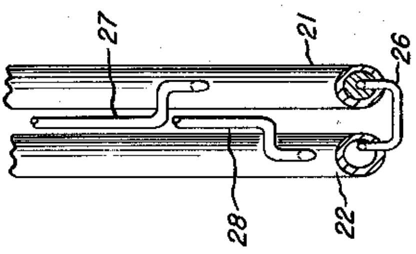


Fig. 1

Fig. 3



INVENTORS:
Paul E. Mayes
BY *Robert L. Carrel*

Merriam, Smith & Marshall
ATTORNEYS

Oct. 22, 1963 P. E. MAYES ETAL **3,108,280**

LOG PERIODIC BACKWARD WAVE ANTENNA ARRAY

Filed Sept. 30, 1960 2 Sheets-Sheet 2

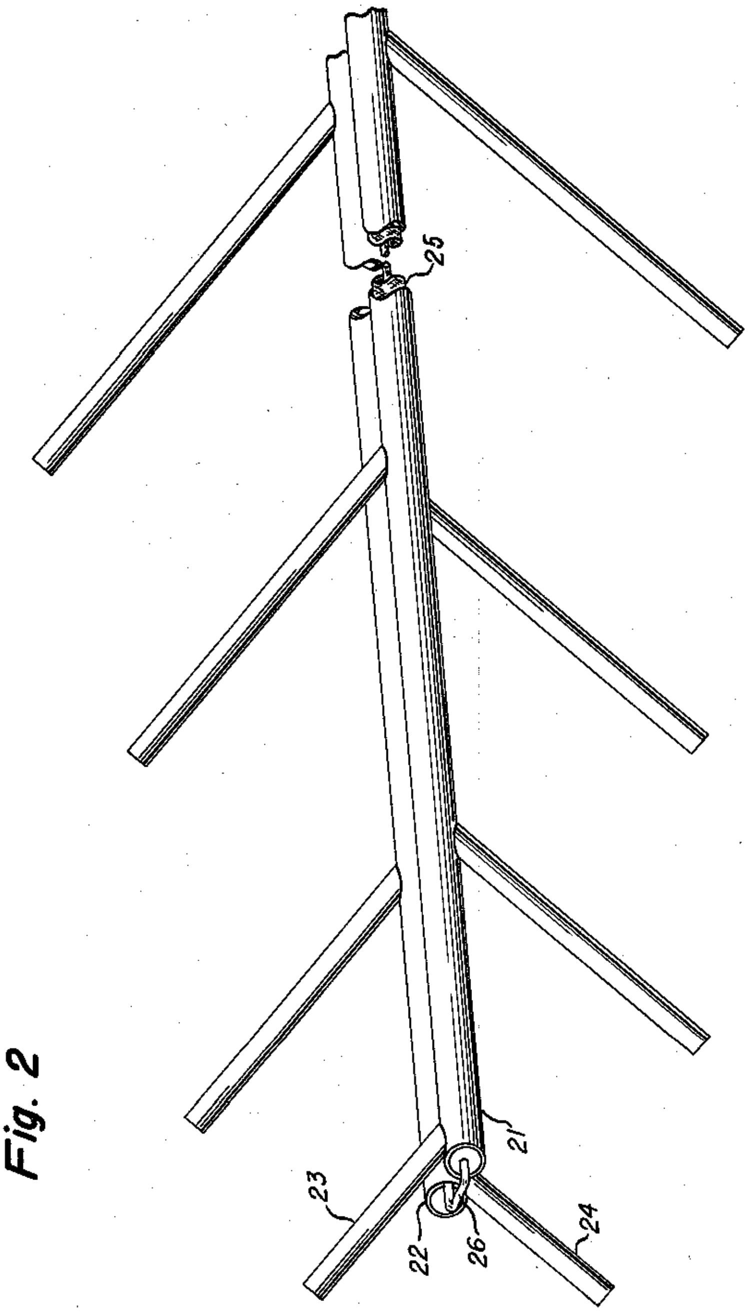


Fig. 2

INVENTORS:
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Robert L. Carrel

BY

Merriam, Smith & Marshall
ATTORNEYS

United States Patent Office

3,108,280
Patented Oct. 22, 1963

3,108,280

LOG PERIODIC BACKWARD WAVE ANTENNA ARRAY

Paul E. Mayes, Champaign, and Robert L. Carrel, Urbana, Ill., assignors to The University of Illinois Foundation, a non-profit organization of Illinois

Filed Sept. 30, 1960, Ser. No. 59,671
10 Claims. (Cl. 343—792.5)

This invention relates to antennas and more particularly it relates to antennas having unidirectional radiation patterns that are essentially independent of frequency over wide bandwidths.

In the copending application of Dwight E. Isbell, Ser. No. 26,589, filed May 3, 1960, there are described certain antennas comprising coplanar dipole arrays which have an unusually wide bandwidth over which the performance of the antennas is essentially frequency independent and the input impedance nearly constant, the antennas also having a unidirectional pattern with a directivity comparable to a Yagi array. As described in the aforementioned application, these arrays comprise a number of dipoles arranged in side-by-side relationship in a plane, the length of the dipoles and the spacing between adjacent dipoles varying according to a definite mathematical formula, with each of the dipoles being fed at its midpoint by a common feeder which introduces an added phase shift of 180° between connections to successive dipoles. The dipoles which are used to make up the array vary progressively in length, the longest dipole element being about ½ wavelength long at the low frequency limit of a given antenna's effective range and the shortest element being about ⅜ wavelength long at the upper frequency limit.

In accordance with the present invention, it has been found that the directivity of an antenna of the type described in the aforementioned application may be increased and the effective frequency range of an antenna of fixed size may be extended by inclining the dipoles of Isbell to form V-elements, each of which consists of two straight arms of equal length defining an apex which points away from the direction of radiation of the antenna which is also the direction in which the element size decreases. The modification of the straight dipoles of Isbell to V-shaped elements permits the antenna to be operated over bands of frequencies higher than those established, as described above, by the length of the shortest dipole in the antenna, with increased directivity, thus obviously increasing the effective frequency range of a given antenna.

The invention will be better understood from the following detailed description thereof taken in conjunction with the accompanying drawings, in which the same numbers are used to denote corresponding elements in the several views and in which:

FIGURE 1 is a schematic plan view of an antenna made in accordance with the principles of the invention;

FIGURE 2 is a perspective view of a practical antenna embodying the invention; and

FIGURE 3 is a fragmentary view of an improved and preferred form of an antenna similar to that shown in FIGURE 2, as seen from a point directly in front of and above the narrow end of the antenna.

Referring to FIGURE 1, it will be seen that the antennas of the invention are composed of a plurality of V-elements, e.g., **11** and **12**, each of which consists of a pair of arms, e.g., **13** and **14**, defining an apex in the middle of the V-elements, said V-elements being arranged in a herringbonelike pattern. The arms of a given V-element are equal in length and corresponding arms of the several V-elements, i.e., the arms on the same side of a line passing through the apexes of the V-elements, are substantially parallel to each other. It will be noted that the lengths of the arms of successive V-elements and the spacing between the apexes of the elements are such that the extremities of the elements fall on a pair of straight lines which intersect to form an angle α. In the preferred embodiment of the invention the antenna is symmetrical about a line passing through the apexes of the V-elements, as shown.

The antenna is fed at its narrow end from a conventional source of energy, depicted in FIGURE 1 by alternator **16**, by means of a balanced feeder line consisting of conductors **17** and **18**. It will be seen that the feeder lines **17** and **18** are alternated between connections to consecutive V-elements, thereby producing a phase reversal between such connections.

The lengths of the arms in the antenna, and the spacing between the V-elements, are related by a constant scale factor τ defined by the following equations:

$$\tau=\frac{l_{(n+1)}}{l_n}=\frac{\Delta S_{(n+1)}}{\Delta S_n}$$

where τ is a constant having a value less than 1, l_n is the length of an arm in any intermediate V-element in the array, $l_{(n+1)}$ is the length of an arm in the adjacent smaller V-element, the subscript n designating the nth arm running in an order from larger to smaller, ΔS_n is the spacing between the apex of the V-element having the arm length l_n and the apex of the adjacent larger V-element, and $\Delta S_{(n+1)}$ is the spacing between the apex of the V-element having the arm length l_n and the apex of the adjacent smaller V-element.

The arms of the individual V-elements forming the antenna array are inclined to point in the direction of decreasing V-element size so that the apex of each of the elements points in a direction away from the angle α formed by the lines passing through the extremities of the individual V-elements.

The angle formed by the arms of a V-element is designated as ψ. It will be seen that when the angle ψ is equal to 180°, the antennas of the invention are identical with those described by Isbell in the application mentioned above. In the instant invention, however, the angle ψ preferably has a value between about 50° and 150°.

It will be seen from the geometry of the invention as given above that the distances from the base line O at the vertex of the angle α to the apexes of the V-elements forming the array are defined by the equation:

$$\tau=\frac{X_{(n+1)}}{X_n}$$

where X_n is the distance from the base line O to the apex of the V-element having the arm length l_n, $X_{(n+1)}$ is the corresponding distance from the base line to the apex of the adjacent smaller V-element, the τ has the significance previously given.

The radiation pattern of the antennas of the invention having the geometrical relationship among the several parts, as defined above, is unidirectional in the negative X direction, i.e., extending to the left from the narrow end of the antenna of FIGURE 1.

The use of V-elements in the antennas of the invention, rather than dipoles, increases the directivity of the invention and also permits more effective utilization of a given antenna since the same structure can be used in several frequency modes to achieve coverage of different frequency bands. In the special case of an antenna having straight dipoles rather than V-elements (i.e., when $\psi=180°$), the effective frequency range is that in which the low limit corresponds to that frequency in which the largest dipole in the antenna is about ½ wavelength long and the upper frequency limit to that frequency in which the smallest dipole in the antenna is about ⅜ wavelength tially coplanar V-elements, each V-element comprising a pair of arms of equal length defining an apex, one of said arms of each V-element being connected at the apex of said V-element to one of said conductors, the other of said arms being connected directly opposite the first to the other of said conductors, the arms of any V-element extending in opposite directions at an acute angle to the plane determined by said conductors, consecutive arms on each of said conductors extending on opposite sides of said plane, the ratio of the lengths of the arms in adjacent V-elements being given by the formula

$$\frac{l_{(n+1)}}{l_n}=\tau$$

where l_n is the length of an arm of a V-element, $l_{(n+1)}$ is the length of an arm in the adjacent smaller V-element, the subscript n designating the nth arm running in an order from larger to smaller, and τ is a constant having a value less than 1, the spacing of the apexes of the V-elements along said feeder line being given by the formula

$$\frac{\Delta S_{(n+1)}}{\Delta S_n}=\tau$$

where ΔS_n is the spacing between the V-element having the arm length l_n and the adjacent larger V-element, $\Delta S_{(n+1)}$ is the spacing between the V-element having the arm length l_n and the adjacent smaller V-element, and τ has the significance previously assigned.

6. The antenna of claim 5 in which the angle formed by said arms with the plane determined by said feeder line, measured in a plane perpendicular to said plane, has a value between about 25° and about 75°.

7. The antenna of claim 5 in which τ has a value of about 0.8 to 0.95.

8. An aerial system for wide-band use comprising a plurality of herringbone-like conducting V-elements planarly arranged, a two-conductor balanced feeder connected to each of said elements at substantially the inner end thereof, each two opposite V-elements forming a pair constituting dipole halves, the connection from each adjacent dipole section being to a different feeder, said V-elements being selectively spaced from each other, each V-element of each pair having arms of substantially equal length substantially defining an apex with the apexes of the plurality of V-elements all lying in substantially a straight line and terminating at the feeder, the said dipoles of each pair being of different electrical lengths with successive dipoles differing in electrical length with respect to each other by substantially the same scale factor, each dipole and the feeder between successive dipoles constituting a cell, and the selective spacings between adjacent dipoles decreasing from one end to the other with the greater spacing being between the longest dipoles and being such that the combination of dipole lengths and spacings provides a substantially uniform wide-band response over a plurality of frequency bands bearing substantially harmonic frequency relationships to each other, the connection between the dipoles and the feeder being made in such a manner that the directive gain of the antenna increases as operation shifts from one band to an adjacent band of higher frequencies, and means to connect the feeder to an external circuit at a location substantially removed from the longest of the V-elements and in the direction of the smallest of the V-elements.

9. An aerial system for wide-band use including a two-conductor balanced feeder extending in a selected plane, a plurality of herringbone-like conducting V-elements planarly arranged and spaced along the feeder, each of the elements having a pair of arms of substantially equal length defining substantially an apex with the apexes of the plurality of V-elements all lying in substantially a straight line and all terminating at the feeder, a connection between each of the V-elements and one of the feeders at the inner end of the elements, the two V-elements forming each pair constituting dipole halves, adjacent dipole sections being connected to different feeders, each of the pairs of dipoles being of different electrical lengths with successive dipoles differing in electrical length with respect to each other by substantially a common scale factor, each dipole and the feeder connected thereto in the region between one dipole pair and the next adjacent dipole pair constituting a cell, the spacings between the dipoles as connected to the feeders differing from each other also by substantially the same common scale factor, the scale factor being so chosen that the combination of dipole lengths and spacings providing the several cells have a substantially uniform wide-band response over several frequency bands bearing substantially harmonic frequency relationships to each other, the connection between the feeder and the dipoles being made in such a manner that the directive gain of the antenna increases with operational shift from one band to another band of higher frequency, and means to connect the feeder to an external circuit at a location substantially removed from the longest of the V-elements in the direction of the smallest of the V-elements.

10. An aerial system for wide-band use including an elongated two-conductor balanced feeder, a plurality of herringbone-like conducting V-elements planarly arranged and spaced along said feeder, each of the elements having a pair of arms of equal length defining substantially an apex with the apexes of the plurality of V-elements all lying in a substantially straight line, a connection between each of the V-elements and the feeder to terminate the elements substantially at the feeder, the two V-elements forming each pair constituting dipole halves, adjacent dipole sections of the plurality being connected to different feeders and the dipoles being relatively spaced so that the spacings between successive dipoles differ from each other by substantially a common scale factor, adjacent dipole sections having different electrical lengths, each dipole and the feeder connected between it and the adjacent dipole constituting a cell, the lengths of the dipoles increasing from end of array where spacings between adjacent dipoles is less to end of the array where adjacent dipoles are spaced the greatest distance, the spacings by the scale factor variation between adjacent dipoles being such that a combination of the various dipole lengths and spacings provides a substantially uniform wide-band response over several frequency bands bearing substantially harmonic frequency relationships to each other, the connection being made in such a manner that the directive gain of the antenna increases as the operation shifts from one band to another band of higher frequency, and means to connect the feeder to an external circuit at a location substantially removed from the longest of the V-elements in the direction of the smallest of the V-elements.

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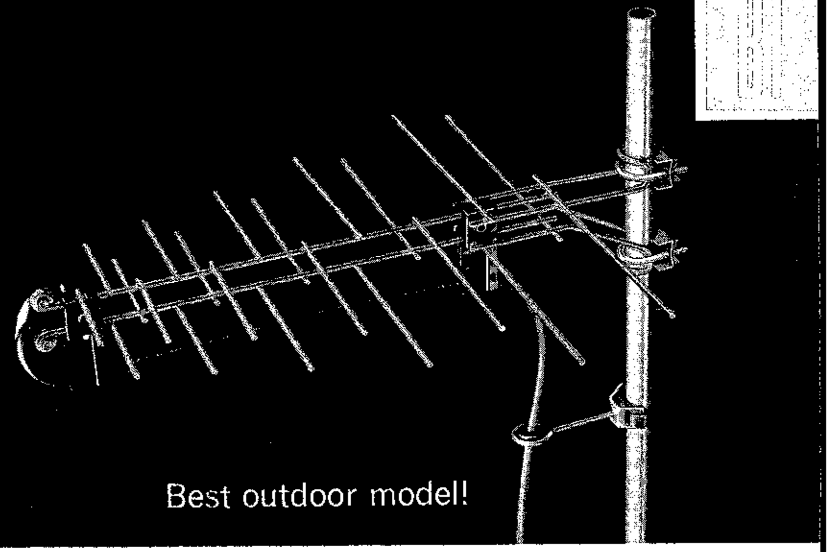
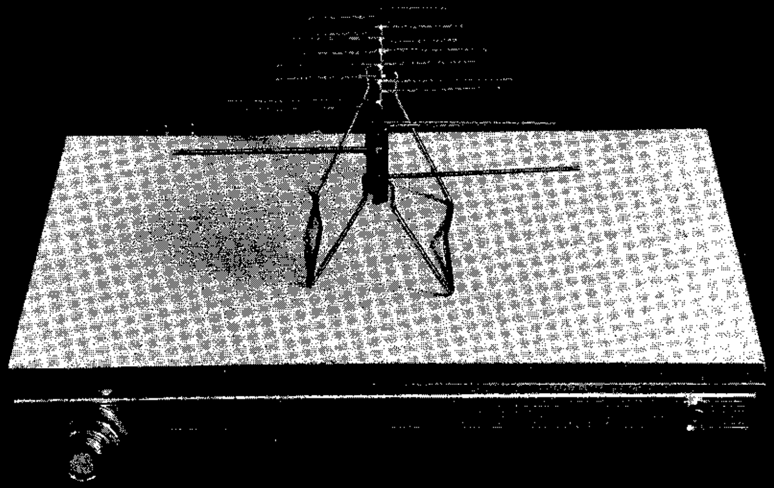
First antennas to deliver uniform, peak performance on all UHF channels



Best outdoor model!

Top indoor model!



BLONDER-TONGUE UHF ANTENNAS
GOLDEN DART outdoors, GOLDEN ARROW indoors

These Blonder-Tongue antennas take advantage of today's most modern approach to TV antenna design—the periodic principle. Result: they provide constant high gain with matched impedance on all channels from 14 to 83.

ALL-CHANNEL REALLY MEANS ALL-CHANNEL

No matter what UHF channel serves your area from 14 to 83, the Golden Dart and the Golden Arrow deliver sharp, clear pictures on every one. The reasons: an excellent front-to-back ratio; sharp directivity to minimize ghosts and other interference; and a low VSWR.

EXCELLENT FOR COLOR OR BLACK AND WHITE TV

Full bandwidth, flat response for sharp black & white and brilliant, true fidelity color pictures.

ENGINEERED BY THE COMPANY WITH THE MOST UHF EXPERIENCE

The same know-how employed in producing 3 million UHF converters has gone into making the finest UHF antennas in the field. By providing peak performance across the full UHF spectrum, they match the high performance standards of Blonder-Tongue UHF converters.

BLONDER-TONGUE UHF ANTENNAS
GOLDEN ARROW INDOOR/GOLDEN DART OUTDOOR

FEATURES:
GOLDEN DART AND GOLDEN ARROW

PEAK PERFORMANCE ON ALL UHF CHANNELS — delivers sharp, clear pictures on every channel 14 to 83.

PERIODIC DESIGN—Dart uses 11 working elements (the Arrow 10 working elements) to provide constant high gain and matched impedance.

EXCELLENT FOR COLOR AND BLACK & WHITE TV — Full bandwidth, flat response from channel 14 to 83.

MINIMIZES GHOSTS AND OTHER INTERFERENCE — Excellent front-to-back ratio, sharp directivity.

GOLDEN DART

COMPLETELY PRE-ASSEMBLED — Nothing to snap out — no screws to tighten — just take it from the box and it's ready to use. Patented stainless steel stripless screw terminals make connection of twin-lead a snap.

MOST COMPACT OF ALL UHF ANTENNAS — Only 17 inches long. Low vertical height displacement makes it easy to piggy-back with any VHF antenna. (Complete with two U-bolts for secure mast-mounting.)

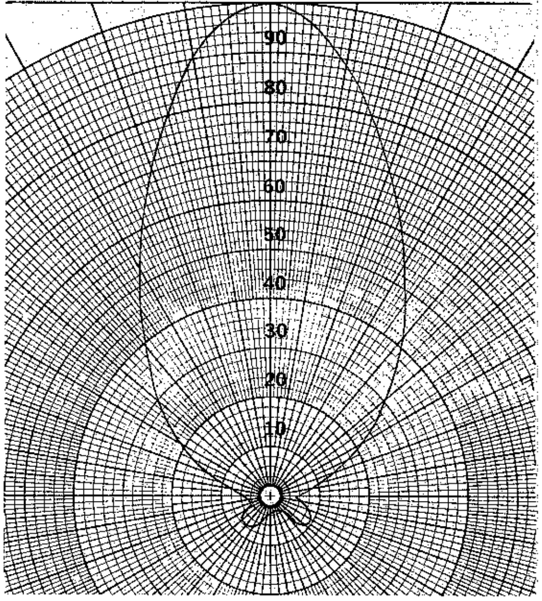
RUGGED, UNITIZED WELDED CONSTRUCTION—No rivets, no soldering—mean no moveable joints that can corrode and impair performance.

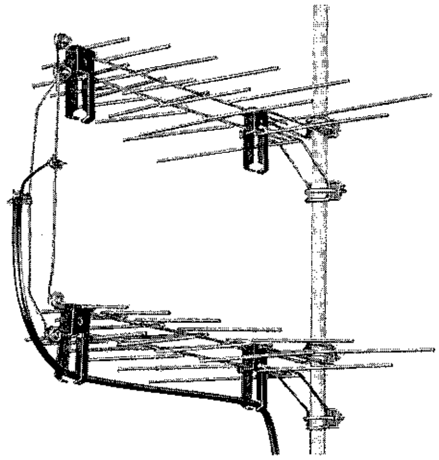
GOLDEN ARROW

RUGGED CONSTRUCTION — Welded construction means durability. Complete with 300-ohm twin-lead with spade lugs for 30-second installation. Connection is far more secure than any other antenna. Won't pull apart. Skid-proof rubber legs.

SPECIFICATIONS
GOLDEN DART AND GOLDEN ARROW

FREQUENCY COVERAGE:	465 mc-890 mc
VSWR:	3 or better over entire UHF band
FRONT-TO-BACK RATIO:	(Arrow) 20 db min. (Dart) 20 db min. (typical 30.0 db)
HALF POWER BEAM WIDTH (horizontal):	Approx. 50°
POLARIZATION:	Horizontal
NUMBER OF ELEMENTS:	(Arrow) 10 (Dart) 11
MOUNTING:	(Arrow) Mounts on stand supplied (Dart) Mast mounting (1-2½" mast); two clamps (supplied)
TRANSMISSION LINE:	(Arrow) 300-ohm balanced. (4' twinlead supplied) (Dart) 300-ohm balanced twinlead
CONSTRUCTION:	(Arrow) steel wire with brass, plate lacquer dip (Dart) steel with mil spec zinc plate iridite finish (gold color)
SHIPPING WEIGHT:	(Arrow) 1½ lbs. (Dart) 2 lbs.
SIZE (HWL):	(Arrow) 12"x6"x8½" (Dart) 17" x 14" x 3¾"





STACKED GOLDEN DARTS FOR EXTRA GAIN

Two Golden Darts may be stacked easily for extra gain (3 db) and better impedance match (VSWR 2.0). Order model 3519 stacking bars.

RELATED EQUIPMENT

Blonder-Tongue manufactures the world's most complete line of UHF products including a variety of UHF converters for all reception areas. To improve snowy pictures in difficult reception areas, use the mast-mounted Able-U2 UHF amplifier. To combine or split antennas or transmission lines, use the UHF-2 coupler.

The A-107 coupler can be used to combine or split UHF & VHF signals. The new UV-2 is the world's first channel 2 to 83 two-set coupler.

BLONDER-TONGUE
9 Alling Street, Newark 2, New Jersey
home TV accessories • closed circuit TV
• community TV • UHF converters • master TV

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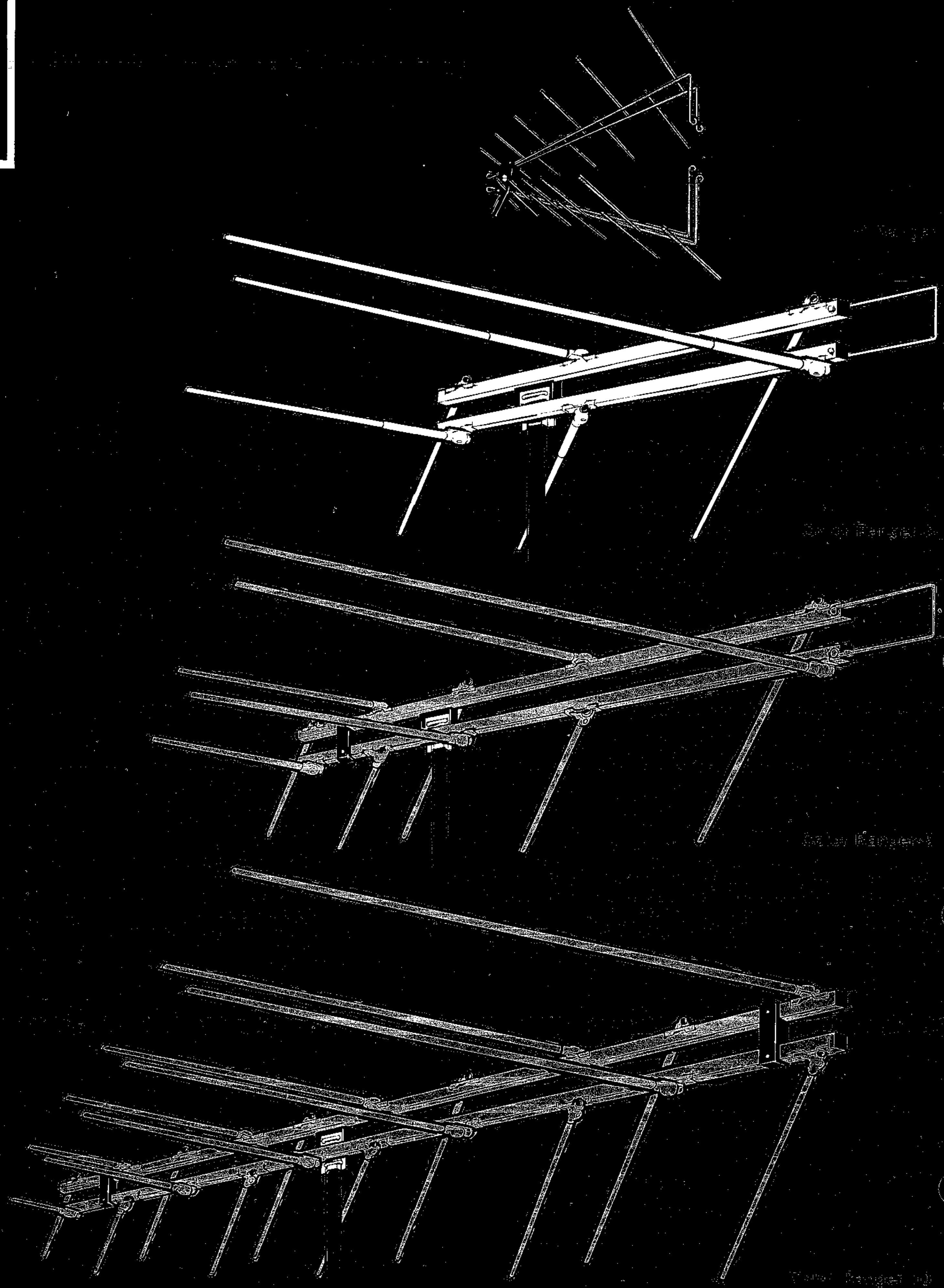
Printed in U.S.A.



The new Blonder-Tongue color ranger antenna line

U-Ranger

Eleven-Element
True Log-Periodic UHF
Add-On Antenna

Superb reception of black-and-white and color TV. Improves VHF reception of Color Ranger antennas for any signal area. Attaches in seconds to all Blonder-Tongue Color Ranger antennas. No couplers and only one downlead needed for VHF/FM and UHF.

Color Ranger-3

Three-Element
True Log-Periodic Antenna

For metropolitan and suburban use. Outperforms dipoles, flying V's, and conicals. Excellent for color TV and FM stereo. Recommended for strong signal areas where ghosts are not a major problem. Add UHF with the U-Ranger.

Color Ranger-5

Five-Element
True Log-Periodic Antenna

Outstanding metropolitan and suburban antenna. Superb reception of color TV and FM stereo. Performs better than stacked flying V's and conicals. Superior to most small yagis. Recommended for strong-to-medium signal areas and *for all but the most severe cases of ghosting.* Add sparkling UHF with the U-Ranger.

Color Ranger-10

Ten-Element
True Log-Periodic Antenna

Superior metropolitan, suburban *and* fringe-area reception. Outperforms yagis and even many large antenna arrays. Brilliant reception of color TV and FM stereo. Recommended for all signal areas, especially those with weak signals, or where ghosts are a severe problem. Add crystal-clear UHF with the U-Ranger.

NOW . . . the first TRUE log-periodic antenna . . . the new Color Ranger . . . outperforms other antennas in any reception area. It is particularly effective for color or where ghosting is a problem because it has:

1. Uniform gain across entire band for brilliant color reception.
2. Best front to back ratio in the industry for outstanding reception in weak signal areas and positive ghost-killing power.
3. Uniform impedance across entire band.

IT'S CONVERTIBLE, TOO! The Color Ranger VHF antenna converts to UHF/VHF instantly and at any time, now or as needed for new UHF stations coming on the air, with the U-Ranger add-on. No couplers, no extra downlead required! One lead carries VHF/FM and UHF signals.

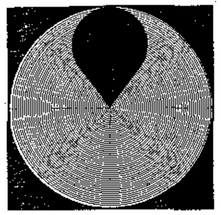
And only the Blonder-Tongue Color Ranger offers all these outstanding features:

Electrical Features:

1. The only convertible line . . . install VHF now . . . add UHF later.
2. No couplers needed to add UHF, now or later. Just connect VHF downlead to UHF add-on's terminals.
3. UHF add-on improves VHF reception.
4. Built-in stand-offs keep twinlead in correction position (not required on Ranger-3).
5. Boom is transmission line . . . no wires to corrode or break.
6. All elements are plated (not anodized), making all surfaces conductive (elements on Ranger-3 are pure aluminum).
7. No crimped connections—longer life.
8. Spring-tension, knife-edge contact points mean permanent electrical contact of all elements.

Mechanical Features:

1. Dual boom for double strength.
2. No braces or supports required.
3. Snap-out elements, for fastest assembly.
4. U-bolt mounting, for easy assembly and extra ruggedness.
5. Heavy duty 7/16" (not 3/8") elements.
6. Elements reinforced near joints with 6" double tubing.
7. Fewer joints for greater strength.
8. Weatherproof, stripless screw connections.
9. Extra-strong polypropylene insulators.
10. Riveted polypropylene end caps on boom maintain shape under all conditions.
11. U-Ranger has double spot-welded elements for added strength.



A "Snap" to assemble

There isn't much to say about assembling a Ranger antenna. There just isn't that much to it! Simply:

- Carry it up (one handed) to the mast.
- Snap out the elements.
- Fasten the antenna to the mast with a single U-bolt (two for the ten-element).
- Screw in a stand-off.
- Fasten the downlead to the stripless screws (no cable stripping is required—no extra bracing).
- Now connect the downlead to the set and watch the sharp, crystal-clear pictures on all channels.

To add UHF at any time, fasten the UHF add-on to VHF antenna. Connect the downlead to the UHF antenna instead of the VHF antenna. That's all there is to it!

What is true log periodic?
What it is
What it does

The true log periodic antenna is an outstanding advance over previous antenna designs. It affords reception previously possible only with large commercial antenna installations. The three essential qualities of a good antenna are:

1. Broad, flat bandpass
2. Good match, and
3. High directionality

By comparing these three characteristics, it is easy to understand how this log periodic design outperforms conventional antennas.

1. Broad, Flat Bandpass

The bandwidth of a TV channel is approximately 6 megacycles. For optimum reception, an antenna must receive and pass the entire 6-megacyle bandwidth. Loss of bandwidth will result in poor contrast, color smear or even loss of color.

A CONVENTIONAL ANTENNA receives the complete bandwidth of one or two channels, while reception drops off severely on other channels. This causes variations of picture and color quality between stations. (*This is why there are lowband antennas, highband antennas, and single-channel yagis.*)

BLONDER-TONGUE COLOR RANGER true log periodic antennas receive the complete bandwidth of *all* channels. This is because its unique design adds the output of all its elements to produce a constant output at all channels.

2. Good Match

Ideally an antenna should match the 300-ohm impedance of the TV set at every channel. *Practically, this is impossible. However, for best* results an antenna should maintain constant impedance over all channels, because changes in impedance cause changes in picture quality.

Since CONVENTIONAL ANTENNAS have better match at certain channels than at others, they automatically produce variations in picture quality between stations.

The BLONDER-TONGUE COLOR RANGER *antennas maintain uniform match on all channels* and at a value closely approaching the ideal.

3. High Directionality

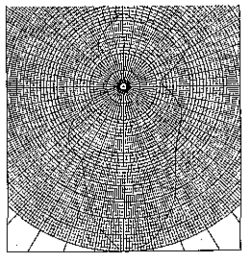
Antennas can cause ghosts. These occur when a signal is received from more than one direction (e.g. reflected from buildings or hills). While even limited ghosting is annoying on black-and white broadcasts, on color broadcasts ghosts cause smear, loss of color intensity and even *complete loss of color.*

The two directional patterns below reveal the Color Ranger's superior performance.

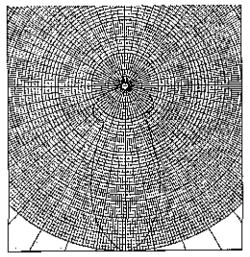
The extra lobes of the CONVENTIONAL ANTENNA'S directional pattern (A) show it will receive considerable signal from several directions. This permits both direct and reflected signals to enter the set, causing ghosts.

The absence of lobes on the BLONDER-TONGUE COLOR RANGER (B) proves its almost complete freedom from ghost pick-up.

A



B

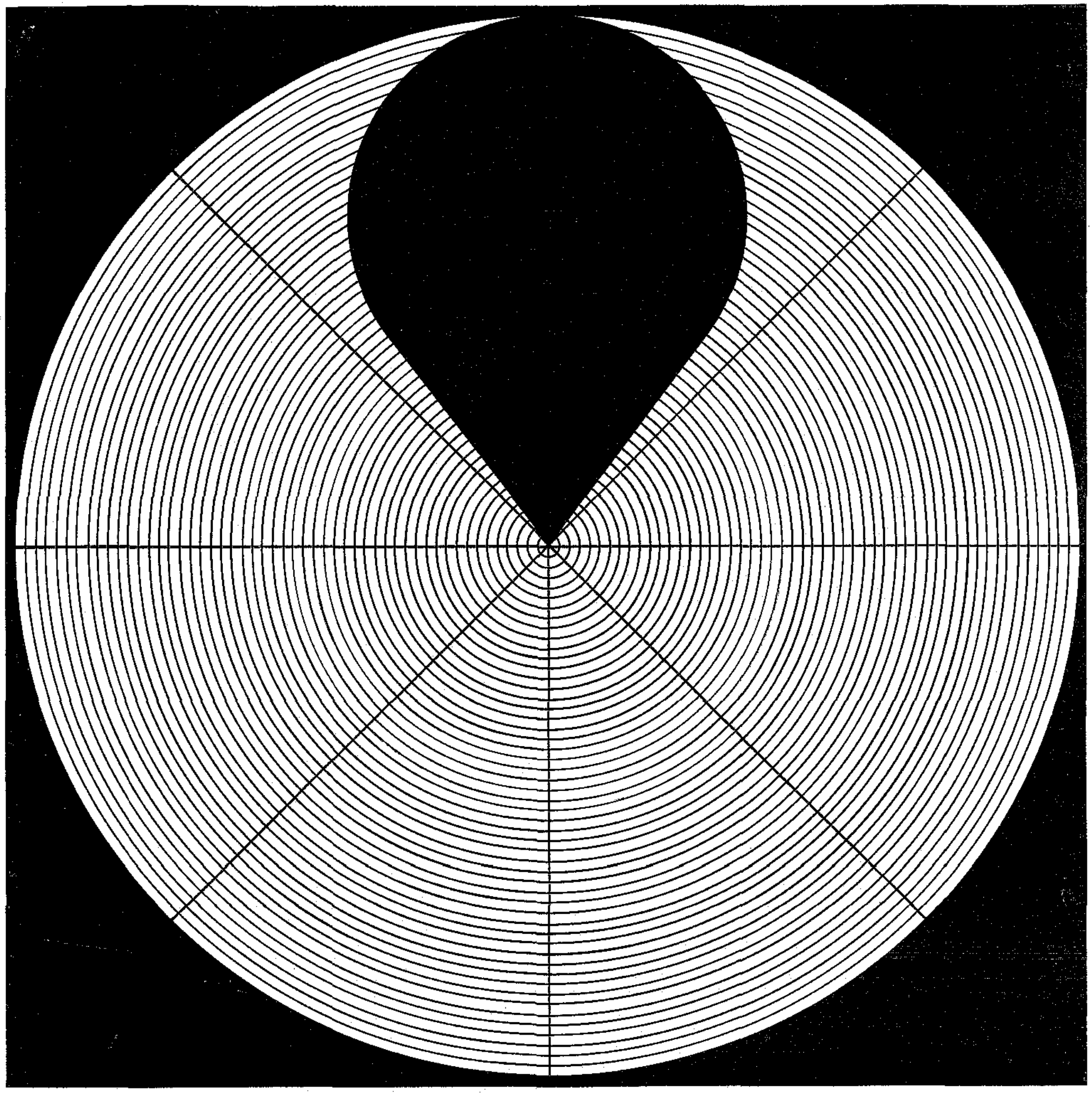


DON'T FORGET . . . a TV distribution system is only as good as its components. Blonder-Tongue makes a complete line of "top-rated" amplifiers, converters, couplers, and splitters to meet every need.

BLONDER-TONGUE
9 Alling Street, Newark, New Jersey 07102
home TV accessories • closed circuit TV •
community TV • UHF converters • master TV

Distributed by:

To re-order, refer to No. 52



New look in true log periodic design

The new Blonder-Tongue color ranger antenna line

NEW. . . Install VHF now . . . Add UHF later. . . No couplers required. . .
It's convertible!

NEW. . . UHF add-on acts as a VHF signal director (improves VHF signal reception)!

NEW. . . True log periodic design for constant gain across the entire bandwidth (no station dropouts).

NEW. . . Built-in support for download protection.

NEW. . . Light weight. . . Can be installed by one man.

APPROVED FOR COLOR

Category 8 -

	64-65	65-66
	$	$
Admiral Sales	295	376
Allied Radio	8647	3242
Ancha Electronics	—	17
Audio Tel	18	—
B + W Inc	398	369
B + P Elec	—	2
Beatty Elec	—	55
Cremer Eng'g	21	17
Electro Parts Co	-	7
Gills Custom Sound	28	—
Howard Elec Sales	394	—
Illinois Elec	88	—
Interstate Elec	5	—
J M Radio TV Sup	76	30
J Kayle	534	495
Kelsen Elec Sup	28	—
Kraus Elec	84	—
Sundry Accounts	1224	—
Marsh Rad Sup	32	109
Melvin Elec Inc	1171	309
Midstate Dist.	255	123
Modern Communic.	—	94

	#	$
Mueller Elec.	—	17
Newark Elec.	1393	345✓
Northern Commun	28	—
Geo Pettitt	4	32✓
Pilgrim Dist.	316	
Rich Eng'g	31	—
Wheeling Rd Sal	57	62✓
Stolz Wicks	213	342✓
Superior Radio Pts	30	—
Tri Rental TV	5	—
United Rad Service	99	128
Viking Sales Corp	497	60

172

175

UHF GOLDEN DART
Outdoor Periodic Antenna

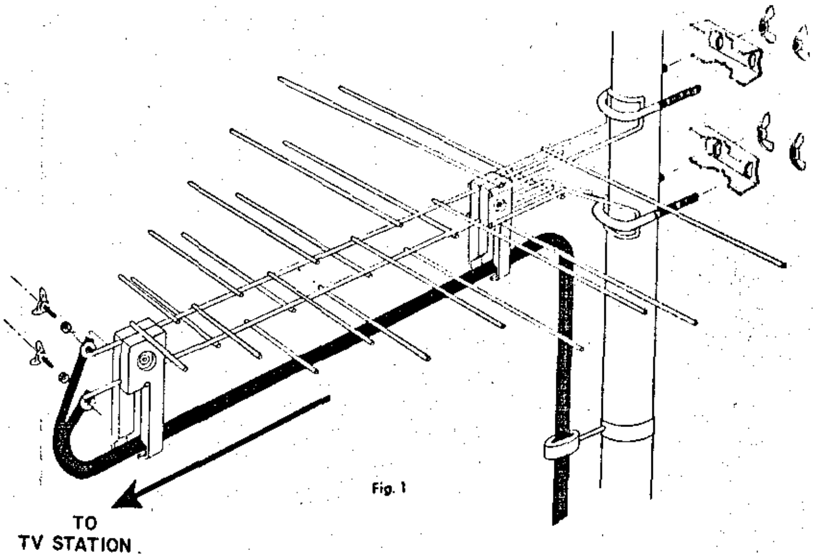


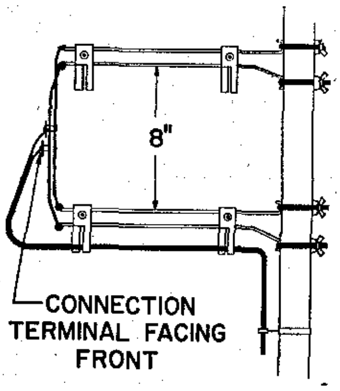
Fig. 1

U. S. Patent 3,016,510 and
Foreign Patents,
Patent Pending.

INSTALLATION INSTRUCTIONS

1. Mount antenna as shown in Fig. 1.
2. Assemble thumb screw and stripless washer on the flat side of the threaded stud.
3. Slit twin lead and flatten or trim end to fit under stripless washer. Note: Low loss foam filled UHF lead is recommended.
4. Tighten thumb screw and check to see that stripless washer pierces insulation and makes contact with wire.
5. Snap twinlead into insulating fingers and use a standoff close to the antenna as shown.

Fig. 2



For Weak Signal Areas Stack Two Darts With Kit 3519

1. Attach stacking bars as shown in Fig. 2.
   Note: bars are attached by slipping over hollow threaded studs on antenna. See Fig. 3.
2. Attach downlead to center of stacking bars and dress thru insulators on bottom Dart, as shown in Fig. 2.

Fig. 3

ASSOCIATED EQUIPMENT

1. ABLE U-2 — High gain all channel transistorized 300 ohm mast mounted UHF amplifier.
2. UHF-2 — UHF Line splitter to feed two TV sets from one antenna or to connect two Darts facing different directions into one down lead.
3. A-107 — Use to combine signals from UHF and VHF antenna as well as splitting UHF-VHF signals from one down lead.
4. CMB-92U — Use to run 75 ohm shielded cable in high interference areas.
5. Complete line of UHF converters for the home and for Master Antenna Systems.

LOOK TO B-T AS THE LEADER IN UHF RECEPTION AIDS

BLONDER TONGUE
9 Alling St., Newark, N. J.
Canadian Div.: Benco Television Assoc., Ltd., Toronto, Ont.

home TV accessories • UHF converters • master TV systems
industrial TV systems • closed circuit TV systems

Oct 65

☆6510390

BLONDER-TONGUE

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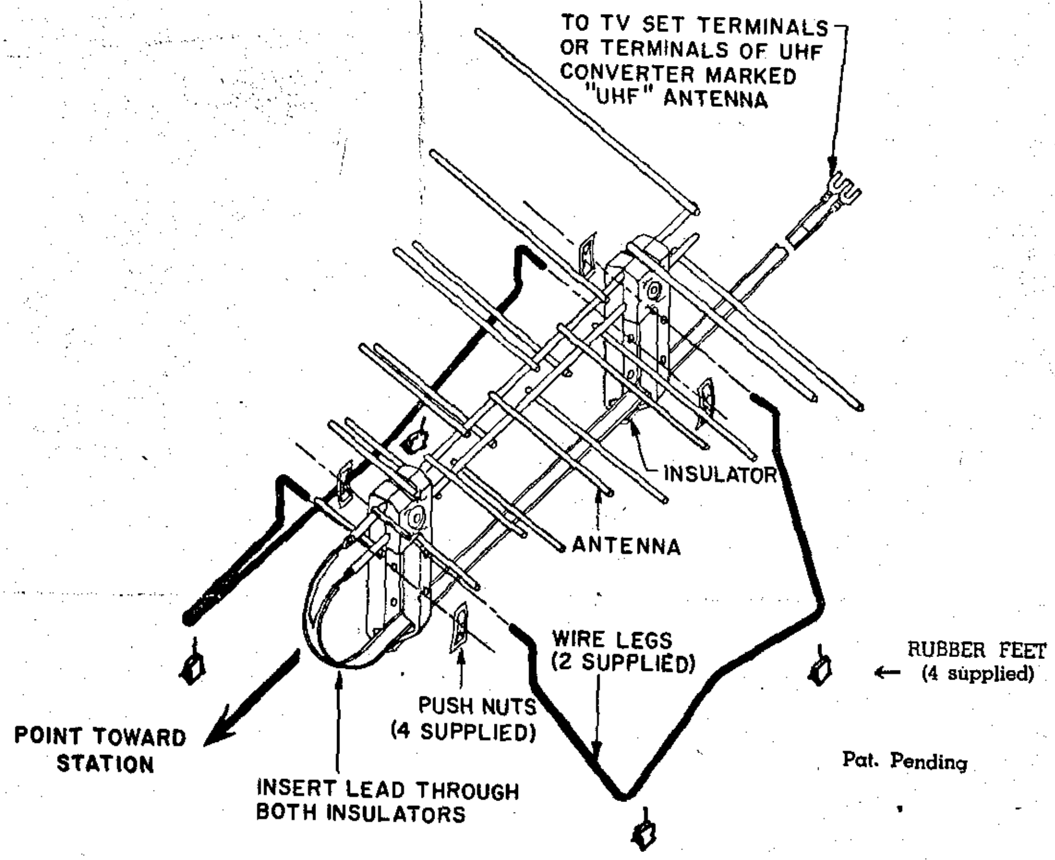
GOLDEN ARROW

INDOOR UHF ANTENNA



ASSEMBLY INSTRUCTIONS

Check contents for the following:

A. (1) antenna assembly (with attached twinlead)
   (2) wire legs
   (4) push-nuts and (4) rubber feet (enclosed in plastic bag)

B. Insert lead through both insulators, as shown.

C. Install wire legs, as shown. (Be sure to use top holes of insulator).

D. Attach rubber feet as shown.

E. If T.V. set has built in UHF tuner, attach lugs of antenna lead directly to terminals on set marked "UHF" antenna. If a UHF converter is employed, install converter following the manufacturers instructions. Attach lugs of antenna to terminals of converter marked "UHF Ant".

POSITIONING THE ANTENNA

Best results are obtained by the **careful** tuning of UHF T. V. set or T. V. set/converter in combination with the correct positioning of the antenna toward the T. V. station. Face short-element side of antenna toward T. V. station. Follow manufacturers instructions for tuning UHF T. V. set or T. V. set/converter. **Slowly** rotate antenna for best picture and sound. Quality of reception may possibly be improved by a slight re-tuning of the T. V. set fine tuning control.

LOOK TO B-T AS THE LEADER IN UHF RECEPTION AIDS

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9 Alling St., Newark, 2 N. J.

home TV accessories • UHF converters • master TV systems
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6650138

PURCHASE-REQUISITION

☐ ALLING ST.
☐ McCARTER HWY.
☐ 2-10 LIBERTY ST.

A
B
C
D
F

DATE [illegible]

AMOUNT	F. O. B.	SHIP VIA	SHIP TO	PRICE	P/O
	DESCRIPTION				
1	[illegible]			[illegible]	
	PRINT OR TYPE				

ACC'T CHG'D. [illegible]32 DEP'T [illegible] USE [illegible]

INITIATED BY: [illegible] AUTHORIZED BY: [illegible]

MEMO COPY

Nº 33313

COMPETITOR PRODUCT ANALYSIS

(12)

PRODUCT: JFD - LPV-TV-16
DATE PERFORMED: 23 SEPT. '66

TESTS ON PATTERNS AND GAIN PERFORMANCE WERE MADE. FOR GAIN RESULTS SEE "ANTENNA RANGE MEASUREMENTS" BOOK #1

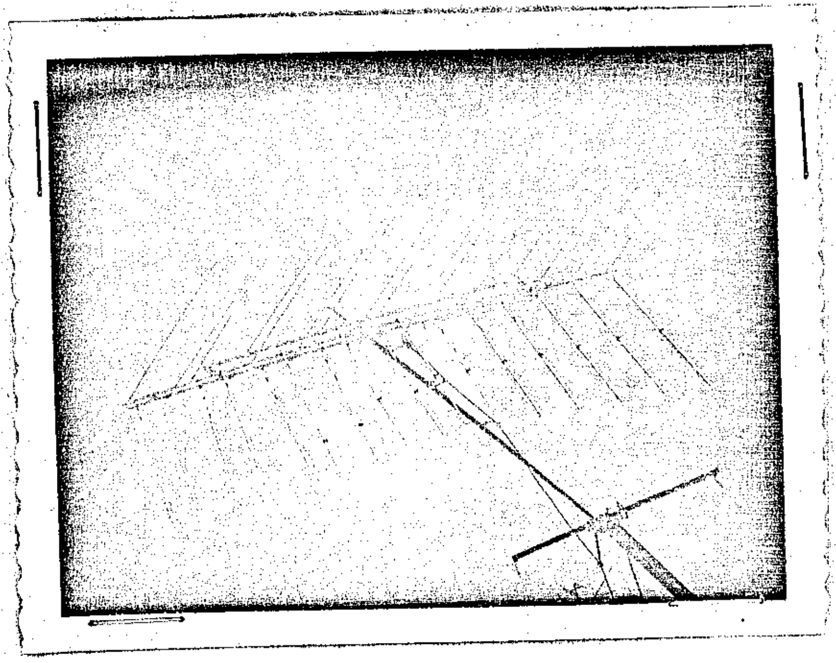
CONSTRUCTION: DUAL BOOM

" GOLD ALODIZING

11 ACTIVE ELEMENTS

5 PARASITIC

- NOTE: 11 ELEMENTS ARE CAPACITIVE LOADED (6 ACTIVE & 5 PARASITIC)



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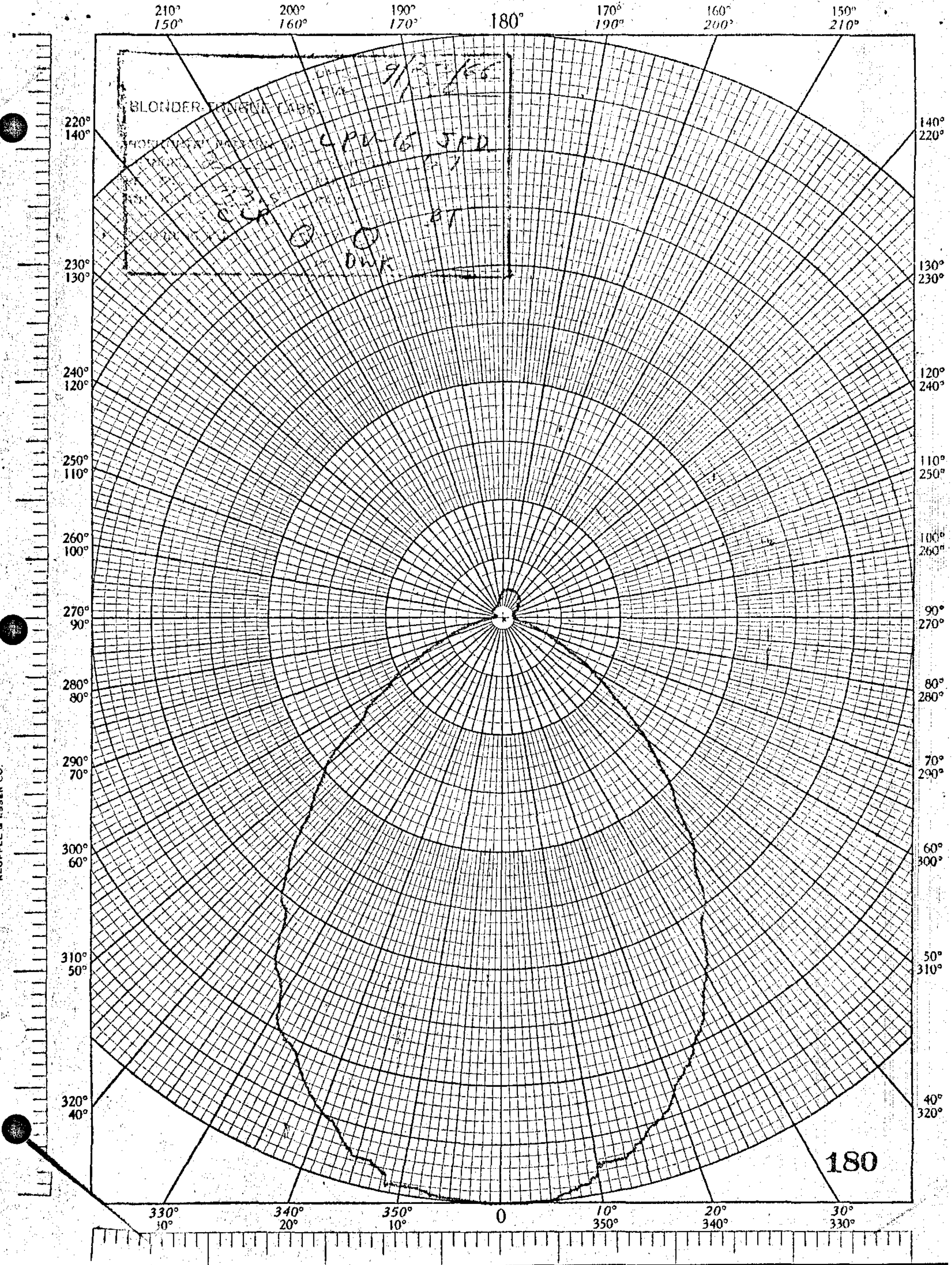
BLONDER-TONGUE LABS
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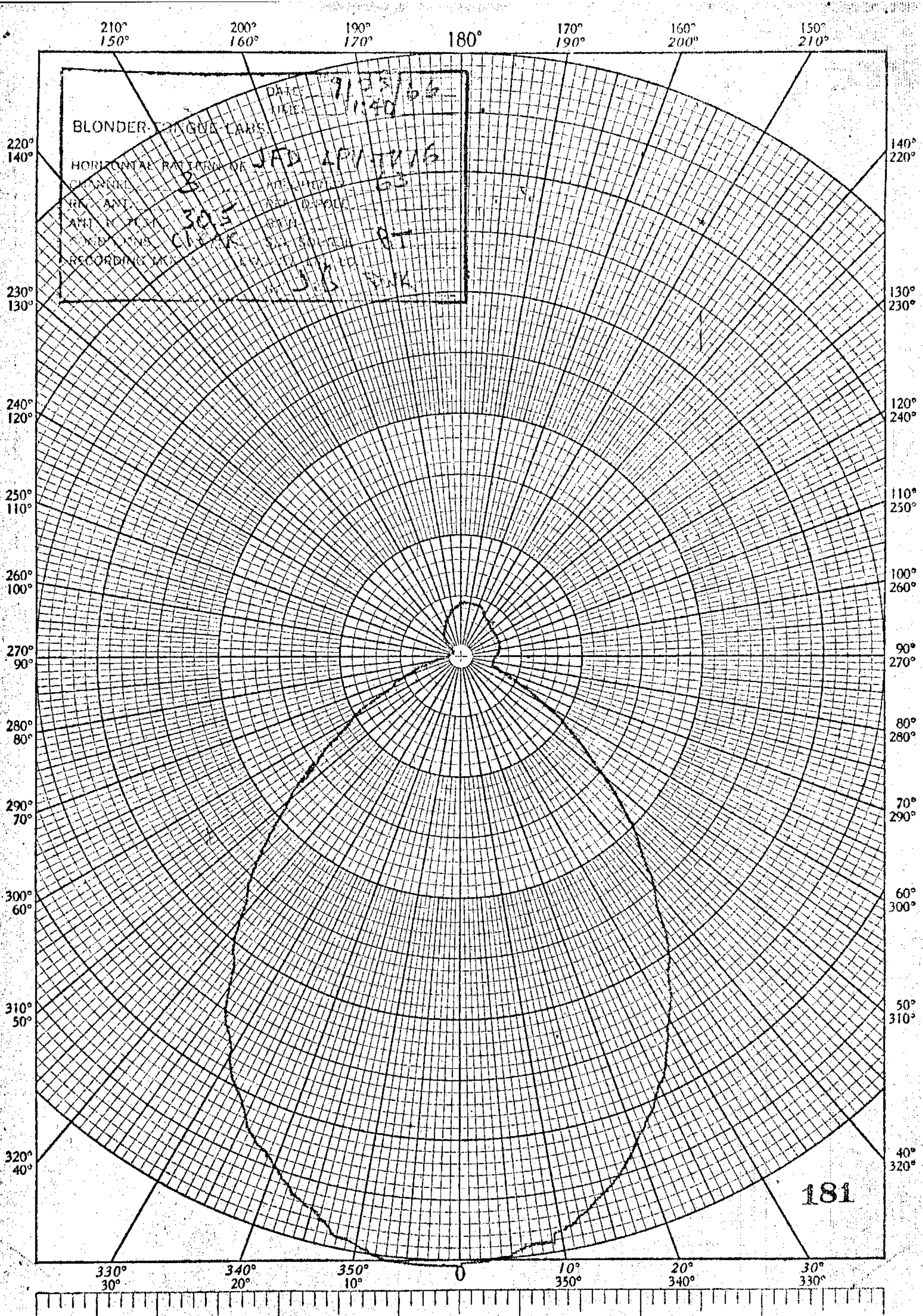
MADE IN U.S.A.
KEUFFEL & ESSER CO.



BLONDER-TONGUE LABS.

DATE 7/13/64

TIME 1140

HORIZONTAL PATTERN OF JFD LPV-TV16

CHANNEL 3

ANT. HGT. 65

REF. ANT. 305

REF. DIPOLE

ANT. H. POL.

GAIN 8.1

CONDITIONS CLEAR

SIG. SOURCE

RECORDING MO...

JB NNK

POLAR CO-ORDINATE 46 4413 KEUFFEL & ESSER CO. MADE IN U.S.A.

BLONDER-TONGUE LABS

DATE: 9/25/64

TIME:

HORIZONTAL PATTERN OF: JFD LPV-TV14

CHANNEL: 4

FREQUENCY:

REF. ANT.:

REF. FIELD:

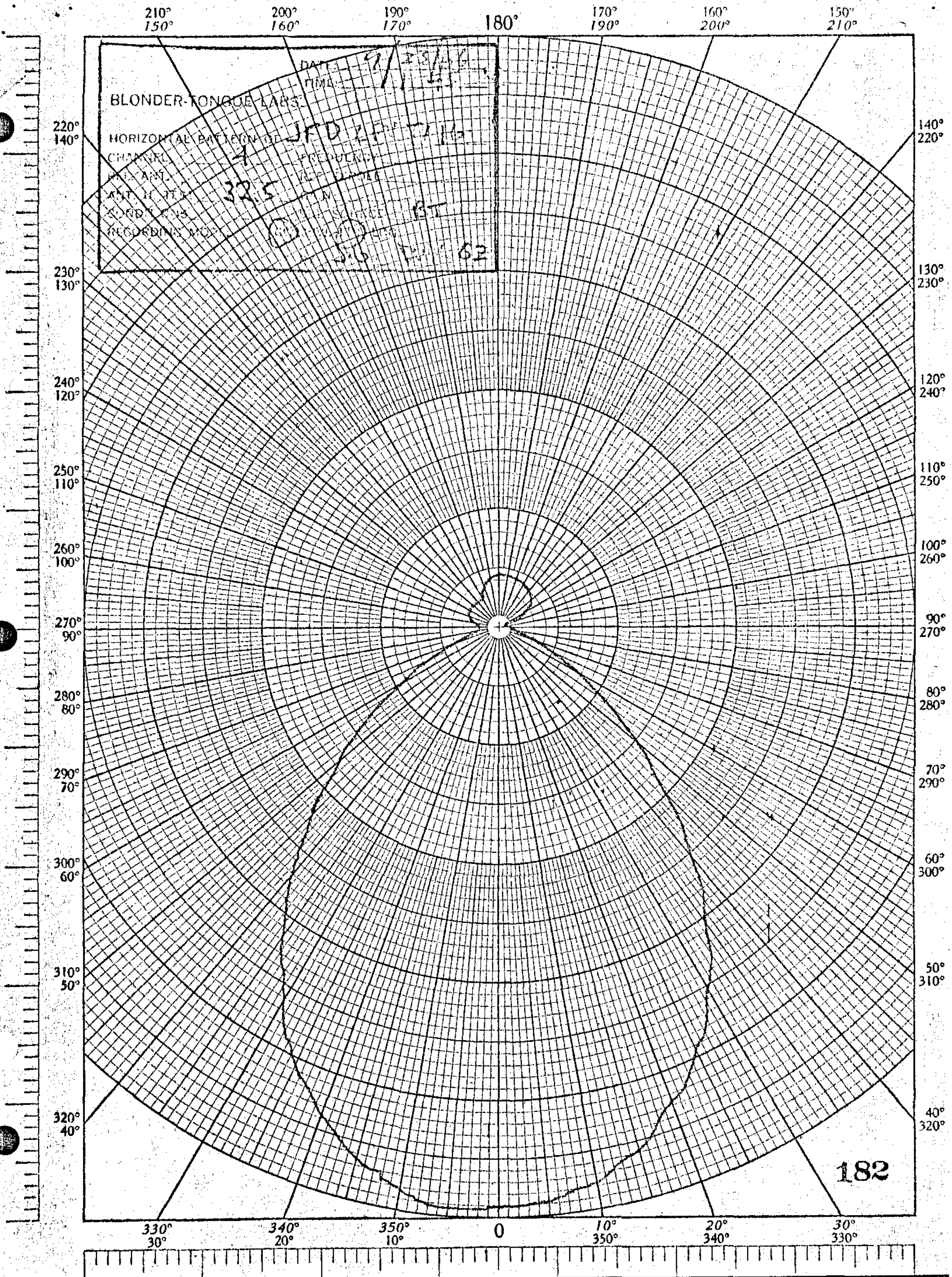
ANT. HEIGHTS: 32.5

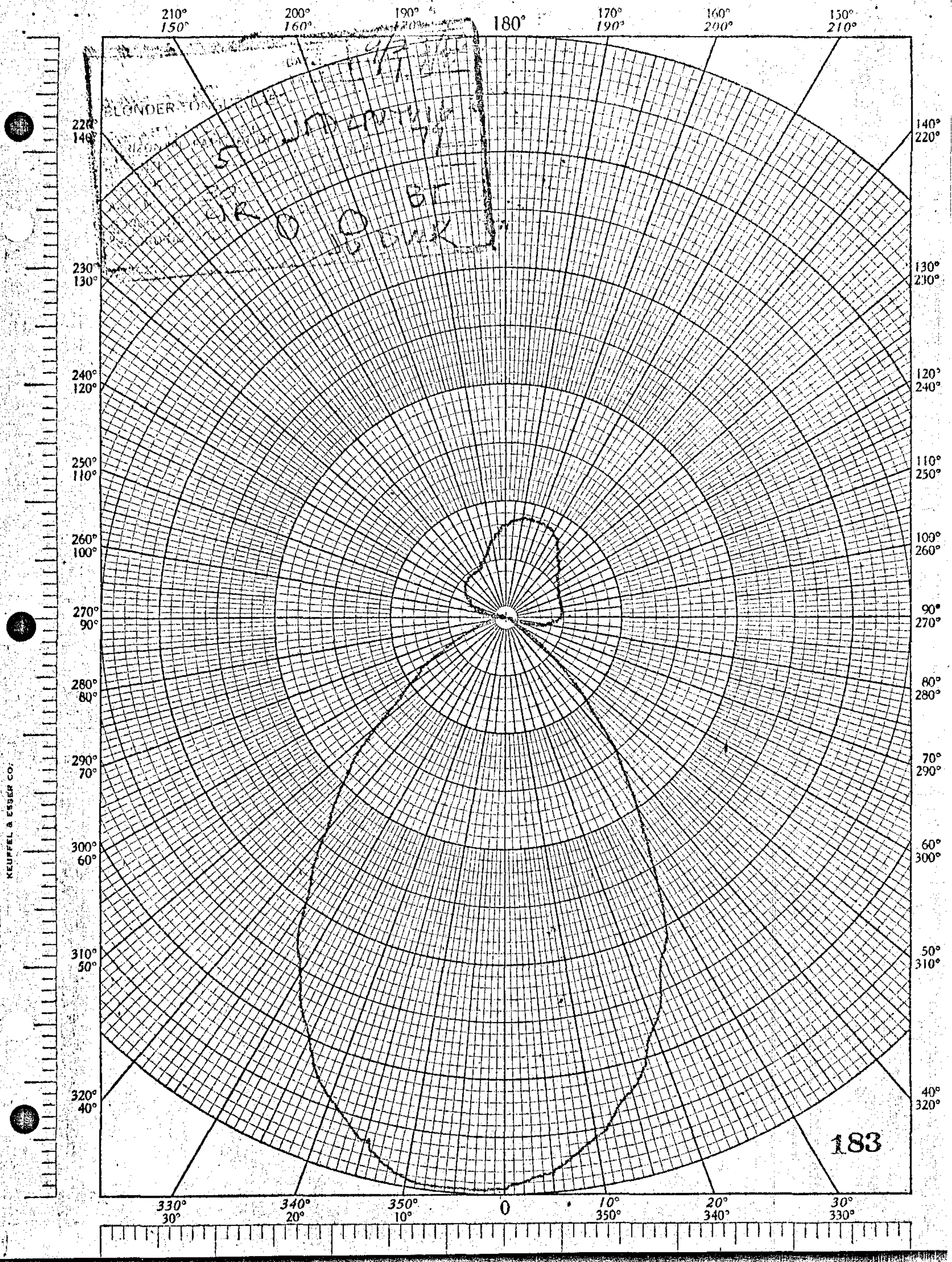
CONDITIONS:

SIGNAL SOURCE: BT

RECORDING MODE: (LIN) (LOG)

SG TV 62

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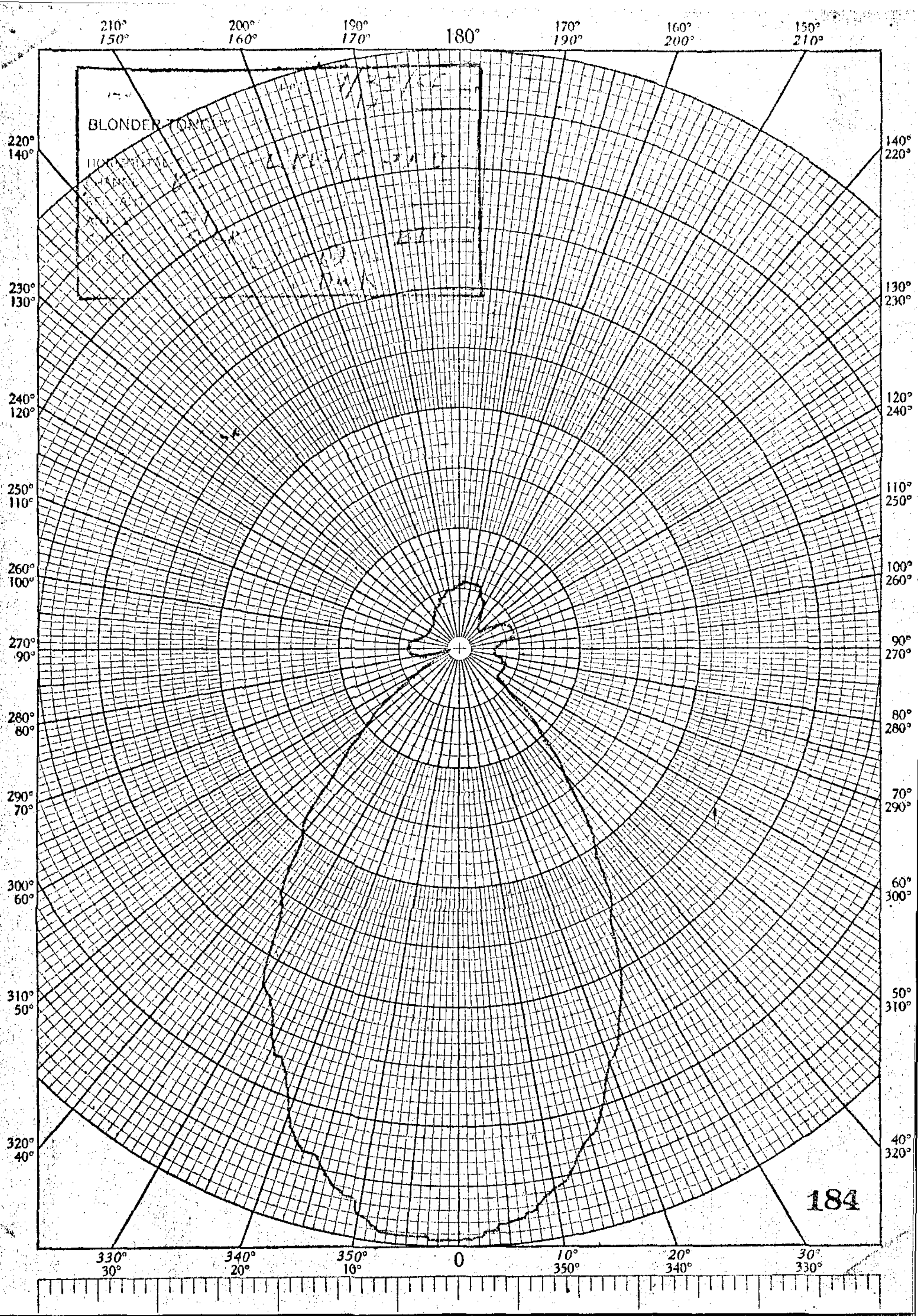
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MADE IN U.S.A.
KEUFFEL & ESSER CO.

BLONDER-TONGUE LABS.

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TIME: 2130
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REF. ANT.: 76.5
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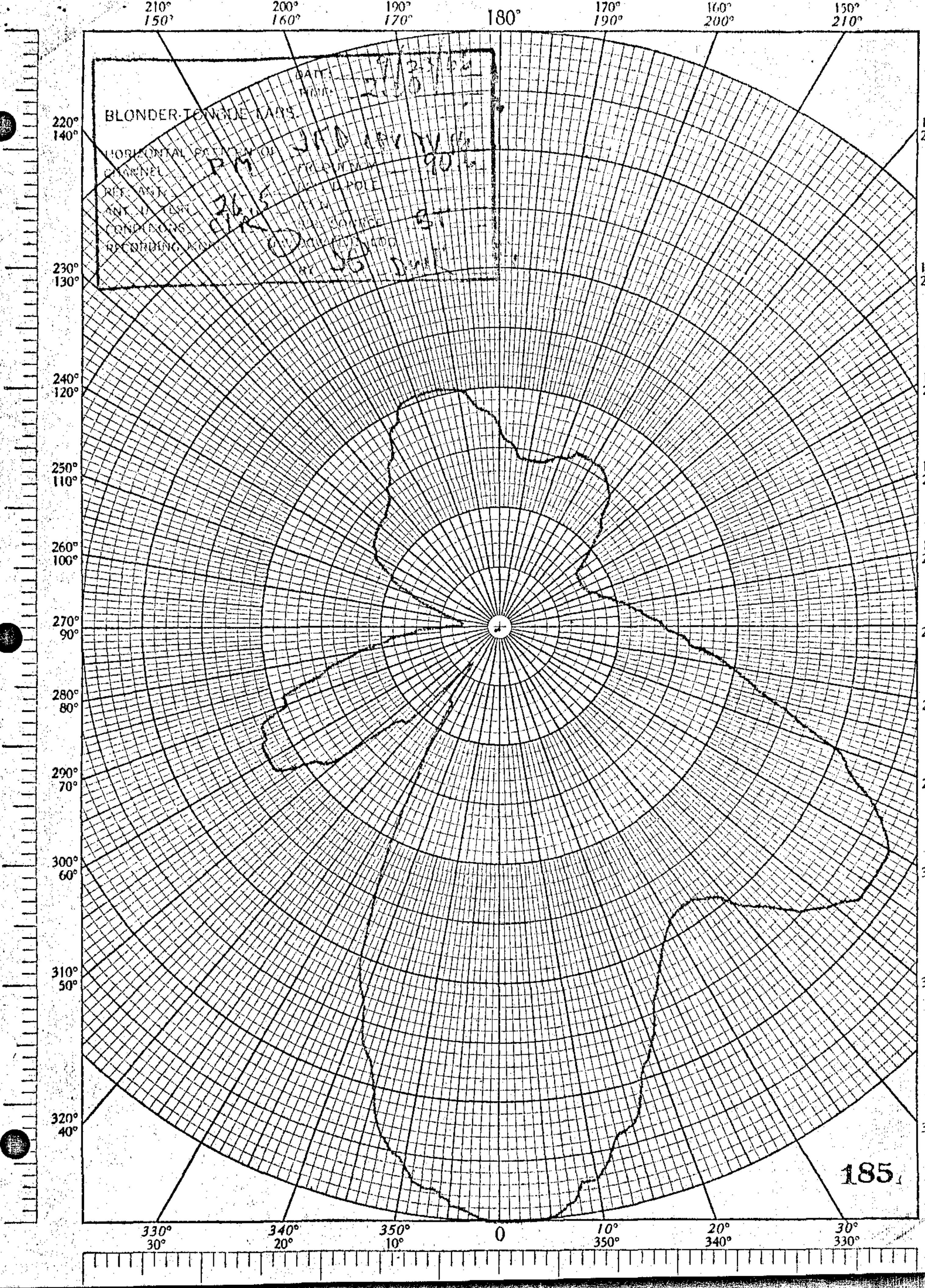
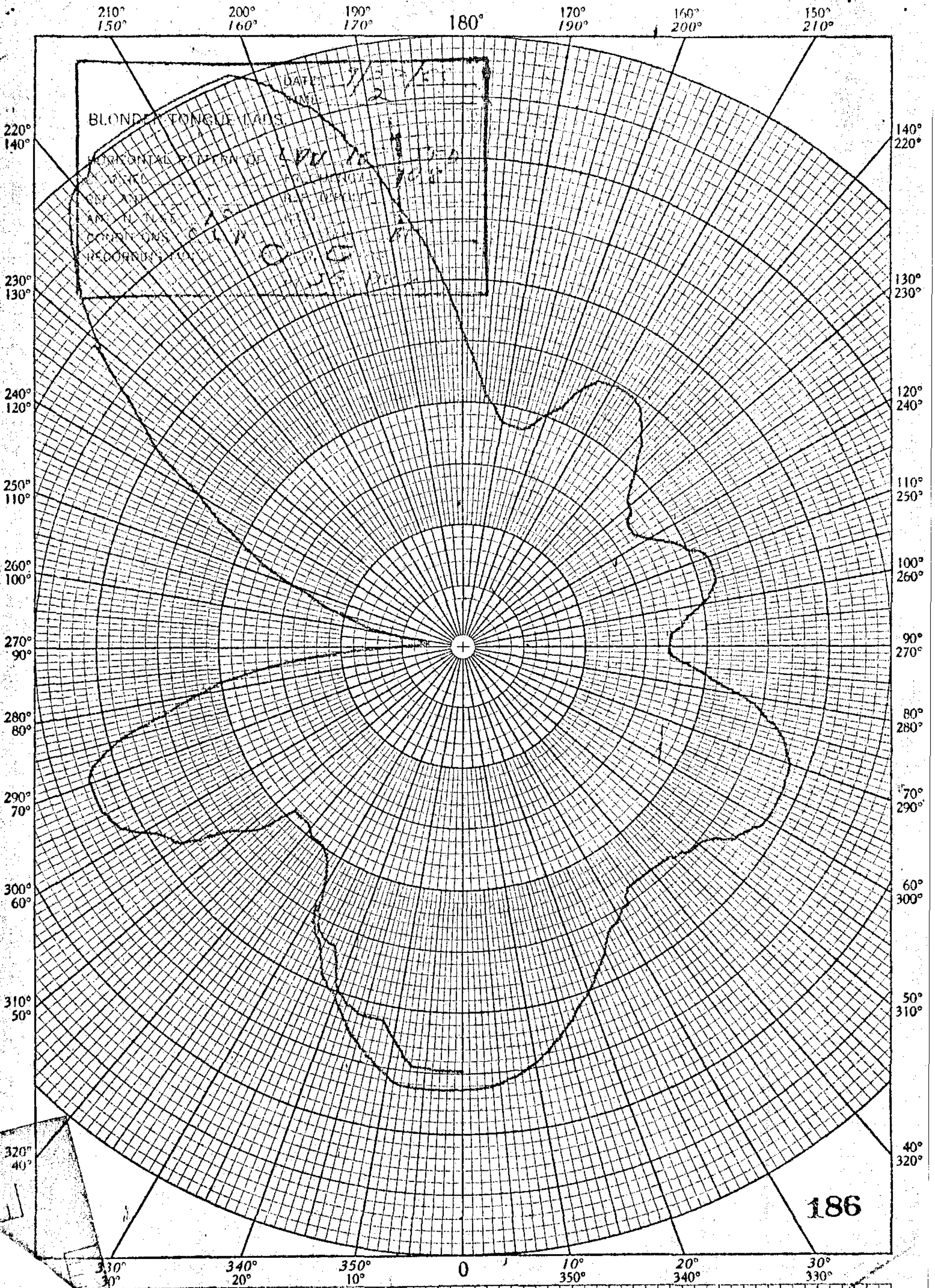
SOURCE: 57
POOR GOOD
BY: DS





BLONDER TONGUE LABS

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TIME

HORIZONTAL PATTERN OF

CONDITIONS

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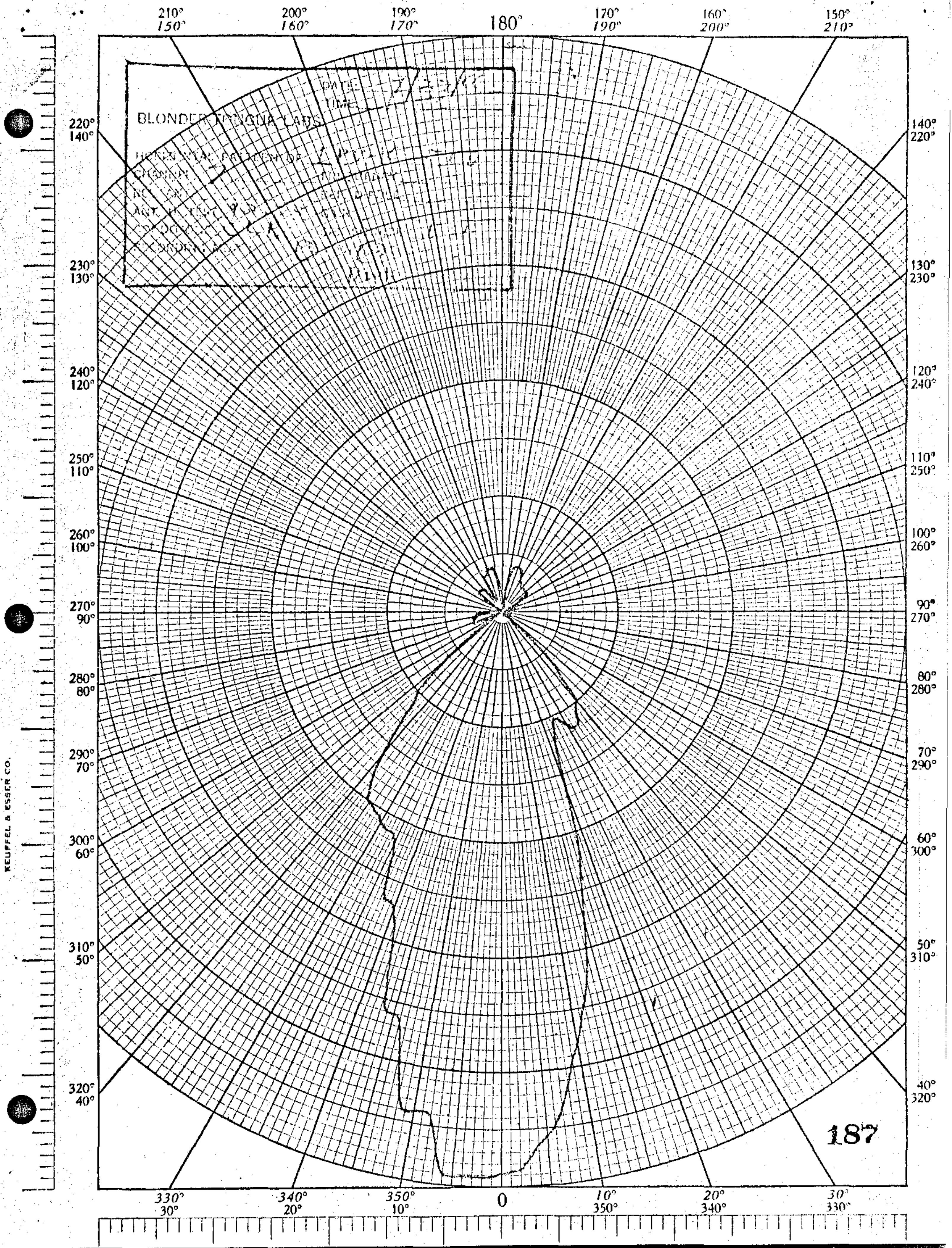
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KEUFFEL & ESSER CO.
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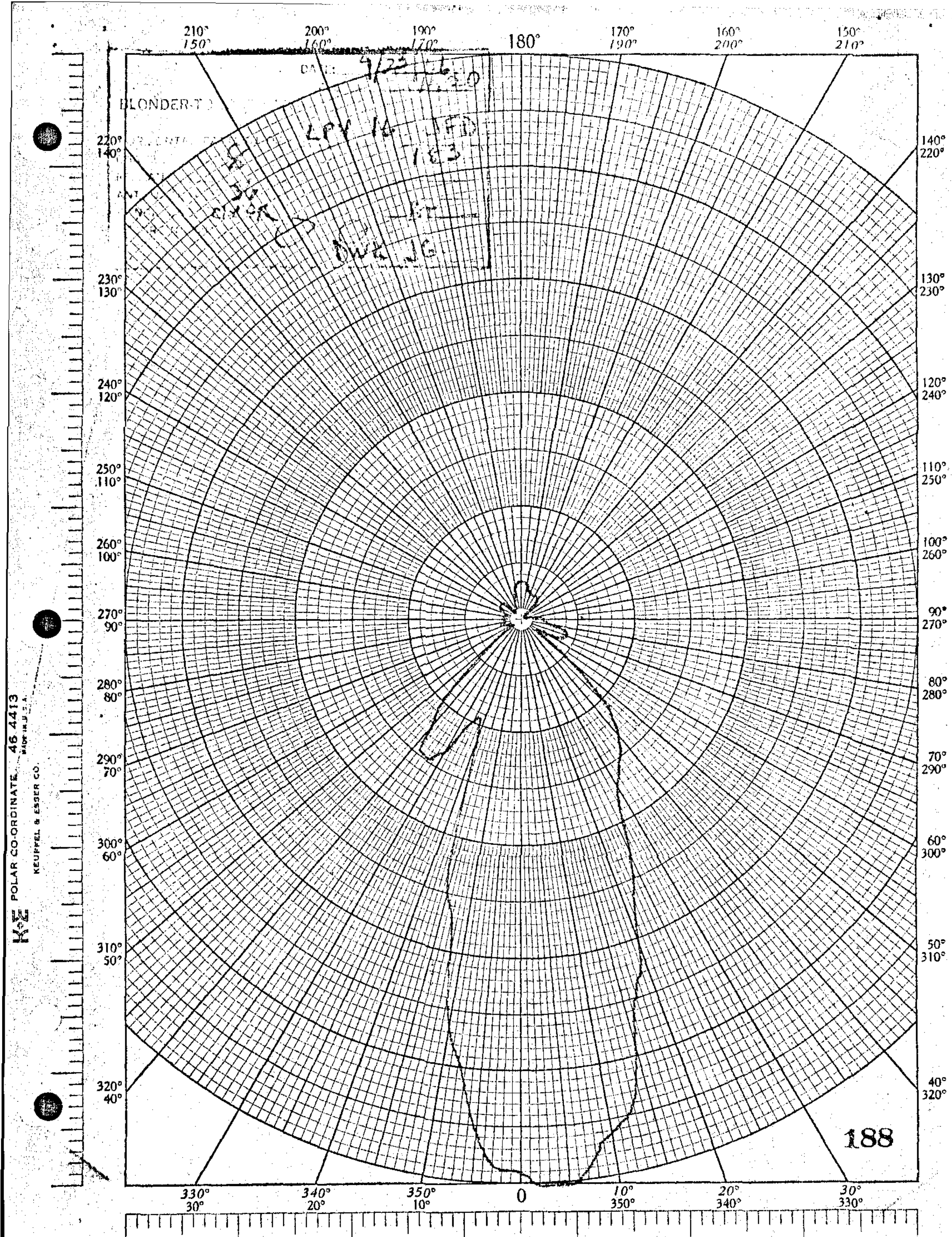
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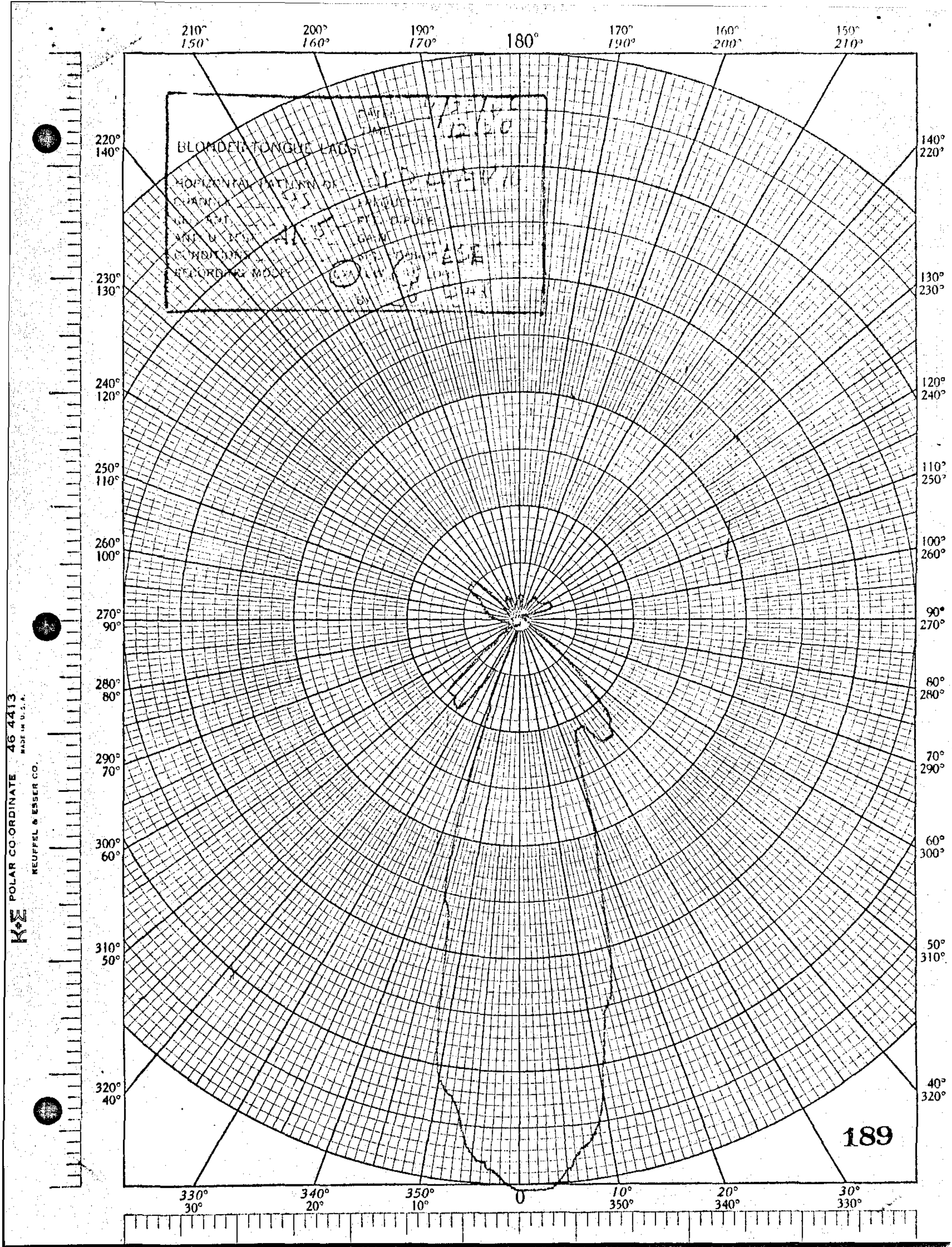

BLONDER-TONGUE LABS

DATE 7/27/70

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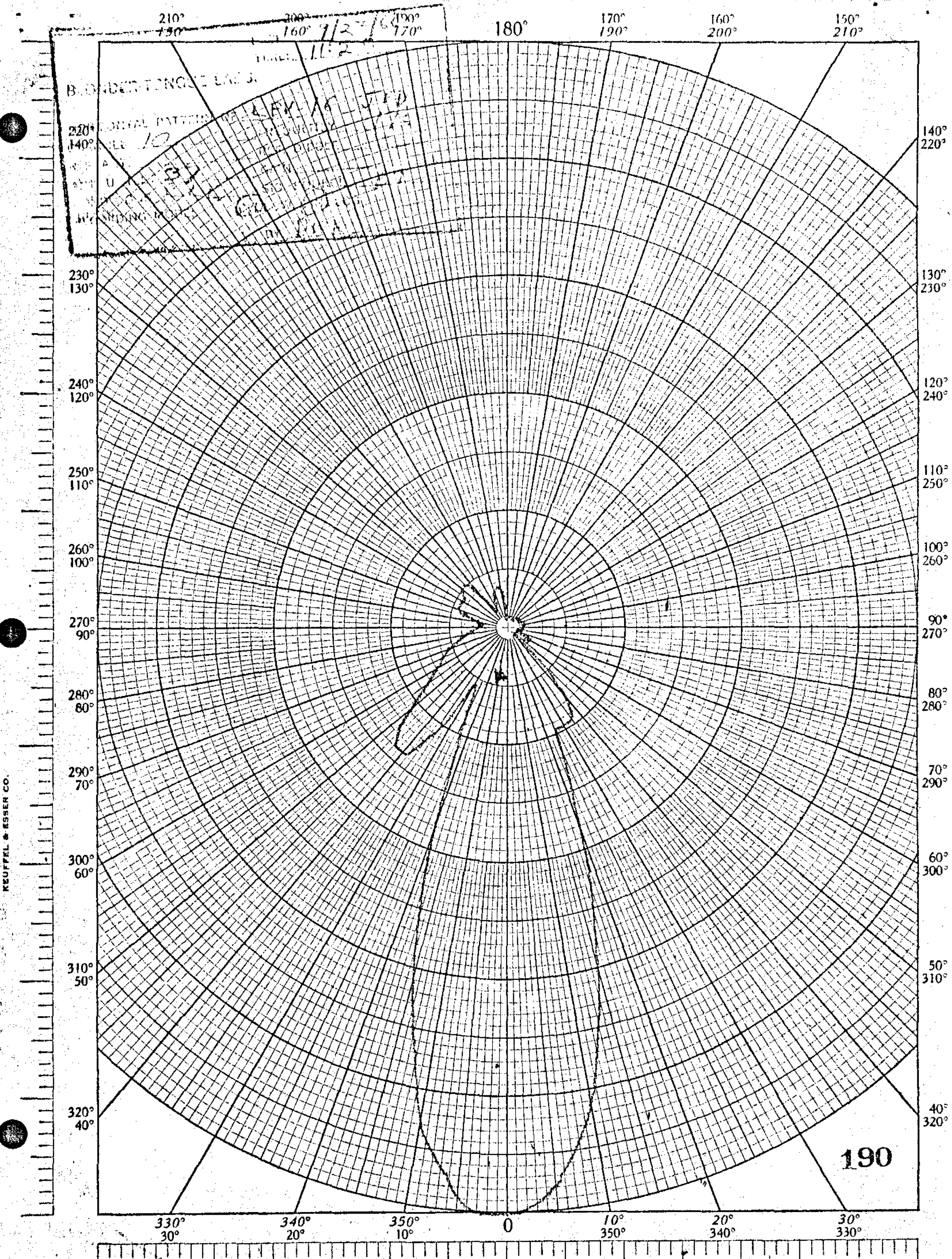

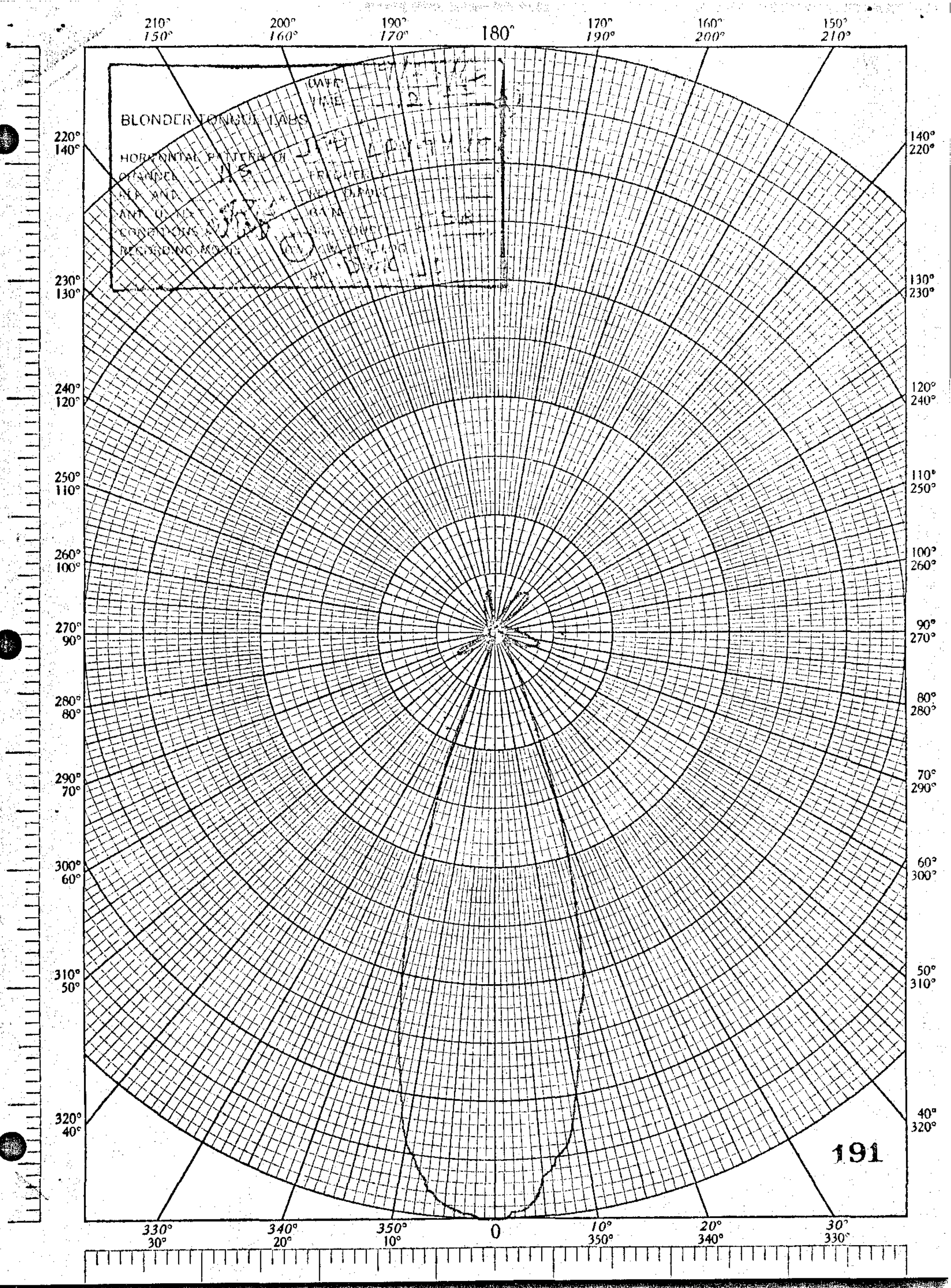
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KEUFFEL & ESSER CO. MADE IN U.S.A.

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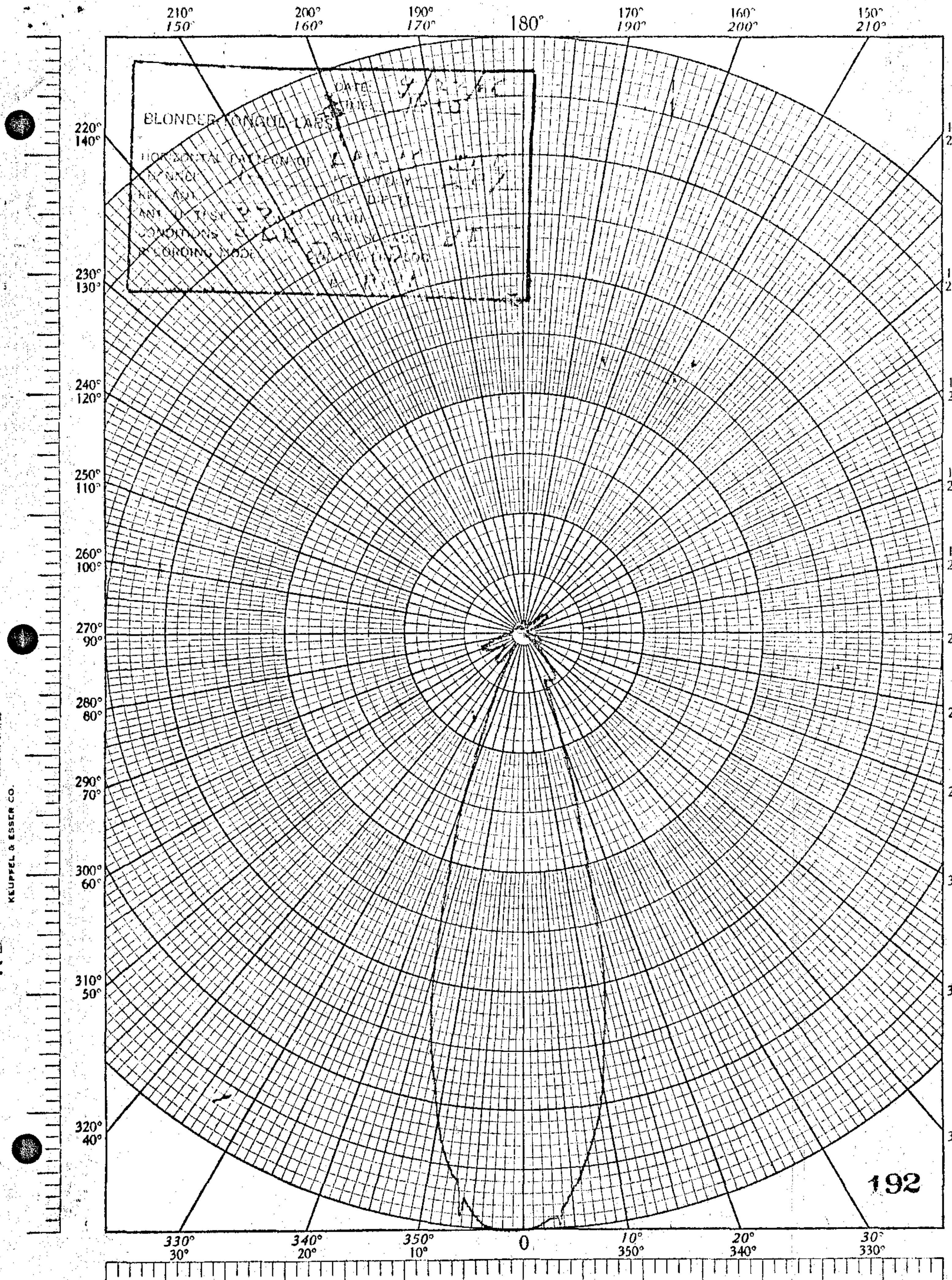
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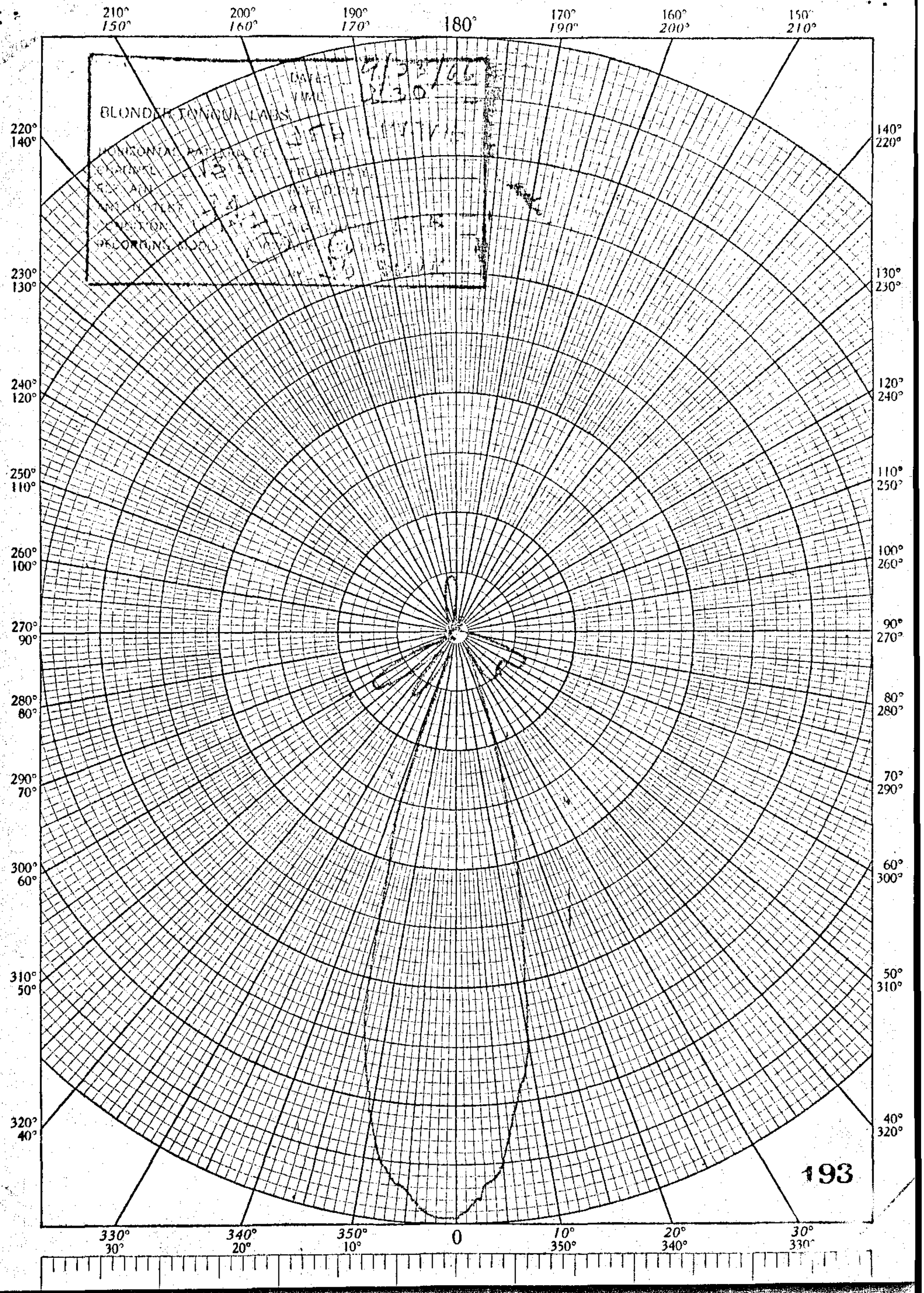
K&E POLAR CO-ORDINATE 46 4413 MADE IN U.S.A.
KEUFFEL & ESSER CO.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POLAR CO-ORDINATE 46 4413
KEUFFEL & ESSER CO.
MADE IN U.S.A.

(13) LPVU-12

PREPARED BY: AS
12/65

COMPETITIVE PRODUCT EVALUATION

1. SUBJECT: JFD ANTENNA.
2. MODEL: LPV-VU12 CAP ELECTRONIC DIPOLE LOG PERIODIC VHF/UHF/FM ANT.
3. LIST PRICE: $49.95
4. PATENTS CLAIMED: 2,958,081 2,985,879 3,011,168 3,108,280 3,150,376
   ADDITIONAL PATENTS PENDING (US & CANADA).
   UNDER EXCLUSIVE LICENSE FROM THE UNIVERSITY OF ILL. FOUNDATION.
5. ACCESSORIES SUPPLIED; VHF/UHF/FM SPLITTER/COUPLER, INSTRUCTION SHEET.
6. CARTON; THREE COLOR DISPLAY 11'5" LONG.
7. TOTAL BOOM LENGTH; 8'9".
8. FINISH: "GOLD ALODIZING"
9. INSULATION MATERIAL; IMPLEX A ACRYLIC.
10. ELEMENT MATERIAL: ALUMINUM, 3/8" WITH SEAMS.
11. BOOM MATERIAL: ALUMINUM, 3/4" x 3/4"
12. MOUNTING; TWO "U" BOLTS.

13. PERFORMANCE: (ALL MEASURMENTS DONE WITHOUT COUPLER SUPPLIED)

13.1 GAIN; OVER A TUNED DIPOLE

CH. OR FREQ.	2	3	4	5	6	90.6	110	7	8	9	10	11	12	13	470	560	660	760	890
DB GAIN	3.9	3.6	3.7	3.5	3	≈2.0	-9.0	6.2	8.0	9.9	7.5	9.6	5.6	7.2	8.0	7.4	10.0	5.5	4.5

13.2 VSWR:

13.2.1	54 - 88 MC	3.5	MATCH; 1.8:1
13.2.2	88 - 108 MC	13	1.2:1
13.2.3	174 - 216 MC	2.3	2.4:1
13.2.4	470 - 890 MC	4.5	1.6:1

13.3 FRONT TO BACK RATIO:

13.3.1	54 - 88 MC	13 dB - 20 dB
13.3.2	88 - 108 MC	8 dB - 17 dB
13.3.3	174 - 216 MC	14 dB - 30 dB
13.3.4	465 - 890 MC	8.5 dB - 30 dB

13.3.5 SIDE LOBE REJECTION 174-216 MC - 9.5 dB OR BETTER
13.3.6 ✓ ✓ ✓ 465-890 MC - 5.0 dB OR BETTER

13.4 HORIZONTAL BEAMWIDTH (E-PLANE 3.0 dB POINTS)

13.4.1	54 - 88 MC	66° - 78°
13.4.2	174 - 216 MC	26° - 30°
13.4.3	465 - 890 MC	17° - 45°

14. CONCLUSION

14.1 LOW-BAND PERFORMANCE: OPERATING AT $\frac{\lambda}{2}$ MODE THE VSWR, GAIN AND PATTERN ARE TYPICAL FOR THIS MODE. GAIN HOWEVER IS SLIGHTLY LOW AND FRONT TO BACK RATIO IS NOT TOO GOOD.

14.2 FM PERFORMANCE: GAIN DROPS FROM +2.0 dB AT 90.6MC TO APP. − 8.0dB AT108MC. THE PATTERN DETERIORATES AT THE HIGH END OF THE FM AND THE VSWR IS VERY POOR.

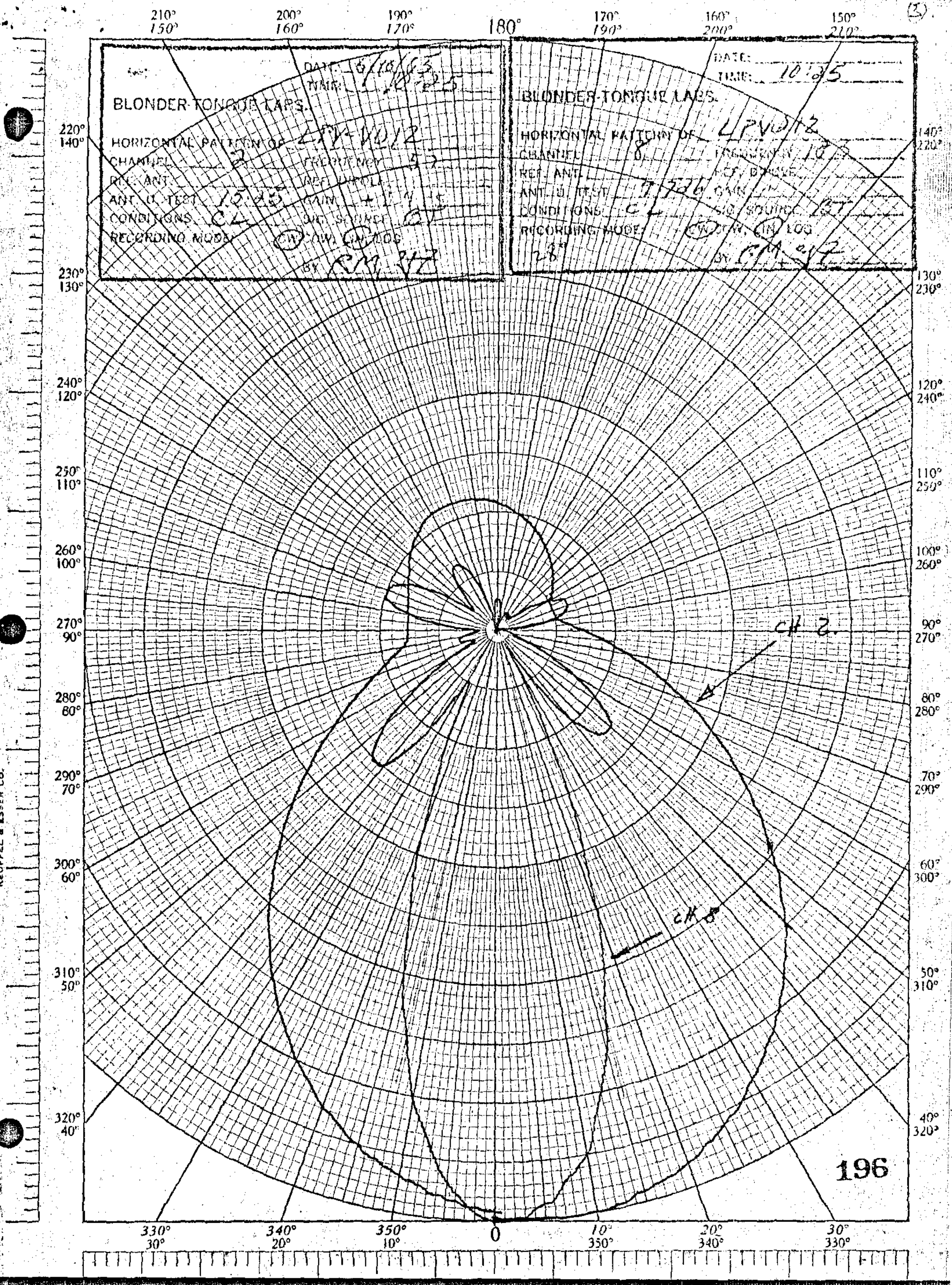
14.3 HIGH-BAND PERFORMANCE; VSWR AND PATTERN ARE TYPICAL FOR THE $3/2\ \lambda$ MODE OPERATION. THE GAIN VARIES FROM A LOW OF 6.2 dB TO A HIGH OF 9.9 dB.

14.4 UHF PERFORMANCE: VERY NARROW PATTERN AT SOME POINTS ($\frac{7}{2}\lambda$ TO $\frac{9}{2}\lambda$ MODE OF OPERATION) GAIN VARIES FROM 10 dB AT THE CENTER OF THE BAND TO A LOW OF 4.5 dB AT THE HIGH END.
THE PATTERN DETERIORATES FROM APPR. 700 MC AND UP.
ANTENNA POSITIONING IS VERY CRITICAL FOR THE HIGH GAIN PORTION OF THE BAND (17.0° BEAMWIDTH)

14.5 INSTALLATION IS QUITE SIMPLE. THE DOWN LEAD IS CONNECTED TO A SPECIAL TRANSMISSION LINE SECTION.
THE NEW SNAP-IN MECHANISM IS QUITE SLOPPY IN TOLERANCE PERMITTING THE DIPOLES TO WOBBLE.
SLOPPY AND LOOSE RIVITING PERMITS NOISY DIPOLE CONNECTIONS TO BOOM.

14.6 FOR PERFORMANCE OF VHF/UHF/FM INDOOR COUPLER AC-80, SEE COMPETITIVE PRODUCT ANALYSIS 1/5/65.

(3)



BLONDER-TONGUE LABS.

DATE: 6/10/63

TIME: 10:25

HORIZONTAL PATTERN OF: LPV-VO12

CHANNEL: 2

FREQUENCY: 57

REF. ANT.:

REF. DIPOLE:

ANT. U. TEST: 15:25

GAIN: +1 N 1.5

CONDITIONS: CL

SIG. SOURCE: G

RECORDING MODE: [✓ CW] CCW, [✓ LIN] LOG

BY: CM 3/7

BLONDER-TONGUE LABS.

DATE:

TIME: 10:25

HORIZONTAL PATTERN OF: LPVO12

CHANNEL: 8

FREQUENCY: 183

REF. ANT.:

REF. DIPOLE:

ANT. U. TEST: 7:326

GAIN:

CONDITIONS: CL

SIG. SOURCE: 137

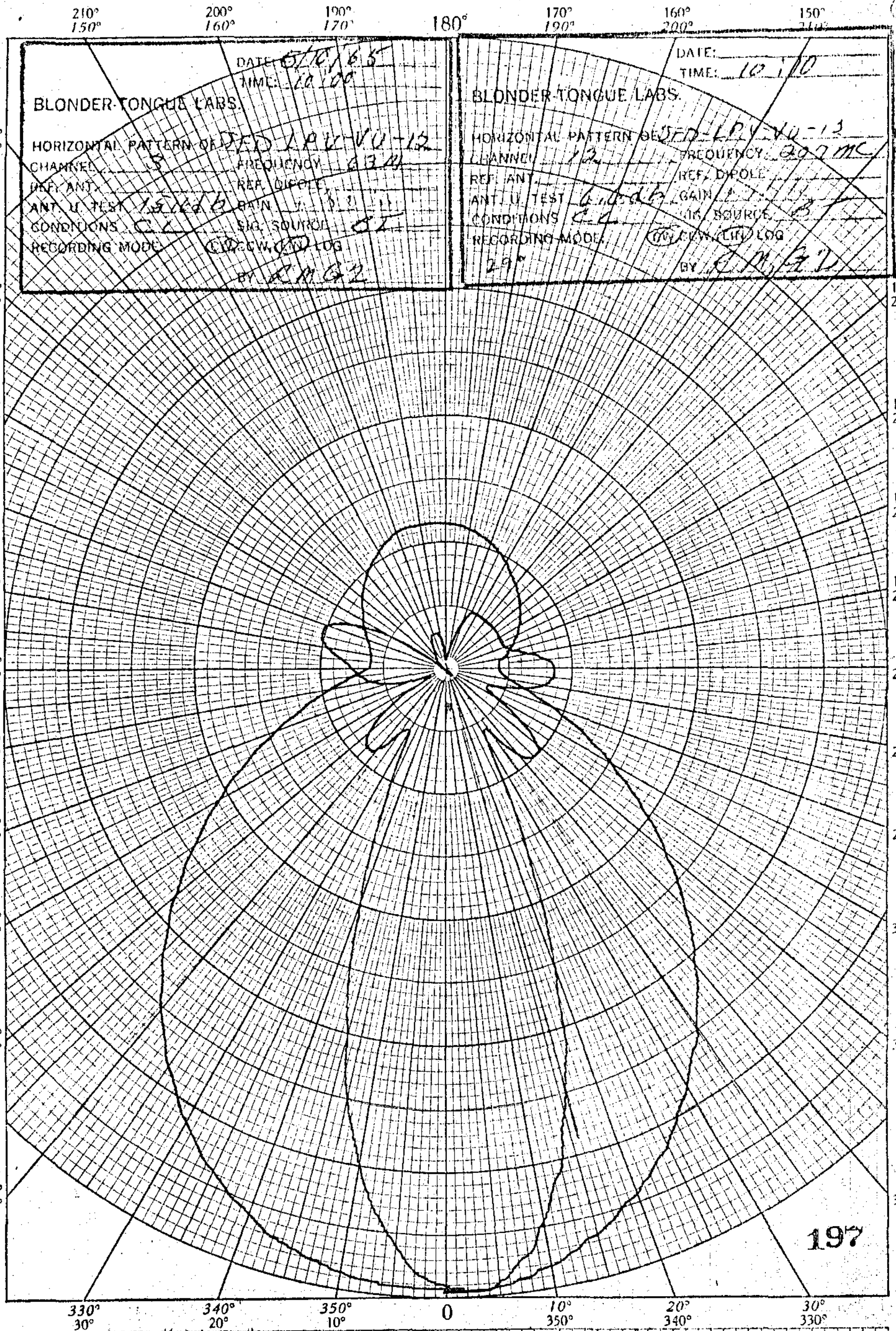
RECORDING MODE: [✓ CW] CCW, [✓ LIN] LOG

28"

BY: CM 3/7

196

(4)



BLONDER-TONGUE LABS.

DATE: 6/10/65
TIME: 10:00
HORIZONTAL PATTERN OF JFD LPV-VU-12
CHANNEL 5
FREQUENCY 83 M
REF. ANT.
REF. DIPOLE
ANT. U. TEST 15.2 db
GAIN [illegible]
CONDITIONS C.L.
SIG. SOURCE 8 I
RECORDING MODE [✓ CW], CCW, [✓ LIN], LOG
BY KMG2

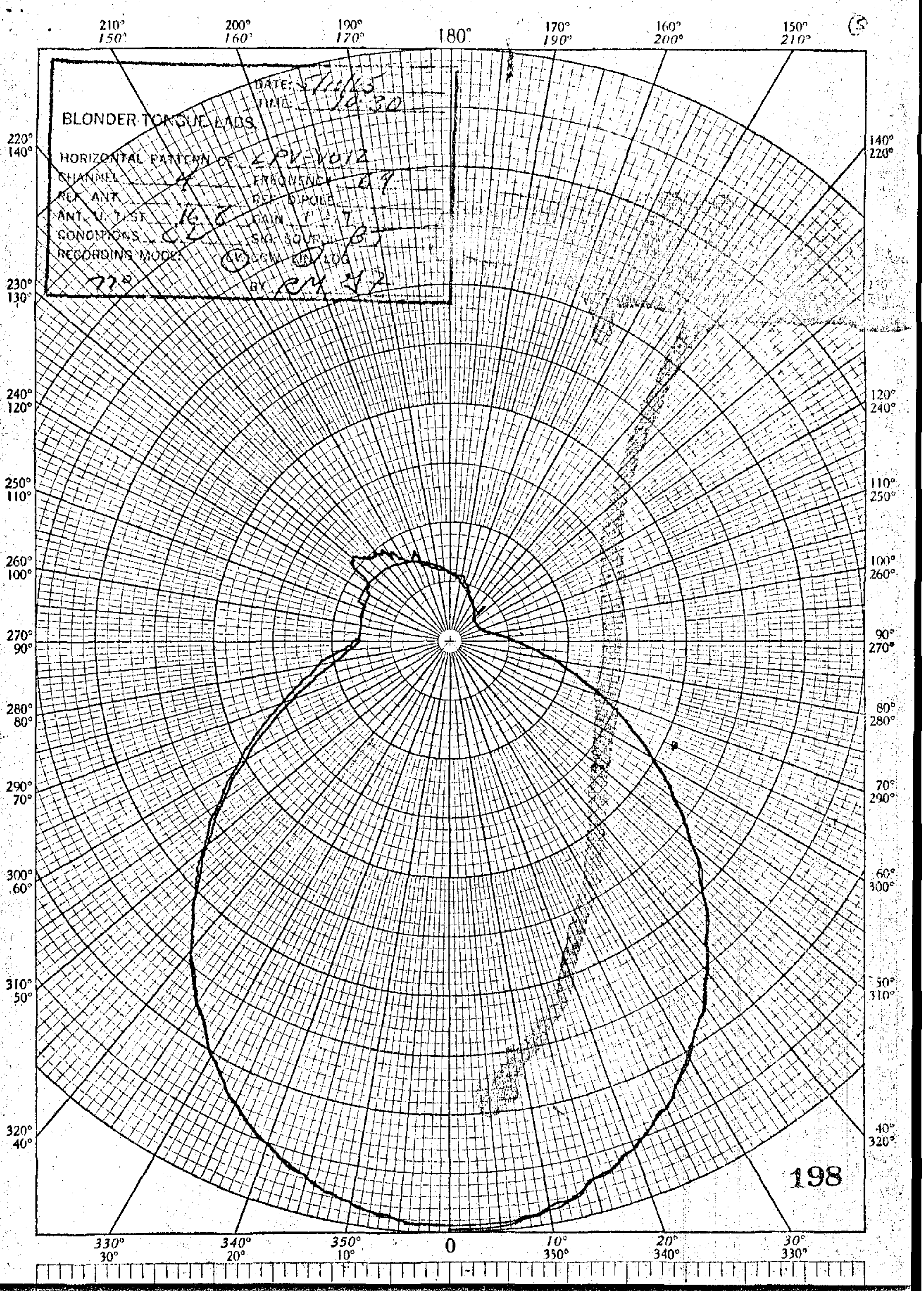
BLONDER-TONGUE LABS.

DATE:
TIME: 10:10
HORIZONTAL PATTERN OF JFD-LPV-VU-13
CHANNEL 12
FREQUENCY 207 MC
REF. ANT.
REF. DIPOLE
ANT. U. TEST 6.0 db
GAIN [illegible]
CONDITIONS C.L.
SIG. SOURCE B I
RECORDING MODE [✓ CW], CCW, [✓ LIN], LOG
29°
BY C.M.A.D.

197

K&E POLAR CO-ORDINATE 46 4412
MADE IN U.S.A.
KEUFFEL & ESSER CO.

(5



BLONDER-TONGUE LABS.

DATE: 7/1/63

TIME: 10:30

HORIZONTAL PATTERN OF LPV-VO12

CHANNEL 4

FREQUENCY 67

REF. ANT.

REF. DIPOLE

ANT. U. TEST 16 T

GAIN 7.4

CONDITIONS CL

SIG. SOURCE B7

RECORDING MODE: [✓ AV] CGM [✓ LIN] LOG

72°

BY RM JJ

198

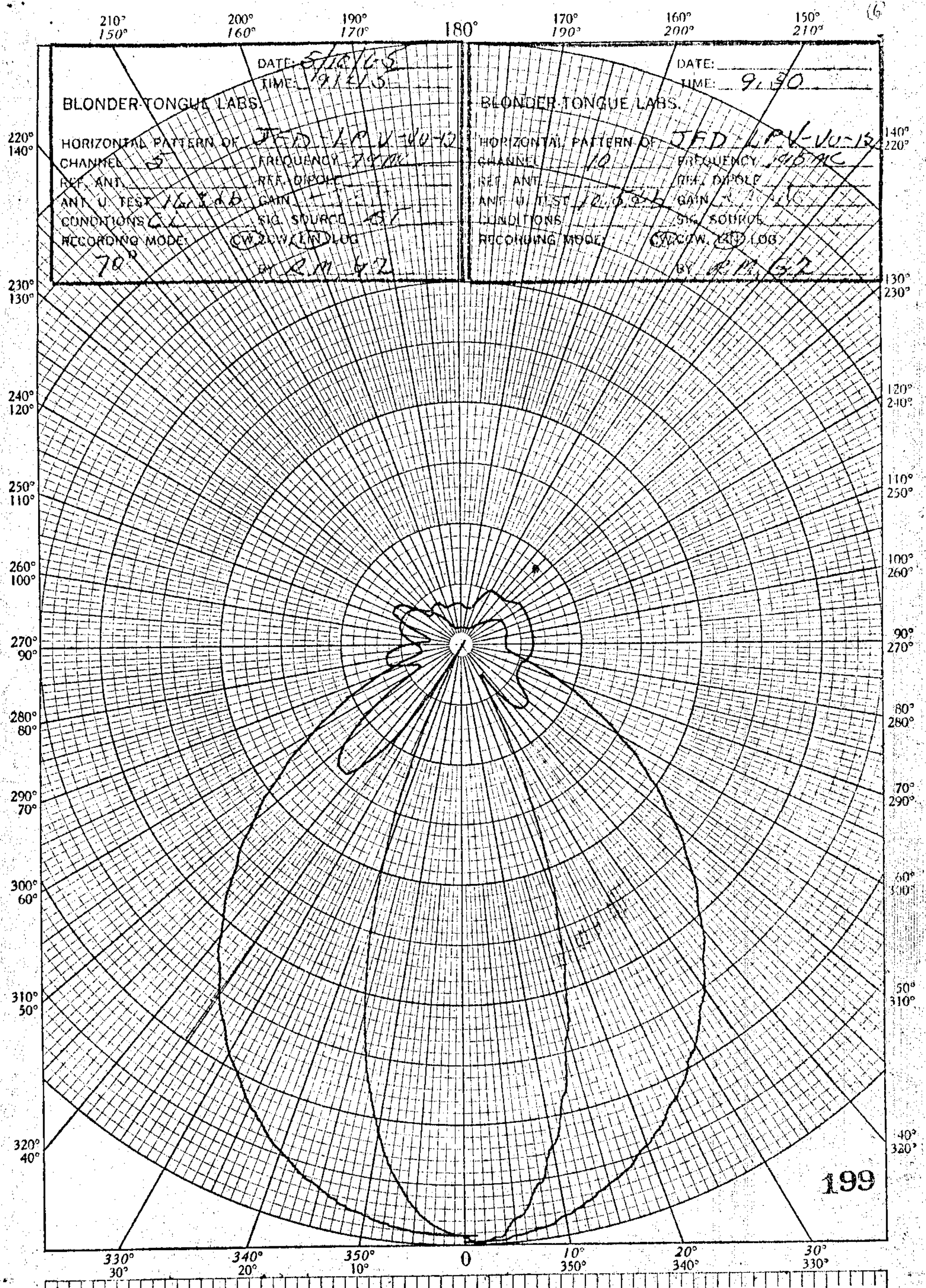
(6

BLONDER-TONGUE LABS.

DATE: 5/12/65
TIME: 9:25
HORIZONTAL PATTERN OF JFD LPV-VU-12
CHANNEL 5 FREQUENCY 79 MC
REF. ANT. REF. DIPOLE
ANT. U. TEST 16.3 db GAIN [illegible]
CONDITIONS C.L. SIG. SOURCE 457
RECORDING MODE: [✓ CW] 2CW [✓ LIN] LOG
70°
BY RM 62

BLONDER-TONGUE LABS.

DATE:
TIME: 9:30
HORIZONTAL PATTERN OF JFD LPV-VU-12
CHANNEL 10 FREQUENCY 195 MC
REF. ANT. REF. DIPOLE
ANT. U. TEST 12.9 db GAIN [illegible]
CONDITIONS SIG. SOURCE
RECORDING MODE: [✓ CW] CCW. [✓ LIN] LOG
BY RM 62



199

K+E POLAR CO-ORDINATE 46 4412
KEUFFEL & ESSER CO. MADE IN U.S.A.

(8)

DATE 5/16/65

TIME 10:35

BLONDER TONGUE LABS.

HORIZONTAL PATTERN OF ZPV-VU12

CHANNEL FM FREQUENCY 98.6

REF. ANT. ____ REF. DIPOLE

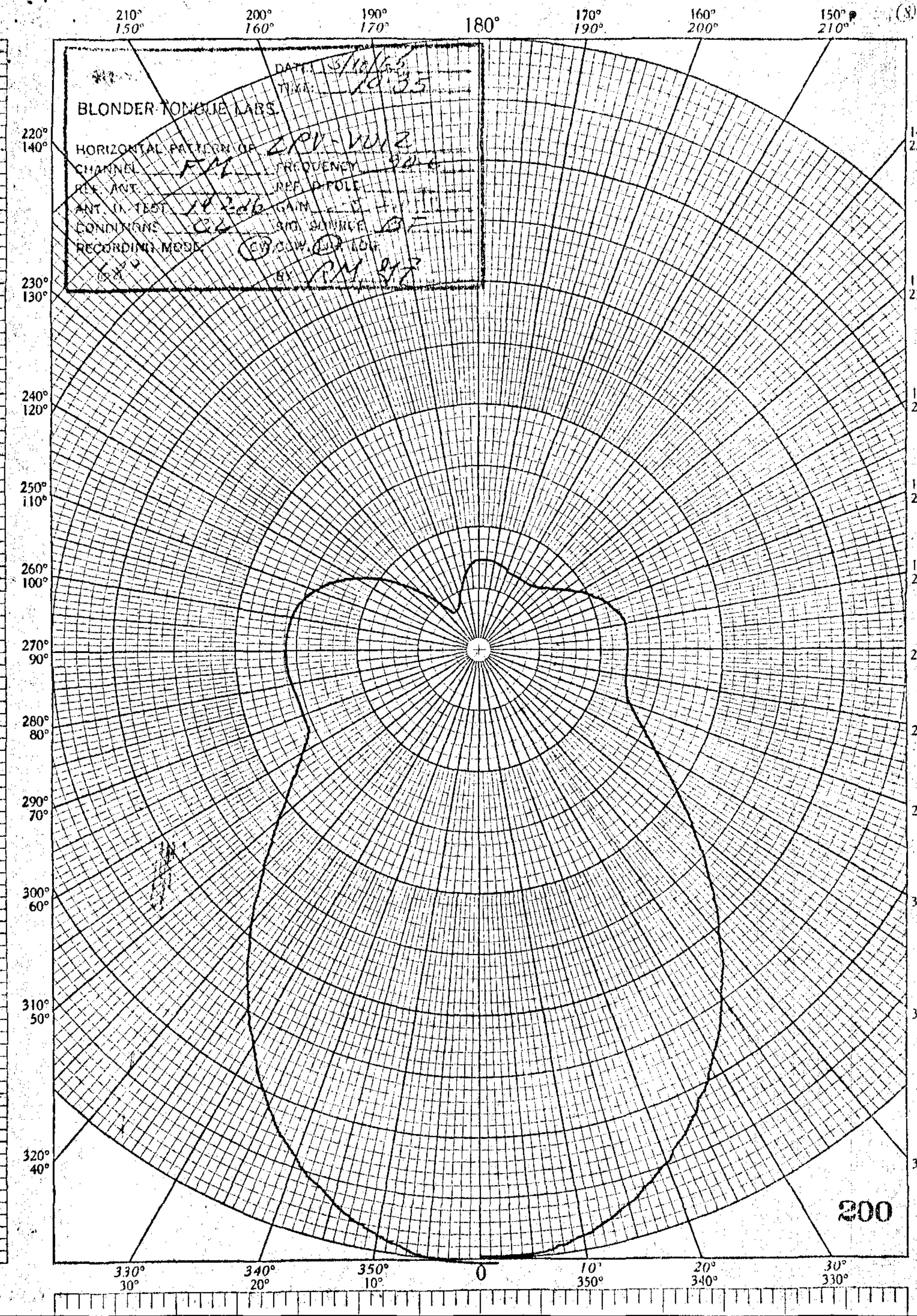
ANT. IN TEST 1X 2db GAIN [illegible]

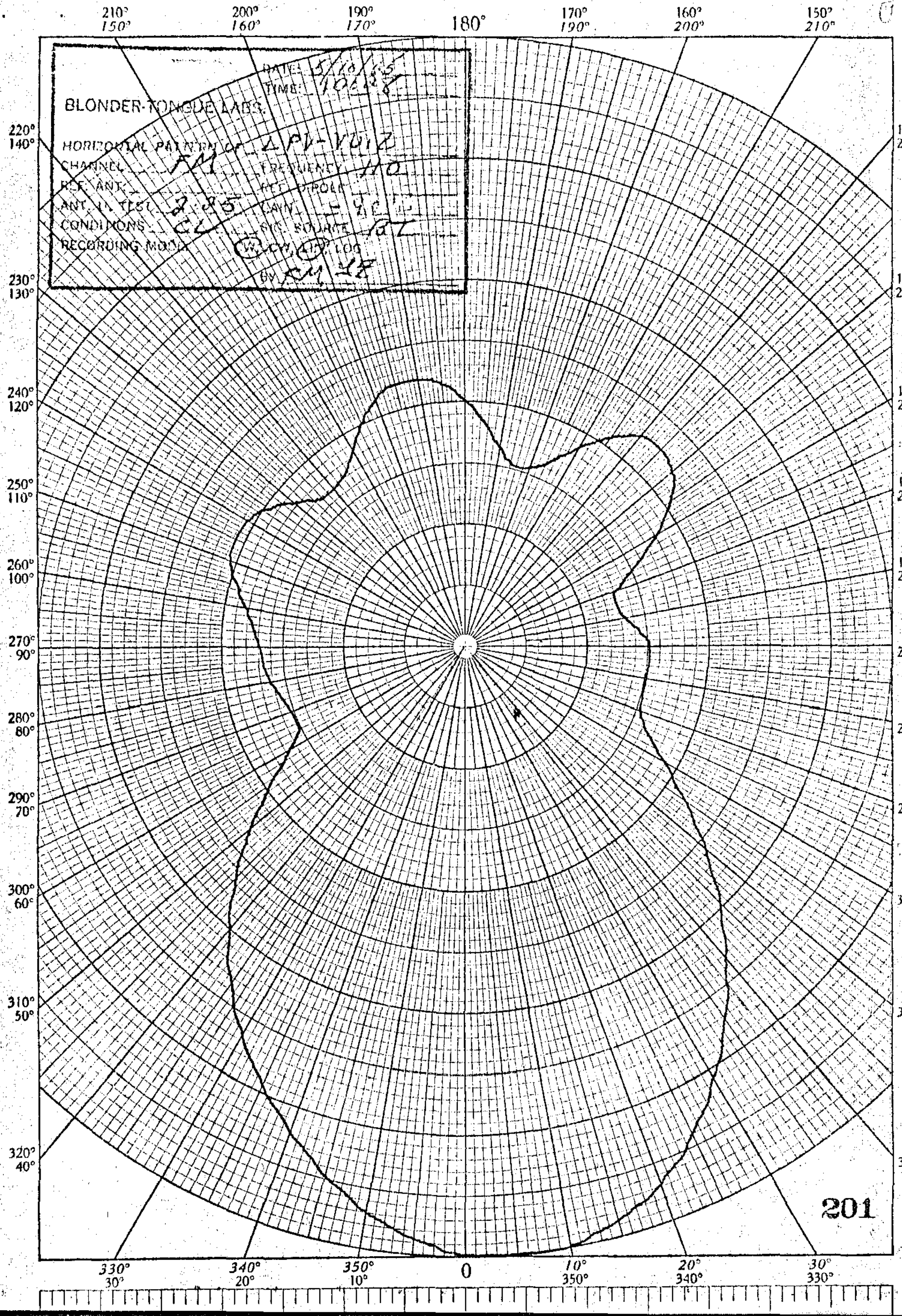
CONDITIONS CL SIG. SOURCE BF

RECORDING MODE [✓ CW] CCW [✓ LIN] LOG

6X

BY RM JZ





BLONDER-TONGUE LABS.

DATE: 5/10/85

TIME: 10:28

HORIZONTAL PATTERN OF APV-VU12

CHANNEL FM FREQUENCY 110

REF. ANT. — REF. DIPOLE

ANT. U. TEST 2.35 GAIN — 4E

CONDITIONS CL SIG. SOURCE RZL

RECORDING MODE [✓ W], CW, [✓ LIN], LOG

BY KM YR

K+E POLAR CO-ORDINATE 46 4412 MADE IN U.S.A.
KEUFFEL & ESSER CO.

(10

BLONDER-TONGUE LABS.

DATE: 5/10/43

TIME: 1105

HORIZONTAL PATTERN OF LPV-UHF

CHANNEL 75

FREQUENCY 834.75

REF. ANT.

REF. DIPOLE

ANT. U. TEST 16.5db

GAIN [illegible]

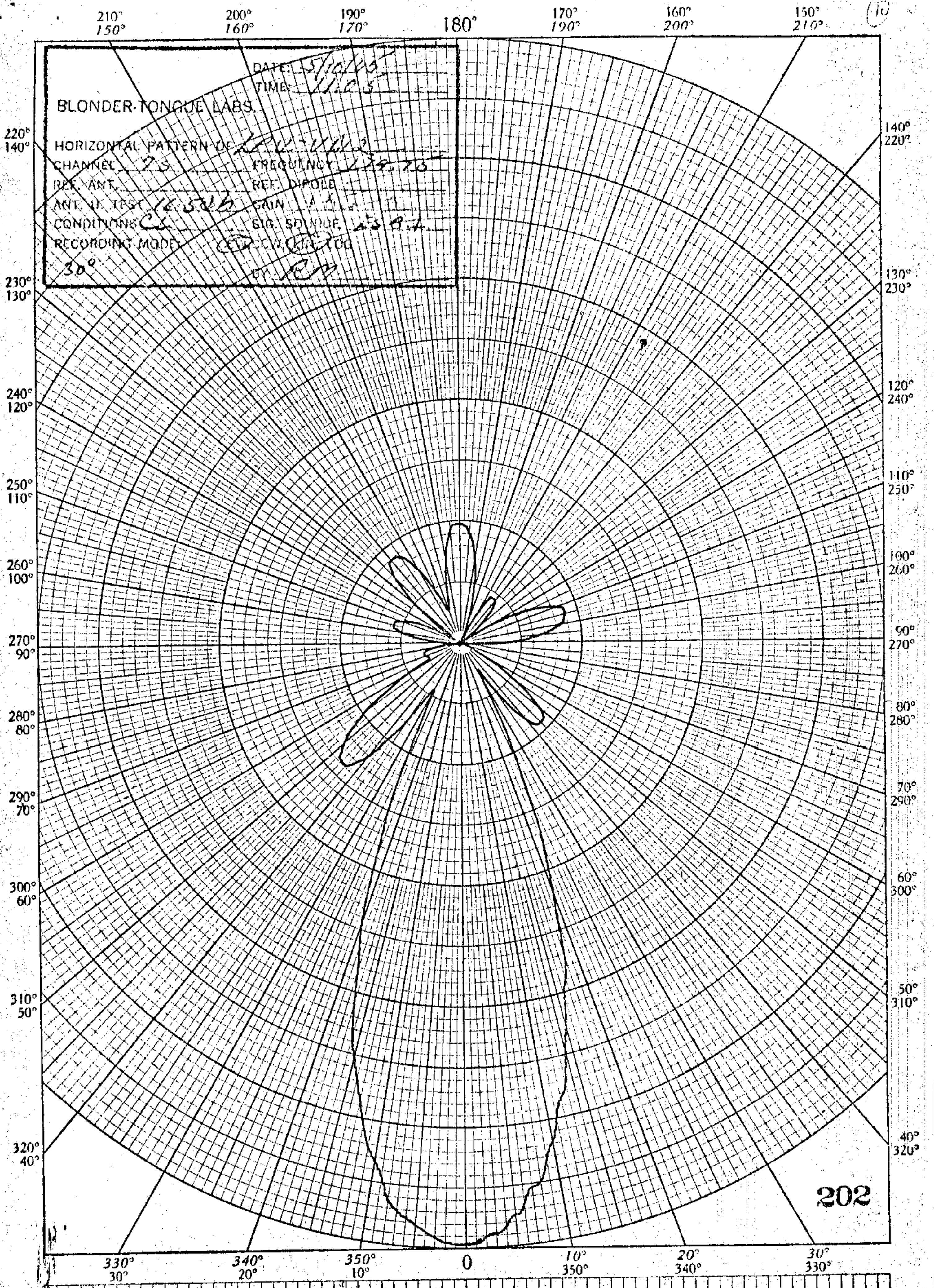
CONDITIONS CL

SIG. SOURCE 45 R.A.

RECORDING MODE [✓ CW] CCW [✓ LIN] LOG

30°

BY RM



202

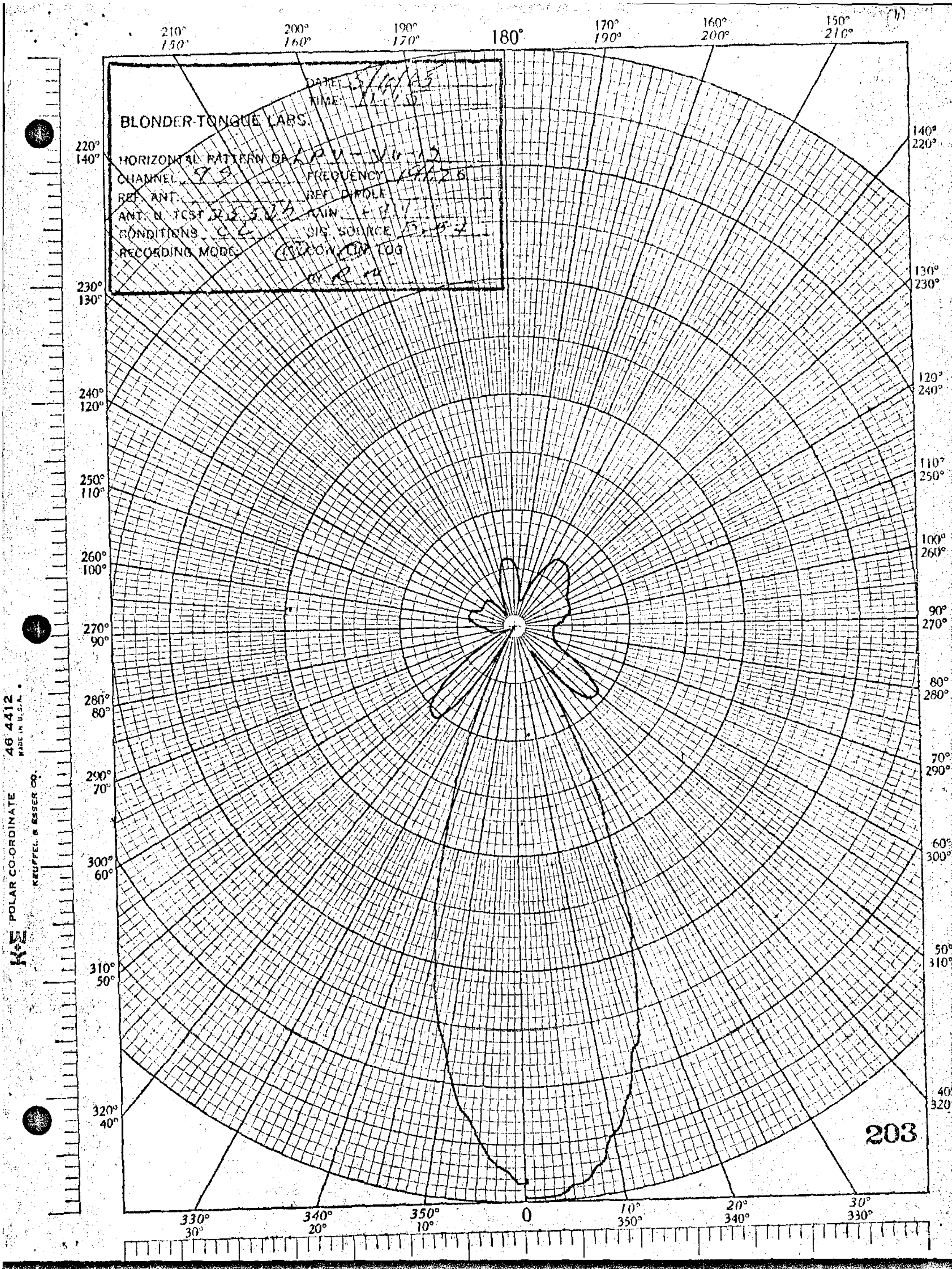
K+E POLAR CO-ORDINATE 46 4412 MADE IN U.S.A.

KEUFFEL & ESSER CO.

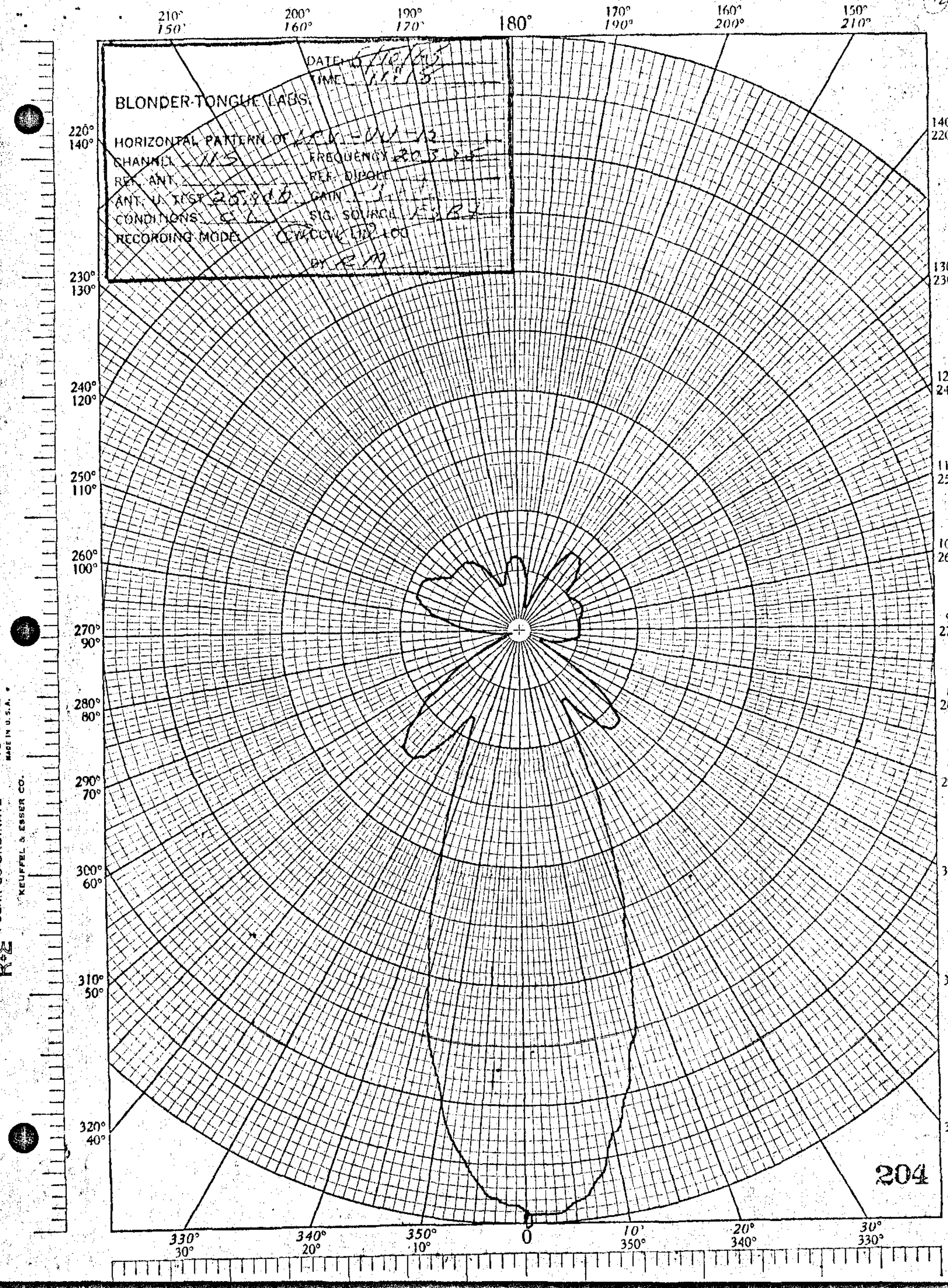
DATE 3/14/85
TIME 11:15

BLONDER-TONGUE LABS.

HORIZONTAL PATTERN OF LPV-VU-12
CHANNEL 79 FREQUENCY 197.25
REF. ANT. REF. DIPOLE
ANT. U. TEST 223526 GAIN +8.7
CONDITIONS C2 SIG. SOURCE BT-2
RECORDING MODE: [✓ LIN] CON. [✓ LIN] LOG
BY R.W.



(12)



BLONDER-TONGUE LABS.

DATE 6/12/65

TIME 11:15

HORIZONTAL PATTERN OF LCU-UV-12

CHANNEL 11S FREQUENCY 203.25

REF. ANT. ______ REF. DIPOLE ______

ANT. U. TEST 205.4 16 GAIN 11

CONDITIONS CL SIG. SOURCE [illegible]

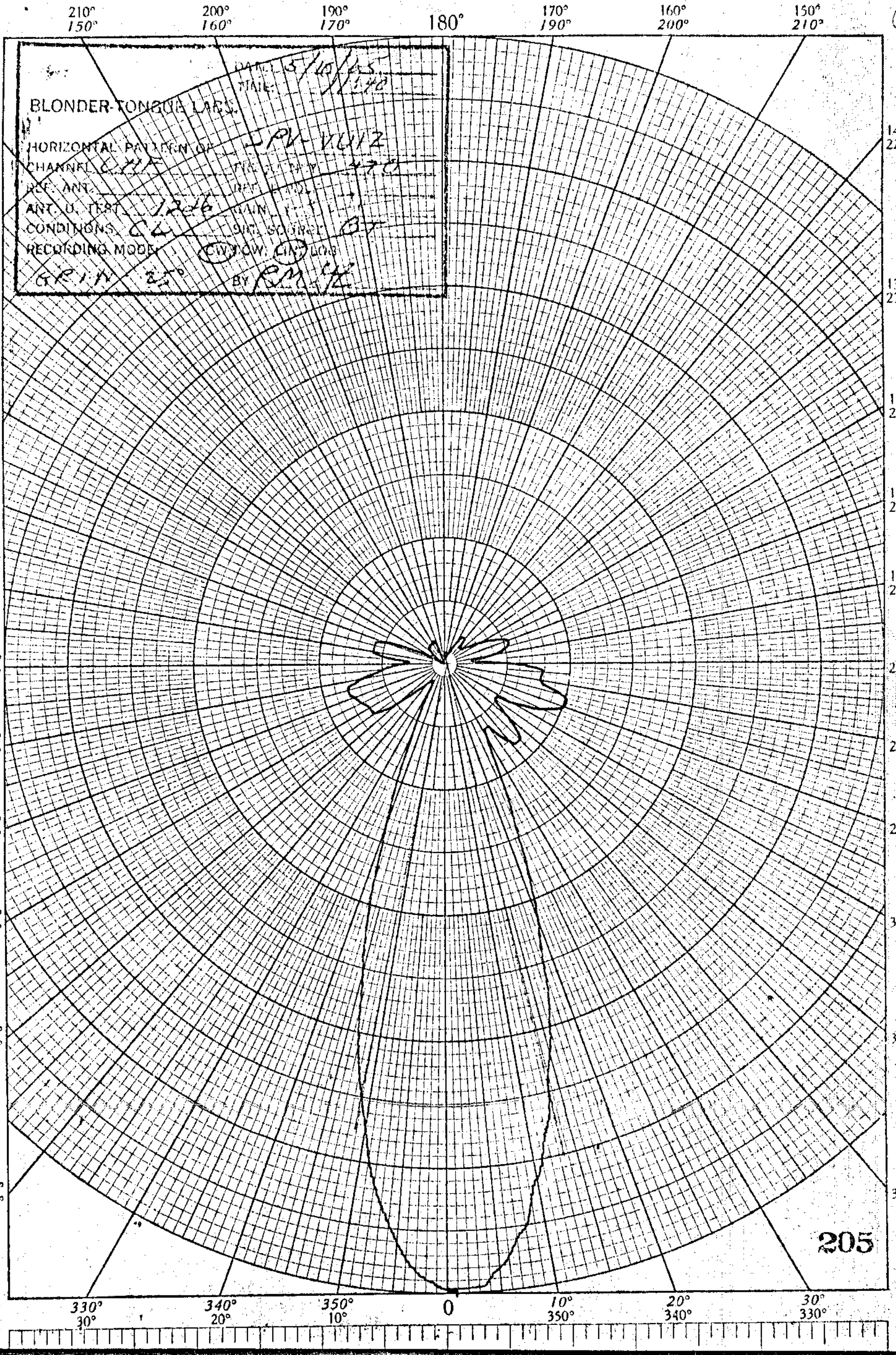
RECORDING MODE: [✓ CW] CCW LIN LOG

BY RM

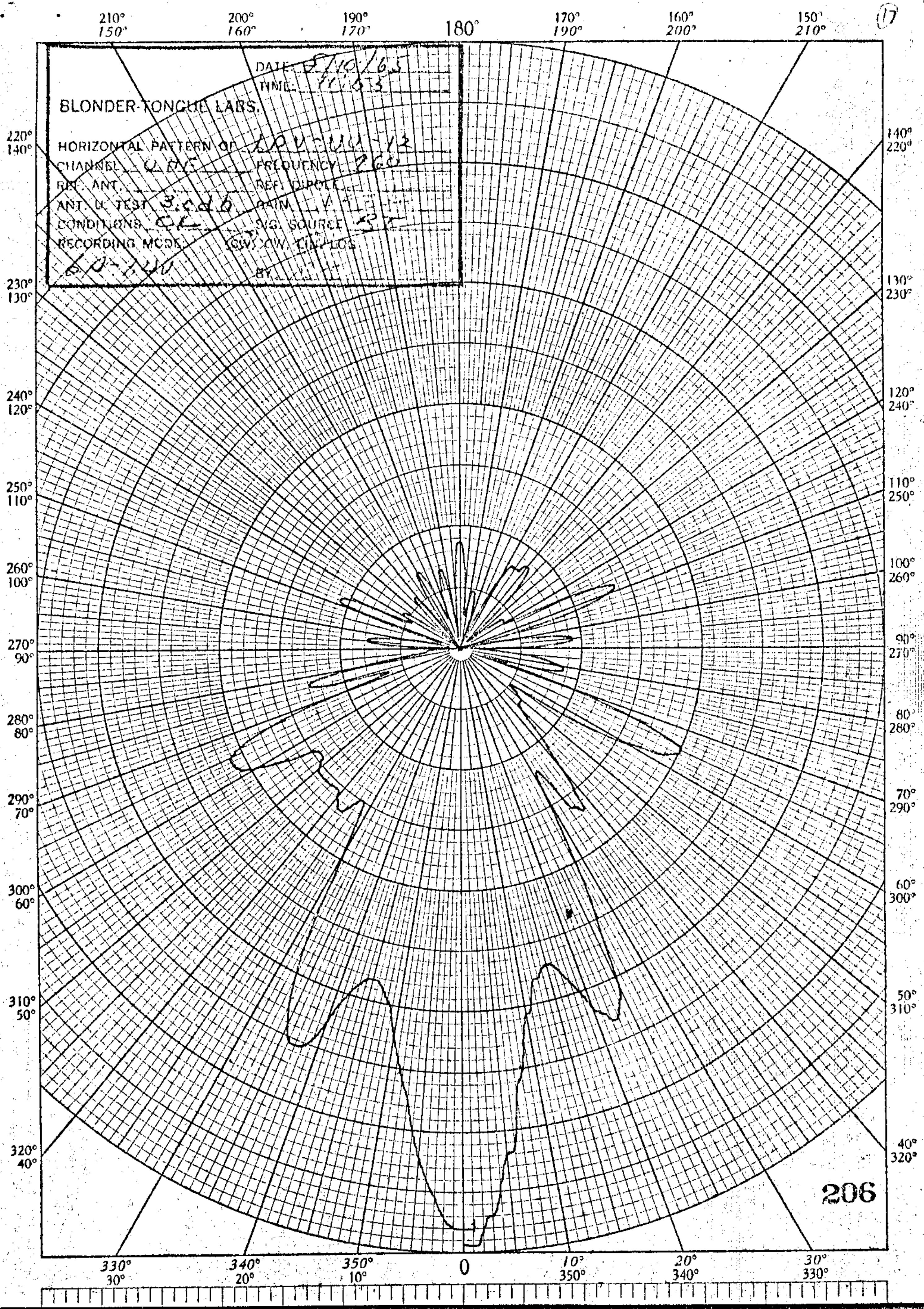
DATE 5/10/85
TIME 1140

BLONDER-TONGUE LABS.

HORIZONTAL PATTERN OF JPV-VU12
CHANNEL UHF FREQUENCY 470
REF. ANT. REF. LEVEL
ANT. U. TEST 1226 GAIN
CONDITIONS CL SIG. SOURCE BT
RECORDING MODE [✓ CW] POW. [✓ LIN] LOG
GAIN 25° BY RMK



(17)

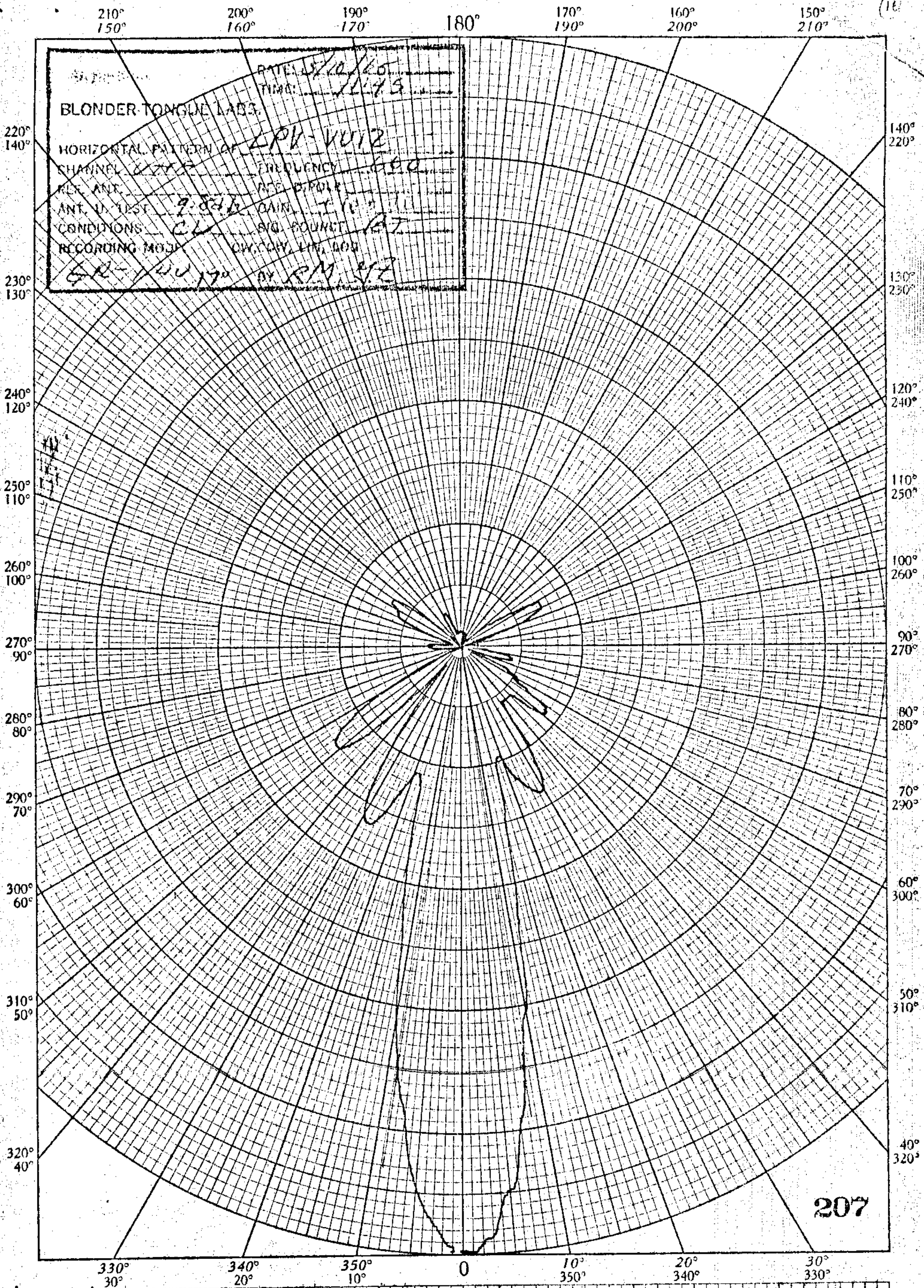


DATE 8/10/65
TIME 11:05

BLONDER-TONGUE LABS.

HORIZONTAL PATTERN OF LPV-UU-12
CHANNEL UHF FREQUENCY 260
REF. ANT. REF. DIPOLE
ANT. U. TEST 3.cdb GAIN
CONDITIONS OK SIG. SOURCE BT
RECORDING MODE (SW) CW, LIN, LOG
LP-100
BY

206



DATE: 5/10/60

TIME: 1145

BLONDER-TONGUE LABS.

HORIZONTAL PATTERN OF LPV-VU12

CHANNEL [illegible] FREQUENCY 600

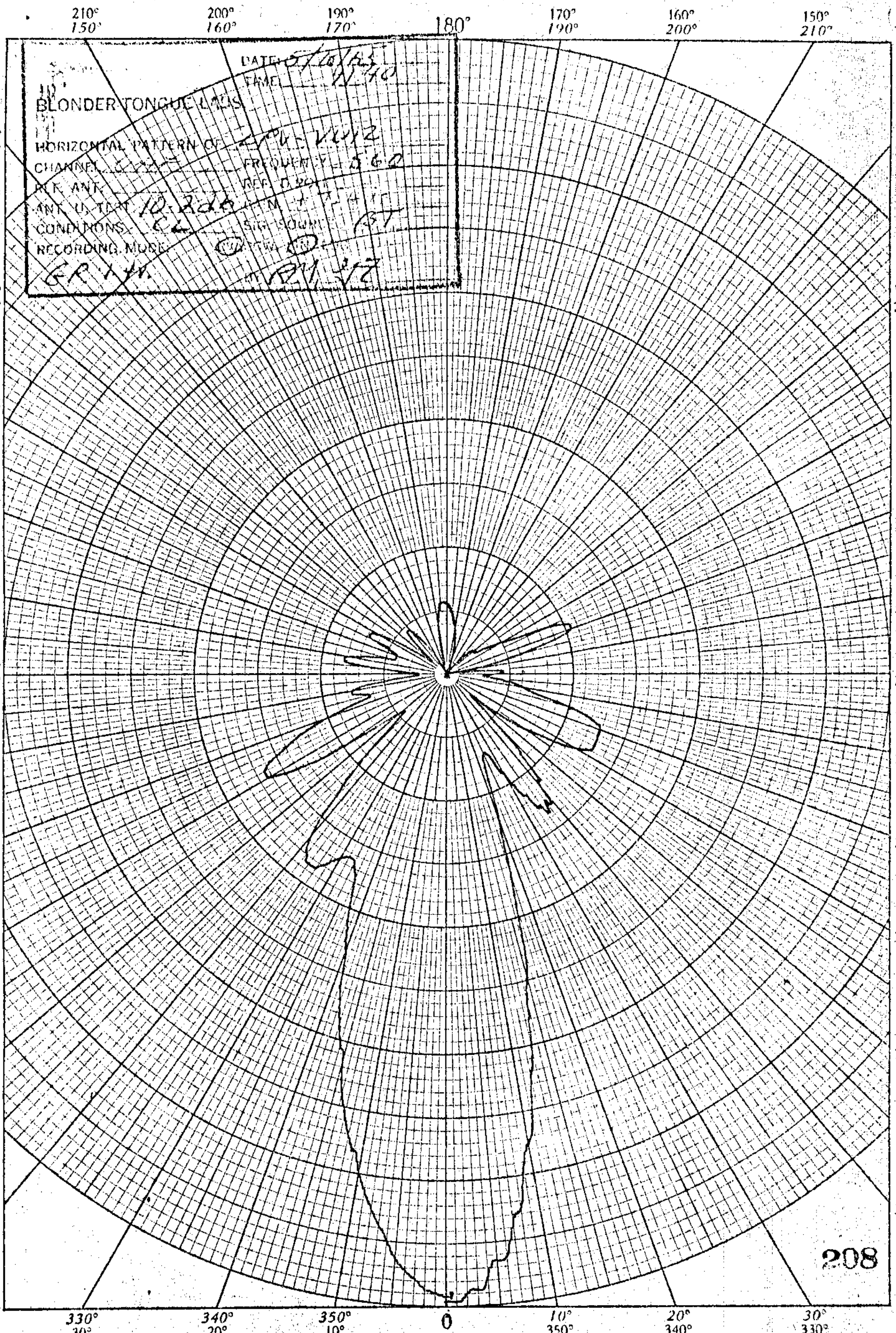
REF. ANT. ADJ. DIPOLE

ANT. U. TEST 7.8db GAIN [illegible]

CONDITIONS CL SIG. SOURCE 47

RECORDING MODE CW, CAV, LIN, LOG

GR-VU 17° BY RM [illegible]



BLONDER TONGUE LABS

DATE 5/16/83

TIME 11:40

HORIZONTAL PATTERN OF LPV-VU12

CHANNEL [illegible]

FREQUENCY 560

REF. ANT.

REF. D. POT.

ANT. U. TEST 10-2db

GAIN +7.4

CONDITIONS CL

SIG. SOURCE BT

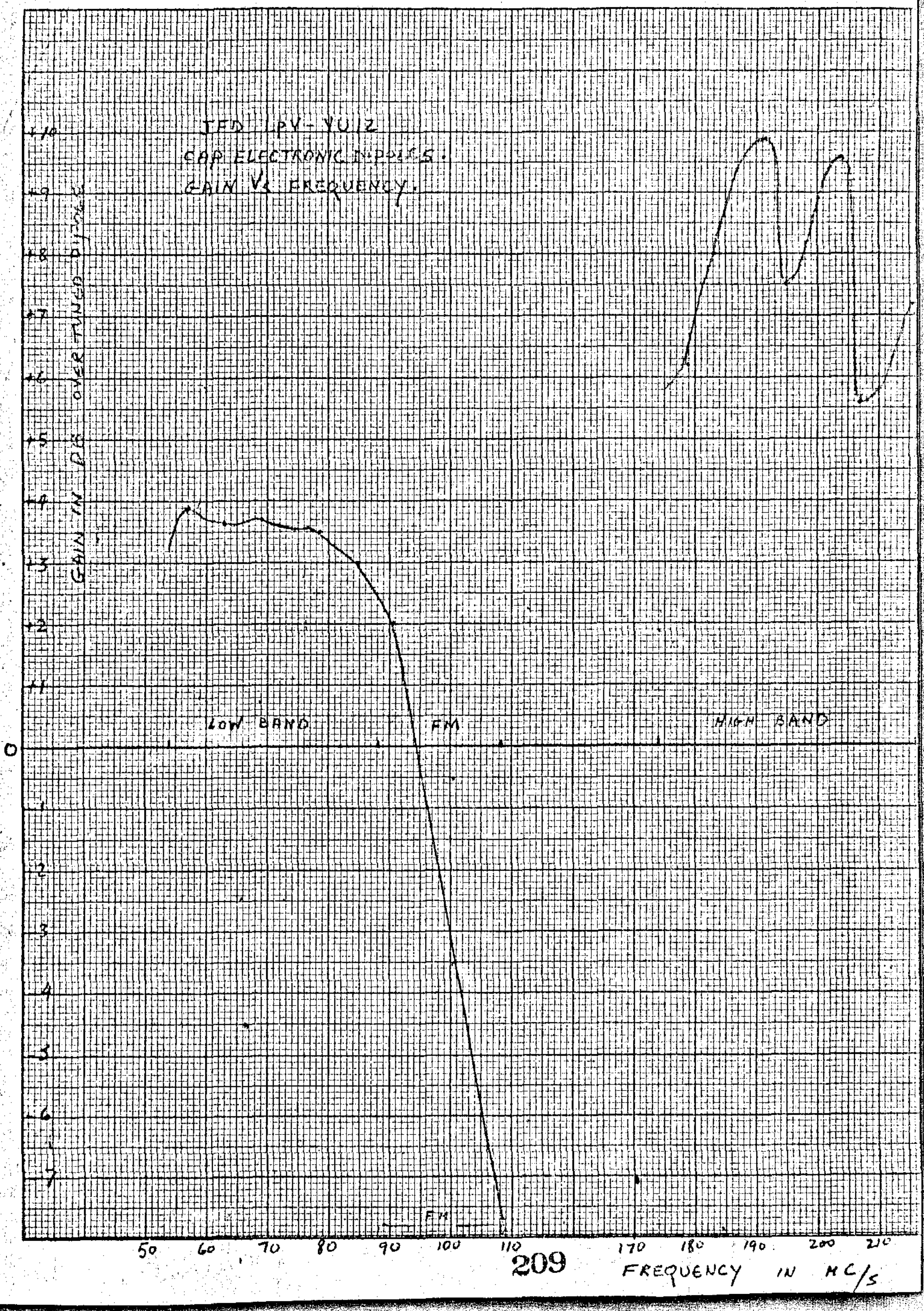
RECORDING MODE [✓ CW] CW

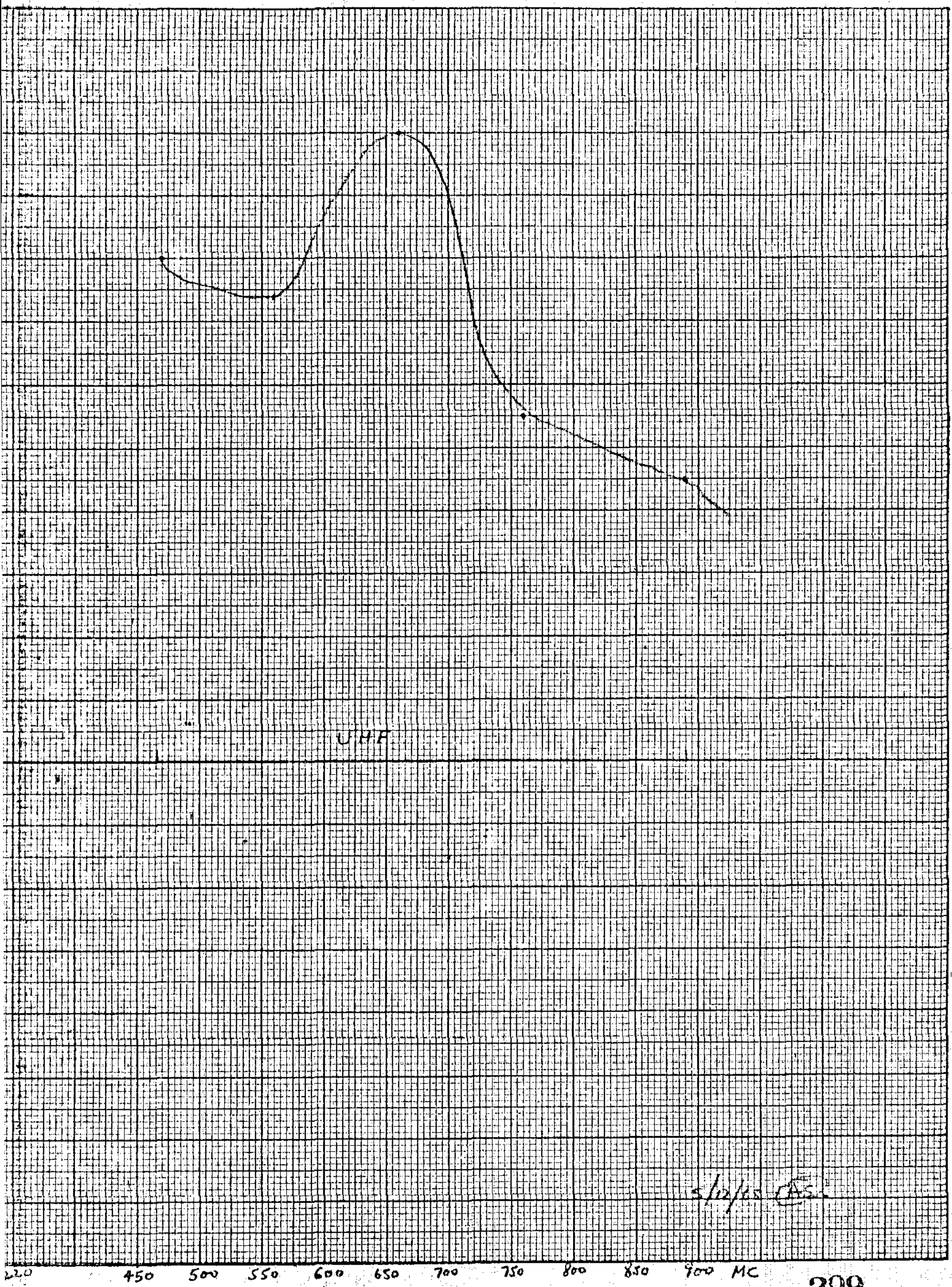
GR 1 hr.

BY RM 3/2

208

K+E POLAR CO-ORDINATE 46 4412
KEUFFEL & ESSER CO. MADE IN U.S.A.


TFD PV-YU12
CAP ELECTRONIC DIPOLES.
GAIN VS FREQUENCY.
GAIN IN DB OVER TUNED DIPOLE
+10
+9
+8
+7
+6
+5
+4
+3
+2
+1
0
-1
-2
-3
-4
-5
-6
-7
LOW BAND
FM
HIGH BAND
FM
50
60
70
80
90
100
110
170
180
190
200
210
FREQUENCY IN MC/S



5/12/65 CAS

Blonder (15)

PREPARED BY: GZ
APPROVED BY: AS (RS)
CHECKED BY: GZ
DATE: 8/16/65

212

PROJECT #1407
MODEL: COLOR RANGER -5
IBM#3524

COMPANY CONFIDENTIAL

1. GENERAL DESCRIPTION:

THE COLOR-RANGER-5 ANTENNA IS A LOG-PERIODIC DESIGN COVERING THE ENTIRE VHF BAND PLUS FM (WITH SLIGHT DEGRADATION) UTILIZING ALL ACTIVE DIPOLE ELEMENTS. THE CR-5 OFFERS GOOD GAIN WITH ADEQUATE SIDE LOBE REJECTION AND FRONT-TO-BACK RATIO. THE U-RANGER (A UHF ADD-ON) IS AVAILABLE AND EASILY AND EFFICIENTLY EXTENDS THE RECEPTION OF THE CR-5 TO COVER ALL UHF CHANNELS (14-83). DUAL BOOM, RUGGED CONSTRUCTION, SPRING-LOADED SNAPLOCKS, STAINLESS STEEL PIERCING WASHERS - AND MANY MORE ELECTRICAL AND MECHANICAL FEATURES, INSURE A QUALITY ANTENNA.

2. ELECTRICAL FEATURES:

2.1 LOG-PERIODIC DESIGN - UTILIZES 5 DIPOLE ELEMENTS

2.2 RECEIVES: VHF-LB (54-88MC)
VHF-HB (174-216MC)
FM (88-108) WITH DEGRADATION IN GAIN

2.3 FLAT RESPONSE - IDEAL FOR COLOR RECEPTION

2.4 PRIMARILY A METROPOLITAN ANTENNA WITH SATISFACTORY PERFORMANCE IN SUBURBAN AREAS.

2.5 GOOD SIDE-LOBE REJECTION.

2.6 ADEQUATE BACK-LOBE SUPPRESSION.

2.7 GOOD DIRECTIVITY

2.8 NO CROSS-OVER NETWORKS

2.9 MINIMUM NUMBER OF JOINTS

2.10 NO RIVET CONNECTIONS - CONDUCTIVE PLATING

2.11 LOW LOSS POLYPROPYLENE INSULATORS

2.12 LARGE STAINLESS STEEL PIERCING WASHERS MAKE DOWNLEAD CONNECTION.

2.13 OBSOLESCENCE PROOF - UHF ADD-ON AVAILABLE (U-RANGER).

3. MECHANICAL FEATURES:

3.1 DUAL BOOM CONSTRUCTION - 13/16" SQUARE (57-15/32" LONG)
3.2 LARGE DIAMETER ELEMENT TUBING - 7/16"
3.3 REINFORCED TUBING AT SNAP-LOCKS (3/8 x 6" INSERT)
3.4 SPRING LOADED, POSITIVE JOINT SNAP-LOCKS.
3.5 CONDUCTIVE, GOLD FINISH, IRIDITE PLATING.
3.6 ONE 3-1/2" STAND-OFF SUPPLIED.
3.7 LARGE STAINLESS STEEL PIERCING WASHERS.
3.8 BACK-UP PLATE FOR REINFORCED MOUNTING.
3.9 RUST-PROOF MOUNTING HARDWARE
3.10 WEIGHT/CARTON: APPROX. 6 LBS. (2,690 GRAMS)
3.11 CARTON DIMENSIONS: 3" x 5-1/2" x 72"
3.12 3-COLOR DISPLAY CARTON.
3.13 PACKAGING - UNIT CARTON
3.14 ILLUSTRATED INSTRUCTION MANUAL SUPPLIED.

4. TABULATED PERFORMANCE*

*MEASUREMENTS OF PRODUCTION SAMPLES.

*THE FOLLOWING MEASUREMENTS REPRESENT PERFORMANCE OF A COLOR RANGER-5 WITHOUT THE ADDITION OF THE "U" RANGER, WHICH WILL SLIGHTLY IMPROVE THE LOW BAND AND FM PERFORMANCE. A REVISED COMPANY CONFIDENTIAL WILL SOON BE ISSUED TABULATING THIS ANTENNA'S PERFORMANCE WITH AND WITHOUT THE "U" RANGER.

CH.#	FREQ. IN MC/S	ABSOLUTE GAIN IN DB (1)	FRONT TO BACK RATIO IN DB	BEAMWIDTH (2)
2	57	+2.75	10.0	79°
3	63	+2.0	11.4	76°
4	69	+2.4	19.2	76°
5	79	+1.75	15.5	76°
6	85	-1.0	11.7	78°
FM	90.6	≈ -1.5	12.4	82°
FM	108	≈ -4.0	3.5	85°
7	179.75	+5.9	22.0	33°
8	183	+7.0	17.0	23°
9	191.75	+7.0	22.0	32.5°
10	195	+6.6	8.0	26°
11	203.75	+5.0	10.5	43°
12	207	+4.5	21.0	38.5°
13	215.75	+4.35	20.0	36°

4. TABULATED PERFORMANCE (CONT.)

4.1 NOTES: 1. GAIN IN DB OVER A TUNED DIPOLE (RETMA STANDARDS)
2. MEASURED AT -3DB POINTS.

4.2 VSWR - (REFERRED TO 300Ω) MATCH RATIO IN PARENTHESIS.

4.2.1 CR-5 WITHOUT "U" RANGER

54-88 MC	3.0 (2:1)
88-108MC	20.0 (1.1:1)
174-216MC	2.3 (2.5:1)

4.2.2 CR-5 WITH "U" RANGER

54-88MC	2.3 (2.5:1)
88-108MC	5.0 (1.5:1)
174-216MC	3.0 (2:1)

PREPARED BY: CZ
CHECKED BY:
APPROVED BY:
DATE: JULY 26, 1965

PROJECT #1476
MODEL: COLOR RANGER 3
IBM #3528

COMPANY CONFIDENTIAL

1. GENERAL DESCRIPTION:

THE COLOR RANGER-3 ANTENNA IS A LOG-PERIODIC DESIGN WHICH COVERS THE VHF LOW BAND, VHF HIGH BAND, PLUS FM (SOME DEGRADATION IN GAIN AT FM) USING 3 DIPOLE ELEMENTS. THE CR-3 IS PRIMARILY A METROPOLITAN ANTENNA, WITH SOME LOSS IN GAIN AT THE VHF LOW BAND AND FM; BUT HAVING FAIRLY GOOD GAIN AT THE VHF HIGH BAND. DIRECTIVITY, ADEQUATE SIDE AND BACK LOBE SIGNAL REJECTION MAKE THE COLOR RANGER-3 A GOOD METROPOLITAN ANTENNA. THE RECEPTION OF THE CR-3 CAN BE EXTENDED TO INCLUDE UHF (CH. 14-83) BY THE ADDITION OF THE "U" RANGER. DUAL BOOM CONSTRUCTION, SPRING-LOADED SNAP LOCKS, STAINLESS STEEL PIERCING WASHERS AND MANY MORE FEATURES HAVE INSURED A QUALITY ANTENNA.

2. ELECTRICAL FEATURES:

2.1 LOG PERIODIC DESIGN - UTILIZES 3 DIPOLE ELEMENTS
2.2 RECEIVES - VHF-LB (54-88MC)
VHF-HB (174-216MC)
FM (88-108MC)
2.3 PRIMARILY A METROPOLITAN ANTENNA, WITH ADEQUATE PERFORMANCE IN SUBURBAN AREAS.
2.4 NO CROSS-OVER NETWORKS.
2.5 MINIMUM NUMBER OF JOINTS.
2.6 LOW LOSS POLYPROPYLENE INSULATORS.
2.7 LARGE STAINLESS STEEL (PIERCING WASHERS 1/2" O.D.) MAKE THE DOWNLEAD CONNECTION.
2.8 OBSOLESCENCE-PROOF - UHF ADD-ON AVAILABLE ("U" RANGER).

3. MECHANICAL FEATURES:

3.1 DUAL BOOM CONSTRUCTION - 13/16" SQUARE X 19-1/8".
3.2 ELEMENT TUBING - 3/8" ALUMINUM.
3.3 REINFORCED TUBING AT SNAP-LOCKS (7/16" X 6" SLEEVE)
3.4 SPRING LOADED, POSITIVE JOINT SNAP-LOCKS.
3.5 LARGE STAINLESS STEEL PIERCING WASHERS (1/2")
3.6 RUST PROOF MOUNTING HARDWARE.
3.7 CARTON:
  3.7.1 3 COLOR DISPLAY
  3.7.2 SIZE: 2-3/8" X 5-1/2" X 62-1/2" (APPROX. 1,025 CU. IN.)

3. MECHANICAL FEATURES: (CONT.)

3.8 PACKAGING: UNIT CARTON

3.9 COMPARISON: SEE COMPANY CONFIDENTIAL ON COLOR RANGER 5 AND COLOR RANGER 10.

4. TABULATED PERFORMANCE*

VHF

CH#	FREQ.	ABSOLUTE GAIN (1)	FRONT TO BACK RATIO	BEAMWIDTH (2)
2	57MC	-0.05DB	+2.3DB	88°
3	63MC	-3.3 DB	+3.2DB	88°
4	69MC	-0.2 DB	+3.2DB	90.5°
5	79MC	-2.05DB	+4.5DB	35.5°
6	85MC	-5.76DB	+4.0DB	87.5°
FM	90.6MC	-5.6 DB	+4.6DB	82.5°
FM	108 MC	-3.9 DB	+3.2DB	69°
7	179.75MC	+3.5 DB	+3.8DB	32.5°
8	183 MC	+4.7 DB	+4.4DB	31°
9	191.75MC	+4.7 DB	+5.7DB	32°
10	195 MC	+5.2 DB	+6.7DB	32°
11	203.75MC	+5.4 DB	+ 8 DB	33°
12	207 MC	+5.5 DB	+3.6DB	31°
13	215.75MC	+5.45DB	+13.7DB	33°
WITH "U" RANGER				
UHF	470MC	+4.05DB	+14.8DB	74°
	560MC	+4.9 DB	+ 28 DB	53°
	660MC	+6.0 DB	+ 30 DB	52°
	760MC	+5.6 DB	+ 24 DB	62°
	890MC	+6.35DB	+ 35 DB	67°

NOTES: 1. GAIN IN DB OVER A CALIBRATED REFERENCE ANTENNA. (SECONDARY STANDARD)

2. MEASURED AT -3DB POINTS.

*BY ACTUAL FREE SPACE MEASUREMENT.

(171)

PLEASE RETURN THIS

217 *Speed Reply*

◄ ◄ ◄ ◄ TO WES

3/12/65
DATE

ENGINEERING DEPARTMENT

BLONDER-TONGUE LABORATORIES, INC.

9 ALLING STREET, NEWARK, N. J. 07102

To WES → G. → H.G.
3/18/65 MARKETING
↓
3/18/65 WES.

SUBJECT
Boom Label
5 & 9 Element
Antennas

Message

FOR CONSIDERATION, ETC

PLEASE APPROVE AND/OR COMMENT.

NEED NO LATER THAN 3/19/65

SIGNED

ORIGINATOR — DO NOT WRITE BELOW THIS LINE

Reply

TO ______________________ DATE ____________

SIGNED

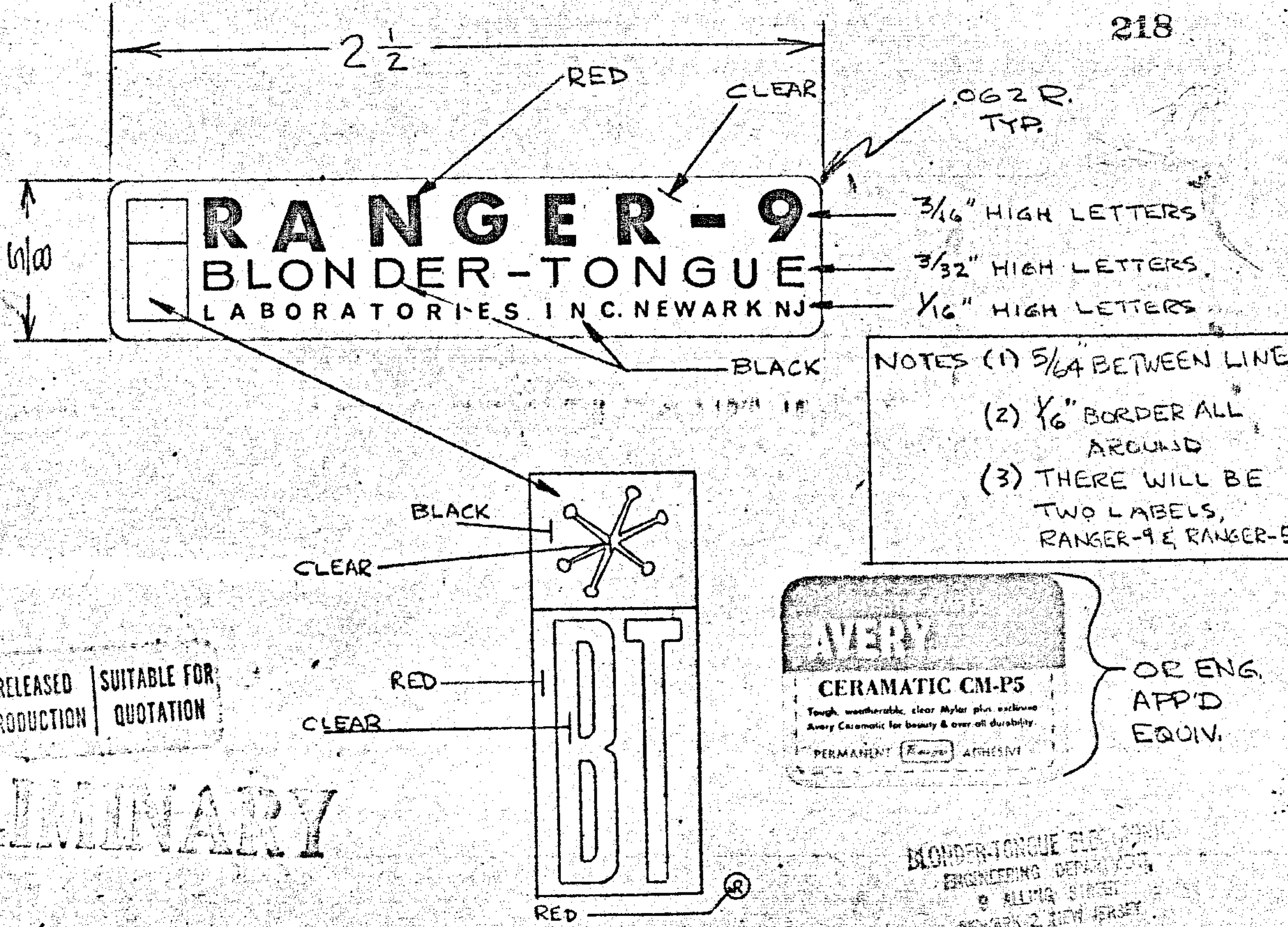
103 SR

ADDRESSEE — *RETURN WHITE COPY*

ORIGINATOR FOLD MARKS

ADDRESSEE FOLD MARKS

17



NOTES (1) 5/64 BETWEEN LINES

(2) 1/16" BORDER ALL AROUND

(3) THERE WILL BE TWO LABELS, RANGER-9 & RANGER-5

NOT RELEASED FOR PRODUCTION | SUITABLE FOR QUOTATION

PRELIMINARY

BLONDER-TONGUE ELECTRONIC
ENGINEERING DEPARTMENT
9 ALLING STREET
NEWARK 2 NEW JERSEY

EJG 3/12/65

BLONDER-TONGUE SYSTEMS, INC.
9 ALLING STREET
NEWARK 2, N. J.

55-2
212

20

The Sum [illegible] 5 [illegible] 00 cts

221

Pay

DISCOUNT	VOUCHER NO.	CHECK NO.	DATE	AMOUNT
		177	9/16/63	1965.00

TO THE ORDER OF

Liberty Mold & Duplicating Co.
80 Fadem Road
Springfield, New Jersey

ACCT. NO.	DATE	INVOICE NO.	AMOUNT	TOTAL	VO. NO.
350	8/16/63	581	1965.00	~~19165~~ 1965.00	VR8-19

PAID
9·17·6

BLONDER-TONGUE SYSTEMS, INC.

Received From [illegible] Mold & Duplicating Co.

☐ Partial 222 No. 60522
☒ Complete Date 8-16-63 196

PUR. ORDER NO.	VIA ☐ Freight ☐ Express ☐ Truck ☐ P. P.	WAYBILL NO.	NO. PKGS.	WEIGHT	TRANS. CHARGES
F19469-T	Carrier Vendor	—	1		$

☐ STOCK ☐ SHIPPING ☐ OFFICE ☐ LAB. ☐ MAINT. ☐ OTHER ☐ Prepaid Collect ☐ Cash ☐ Charge

RECEIVING DATA

PART NO.	1.	2.	3.	4.	5.
QUANTITY RECEIVED	1 -	Complete	Mold		
QUANTITY PURCHASED					
OVER		(repair)			
SHORT					
WEIGHT & CARTONS					

AUDIT

INCOMING INSPECTION DATA

INSPECTION REPORT NO.					
INSPECTION COMPLETED					
INSPECTOR					

REMARKS

RR-101-5M-128

ANOTHER QUALITY PRODUCT of WATSEKA ILL.

AUDIT

Received From Federated Mold & Duplicating Co

☐ Partial 223 No. 60554
☒ Complete Date 8-22- 1963

PUR. ORDER NO.	VIA ☐ Freight ☐ Express ☐ Truck ☒ P. P.	WAYBILL NO.	NO. PKGS.	WEIGHT	TRANS. CHARGES
F20318.	Carrier Vendor		1		$

☐ STOCK ☐ SHIPPING ☐ OFFICE ☐ LAB. ☐ MAINT. ☐ OTHER ☐ Prepaid Collect ☐ Cash ☐ Charge

RECEIVING DATA

PART NO.	1.	2.	3.	4.	5.
QUANTITY RECEIVED	1- Complete	mold -	Clamp outdoor	V.H.	Antenna
QUANTITY PURCHASED					
OVER		Note -	This is a repair.		
SHORT					
WEIGHT & CARTONS					

INCOMING INSPECTION DATA

INSPECTION REPORT NO.					
INSPECTION COMPLETED					
INSPECTOR					

REMARKS

RR-101-5M-123

ANOTHER [illegible] PRODUCT • WATSEKA, ILL.

PURCHASE ORDER

2-0

DATE	RECEIVING NO.	QUANTITY	DATE	RECEIVING NO.	QUANTITY	DATE	RECEIVING NO.	QUANTITY
							224	
			8/16/63	60522	1			

F 20318-799

TO: Liberty Mold & Duplicating Co.
[illegible] Road
Springfield, New Jersey

D 350

DATE 6/28/63

SHIP TO: 1181 McCarter Highway
Newark, New Jersey

ATT: Mr. C. Poschner

TERMS	F.O.B.	SHIP VIA
	Delivered	Your truck

OUR PART NO.	QUANTITY	DESCRIPTION	PRICE
629819		This is your authorization to build one (1) two cavity injection mold for clamp, outdoor antenna, per Dwg. 61-1352-B enclosed. This mold to be used in our Van Dorn H-200 molding machine	$1965.00
		Confirming phone order to Mr. Poschner - 6/27/63	
		DELIVERY SCHEDULE Ship to arrive in our plant: Aug. 19, 1963	

PAID
[illegible]

JECT TO CONDITIONS
TED ON REVERSE SIDE
umber must appear on
Packing Slips & Corr.

David H. Rubin
AUDIT

ELECTROCOMP, INC.

PURCHASING AGENT

20

LIBERTY MOLD & DUPLICATING CO.
225
Complete Services for the Plastic and Die Casting Industry
ENGINEERING • DUPLICATING & ENGRAVING • HOBS & HOBBING • ELECTRIC DISCHARGE MACHINING
80 FADEM ROAD • SPRINGFIELD, NEW JERSEY • DRexel 6-8300

Invoice № 581

Invoice Date	August 16, 1963
Your Pur. Order #	E 20318-799
Your Molding Order #	
Your Tool Order #	
Your S. O. #	
Your Dept. No.	
Our S. O. #	485-63
Typed by	cm

Terms: Net 30 Days NO DISCOUNT

Sold to

Electrocomp, Inc.
9 Alling Street
Newark, New Jersey

D 350

Via

This is your authorization to build one (1) ~~xxx~~ two cavity injection mold for clamp, outdoor antenna, per drawing # M-1552-B enclosed. This mold to be used in our Van Dorn H-260 molding machine ✓ $ 1,965.00

RECEIVED
AUG 19 1963

N

Due Date 9/16			
Rec'd. 1/3	Price ✓		
Inv. Date 8/16	Inv. Number 581		
INVOICE AMT.	$ 1965	¢ —	
Account Number D350	G/L Amt. $ 1965	¢ —	
Account Number	G/L Amt. $	¢	
P/O #	Ext.		

"Seller represents that with respect to the production of the article and/or the performance of the services covered by this Invoice, it has fully complied with section 12(a) of the Fair Labor Standards Act of 1938 as amended."

LMB 1M 12-62

Engineering Dept. Memo #78

To: George Kaplan June 30, 1965

From: Abe Schenfeld

Subject: Antenna Field Trip to Georgia (June 8 - June 11)

1. Arrival and Pre-Testing Conference

1.1 Upon arrival at Atlanta Airport, we drove directly to the Specialty Distr. Co. and met J. E. Eaton (Stumpy), General Sales Manager, and Hershall Bagwell, Manager of the Atlanta Branch.

.2 We assembled a Color Ranger-5 and a U-Ranger and pointed out all the features.

.3 Stumpy then suggested we start our field testing in North Atlanta.

2. First Location -- Northwest of Atlanta

2.1 We met W. E. Kaylor, Manager of Specialty Distr. Branch.

2.2 We were introduced to the local dealer and learned that a severe ghost problem exists throughout the area on Channel 2 a major color station (hills and tall trees throughout). Other channels in the area are 5 and 11.

2.3 We learned that most new installations are for color sets.

2.4 Most installations use the Channel Master Cross Fire Series antennas as they found to reject ghosts best of all other antennas.

2.5 The JFD LPV series has poor lobe rejection.

2.6 The test was conducted at a new color installation, a one-story private home. A Channel Master 3605 7 elements was installed but didn't eliminate the reflections entirely.

2.7 After viewing the picture, we installed the Color Ranger-5 on a portable pole slightly under the height of the existing antenna and approximately 15 feet away from it in line with the transmitter.

2.8 The dealer and two of his servicemen claimed that our Color Ranger-5 performs slightly better than the Channel Master 7 element antenna for ghost rejection on Channel 2 and delivered slightly crisper signals on Channels 5 and 11.

2.9 THE COLOR RANGER-10 WAS SUBSTITUTED FOR THE COLOR RANGER-5 AND ODDLY ENOUGH DID NOT SHOW AN IMPROVEMENT ON CHANNEL 2 OVER THE COLOR RANGER-5. (THE COLOR RANGER-10 HAS AT LEAST 10DB BETTER BACK LOBE REJECTION).

3\. SECOND LOCATION -- MARIETTA

3.1 WE MET MR. DUPRI, DEALER

3.2 MR. DUPRI INFORMED US THAT THERE IS A SEVERE GHOST PROBLEM ON CHANNEL 2.

3.3 MR. DUPRI TRIED ALL ANTENNA AND FOUND CHANNEL MASTER CROSS FIRE SERIES TO PERFORM BEST.

3.3.1 HE CANNOT USE THE JFD LPV IN MOST OF HIS LOCATIONS. HE FOUND THAT THE JFD LPV HAS MORE GAIN IN THE HIGH-BAND THAN THE CHANNEL MASTER ANTENNA.

3.3.2 HE FOUND THE WINEGARD ANTENNAS TO HAVE LARGE VARIATION IN GAIN, AND THEY DROP SHARPLY IN GAIN ON CH-6. (WE SUBSTANTIATED HIS OBSERVATION IN THE LAB).

3.3.3 MOST NEW INSTALLATIONS ARE COLOR SETS.

3.3.4 THE CHANNELS IN THE AREA ARE 2, 5, 11, 30. CH-30 IS AN EDUCATIONAL CHANNEL AND IS NOT POPULAR AT ALL.

3.4 THE TEST WAS CONDUCTED AT A NEW INSTALLATION (COLOR SET). A CHANNEL MASTER 3604 11 ELEMENTS ALREADY INSTALLED AND A SLIGHT GHOST ON CHANNEL 2 WAS OBSERVED.

3.5 THE COLOR RANGER-10 WAS SUBSTITUTED FOR THE EXISTING ANTENNA AND WAS RATED TO PERFORM APPROXIMATELY THE SAME AS THE CHANNEL MASTER 11 ELEMENTS.

3.6 MR. DUPRI SHOWED ENTHUSIASM. HIS REASON WAS THAT AS A LOG-PERIODIC IT PERFORMED BETTER THAN THE JFD ANTENNAS, HAD MORE H.B. GAIN THAN THE C.M. AND THE SAME LOBE REJECTION.

HE INDICATED THAT HE WOULD LIKE TO TRY OUR ANTENNAS IN OTHER LOCATIONS AND GRAHAM SISSOM PROMISED TO SUPPLY HIM WITH A FEW ANTENNAS.

4\. THIRD LOCATION -- ROME

4.1 ROME IS SITUATED APPROXIMATELY HALF WAY BETWEEN ATLANTA AND CHATTANOOGA, TENNESSEE, 60 MILES FROM EACH.

4.2 RECEPTION IS: CH 3, 9, 12 FROM CHATTANOOGA AND
CH 2, 5, 11 FROM ATLANTA.

CH 2 FROM ATLANTA IS A MAJOR COLOR STATION. SINCE HALF OF THE TOWN (50,000 POP.) IS BLOCKED AND CANNOT RECEIVE CH 2 FROM ATLANTA, THEY HAVE TO RELY ON CH 3 (COLOR) FROM CHATTANOOGA. A SEVERE GHOST PROBLEM EXISTS ON CH 3.

4.3 TEST CONDUCTED AT SAVAGE ELECTRONICS AND TV SERVICE (MR. STEVE SAVAGE IS OWNER-DEALER).

4.4 MR. SAVAGE CLAIMS THAT THE C.M. CROSS FIRE 3601 23 ELEMENTS HAS BEST GHOST REJECTION (BUT DOES NOT SOLVE THE PROBLEM COMPLETELY.)

4.4.1 THE JFD LPV-14 HAS BETTER R.B. GAIN AND HE USES IT FOR THE ATLANTA STATIONS ONLY (CH 2, 5, 11).

4.4.2 HE USES THE KAY-TOWNES ANTENNAS WHICH ARE DIRECT COPIES OF THE CHANNEL MASTER 3601 AND THE JFD LPV-14. (THE KAY-TOWNES PLANT IS ONLY A FEW MILES AWAY).

HE AGREES THAT THE KAY-TOWNES ARE SOMEWHAT FLIMSY IN CONSTRUCTION BUT OTHERWISE FOUND TO PERFORM EXACTLY AS THE ORIGINAL MODELS.

4.5 ON HIS TEST SITE HE HAS A FEW C.M. CROSS FIRES AND A FEW LPV-14'S MOUNTED WITH A ROTATOR TO ORIENT THE ANTENNAS TOWARD ATLANTA OR CHATTANOOGA.

4.6 A DIRECT COMPARISON BETWEEN THE C.M. 23 ELEMENTS AND THE COLOR RANGER-10 (SAME MAST) SHOWED THAT THE C.M. ANTENNA HAD A BETTER GHOST REJECTION ON CH 3. ALL OTHER CHANNELS WERE APPROXIMATELY THE SAME. (SEE CHART).

4.7 A DIRECT COMPARISON BETWEEN A JFD LPV-14 COPY BY KAY-TOWNES AND THE COLOR RANGER-10 PROVED OUR ANTENNA TO BE SUPERIOR ON GHOST REJECTION AND GAIN ON CH 3. THE GAIN COULD EASILY BE NOTICED ON THE SCREEN.

4.8 C.M. 23 ELEMENTS VS COLOR RANGER-10

		SIG. LEVEL C.M. 3601 23 EL.		SIG. LEVEL COLOR RANGER-10	
	CHANNEL	PIX.	SOUND	PIX.	SOUND
ATLANTA	2	170µV	165µV	170µV	180µV
	5	140µV	175µV	120µV	130µV
	11	45µV	60µV	53µV	58µV
CHATTANOOGA	3	400µV	250µV	330µV	270µV
	9	110µV	50µV	110µV	30µV
	12	110µV	65µV	110µV	71µV

C.M. 23 ELEMENTS VS JFD LPV-14

CHATTANOOGA

CHANNEL	SIG. LEVEL JFD LPV-14 PIX.	SOUND	SIG. LEVEL C. M. 23 PIX.	SOUND
3	275µV*	225µV	810µV	300µV
9	140µV	65µV	125µV	60µV
12	120µV	25µV	120µV	80µV

* NOTE LOW LEVEL

5. Fourth Location -- Statesboro

5.1 Statesboro is approximately 250 miles south of Atlanta receiving channels 3, 6, 11, approximately 45-50 miles from Savannah and channels 6, 12, approximately 60 miles. (Ch 6 is major color station).

5.2 Location: Oath's TV Sales and Service.

5.3 A Winegard CL-44 antenna with a mast mounted booster and rotator (15db gain, Winegard). Mounted on top of a 70 ft. mast. Additional 25db of amplification is provided at the set location. (Jerrold amp.)

5.3.1 Two stacked conicals (Kay-Townes) mounted approximately 25 ft. on the roof.

5.4 The Color Ranger-10 was mounted approximately 25 ft. high (same height as the stacked conicals).

5.5 The Color Ranger-10 pulled in fairly clean signals and was judged by the chief technician and two servicemen to perform as well as the best antenna tried at this location.

5.6 Color performance (Ch 6) was judged best and was much better than the CL-44 Winegard. (Might be due to the booster on the Winegard).

5.7 The stacked conicals delivered very snowy signals which were completely unviewable. The Color Ranger-10 had at least 6-10db more gain.

6. PRICE COMPARISON

MODEL	LIST	DEALER 12 & UP	DIST.
JFD LPV-11	$39.95	$ 19.98	$14.58
JFD LPV-14	49.95	24.98	17.98
CHANNEL MASTER 3605(7)	14.95	9.00	5.40
CHANNEL MASTER 3604(11)	21.95	13.00	7.92
CHANNEL MASTER 3601(23)	49.95	30.00	17.98
COLOR RANGER-5		144 ANTENNAS	7.50
COLOR RANGER-10		FREIGHT PREPAID	12.80

7. CONCLUSIONS AND OBSERVATIONS

7.1 STUMPY EATON, GENERAL MANAGER OF SPECIALTY DISTR. CO., HERSHALL BAGWELL, MANAGER OF THE ATLANTA STORE AND ALL DEALERS LIKED THE MECHANICAL CONSTRUCTION.

7.2 ALL DEALERS AND TECHNICIANS CLAIMED THAT OUR ANTENNAS PERFORM BETTER THAN THE JFD LPV ANTENNAS, AND THAT THE CHANNEL MASTER CROSS FIRE ANTENNAS HAVE BETTER BACK LOBE REJECTION THAN OUR ANTENNAS.

7.3 DEALERS SEEMED TO HAVE A GOOD, PRACTICAL ANTENNA KNOWLEDGE. THEY ARE FAMILIAR WITH THE MAJOR ANTENNAS ON THE MARKET AND HAVE AN IDEA HOW THEY PERFORM.

7.4 DEALERS SHOWED A GREAT CONCERN OVER THE PERFORMANCE AT EACH HOME INSTALLATION. EVEN WHEN THE CUSTOMER WAS SATISFIED, THE DEALERS HAD TO BE SATISFIED AND DID ALL THEY COULD TO IMPROVE RECEPTION.

7.5 MANY DEALERS SHOWED ENTHUSIASM FOR OUR ANTENNAS AND OFFERED THEIR HELP IN FUTURE TESTS.

7.6 STUMPY EATON CLAIMED THAT THE JFD LPV-11 AND LPV-14 ARE THE BEST SELLERS. HE WAS NOT AWARE OF THE GHOST PROBLEM ON CHANNELS 2 AND 3 THAT EXISTS THROUGHOUT THE AREA, NOR WAS HE AWARE THAT THE CHANNEL MASTER ANTENNAS WERE USED BY THE DEALERS AND SELLING THAT GOOD.

7.7 STUMPY EATON, UPON LEARNING OF THE SUCCESS OF THE CHANNEL MASTER ANTENNAS, INDICATED THAT HE WOULD LIKE OUR ANTENNAS TO PERFORM BETTER.

7.8 JFD ENGINEERS ARE CONSTANTLY MAKING FIELD TRIPS AND ARE FIELD TESTING ANTENNAS AND BOOSTERS.

7.9 THE REMBRANDT INDOOR ANTENNAS ARE GOOD SELLERS IN THE SOUTH. THE SALESMEN ARE GETTING $0.50 FOR EVERY ANTENNA THEY SELL FROM THE MANUFACTURER.

7.10 THE JERROLD COLOR GUARD CAMPAIGN HAS NO IMPACT.

7.11 ROTATOR SALES ARE NOT GOOD.

7.12 IN THE FUTURE, IT SEEMS ADVISABLE TO INVESTIGATE THE PROBLEMS OF THE SPECIFIC MARKET IF WE PLAN TO INTRODUCE AN ANTENNA IN THAT MARKET. THE ESTIMATED SALES FOR THIS AREA (2,000 ANTENNAS PER WEEK) SHOULD HAVE WARRANTED AN INVESTIGATION OF THIS AREA AND WHETHER THE NEED FOR CUSTOM-MADE ANTENNAS WOULD HAVE BEEN TO OUR ADVANTAGE.

7.13 AS A RESULT OF THE ABOVE FINDINGS, A COLOR RANGER-12 WAS DESIGNED (WHICH IS EQUIVALENT OR SUPERIOR IN PERFORMANCE TO THE C. M. 18 ELEMENT ANTENNA) AND SHIPPED TO GRAHAM SISSOM FOR FIELD TESTING.

<u>DISTRIBUTION LIST:</u>

I. BLONDER
J. BALASH
H. GILBERT
D. HELKOSKI
G. KAPLAN
G. SISSOM
B. TONGUE
ALL PROJECT ENGINEERS

MANUFACTURERS REPRESENTATIVE

MIKE STOBIN CO.

14663 Arminta St.
Van Nuys, Calif. 91401
STate 2-9421

July 25, 1966

John Lineman
Blonder-Tongue Laboratories
9 Alling Street
Newark, New Jersey

Dear John:

I attended the AIBTR (American Institute For Better Television Reception) dealer kickoff meeting Wednesday night, and I thought you might like to know what they are doing.

It was a very well attended meeting. Most of the two step distributors were there as well as about 500 to 700 dealer people.

Clancey from JFD made a very nice speech and representatives from all the antenna manufacturers that belong were present. I think we got about as much good out of the thing, because there was very little mention of antenna brands, and I made sure all the distributors saw my face. Antennacraft doesn't belong to the association, but their rep was there too. All the T.V. channels, UHF and VHF will be putting on free 60 second spots pushing new antennas for better reception. They will tell people to call Operator 25, Western Union, after each spot, to get the name of a member dealer near them. Operator 25 has a list of dealers by area and will, on a revolving basis, give the caller two dealers to call.

All sort of advertising material, including bumper stickers will be poured into dealers hands.

This is going to really give the antenna business a shot in the arm. I'm crying in my beer because the majority of our distributors have not yet had the use of the antenna vehicle and won't have until the end of August, which will be when the main push is over.

Regards,

Len

Len Pinkowski

LP/pjm
Enclosures
cc - Graham Sisson
Mike Stobin

AIBTR

DEALER KICK-OFF MEETING

WEDNESDAY, JULY 20, 1966 - 7:00 P.M.

Hollywood Palladium

1 — PERSONAL DISCUSSIONS WITH ENGINEERS FROM ALL TV STATIONS.

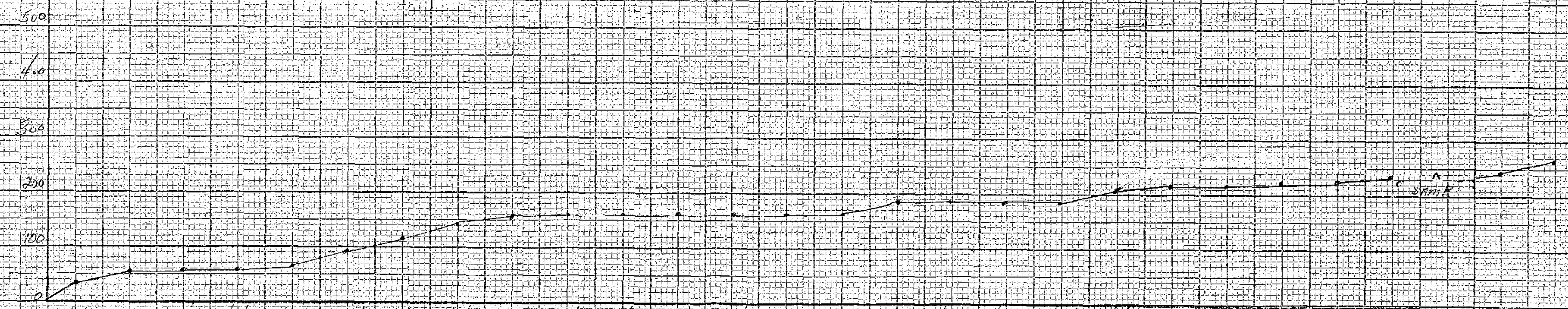
2 — ENTERTAINMENT.

3 — PREVIEW OF ACTUAL SPOTS TO BE TELEVISED.

4 — LEARN HOW YOU CAN GET MAXIMUM BENEFITS FROM THE LARGEST TV ANTENNA CONSUMER PROGRAM EVER.

FREE → *All Dealers Invited* ← FREE

Project #1264
Amplifier Antenna
VHF/UHF ANTENNAS



12/21/62	12/28/62	1/4/63	1/11/63	1/18/63	1/25/63	2/1/63	2/8/63	2/15/63	2/22/63	3/1/63	3/8/63	3/15/63	3/22/63	3/29/63	4/5/63	4/12/63	4/19/63	4/26/63	5/3/63	5/10/63	5/17/63	5/24/63	5/31/63	4/7/63	8 WKS	6/14/63	6/21/63
30½ PL	7 WES	–	–	16½	24	30¼	32	9½	–	–	–	–	–	–	31½	–	–	–	1¼ HS	1¼ S.B	–	3 S.B	–	1½ S.B		3 S.B	11 PL
1 IK 8 WES	5½ PL	52	52	11½	24	30¼	32	9½	154–	154–	154–	154–	154–	154–	31½	185½	185½	185½	4 S.B. 4½ WES	6½ WES 4 AS	219–	3¾ WES	225¾	6¾ WES		2 R.L. 4 WES	4¾ WES
39½	12½			52	68½	92½	122¾	144¾							154–				2 S.L.	11¾		6¾		7¼		9–	6 AS
	39½			63½	92½	122¾	144¾	154–							185½				21¾	207¼		219		225¾		233–	6 HS
	52																		185½	219–		225¾		233–		242–	27¾
																			207¼								242–
																											269¾

Early dates of
invention

AMERICAN INSTITUTE FOR BETTER TELEVISION RECEPTION

ACCREDITED
RECEPTION
SPECIALIST

INDUSTRY APPROVED