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NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report on

# Repair of Model OA Antenna Measuring Equipment Type 4360, Serial #1 Assigned to Navy Yard, Pearl Harbor.

NAVAL RESEARCH LABORATORY
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WASHINGTON,D.C.

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## TABLE OF CONTENTS


| | SUBJECT | PAGE |
|---|---|---|
| 1. | AUTHORIZATION | 1 |
| 2. | OBJECT | 1 |
| 3. | ABSTRACT | 1 |
| | (a) Conclusions | 1a |
| | (b) Recommendations | 1a |
| 4. | DESCRIPTION OF MATERIAL UNDER TEST | 2 |
| 5. | METHOD OF TEST | 2 |
| 6. | DATA RECORDED DURING TEST | 2 |
| 7. | PROBABLE ERROR OF MEASUREMENT | 2 |
| 8. | RESULTS OF TESTS | 2 |
| 9. | CONCLUSIONS | 5 |


### Appendices


| | | |
|---|---|---|
| Data on Accuracy of Capacity and Resistance Measurement OA 4360, Ser. #1 | Table 1 | |
| Data on Capacity Range Measurable at Certain Frequencies | - | 2 |
| Data on Capacity and Resistance Measurements with External Loading Coil as well as Internal Loading Coil | - | 3 |


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AUTHORIZATION

1. This problem was authorized by Bureau letter, reference (a) and additional references pertinent to this problem follow as references (b) to (d) inclusive.

Reference: (a) Bueng.let.NR90/S67(8-1-W8) of 27 Sept. 1934.
(b) Comdt.Navy Yard,Pearl Harbor, let. NR90/S67(43)(15106CW) of 1 Aug. 1934 to Bueng.
(c) Specifications RE 13A 413B.
(d) NRL Report of 10 April 1933 on Problem M6-1.

OBJECT

2. The object of the test was to repair any damage which the antenna measuring equipment may have suffered in the past and to compare the performance of the set from Pearl Harbor, Serial #1, with the set Serial #6 already at the Naval Research Laboratory. The sets, hereinafter, will be referred to as #1PH and #6NRL.

ABSTRACT OF TEST

3. The Set #1PH was repaired mechanically and electrically and tested for accuracy of measurements of capacity and resistance. A number of mechanical defects were found and repaired. Serial #1PH was compared to Set #6NRL and both were tested using certain external loading coils as well as the internal loading coils mounted in the sets.

CONCLUSIONS

(a) Set #1PH has been repaired and is now in proper operating condition.

(b) The Set #1PH was found to operate with approximately the same degree of accuracy as was found to exist for Set #6NRL.

(c) The accuracy is not that required by the specifications but is as good as can be expected from the present equipments.

(d) The accuracy of these sets, however, is not as good as was found for the preliminary models which this Laboratory had an opportunity to test.

RECOMMENDATION

(a) It is recommended that there be manufactured a set of low loss or low resistance inductance coils for each equipment which can be used as External Loading Coils in place of the Internal Loading Coils which are incorporated in the equipments. The accuracy of both capacity and resistance measurements would be improved sufficiently to warrant the use of such coils, particularly in the case of antennae having effective resistances of less than 5 ohms. Even with the use of the external coils, however, the percentage accuracy of the resistance measurements for low antenna resistances will not be great, and the results will be of a qualitative rather than a quantitative nature. For values greater than 5 ohms the accuracy will approach that of the specifications.

DESCRIPTION OF MATERIAL UNDER TEST

4. The material under test was Model OA antenna measuring equipment type CAG-4360, Serial #1 and Serial #6. The frequency range of these sets is from 16 Kcs to 170 Kcs.

METHOD OF TEST

5. The method used in the Model OA type 4360 antenna measuring equipment is a direct substitution method. A radio frequency voltage is fed through an adjustable loading inductance and an antenna tuning condenser to the antenna. The antenna tuning condenser is adjusted until the system is resonated to the impressed frequency. The magnitude of the impressed voltage is read on a vacuum tube voltmeter used in place of a current indicating instrument. As a second step, a transfer switch throws the impressed voltage from the antenna to an adjustable phantom condenser and decade resistance box, both contained within the set and both of which are adjusted until the vacuum tube voltmeter reading is the same as it was in the first case.

6. When external loading coils were used, a decade resistance box was placed in series with the coil so that on transferring from the internal loading coil to the external, additional resistance might be added to keep the voltage drop constant across that portion of the circuit. The necessary additional resistance gave directly the difference in the resistance of the two types of loading coils. For this work, condensers of known capacity and resistance at the frequencies of test were used in place of antennae.

DATA RECORDED DURING TEST

7. The data recorded in the tests are given in Tables 1 to 3.

PROBABLE ERROR OF MEASUREMENT

8. The capacities tested were known to 0.1% and the resistances to 10%.

RESULTS OF TESTS

9. A thorough mechanical and electrical inspection was given the Model OA equipment type 4360 Set #1. This set #1PH was found to have a number of defects, any combination of which might have been the cause of erratic results or of making it appear that the set was inoperable. One of

the fixed condensers making up the Phantom Condenser Bank tested as having an open circuit. There was an intermittent contact in one of the fixed condensers of the Antenna Tuning Capacitor Bank. The transfer switch permitting the change from the real antenna to the phantom circuit did not make good contact, and on one terminal of the switch there was so much solder that occasionally a slight pressure on the handle or knob of the switch resulted in a shorting to ground of the antenna. Likewise, the switch permitting a transfer from an Internal Loading Coil to an External one did not make good contact. The switch blades and studs of the Antenna Tuning Step Capacitor switch, of the Internal Load Selector switch and of the Oscillator Coil Selector switch had to be disassembled and cleaned. In a part of the Oscillator Coil Selector switch it was found that one set screw was completely out and the other set screw so loose as to be useless. To repair this is a major operation, and either more care must be exercised in the assembly of such an inaccessible switch or else all such switches must be located in an easily accessible spot. Furthermore, the connection from the Internal Loading Coil Tap #9 to the switch stud had broken loose from the lug.

10. Having located and repaired these defects, the measurements set forth in Table 1 were taken on Serial #1PH. The capacity chosen to be measured was of the order of magnitude of one antenna capacity at Pearl Harbor. Additional resistances were added at the low frequency to approximately cover the range of values which were considered reasonably normal ones. The table shows that the error in the measurement of capacity is uniformly small and is approximately constant at those frequencies for which the antenna is used. The resistance values, however, are uniformly high in value, and the error either on a percentage basis or in absolute magnitude is extraordinarily large.

11. The magnitude of the error of measurement with the equipments varies throughout the frequency range with the particular combination of capacity and resistance being measured, and no single value should be expected to apply for all conditions.

12. Table 2 indicates the range of capacity which may be measured at a given frequency using the internal loading coils supplied with the equipment and under the condition that the comparator meter shall read at least 1/3 of the full scale value, which in itself is not sufficient for accurate measurements. The latter part of the table shows that by the use of two external loading coils the

range of values may be increased.

13. This limitation of the capacity range which could be measured at certain frequencies was likewise noticed on set #6NRL.

14. In the preliminary models submitted for test before the production sets were made, this limitation was not observed and its existance in both set #1PH and #6NRL led to the assumption at first that the oscillator output must be low.

15. Investigation showed that this was not the case but that the trouble lay in the unusually high resistance of the internal loading coils. Two coils of the Universal wound type were obtained which had the same inductance as the Internal Load Coils #1 and #7 of set #1PH. These inductances were 20.7 millihenries and 1.13 millihenries respectively. When these Universal wound coils were compared to the corresponding internal loading coils of the two sets, it was found that the large coil had from 55 to 60 ohms and the small coil 38 to 42 ohms less resistance than either corresponding internal coil of the two sets. The ratio of coil resistances, internal to external, was approximately 7 to 1 in the case of the large coil and 4 to 1 in the case of the small coil.

16. Table 3 records the results of measurements taken on each set. A given capacity was measured at the same frequency using, first, a Universal wound coil externally and, secondly, the internal loading coil supplied. Not only is there an improvement in the accuracy of the capacity measurement to a very appreciable degree, but the extraordinarily marked increase in the accuracy of resistance measurements indicates that such coil resistances as exist at present in the sets can not be tolerated. As indicated in the last column, one of the major difficulties in using the internal loading coils in these cases is the greatly reduced comparator reading. The reduction is so great that normally one would say that the measurement could not be made at all.

17. Since, in the examination of the preliminary model no suspicion arose as to high resistance of the loading coils no tests were made to cover this point, and it is not known in what respect the loading coils of the production equipments differ from those in the model.

18. Under the present circumstances, the simplest way to gain an increase in accuracy with these sets is to make up a series of coils of inductance corresponding to the internal loading coils and use the coils externally, or in case of a transmitting antenna use the actual loading

coil of the transmitting set itself. The oscillator is shielded from the loading coil, even though this is used externally, so that no trouble should be experienced from that source, and any other interfering voltage will be picked up by the antenna itself and will give as much trouble as though it were picked up by the loading coil.

19. It is of the utmost importance that all the phantom circuit elements shall be of the lowest possible resistance. This method of measurement essentially determines the difference in resistance between the real antenna and phantom condenser which is substituted. In order that the greatest possible change shall be registered on the comparator meter, which is the means of indicating the difference, the circuit resistance exclusive of the antenna or phantom condenser should be small enough so that at least a ten per cent change in the phantom resistance should be observable for any antenna resistance greater than 1 ohm. Since the smallest phantom resistance steps are of 0.1 ohm values, for any antenna resistances less than 1 ohm the percentage error must be increasingly larger as the value decreases, unless one resorts to interpolation of the comparator meter reading.

CONCLUSIONS

20. Set #1PH has been repaired and is now in proper operating condition.

21. The set #1PH was found to operate with approximately the same degree of accuracy as was found to exist for set #6NRL.

22. The accuracy is not that required by the specifications but is as good as can be expected from the present equipments.

23. The accuracy of these sets, however, is not as good as was found for the preliminary models which this Laboratory had an opportunity to test.

TABLE 1

Data on Accuracy of Capacity and Resistance Measurement
OA 4360, Serial #1
Capacity being measured = 10,224 Mmfd.

| Freq.in Kcs. | Load Coil | Phantom Capacity | Capacity error in % | Resistance added in addition to condenser resistance | Total of condenser resistance and added resistance | Apparent resistance as measured by set. | Resistance error in % |
|---|---|---|---|---|---|---|---|
| 20 | 1 | 9898 | -3.2 | 0.0 | 0.24 | 2.3 | +858 |
| 20 | 1 | 9868 | -3.5 | 0.4 | 0.64 | 2.6, 2.2 } 2.4 | + 275 |
| 20 | 1 | 9935 | -2.8 | 0.8 | 1.04 | 2.2, 3.2, 3.4, 3.0 } 2.95 | + 184 |
| 20 | 1 | 9850 | -3.7 | 1.2 | 1.44 | 3.8, 3.4 } 3.6 | + 150 |
| 25 | 2 | 9856 | -3.7 | 0 | 0.19 | 2.4 | + 1165 |
| 30 | 3 | 9897 | -3.2 | 0 | 0.16 | 2.1 | + 1210 |
| 35 | 4 | 9858 | -3.7 | 0 | 0.14 | 2.35 | + 1580 |
| 50 | 5 | 9948 | -2.7 | 0 | 0.10 | 1.63 | + 1500 |
| 75 | 6 | 9406 | -8.0 | 0 | 0.065 | 3.26 | + 5010 |
| 100 | 7 | 9136 | -10.6 | 0 | 0.05 | 3.55 | + 7000 |

TABLE 2

Data on Capacity Range Measurable at Certain Frequencies.

| Freq. in Kcs. | Load | Capacity in Mmfd. Maximum | Minimum |
|---|---|---|---|
| 16.65 | Internal | 24,400 | 14,200 |
| 20.4 | " | 17,700 | 5,100 |
| 23.5 | " | 13,900 | 3,100 |
| 27.5 | " | 20,800 | 2,000 |
| 36.0 | " | 16,300 | < 1,000 |
| 48.7 | " | 17,700 | < 1,000 |
| 100.0 | " | 6,600 | < 1,000 |
| 170.0 | " | 6,600 | < 1,000 |
| 16.65 | External Univ.Coil (20.7 mh) | 30,200 | 14,600 |
| 16.65 | Internal Coil #1 | 24,400 | 14,200 |
| 160.0 | External Univ.Coil(1.13 mh) | 8,600 | < 1,000 |
| 160.0 | Internal Coil #7 | 3,300 | < 1,000 |

TABLE 3

Data on Capacity and Resistance Measurements with External Loading Coil as well as Internal Loading Coil.

| Set No. | Freq. in Kcs. | Load | Phantom Capacity | Cap. error in % | Apparent resistance by set. | Resistance error in % | Comparator reading, 15 ma full scale |
|---|---|---|---|---|---|---|---|
| Capacity being measured 29,000 mmfd. R of condenser = 0.42 ohms. | | | | | | | |
| 1 PH | 19.8 | Universal Coil 20.7 mh | 28,320 | -3.1 | 0.86 | +105 | 1.32 ma |
| | | Internal Coil #1 | 24,320 | -16.8 | 16.06 | +3,730 | 0.18 |
| Capacity being measured 22,500 mmfd. R = 0.2 ohms. | | | | | | | |
| 1 PH | 17.8 | Universal Coil 20.7 mh | 22,400 | -0.44 | 0.59 | +195 | 1.49 |
| | | Internal Coil #1 | 21,050 | -6.9 | 4.09 | +1,940 | 0.26 |
| 6NRL | 17.8 | Universal Coil 20.7 mh | 22,200 | -1.3 | 0.66 | +230 | 1.48 |
| | | Internal Coil #1 | 21,150 | -6.0 | 3.66 | +1,730 | 0.19 |
| Capacity being measured 5,000 mmfd. R = 0.62 ohms. | | | | | | | |
| 1 PH | 150 | Universal Coil 1.13 mh | 4,924 | -1.5 | 1.55 | +158 | 1.45 |
| | | Internal Coil #7 | 4,555 | -8.9 | 5.55 | +826 | 0.21 |
| 6 NRL | 150 | Universal Coil 1.13 mh | 4,911 | -1.8 | 1.65 | +183 | 1.45 |
| | | Internal Coil #7 | 4,358 | 12.8 | 7.35 | +1,125 | 0.10 |

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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report on

# Test of Class I-A and II-A Receiving Equipments modified as of 1 February 1935.

NAVAL RESEARCH LABORATORY
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TABLE OF CONTENTS


| Subject | Page |
|---|---|
| 1. AUTHORIZATION OF TEST | 1 |
| 2. OBJECT OF TEST | 1 |
| 3. ABSTRACT OF TEST | |
| (a) Conclusions | 4a |
| (b) Recommendations | 4b |
| 4. MATERIAL UNDER TEST | 5 |
| 5. METHOD OF TEST | 5 |
| 6. DATA RECORDED DURING TEST | 7 |
| 7. PROBABLE ERROR IN RESULTS | 8 |
| 8. RESULTS OF TESTS | 8 |
| 9. SUMMARY OF DEFECTS | 24 |
| 10. CONCLUSIONS | 33 |


APPENDICES


| | Table No. |
|---|---|
| CLASS I-A RECEIVER | |
| Frequency Range and Sensitivity Range and Average Sensitivity | 1 |
| Average Maximum Noise Level and Variation of Each Band | 2 |
| Frequency Overlap | 3 |
| Accuracy of Resetability | 4 |
| Resonant Overload | 5 |
| Frequency Stability vs Line Voltage Change | 6 |
| Frequency Stability vs Change in Regeneration from Optimum to Standard | 7 |
| Frequency Stability vs Trimmer Capacitor Settings | 8 |
| Frequency Stability vs Change in Input Signal Intensity | 9 |
| Frequency Stability vs Change in Volume Control Setting | 10 |
| Peak Frequencies of Variable Attenuators | 11 |
| Attenuation Characteristics of Variable Attenuator | 12 |
| Range of Manual Volume Control | 13 |

CLASS II-A RECEIVER — Table No.


Frequency Range, Sensitivity Range, and Average Sensitivity of Each Band..... 14
Average Maximum Noise Level and Variation of Each Band..... 15
Frequency Overlap..... 16
Accuracy of Resetability..... 17
Resonant Overload..... 18
Frequency Stability vs Line Voltage Change..... 19
Frequency Stability vs Change in Regeneration from Optimum to Standard..... 20
Frequency Range of Wobbler..... 21
Frequency Stability vs. Change in Input Signal Intensity..... 22
Summary of Attenuation Characteristics of Band Pass Filter..... 23
Peak Frequencies of Variable Attenuator..... 24
Attenuation Characteristics of Variable Attenuators..... 25
Range of Manual Volume Control..... 26
Results of Tests on Foil Paper Capacitors, Transformers, Filter and Resistors..... 27
Results of Tests on RF Inductors, Class I-A and II-A Receivers.. 28
Harmonic Interaction - Multiplex Operation, Class I-A and II-A Receivers..... 29
Sensitivity, Class I-A Receiving equipment, using duplicate tubes..... 30
Sensitivity, Class II-A Receiving equipment, using duplicate tubes..... 31


CLASS I-A RECEIVER, Plates 1 to 36 incl.
CLASS II-A RECEIVER, Plates 37 to 82 incl. — Plate No.


Main Tuning Dial Calibration..... 1
Secondary Control Calibrations..... 2
CW Sensitivities - a.c. Operation..... 3
Maximum Noise Level and Maximum Variation in Noise Level..... 4
Selectivity - Band 1 for Optimum Gain..... 5
Selectivity - Band 2 for Optimum Gain..... 6
Selectivity - Band 3 for Optimum Gain..... 7
Selectivity - Band 4 for Optimum Gain..... 8
Selectivity - Band 5 for Optimum Gain..... 9
Selectivity - Band 6 for Optimum Gain..... 10
Resonant Overload Characteristics, Band 1..... 11
Resonant Overload Characteristics, Band 4..... 12
Resonant Overload Characteristics, Band 6..... 13
Output Signal plus Noise Level vs Noise Level, Band 1..... 14
Output Signal plus Noise Level vs Noise Level, Band 4..... 15
Output Signal plus Noise Level vs Noise Level, Band 6..... 16
Volume Control - Range and Linearity, Band 1..... 17
Volume Control - Range and Linearity, Band 4..... 18
Volume Control - Range and Linearity, Band 6..... 19

Plate No.


Volume Control, Range and Linearity - Band 4..... 62
Volume Control, Range and Linearity - Band 5..... 63
Volume Control, Range and Linearity - Band 6..... 64
Volume Control, Range and Linearity - Band 7..... 65
Volume Control, Range and Linearity - Band 8..... 66
Volume Control, Range and Linearity - Band 9..... 67
Volume Control Characteristic - Band 1..... 68
Volume Control Characteristic - Band 2..... 69
Volume Control Characteristic - Band 3..... 70
Volume Control Characteristic - Band 4..... 71
Volume Control Characteristic - Band 5..... 72
Volume Control Characteristic - Band 6..... 73
Volume Control Characteristic - Band 7..... 74
Volume Control Characteristic - Band 8..... 75
Volume Control Characteristic - Band 9..... 76
Overload Characteristics of Audio Amplifier with and without AVC..... 77
Audio Frequency Characteristic of Audio System with and without AVC..... 78
Audio Frequency Characteristic of Audio System with and without Filters (specification method)..... 79
Attenuation Characteristic of Band Pass Filter..... 80
Attenuation Characteristic of Variable Attenuators..... 81
Load Characteristics of Output Transformer..... 82

AUTHORIZATION OF TEST

1. The tests reported upon herein were authorized by reference (a) below. Other pertinent data are listed as references (b) to (d) inclusive.

Reference: (a) BuEng.let. S67/46(1-19-W8) of 22 January 1935.
(b) BuEng.specifications RE 13A 500A.
(c) NRL report on test of Class I-A and II-A receivers, No. R-1098. BuEng.problem R5-13 of 28 Nov. 1934.
(d) RCA Mfg.Co. Descriptive Specifications AS-P20495-C.

OBJECT OF TEST

2. The object of the tests was to determine first, compliance with the specifications, reference (b), and second, to determine if the equipments are satisfactory for Naval use.

ABSTRACT OF TEST

3. The Class I-A and II-A equipments were carefully inspected, first as to mechanical construction and arrangement to determine to what extent the objectionable features listed in reference (c), paragraph 301, (Summary of defects), were corrected; and second, to make it possible to estimate to what extent the changes made affect the electrical performance of the equipments. This having been done, in view of the urgency of the situation it was felt that only the tests as listed below were necessary to determine the change in performance over that reported upon in reference (c). The conclusions and recommendations in this report are therefore based upon the results of tests as reported upon herein and such performance as reported upon in reference (c) as it is reasonable to assume was not affected by the modifications in the equipment made between the two tests. The electrical tests conducted upon the modified equipments and reported upon herein are listed below in the first group while the tests depended upon for conclusions as reported in reference (c) are listed in the second group.

Tests Made on Modified Equipments

(A) Sensitivity a.c. operation.

(B) Selectivity at high frequency end of each band and for optimum gain only, -- (a.c. operation).

(C) Maximum noise level, -- a.c. operation.

(D) Resonant Overload - Bands 1, 4 and 6 only in Class I-A and all bands in II-A; also for bands 1 and 6 of Class I-A with alignment for 800 cycle beat note.

(E) Capacity range of trimmer capacitors, both I-A and II-A receivers.

(F) Measurement of line power consumption with and without ballast lamp.

(G) Time constants of receivers without AVC.

(H) Radio frequency harmonic interference.

(I) Salt water test of component parts.

(J) Frequency overlap and tuning dial calibration.

(K) Accuracy of resetability.

(L) Effect of frequency "wobbler" on oscillator frequency of II-A receiver.

(M) Frequency stability under conditions of changes in line voltage (with and without the ballast lamp), control settings (exclusive of main tuning control), input signal intensity, and vibration.

(N) Audio frequency characteristics of audio amplifier, band pass filter, low pass filter, and variable attenuators, taken as follows:

(1) Audio amplifier with and without AVC - 6 milliwatt output.
(2) Audio amplifier and low pass filter with and without AVC for Class I-A receiver - 6 milliwatt output.
(3) Audio amplifier with variable attenuators - 6 milliwatts output. Same except for band pass filter for II-A receiver.
(4) Audio amplifier with low pass filter and low tap of variable attenuator in for I-A receiver. Same except with band pass filter in for II-A receiver.

(O) Manual volume control characteristics, low and high frequency ends of bands 1, 4 and 6 for I-A receiver and the high frequency end of all bands for the II-a receiver.

(P) Range and linearity of AVC level control for Class I-A receiver.

(Q) Overload characteristics of audio amplifier measured as follows:

(1) Audio amplifier without AVC.
(2) Audio amplifier with AVC. Level set at maximum for I-A only.

(3) Audio amplifier with AVC level set to limit output to 6 milliwatts for I-A only.
(4) Audio amplifier with AVC level set to limit input to 0.5 milliwatt for I-A only.

(R) Regulation of rectifier power unit with and without the ballast lamp for the Class I-A equipment.

Tests Made on Original Equipments, the Results of which are Applicable to Modified Equipments.

(a) Sensitivity - battery operation.

(b) Selectivity at reduced gain.

(c) Maximum noise level - battery operation.

(d) Resonant overload, bands 2, 3 and 5 of I-A receiver and low frequency end of all bands of Class II-A receiver.

(e) Overload selectivity (incomplete).

(f) Frequency stability for changes in line frequency.

(g) Radio frequency interference multiplex operation.

(h) Measurement of battery drain.

(i) Frequency stability for changes in line frequency.

(j) Audio frequency cross talk.

(k) Frequency stability under conditions of changes in line voltage with ballast lamp, control settings (exclusive of main tuning control) input signal intensity and vibration at low frequency end of each band.

(l) Audio frequency of audio amplifier, band-pass filter, and variable attenuators, taken as follows for 300 milliwatts:

(1) Audio amplifier with and without AVC.
(2) Audio amplifier with band pass filter.
(3) Audio amplifier with variable attenuators.

(m) Manual volume control characteristics at low and high frequency ends of bands 2, 3 and 5 for the Class I-A receiver, and for the low frequency end of all bands in the Class II-A receiver.

(n) Transrectification.

(o) Range and linearity of the AVC level control of the Class II-A receiver.

(p) Time constants of receiver with AVC.

Plate No.


Volume Control Characteristics, Band 1..... 20
Volume Control Characteristics, Band 4..... 21
Volume Control Characteristics, Band 6..... 22
AVC Level Control - Range and Linearity..... 23
Overload Characteristics of Audio System with and without AVC.. 24
Overall Audio Frequency Characteristics of Audio Amplifier with Low Pass Filter, with and without AVC..... 25
Overall Audio Frequency Characteristics of Audio Amplifier without Filter, with and without AVC..... 26
Amplifier with Filters - 6 and 300 milliwatts Output..... 27
Overall Audio Frequency Characteristics of AF Amplifier with Filter Specification Method - 6 milliwatts Output..... 28
Attenuation Characteristic of Low Pass Filter..... 29
Attenuation Characteristics of Variable Attenuators..... 30
Output Load Characteristic..... 31
Audio Frequency Characteristics of AF Amplifier and Type X7-1820 Band Pass Filter before and after Salt Water Test of Filter..... 32
Regulation of Rectifier Power Unit with Ballast Lamp..... 33
Regulation of Rectifier Power Unit without Ballast Lamp..... 34
Resonant Overload Characteristics, Band 1, for 800 cycle beat note..... 35
Resonant Overload Characteristics, Band 6, for 800 cycle beat note..... 36
Main Tuning Dial Calibration..... 37
Secondary Control Calibration..... 38
CW Sensitivity - AC Line Operation..... 39
Maximum Noise Level - Maximum Variation of Noise Level..... 40
Selectivity at Optimum Gain - Band 1..... 41
Selectivity at Optimum Gain - Band 2..... 42
Selectivity at Optimum Gain - Band 3..... 43
Selectivity at Optimum Gain - Band 4..... 44
Selectivity at Optimum Gain - Band 5..... 45
Selectivity at Optimum Gain - Band 6..... 46
Selectivity at Optimum Gain - Band 7..... 47
Selectivity at Optimum Gain - Band 8..... 48
Selectivity at Optimum Gain - Band 9..... 49
Resonant Overload - Band 1..... 50
Resonant Overload - Band 2..... 51
Resonant Overload - Band 3..... 52
Resonant Overload - Band 4..... 53
Resonant Overload - Band 5..... 54
Resonant Overload - Band 6..... 55
Resonant Overload - Band 7..... 56
Resonant Overload - Band 8..... 57
Resonant Overload - Band 9..... 58
Volume Control, Range and Linearity - Band 1..... 59
Volume Control, Range and Linearity - Band 2..... 60
Volume Control, Range and Linearity - Band 3..... 61

(i) That the bare #16 B&S gauge r.f. bus wires in the band selector switch compartments be color coded or provided with some means of identification to facilitate servicing.

(j) That a filter assembly be furnished either within the receiver cabinet or separately that will effectively filter all power supply leads when the receiver is used for battery operation.

(k) That the manufacturer be required to furnish for approval a drawing showing a facsimile of the front of the panels of each equipment with the panel markings and nameplates that he proposes to furnish in production.

(l) That the following component parts be made more accessible for servicing:

(1) Plate by-pass condensers in the I-A receiver.
(2) The 1/2-watt resistors mounted on the main resistor panel in both receivers.
(3) R.F. filter resistors, particularly those in the first stage of the I-A and the second stage of the II-A.
(4) The audio attenuator in the I-A equipment.
(5) The mica r.f. filter condensers in the II-A equipment (3 in one group mounted on a single screw).

(m) That the following parts be redesigned, as indicated, to assure better operation or greater accessibility for servicing:

(1) The audio sockets in both equipments should be secured with removable screws instead of rivets.
(2) The regeneration, AVC level control and sensitivity control be locked against rotation by some positive means other than the friction of the collar and nut with the panel, as provided by the single hole mounting arrangement.
(3) The mica condenser connected across the output transformer be mounted with screws and lock washers, with provision that the chassis base provide the necessary threads for the screw, thus eliminating the necessity for the nuts which would be located in an inaccessible place.
(4) That the toggle switches be of an improved design to assure positive operation, even though infrequently used.

(n) That the antenna and ground binding posts be more securely fastened so as to prevent loosening in service. A husky lock

washer with sufficient spring to take up the continuous "give" that may be expected from the lead washer would appear to be appropriate; and further, that these binding posts be marked for identification in some appropriate manner.

(o) That the free play between the gear attached to the slow moving main dial and its driving gear be removed to prevent audible rattle with vibration.

(p) That the manufacturer be warned that the Class I-A receiver is barely within specification limits as regards sensitivity and that no allowance has been made for manufacturing tolerance.

(q) That band 9 of the Class II-A receiver be so modified as to comply with the resonant overload specification.

(r) That specifications for the purchase of similar equipment in the future require that overall receiver blocking not occur at less than one volt input when the receiver is adjusted for standard test conditions.

(s) That consideration be given to the failure of the output impedance of both receivers to meet the specifications, with due regard to the fact that these receiver outputs will in practice frequently be used in parallel. When operated in parallel, the 1,000 ohm output would be more favorable than the 600 ohm impedance specified.

(t) That modifications be made in both receivers to assure the degree of frequency stability for change from an optimum to a standard oscillation condition only if the Bureau feels that such performance is worth an appreciable delay which would undoubtedly result. So far as is known, these receivers have demonstrated better performance in this respect than any others tested at this Laboratory.

(u) That the attenuation characteristics of the variable audio attenuators at their 20 decibel point be narrowed to comply with specifications.

(v) That paragraph 6-54 of the governing specifications be revised to call for a volume control range of 80 decibels with a 100,000 microvolt input instead of a 30,000 microvolt input. The present specification is inconsistent in that the Class II-A receiver sensitivity is specified as not less than 10 microvolts above 8,000 Kcs, and a receiver that would pass the sensitivity specification would not necessarily pass the volume control range specification.

(w) That several samples of the paper condensers as used for R.F. by-pass in the I-A receiver be furnished for break-down test. The samples should include types M68530 and M68545.

(x) That ballast lamps be required in the power units of both equipments, even though the specifications as to frequency stability are met without them. The improved stability and increased tube life would seem to justify their use.

(y) That the modified preliminary models of the Class I-A and II-A radio receiving equipments be considered as acceptable for Naval service after the pertinent recommendations listed above have been complied with in a manner meeting the approval of the Bureau of Engineering.

MATERIAL UNDER TEST

4. The material under test consisted of one complete preliminary model Class I-A receiving equipment and one complete preliminary model Class II-A receiving equipment. Each equipment consisted of a receiver and its associated rectifier power unit. A control box was furnished in common with both equipments. These equipments have been modified by the manufacturer since the tests reported upon in ref.(c) to more closely meet the governing specifications.

5. The Class I-A and II-A radio receiving equipments were manufactured by the RCA Manufacturing Company, Inc. of Camden, New Jersey, and were submitted for tests to determine compliance with the governing specifications. The Class I-A radio receiver covers a rated frequency range of from 15 to 600 kilocycles, while the Class II-A radio receiver covers a rated frequency range of from 0.3 to 23 megacycles. Each equipment is capable of being operated from either a 115 volt, 60 cycle, single phase supply or from storage batteries. In the latter method of operation, the rectifier power unit is not used.

6. The subject equipment was delivered to the Laboratory on 1 February 1935 by a representative of the manufacturer.

METHOD OF TEST

7. The methods of test as described in paragraphs 9, 10, 11, 12, 13, 14, 15, 17, 18, 20, 24, 25, 26, 27, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 50 and 51 of reference (c) apply in the case of the tests reported upon herein with the exceptions as indicated below. The tests reported upon herein are enumerated under the heading "Abstract of Tests" and the sub-heading "Tests made on Modified Equipment". The paragraphs of reference (c) not mentioned above do not apply to these tests. The paragraph numbers at the beginning of each paragraph following refers to reference (c).

8. Paragraph 9 - The same table I as furnished in ref.(c) lists the types of instruments used and this applies to the tests as reported on herein. Table II of ref.(c) is applicable to the tests on the modified equipments only after due regard to change of the letters in the first column indicating the various tests as given therein.

9. Paragraph 12 - The last sentence of this paragraph should be changed to read, "At the higher frequency ranges of the Class I-A radio receiver it was found necessary when increasing the regeneration control (feed-back) from OPTIMUM OSCILLATION to STANDARD OSCILLATION to readjust the main tuning dial to maintain STANDARD

OUTPUT FREQUENCY; for the Class II-A radio receiver the STANDARD OUTPUT FREQUENCY was controlled by the frequency "wobbler"."

10. Paragraph 13 - No battery sensitivities were taken. Sensitivities at 5 frequencies for each band were taken for a.c. line operation. Sensitivities as well as detector action were checked for a few frequencies using duplicate tubes picked at random from laboratory stock to determine whether or not the tubes supplied with the equipment gave average performance.

11. Paragraph 14(a) and (b) - The selectivity tests were conducted in accordance with the procedure outlined in reference (b), par. 7-8.

12. Paragraph 17 - Maximum noise level tests were made in accordance with par.7-9 of reference (b).

13. Paragraph 18 - Tests were made in accordance with reference (b) except that the output frequency of the Class II-A receiver was maintained at 1,000 cycles by "wobbler" adjustment, this being necessary due to normal frequency drift of the signal generator and the tendency of the autodyne oscillator to "pull-in".

14. Paragraph 22 - The method as outlined for a.c. tests only, applies.

15. Paragraph 27 - Tests as outlined herein were made using an a.c. power supply instead of a battery.

16. Paragraph 33 - In addition to the usual leakage resistance measurements, a frequency response characteristic was made in the case of a sample band pass filter before and after a 72 hour salt water immersion. In order to determine the effectiveness against moisture in the case of the coil systoms as in the Class I-A receiver, similar coils with wax treatment as proposed by the manufacturer were subjected to a 24 hour immersion in fresh water. Tests were made to determine their merit as indicated by a measurement of their Q both before and after immersion.

17. Paragraph 38(a) - Frequency stability measurements as resulting from the effect of a change in line voltage were made in accordance with reference (b), par. 6-31, except that they were made both with and without the ballast lamp.

All of the tests outlined in this paragraph were made only at the high frequency end of each band for both equipments.

18. Paragraph 39 - No vibration tests were conducted other than to observe the effect of shock as resulted from hand blows from several angles.

19. Paragraph 40 - The audio frequency source as used in audio frequency measurements was from a General Radio beat frequency audio oscillator or a General Radio interpolation oscillator. The voltages as furnished from either of these equipments required an additional amplifier which was of General Radio manufacture. The output of this amplifier was reduced to a known level by the use of a General Radio microvolter. The tests as outlined under this paragraph heading were altered to conform to the modification in the Class I-A receiver which no longer possesses a band pass filter, a low pass filter being substituted therefor.

20. Paragraph 42(a) - In the case of the Class II-A receiver, inputs were carried up to and just beyond the specification limit of 30,000 microvolts (see specifications, par. 6-54).

21. Paragraph 42(b) - No noise vs. output signal plus noise measurements were made in the case of the Class II-A receiver.

22. Paragraph 42(c) - In the Class II-A receiver, measurements were taken for a constant input which produced maximum output at optimum gain.

23. Paragraph 43 - Tests were made for manual volume control characteristics described under (a), (b) and (c), of paragraph 42, reference (c), for the low frequency ends of bands 1, 4 and 6 of the Class I-A receiver and the high frequency end of all bands of the Class II-A receiver.

24. Paragraph 50 - The audio amplifier characteristics including the AVC were taken with the AVC level control adjusted for maximum, 6, and .5 milliwatt level settings. Using the same set-up, the range and linearity of the AVC level control were determined for different settings of the level control throughout its range and with an applied input signal of such magnitude as to assure limiting action at any setting of the AVC level control.

25. Paragraph 51 - The regulation characteristics of the rectifier power unit as supplied with the Class I-A equipment were determined by the procedure as outlined in reference (c) with the exception that all measurements were taken immediately after each change in line voltage. Regulation characteristics were obtained both with and without the ballast lamp.

DATA RECORDED DURING TEST

26. Complete data were recorded on all tests conducted and this information is contained in Tables 1 to 31, and Plates 1 to 82, appended hereto.

PROBABLE ERRORS IN RESULTS

27. The data as submitted in reference (c) relative to probable errors in results are applicable in the case of the subject tests with the following exceptions. The paragraph numbers in each case refer to the paragraphs with like numbers in reference (c).

28. Paragraph 57 - Attention is invited to Tables 1 and 2 of reference (c) for the instruments used in making the tests as covered by this report. Attention is further invited to the fact that the serial numbers of the several instruments may not apply, but this should not affect the accuracies listed.

29. Paragraph 58 - The line voltages were measured with an instrument of such accuracy that it is reasonable to assume that the values given are within 1%. The trimmer capacity ranges are probably accurate to within $\frac{1}{2}$ µµf. The accuracy of the audio measurements are within .5 db from 0 to 30 decibel levels and within 1 db above 30 decibel levels.

RESULTS OF TESTS

30. The description of the Class I-A and II-A equipments as given in reference (c) applies except for the modifications made since the above tests. These exceptions are listed below. All paragraph numbers are referred to by the numbers as given in reference (c) for exceptions to test results differing from those reported in that reference.

31. Paragraph 60 - Item (g) should, when applied to the I-A receiver, read "Low pass filter" instead of "Band pass filter".

32. Paragraph 61 - The coupling condenser referred to as a "fixed variable" type has been replaced with a fixed non-adjustable unit.

33. Paragraph 70 - The method of taking care of the dead end effects of unused inductance is slightly different from that previously described and is shown on diagram P701575 of reference (d).

34. Paragraph 74 - The fixed loading capacities referred to for fixed tuning have been replaced with an adjustable unit for each of bands 1, 2, and 3 and another adjustable unit has been supplied which is common to bands 4, 5 and 6. Mention should also be made of the change in trimmer elements in the second r.f. circuit. In the latter case an adjustable capacitor has been furnished which is common to bands 1 and 2, a separate similar unit for band 3 and another unit common to bands 4, 5 and 6.

35. Paragraph 75 - The tap ratio has been changed in the plate circuits of both r.f. stages to give more uniform gain throughout the range covered by each band.

36. Paragraph 77 - The band pass filter in the Class I-A equipment has been replaced by a lowpass filter having a cut-off at approximately the same point as the high frequency side of the band pass unit previously furnished. This is permanently connected in circuit. The manufacturer, it is understood, furnished this in lieu of the band pass unit at the suggestion of a Bureau representative.

37. Paragraph 78 - The two extreme end bands of the audio attenuator have been changed to cover 448 and 1393 cycles respectively to comply with the range set by governing specifications.

38. Paragraph 87 - The receiver is provided with a switch on the panel which opens or closes both heater and plate supplies for d.c. operation. This switch is furnished with short-circuiting links located back of the panel which can be so arranged as to remove the switch from circuit when a.c. operation is desired. In the latter case the switch in the power unit is effective when the control box is not used and when the control box is used, the switch therein controls the power supply.

39. Paragraph 91 - The power unit has been modified so that the ballast lamp may be cut out of circuit by throwing two switches provided within the unit. The switches select the proper transformer connection to make this possible. The elimination of the ballast lamp reduces the power required for set operation from 200 to about 60 watts.

40. Paragraph 92(c) - The short-circuiting jumper mentioned in connection with the Class II-A receiver antenna circuit is no longer needed, as a third binding post has been provided to adapt the receiver to either simplex or multiplex reception.

41. Paragraph 92(d) - The method as described in reference (c) of coupling the first tube plate through a portion of the interstage tuning inductance is still in effect for bands 4 to 9. On bands 1 to 3 a separate inductance is used in the plate circuit. This change simplifies the wiring to make the tube sockets more accessible and provides a more favorable coupling.

42. Paragraph 92(e) - The second tube uses separate inductance in the plate circuit for all bands.

43. Paragraph 92(i) - All switch contactors and brushes are alike in the modified equipment. Silver contacts of the button type are used for both the fixed movable contacts. The movable contacts are riveted and soldered to a spring arm to provide contact pressure.

44. Paragraph 93 - The schematic diagrams of all units employed in both equipments are included in reference (d).

45. Paragraph 95 (par.1-2) - The models tested have not demonstrated complete compliance with governing specifications. The models have, however, demonstrated an improvement over the first models and greatly superior performance to that of any other autodyne equipment tested at this Laboratory. One characteristic which is believed to be objectionable for Naval use is that this type of receiver (autodyne) will completely block in the presence of strong local interference such as may be expected from transmitters on the same ship or other ships in close proximity. Attention is invited to the comment given on paragraph 1-7(c) of the governing specifications in reference (c).

46. Paragraph 97 (par.1-4) - The frequency range of the two equipments is as follows:

| | | |
|---|---|---|
| Class I-A - | 14.1 - 627 Kcs. | Required range: 15 to 600 Kcs. |
| Class II-A - | .2907 - 23.75 megacycles. | 0.3 to 23 megacycles. |

47. Paragraph 98 (par.1-5) - As the band pass filter has been replaced by a low pass filter in the I-A receiver, speech reception has been somewhat improved.

48. Paragraph 100 (par.1-7(a)) - As the specifications covering the Class IV equipments do not apply in these tests, no definite limit for maximum noise level is in effect. It can be said, however, that the maximum noise level has been greatly reduced over the previous model and is much more uniform.

49. Paragraph 106 (par.3-3) - Frequency Range:

Class I-A - 14.1 - 627 Kcs.
Class II-A - .2907 - 23.75 megacycles.

50. Paragraph 114 (par.3-11) - The band pass filter has been replaced by a low pass filter. The statement made relative to voice reception can be modified to the extent that intelligible voice reception can be expected.

51. Paragraph 116 (par.3-13) - The modified receiver covers any audio tuning range from 448 to 1350 cycles which is within specification limits.

52. Paragraph 122 - The nameplate situation is the same as previously reported in reference (c). This, it is understood, is due to the lack of assigned type numbers for the various units.

53. Paragraph 128 - The variable condenser assembly is essentially the same as described in ref.(c) except that the rotor assembly contact spring has been backed with silver and the shaft

collar is of brass, silver plated. The manufacturer's representative states that it is planned in production to use a silver plated flat spring in place of the composite spring now used. The advisability of using a silver plated contact spring is questionable in this position as it is subject to continuous wear from condenser rotation. It would appear that a composite assembly with solid silver contacts would be preferable.

54. Paragraph 129 - The former description applies to the band selector switch except that the contacts and brushes have been changed in all cases. The new switch uses silver button contacts for both the fixed and movable contact elements. The fixed ones are provided with shanks that pass through the isolantite switch base and are riveted and soldered to terminal lugs. The under side of the contact has been turned with a taper so that a minimum of contact is made with the isolantite base thus reducing the possibility of leakage. The brush is a flat nickel-plated phosphor bronze spring having silver contacts riveted and soldered at each end, one end travelling on the fixed button contacts mentioned above, and the other as an arc shaped contactor which is also of silver. No special construction has been provided for the oscillator switch as described for the previous model, the new type of construction used for all switches being considered superior. The construction employed eliminates all "pigtail" connections. The shaft that showed signs of rust in the previous model has been replaced by one that shows no rust. It is claimed by the manufacturer's representative that a similar shaft of the same material has been tested in a salt spray with negligible corrosive effect. The material used is known as Carpenter #8 stainless steel.

55. Paragraph 131 - The manufacturer has submitted sample coils as used in the low frequency (Class I-A) receiver with wax treatment covering the entire assembly including the terminals. Tests were made to determine the effectiveness of the seal by measuring the coil "Q" before and after 24 hour immersion in fresh water.

56. Paragraph 132 - The lowest frequency coil in the Class II-A receiver which covers the three lowest frequency bands, it is claimed by the manufacturer, will have a similar wax treatment to that described in the paragraph above for the Class I-A coils. The antenna coupling coils have been wound directly on the tube and it is promised that in production they will be wound in a slot in the isolantite tube, which arrangement should be satisfactory. The method of taking off terminal leads has been changed to one that is satisfactory. The medium frequency coils in the Class II-A receiver have not been wax treated. It is promised that an attempt will be made, in production, to wax treat the terminals. No wax has been applied to the coils in the model. The manufacturer's representative states that attempt will also be made to wax dip the entire coil form after the plate winding has been placed thereon, but due to possible changes in coupling characteristics no promise can be made as to the practicability of this procedure. In any event, it is planned

to wind the plate windings in a separate slot cut in the coil form so that plate and grid windings will not actually contact each other. This has not been done in the model.

57. Paragraph 133 - The winding arrangement has been changed on the high frequency coils to permit better protection from humidity conditions. The feedback coil and the grid coil are at the same d.c. potential, thus reducing the possibility of difficulty from d.c. leakage. This applies to all similar coils in the Class II-A receiver. The plate winding is at +B potential but is wound directly on the coil form and is spaced from the grid winding. The feed back winding in the model is wound adjacent to and in contact with the grid winding but it is promised by the manufacturer's representative that it will, in production, be placed in a separate slot. The manufacturer's representative states that attempt will be made to wax treat the terminals of these coils in production, but he feels that it is doubtful if further wax treatment can be made practicable. The terminal connections have been made in a satisfactory manner and with as direct leads as is practicable, thus eliminating the previous criticism of using these leads for inductance trimming. The coil shields have been provided with holes in which a spanner wrench could be used to obtain better leverage for removal. No wrench was supplied or called for in the specifications. It is understood that the manufacturer is, however, planning to furnish one.

58. Paragraph 134 - In this model the coil windings are solder bonded to the switch contact studs. The leads running from the coils to the switches have been very much more neatly arranged and provide greater accessibility for servicing.

59. Paragraph 135 - The so-called "tear drop" mica dielectric condensers have been replaced by air dielectric condensers in all tuned circuits in both receivers.

60. Paragraph 136 - The switch on the audio attenuator has been changed to a type that provides a contact wipe.

61. Paragraph 139 - The end play in the trimmer condenser has been removed.

62. Paragraph 140 - The soldering and wiring has been improved in the new model. The chassis box fit and panel securing screws have been decidedly improved and are satisfactory.

63. Paragraph 141 - The chassis is easily removable and is also easily replaceable except for the fact that the runner on the chassis does not always drop into the slot provided in the box upon the first attempt. It is understood that the manufacturer proposes to furnish a deeper slot in production. A more satisfactory

assembly would be provided if two runners, one at each end, were provided, of such shape as to protect the coil cans from injury when tilting the receiver for servicing.

64. Paragraph 142 - There is no noticeable panel distortion in the new model when the panel is secured in place.

65. Paragraph 143 - The jack washers and nuts which rusted previously are now nickel-plated.

66. Paragraph 146 - Litz wire connections have been wax coated to prevent corrosion.

67. Paragraph 153 - The frequency wobbler has sufficient friction to hold its position under the degree of vibration called for in the tests.

68. Paragraph 157 - The studs on the radio frequency switches have been soldered to their connecting terminals.

69. Paragraph 159 - The wax coated capacitors formerly used for padding have been replaced with air dielectric units.

70. Paragraph 160 - The reference to wax covered capacitors is no longer applicable.

71. Paragraph 162 - It has been stated by the manufacturer's representative that it is their intention in production to provide some means of identification for the solid bus wires to facilitate servicing.

72. Paragraph 171 (par.5-4, ref.(b)) - Attention is called to the comment in reference (c) relative to the lack of filters in the receiver proper when used with a battery supply. Tests have shown that the filtration furnished is satisfactory for a.c. operation.

73. Paragraph 177 (par.5-10, ref.(b)) - The cable length has been corrected to comply with specifications.

74. Paragraph 181 (par.5-14, ref.(b)) - Satisfactory panel securing screws have been furnished.

75. Paragraph 183 (par.5-16, ref.(b)) - The audio tuning band switch marking has been changed to read:

| | | |
|---|---|---|
| 775 | 450 | instead of "low-high". |
| 1300 | 775 | |

76.(a) Paragraph 183 (par.5-16, ref.(b)) - The correct limiting frequencies on the various bands have not been provided on the photo

etched escutcheon plate of the model. It is understood that this will be done on the production equipments.

77. Paragraph 183 (par.5-16, ref.(b)) - A sample photo etched plate was exhibited by the manufacturer which has the scale for all trimmers and the wobbler divided into 50 lines with a 50-0-50 scale. Although this is not in strict compliance with specifications, it is satisfactory for Naval use.

78. Paragraph 183 (par.5-16(c),ref.(b)) - The toggle switch and audio attenuator markings called for in the previous report, reference (c), have not been furnished on the model. The representative furnished a name plate for the toggle switch lettered "AUDIO TUNING" which it is proposed to furnish in production. It is proposed to use numeral designation from 1 to 10 with an arrow showing the direction of rotation for increasing frequency, in the case of the audio attenuators. This has not been done in the case of the model.

79. Paragraph 187 (par.5-20, ref.(b) - The band change switches have been changed, as described, in paragraph 54.

80. Paragraph 189 - All dials are marked on a 0-10 or 0-100 basis, except the wobbler, which is marked with a zero center scale.

81. Paragraph 199 - The manufacturer has proposed to furnish a zero center, 50 division dial having a 50 marking at each end of the scale.

82. Paragraph 200 - The band pass filters are not interchangeable in the I-A and II-A equipments, as the band pass unit has been replaced with a low pass unit in the case of the I-A equipment.

83. Paragraph 201 - The plating on the coil cans is without corrosion. The plating is not continuous on the threaded portion, which may be due to wear or improper plating.

84. Paragraph 202 (par.5-36, ref.(b)) - The component parts have been made considerably more accessible than in the first model. The tube sockets which were not accessible in the first model can now be removed without serious injury to the trimming of the r.f. circuits, if reasonable care is taken. The 1-watt resistors which were difficult to replace in both the I-A and II-A receivers have been made more accessible for replacement by reducing them to the 1/2 watt size. They are not now easy to replace, but it is possible, with due care and proper tools. It is understood that the manufacturer is still working on this feature to improve the accessibility in production. The fixed condensers, which were previously riveted in place, are now mounted with removable screws. The plate by-pass condensers in the I-A equipment are very inaccessible for removal or replacement. Rearrangement is essential to permit servicing. It is understood that

the manufacturer plans to change their location in production. The r.f. filter resistors, particularly those in the first stage of the I-A and the second stage of the II-A, are inaccessible for replacement. A rearrangement is considered necessary. The audio tube sockets in both equipments are riveted to the chassis, which practice does not permit easy replacement. Screw and nut mounting is desired. The regeneration control, AVC level control, and sensitivity control are of the single hole mounted type and are not keyed to prevent rotation should the nut become loosened. All single hole mounting controls, particularly those requiring frequent rotational adjustment, should be keyed. The audio attenuator is difficult to remove due to inaccessibility of the mounting screws. It is understood that the manufacturer intends to change the type of power supply by-pass condenser pack with four single units of the type employed elsewhere in the receivers for plate by-passing. This change should, if accomplished as explained by the manufacturer's representative, make the audio attenuator more accessible. His suggestion that the mounting screws be permanently attached to the attenuator assembly, if put into effect in production, would greatly improve the accessibility. The mica condenser across the output transformer is difficult to remove, but if a nut plate is furnished so that the securing screws will screw into the chassis without loose nuts, it will be reasonably easy to replace.

The antenna and ground binding posts have a tendency to become loosened. This is due to the use of lead washers with an isolantite mounting block and a terminal lug. As there is little or no spring action to the locking device employed, the assembly becomes loosened with strains on the non-elastic lead washer. It is believed that a good springy phosphor bronze (plated) lock washer would retain the necessary tension for satisfactory service. The toggle switches used for audio frequency circuits are not positive in action. Difficulty has been experienced with the type of switch in the Models RAA and RAB receivers. If this type of switch is to be employed, it should be assembled without lubricant and constructed of non-corrosive metal. The large gear upon which the slow moving main dial is mounted in the Class II-A receiver has play enough so that it rattles with vibration. This causes no electrical disturbance, but is audible under vibration conditions as may be expected in service.

85. Paragraph 204 (par.5-38, ref.(b)) - The linearity of the main tuning condenser calibration with frequency is shown on Plates 1 and 37 for the Class I-A and II-A receivers, respectively.

86. Paragraph 212 (par.5-46, ref.(b)) - The attenuator switch has been changed to possess the self-wiping feature.

87. Paragraph 215 (par.5-49) - The knife switch furnished in the first model has been replaced with non-removable link connectors on the terminal block back of the panel. This block is

engraved to indicate that the links must be closed for a.c. operation. For d.c. operation, the links can be swung to an open position and clamped by the terminal screws.

88. Paragraph 216 (par.5-51) - The power units are provided with "on-off" switches used only when a receiver is used without control box on a.c. supply. When both the Class I-A and II-A receivers are used together with the control box, the power "on-off" switches in the control box are effective, the switches in the power unit becoming ineffective. The power "on-off" switches on the receiver panels are effective only when used for d.c. operation with the link connectors properly adjusted.

89. Paragraph 217 (par.5-52) - This equipment differs from the original by the addition of an extra antenna binding post for use when shifting from simplex to multiplex operation. No marking has been provided on these posts for identification.

90. Paragraph 218 (par.6-1, ref(b)) - The sensitivity of both classes of equipment (shown on plates 3 and 39) complies with the requirements of the governing specifications. It will be observed by reference to Plate No. 3 that the sensitivity for bands 4 and 5 of the Class I-A is shown to be slightly outside by an amount less than the possible error of measurement. Attention is invited to this condition, as it is apparent that no allowance has been made for manufacturing tolerance and it is probable that the model has been precisely adjusted by the designing engineers. All sensitivity measurements were made after having adjusted all trimmers for optimum gain and standard oscillation conditions at the overlap frequency for the high frequency end of each band of the Class I-A receiver. The same procedure was followed for the test of the II-A receiver except that the adjustment was made for the low frequency end of each band. Although this results in a more severe test than called for by the specifications, the II-A receiver is within the required sensitivity. Tables 1 and 14 show the frequency and sensitivity ranges as well as the average sensitivity of each band for the Class I-A and II-A receivers, respectively. Attention is invited further to the fact that the average receiver sensitivities, considering the entire range covered for both receivers, are less than for the previous models.

91. Paragraph 219 - The selectivities as obtained on these later models are very similar to those obtained on the previous models except that bands 4, 5 and 6 on the I-A receiver have been improved.

92. Paragraph 220 (par.6-2, ref.(b)) - The selectivities were measured in accordance with the procedure as outlined in the governing specifications and no attempt was made to locate the secondary peaks as was done and reported upon in the case of the first models. The

receivers as furnished were aligned to give a 1,000 cycle beat note. In the case of the Class I-A receiver it was re-aligned at 15 Kcs. for both a 500 and an 800 cycle beat note and listening tests were conducted to determine whether or not there was any apparent improvement in selectivity within the range where stations are adjusted on channels spaced by not over 300 cycles. It was the opinion of the listeners that there was little difference for any of the adjustments. The instruments showed a slight improvement in selectivity for the 500 cycle alignment condition, but this difference was too small to be apparent to the ear, probably due to the fact that the head telephones, as well as the human ear, are peaked for best response near to 1,000 cycles. From these tests it would seem that if any other frequency than 1,000 cycles is selected for alignment, it should not be less than 800 cycles as this frequency more nearly approximates the resonant frequency for the maximum response for both the ear and standard telephones. The selectivities for the Class I-A receivers at optimum gain are shown on Plates 5 to 10 inclusive, while those for the II-A under similar conditions are shown on Plates 41 to 49 inclusive.

93. Paragraph 221 (par.6-3, ref.(b)) - The maximum noise level tests were made in accordance with the procedure as outlined in the existing specifications. It will be observed from reference to Plates 4 and 40 and Tables 2 and 15 that the receivers comply with the specifications. The later models have shown a great improvement over the former in that the maximum noise level has in general been decidedly reduced and is more uniform over the receiver ranges.

94. Paragraph 222 (par.6-4, ref.(b)) - In the case of the I-A receiver, the tests for resonant overloads indicate that they are within specifications. Plates 11, 12 and 13 and Table 5 indicate the results of these tests. Plates 35 and 36 show the resonant overload characteristics as taken for receiver alignment at an 800 cycle beat frequency at 15, 25, 307 and 600 Kcs. It will be observed that the receivers comply with the resonant overload specifications at all of these frequencies and further that complete blocking occurs at a noticeably earlier input level than for the 1,000 cycle alignment. Listening tests indicated further that for a 500 cycle alignment, point blocking occurred at a still lower input level. Plates 50 to 58 and Table 18 show the resonant overload characteristics for the Class II-A equipment. In the case of the Class II-A receivers at the high frequency end of band 9, the detector overloads to prevent resonant overload, as defined in the specifications, from being obtained. The 300 milliwatt output level is reached, however.

95. Paragraph 223 - With regard to the comment as made in the previous report relative to the low input levels at which complete receiver blocking occurred, it should be mentioned that this condition has been improved in the case of the Class I-A receiver by approximately one order. In the case of the II-A receiver, there has been but slight improvement in this respect.

96. Paragraph 224 (par.6-5, ref.(b)) - In view of the lack of adequate equipment for overload selectivity tests and of the similarity of these and the previous models, it is believed that no further light beyond that obtained in previous tests would result from duplication of the few tests that it would be possible to make.

97. Paragraph 229 (par.6-10, ref.(b)) - The panel operated verniers require setting but once for each band and are within the specification requirement regarding range.

98. Paragraph 230 (par.6-11, ref.(b)) - The later models have been furnished with three binding posts, two of which are for antenna and the other for ground connection. The additional binding post has been furnished to eliminate the necessity for a shunting wire, as mentioned in the previous report, for shifting from simplex to multiplex operation. This change eliminates the adverse comment as made previously in this respect.

99. Paragraph 236 (par.6-15, ref.(b)) - For a.c. operation the total supply line consumption is 196 watts for the Class I-A equipment and 193 watts for the Class II-A equipment. Inasmuch as provision has been made to permit operation without the ballast lamp and its associated load resistor, measurements were made to determine the line consumption under this condition. In the case of the Class I-A receiver it was found to be 60 watts, and the II-A receiver 54 watts.

100. Paragraph 237 (par.6-16, ref.(b)) - No tests were made for frequency drift with variation of power input frequency, as previous tests had shown that it was negligible.

101. Paragraph 238 (par.6-17, ref.(b)) - The oscillation control generally operates in a smooth and noiseless manner and permits the entering and leaving of the oscillatory condition at any specific frequency without clicks or squeals at points embracing not more than 2% of the complete range of the regeneration control as measured on the control. An exception to this statement applies to its action on the high frequency or Class II-A receiver which on the high frequency end of band 9 gives a high pitch "squeal" near its maximum position and remote from the standard oscillation position.

102. Paragraph 239 (par.6-18, ref.(b)) - The recovery of the two equipments when adjusted for optimum gain and subjected to sharp impulses having a maximum amplitude of 5 volts and applied across a 50 ohm resistor in series with the standard high and low frequency dummy antenna, depending upon the test frequency, is as follows:

(a) Class I-A receiving equipment. The overall sensitivity returns approximately to normal after 0.016 second at 15 Kcs. and 0.02 second at 600 Kcs.

(b) Class II-A receiving equipment. The overall sensitivity returns approximately to normal after 0.02 second at 300 and 600 Kcs. with the band pass filter. Under the same conditions, except with the band pass filter out, the recovery time was 0.004 second.

103. Paragraph 240 - The data as given in the previous report under this heading does not apply to these tests. Mention should be made, however, of the fact that in the case of Class I-A receiving equipment the low pass filter was in circuit. The results of this test indicate a decided improvement in performance which brings it, in this respect, within the specification limits.

104. Paragraph 241 (par.6-19, ref.(b)) - The two classes of equipment when operated on adjacent antennas do not interfere with each other to a measureable degree when listening on one receiver to the harmonic frequencies of the oscillator of the other receiver under the conditions as specified. Table 29 shows the results of these tests.

105. Paragraph 242 (par.6-20, ref.(b)) - No tests were made for audio cross talk inasmuch as the output circuits have not been changed and it can be safely assumed that the results as previously reported will apply.

106. Paragraph 244 (par.6-22, ref.(b)) - Immersion Tests of Component Parts. The tests made on sample units similar to those contained within the receivers gave results that indicate specification compliance. Table 27 shows the results of tests made in accordance with the governing specifications. It will be observed by reference to this table that the leakage resistances are in general considerably higher at the start than immediately after any of the immersion periods. It will be observed further that these resistances returned to normal after 72 hours at room temperature. It is apparent that the change in leakage resistances was due more to temperature change than to a change in conductivity resulting from moisture. It is therefore recommended that in future specifications all leakage resistances be measured both before and after immersion at the same temperature in each test. In addition to the usual leakage resistance measurements, a type ST1820 band pass filter similar to that used in the Class II-A receiver was measured for its response characteristic both before and after a 72 hour salt water immersion. The results indicated practically no change and are shown on Plate 32.

107. Paragraph 245 (par.6-23, ref.(b)) - The samples tested in accordance with paragraph 6-22 of the governing specifications were claimed to be similar to those included in the Class I-A and II-A equipments and were as shown on Table 27. The test results as given in this table would indicate that several of the units do not pass the governing specifications but it is believed that the drop

in leakage resistance is due to the different temperatures under which measurements were made rather than to the presence of moisture within the assembly. Had moisture penetrated the potted seal the resistances would not have returned to normal within the 72 hours previous to the last test. It is considered that the samples have demonstrated satisfactory moisture exclusion properties.

108. Paragraph 246 (par.6-24, ref.(b)) - The frequency overlap between bands of each receiver is indicated on Tables 3 and 16. Both equipments comply with the specification limits of 5%.

109. Paragraph 247 (par.6-25, ref.(b)) - Resetability. The receivers were found to be well within the limits as set down by the specifications. Tables 4 and 17 show the results of these tests.

110. Paragraph 248 (par.6-26, ref.(b)) - Table 21 shows the range of the frequency wobbler as furnished on the Class II-A receiver. The wobbler control has sufficient friction that it will retain its positions under conditions of normal vibration.

111. Paragraph 249 (par.6-27, ref.(b)) - The manufacturer exhibited a sample escutcheon plate upon which the frequency wobbler scale was zero centered and graduated in 50 divisions with a 50 marking at each extreme end of the scale.

112. Paragraph 250 (par.6-28, ref.(b)) - The results of tests as shown on Plates 31 and 82 indicate that no change has been made from the original model with respect to the load (1,000 ohm) at which maximum output occurs.

113. Paragraph 252 (par.6-30, ref.(b)) - The same statements as made in the previous report apply except that the band selector switches and the variable condenser contactors have been improved. The band selector switches have silver button contacts for both the fixed and movable members. In the case of the condenser, the contactor which makes the contact on the rotor assembly has been backed with a silver strip which appears to function satisfactorily. It has been proposed, however, that in production these contactors be made of silver-plated spring material and as they are subject to continuous wear, no statement can be made as to their life in service. Neither the switches nor the condensers have shown any irregular performance during the short period consumed by these tests and no definite statement as to the probable satisfactory life of these elements under service conditions can be made.

114. Paragraph 253 (par.6-31, ref.(b)) - The frequency stability of the two classes of equipments under conditions of standard oscillations and optimum gain for changes in line voltage of approximately plus or minus 10% of normal is given in Tables 6 and 19. These tables cover the results of tests made both with and without the ballast lamp

in circuit. The Class I-A receiver passes the specifications both with and without the ballast lamp. In the case of the Class II-A receiver, the specifications are complied with when the ballast lamp is used, while without the ballast lamp the specifications are met but with less margin.

115. Paragraph 254 (par.6-32, ref.(b)) - The frequency stability of the oscillator of each class of receiver when the regeneration control is varied from optimum to standard oscillations is recorded in Tables 7 and 20. Specifications are not entirely met in this respect.

116. Paragraph 255 (par.6-33, ref.(b)) - The maximum variation in the receiver frequency due to variations of the panel-operated trimmer capacitors from any point to any other point within their limits in all bands of the I-A receiver is given in Table 8. Similar tests were not made on the Class II-A receiver inasmuch as these trimmers were not changed in the revision of the model and it is felt that the data included in the first report will apply.

117. Paragraph 256 (par.6-34, ref.(b)) - No vibration tests were made except to give the receivers sharp blows with the hand from several angles. The results indicated that the receivers were not affected noticeably by such treatment and that the test results previously reported can be assumed to apply.

118. Paragraph 257 (par.6-35, ref.(b)) - The changes in the frequencies of the detector of the Class I-A and II-A radio receivers, under conditions of STANDARD OSCILLATIONS with OPTIMUM GAIN for a change in input from 0.5 microvolts to such values as to produce MAXIMUM OUTPUT on the several bands of the receivers, are as given in Tables 9 and 22. Tests were made only on bands 7, 8 and 9 in the case of the Class II-A equipment.

119. Paragraph 258 (par.6-36, ref.(b)) - Under conditions of STANDARD OSCILLATIONS and with an impressed signal of such value as to produce MAXIMUM OUTPUT with full gain, variations of the manual volume control down to a point where the signal is just audible, the frequency of the detector of the two receivers varies as indicated in Table 10. The results indicate that the receiver is within the specifications. No tests were made of the Class II-A receiver, this receiver having passed on the original test.

120. Paragraph 260 (par.6-38, ref.(b)) - Band Pass Filters. The audio system of the Class I-A receiver has been provided with a low pass instead of a band pass filter. The Class II-A receiver has been provided with a redesigned band pass filter similar to that furnished in the original model.

121. Paragraph 261 (par.6-39, ref.(b)) - Refer to Plates 29 and 80 for the attenuation characteristics of the Class I-A and II-A radio filters, respectively. The attenuation characteristics of the band pass filters are also summarized in Table 23.

122. Paragraph 262 (par.6-40, ref.(b)) - The band pass filter in the Class II-A radio receiver is so arranged as to be capable of being disconnected by a single control switch on the front panel. In the Class I-A receiver the low pass filter is permanently connected.

123. Paragraph 263 (par.6-41, ref.(b)) - The use of the band pass filter causes an attenuation in the audio amplification of 1.2 decibels for a 6 milliwatt output (specification limit, 4 decibels) at the frequency of minimum attenuation. This applies only to the Class II-A radio receiver, the low pass filter being, as previously stated, permanently connected in the audio system of the Class I-A radio receiver.

124. Paragraph 264 (par.6-42, ref.(b)) - The above mentioned filters in each class of receiver are placed between the detector and first audio amplifier tube.

125. Paragraph 265 (par.6-43, ref.(b)) - The limits of the filters, either low pass or band pass as for the Class I-A and II-A respectively, are not abrogated at any amplifier output level up to 300 milliwatts. Plates 27 and 79 show the characteristics of these units.

126. Paragraph 267 (par.6-45, ref.(b)) - The audio frequency attenuators are capable of being adjusted to accept any frequency within the range specified (450 to 1300 cycles).

127. Paragraph 268 (par.6-46, ref.(b)) - The selector switch has been provided with self-wiping characteristics.

128. Paragraph 269 (par.6-47, ref.(b)) - The peak frequencies at the several taps of the audio attenuator bands are given for the Class I-A and II-A receivers in Tables 11 and 24, respectively.

129. Paragraph 270 (par.6-48, ref.(b)) - Refer to Plates 30 and 81 for the attenuation characteristics of variable attenuators of the Class I-A and II-A receivers, respectively, as measured at the low, middle and high steps of each variable attenuator band. Tables 12 and 23 give a summary of the principal features of the characteristics shown on Plates 30 and 81.

130. Paragraph 271 (par.6-49, ref.(b)) - The attenuation incurred in the audio amplifier by the use of the variable audio attenuators at the frequencies to which they are adjusted is as given in tables 11 and 24.

131. Paragraph 274 (par.6-52, ref.(b)) - The attenuator in the case of the II-A receiver is in the same position as described in reference (c). This also applies to the I-A receiver except that the band pass filter has been replaced by a low pass filter. The attenuator characteristics may be used to modify the filter characteristics when desired.

132. Paragraph 276 (par.6-54, ref.(b)) - The range of the volume control of the Class I-A receiver is such as to provide a maximum attenuation of from 103 to 115 dbs. (min. 100 dbs.), depending upon frequency, in the overall gain of the receiver with an applied CW input of approximately 500,000 microvolts to the receiver at resonance with standard oscillations applied to a standard low frequency dummy antenna. Zero level was taken as standard output. Refer to Plates 17, 18 and 19, inclusive, for curves showing the range and linearity of the volume control measured at the low and high frequency ends of bands 1, 4 and 6. Table 13 shows the tabulation of the ranges for these frequencies.

133. Paragraph 277 - Similar characteristics for the high frequency ends of all bands of the Class II-A receiver are shown on Plates 59 to 67 inclusive. The stray coupling mentioned on the previous test was not evident on these tests which were carried only to a 30,000 microvolt input level, as called for by specifications. The data as given on these plates indicates that all bands comply with the specifications with the exception of bands 8 and 9. This lack of compliance is apparently due to an inconsistency in the specifications.

134. Paragraph 278 - The stray coupling mentioned in the previous report has been considerably reduced. Although noticeable, it is not of sufficient magnitude as to prevent specification compliance.

135. Paragraph 279 - This paragraph is not applicable to the modified equipments.

136. Paragraph 280 - This paragraph is not applicable to the modified equipments.

137. Paragraph 281 (par.6-55, ref.(b)) - No transrectification measurements were made on the modified equipments as the circuit arrangements in both cases were so similar to the previous equipment as to make it apparent that the data previously submitted will apply.

138. Paragraph 283 (par.6-56, ref.(b)) - No tests were made in the modified equipments to determine the effect of the manual volume control setting, on receiver selectivity. The results as obtained previously are believed to be indicative of the performance in this respect for the modified equipments.

139. Paragraph 284 (par.6-57, ref.(b)) - The manual volume control characteristics, as shown on Plates 20, 21 and 22 and 68 to 76 inclusive for the Class I-A and Class II-A equipments respectively, indicate specification compliance. A study of Plates 72 to 76 inclusive for bands 5 to 9 of the Class II-A receiver will show to what extent the stray coupling as mentioned under paragraph 277 is effective.

140. Paragraph 285 (par.6-58, ref.(b)) - The volume control as furnished in the modified Class II-A receiver has been changed to give approximately a continuous variation throughout its range.

141. Paragraph 286 (par.6-59, ref.(b)) - The manual volume control of the Class I-A and II-A radio receivers operates in a manner that the noise level is substantially reduced in direct proportion to a CW signal down to the level where the detector and the audio amplifier noises predominate. Refer to curves shown on Plates 14, 15 and 16 for the Class I-A receiver.

142. Paragraph 286 (par.6-60, ref.(b)) - The volume control in the Class II-A receiver operates in a quiet manner in all bands.

143. Paragraph 293 (par.6-66, ref.(b)) - Inasmuch as there has been no material change in the performance characteristics of the AVC over that for the original model, no further tests were made and it may be assumed that the original test results will apply in the case of the modified equipments.

144. Paragraph 294 (par.6-67, ref.(b)) - Tests were made to determine the range of level control for the AVC as furnished in the Class I-A equipment and the results are shown on Plate 23.

145. Paragraph 297 - Plates 33 and 34 show the regulation of the rectifier power unit with and without the ballast lamp respectively, for the Class I-A equipment.

146. Paragraph 298 - The range and linearity of the AVC level control for the Class I-A receiver is shown on Plate 23. The curve on this plate shows no serious departure from linearity except for the very low levels.

147. Paragraph 299 - Plates 25, 26 and 78 show the audio amplifier characteristics of each class of equipment with AVC (maximum AVC level) to be peaked at about 700 cycles for 6 milliwatts output.

148. Paragraph 300 - Plates 24 and 77 show the overload curves with and without AVC of the audio amplifier of the two classes of equipment. These measurements were made at 1,000 cycles.

SUMMARY OF DEFECTS

149. A summary of the defects noted in such items as do not comply with the requirements of references (a) and (b) is as follows with reference to the paragraph numbers as given in reference (b):

(a) Par. 1-5 -- The low frequency equipment is not entirely satisfactory for voice reception owing to the presence of a low pass filter permanently connected in the audio system. The

substitution of the low pass for the band pass filter has improved this feature over the previous model.

(b) Par. 1-7(a) -- The maximum noise level is not considered as being low for either equipment. The maximum noise level has, however, been greatly reduced over that for the previous equipment and is considered as especially good for a receiver of the autodyne type and which must necessarily have as great an audio gain as this equipment.

(c) Par. 1-7(c) -- Neither class of equipment is considered as possessing a high degree of protection against strong local signals. In the case of the Class I-A equipment, the input level at which complete blocking occurs has been improved by approximately one order. No appreciable improvement has been effected in the case of the Class II-A equipment.

(d) Par.1-10 -- No adequate provision has been made in either equipment for filtering the "B" and heater supply leads as for battery operation.

(e) Par. 3-15 -- The output impedance at 1000 cycles of the output transformer is designed to match a 1000 instead of a 600 ohm load.

(f) Par. 4-2 -- Specifications RE 13A 346S do not show approval for the 6D6, 38041 and 876 types of vacuum tubes used in these equipments.

(g) All of the windings of the Class I-A radio frequency coil systems (except the feed back windings) and the low frequency coils of the Class II-A are wound with 10 x 41 Litz wire. Comment was made in the previous report relative to the possibility of defects from poorly soldered joints and corrosion. The possibility of this difficulty is still apparent in the case of the model. Sample coils were furnished, however, which have been wax-treated to include their terminals which, if used in production, would greatly reduce the possibility of corrosion from the effect of moisture.

(h) Coil terminals have been placed dangerously close together on the isolantite coil tube which, if without protection, would, under severe humidity conditions, probably develop creepage. The terminals in the samples provided for the Class I-A equipment have been wax-coated which should improve this situation. It has been promised by the manufacturer's representative that attempt will be made to wax coat all terminals in the II-A equipment, and, if done in a satisfactory manner, will reduce the possibility of creepage.

(i) The feed back and grid windings of the oscillator coils are wound in the same threaded slots with no separation other than the wire insulation. It is promised by the manufacturer's representative, however, that these windings will be placed in separate grooves, thus eliminating the possibility of direct contact.

(j) None of the coils in the Class II-A receiver, except those covering the three lowest frequency bands, have been wax-treated.

(k) Par. 4-3 -- The use of silver-plated contacts at points where subjected to considerable friction is considered unsatisfactory. Although this has not been done in the model, it has been proposed for production units.

The practice of winding the antenna coupling coil on the isolantite tube without a groove is unsatisfactory.

The plating around the threads on the coil cans is of insufficient thickness.

The following items are difficult to replace when servicing becomes necessary:

(1) The several 1/2 watt resistors that are mounted on a sub-panel in the base of both receivers.
(2) The plate by-pass condensers in the I-A receiver.
(3) The mica r.f. filter condensers in the II-A equipment (three in one group on a single screw).
(4) The second r.f. filter resistors in the II-A and similar resistors in the first stage of the I-A.
(5) The audio frequency tube sockets in both receivers, due to their being riveted in place.
(6) The A.F. attenuator in the I-A receiver.
(7) The mica condenser across the output transformer in the I-A receiver.

The regeneration control, AVC level control and volume control units have a single hole mounting arrangement which may become loosened with use and are not provided with a key lock to prevent rotation when loosened.

The antenna and ground binding posts become loosened with service and are not identified for connection.

The toggle switches are similar to a type known to have given trouble in the past. In the Class II-A the band pass filter switch gave repeated trouble during test from uncertain contact.

The large gear to which the slow-moving dial on the main

tuning assembly is attached rattles with vibration, causing an objectionable audible noise.

(l) Par. 4-4 -- The indices of the slow and fast moving main tuning dials do not properly align.

(m) Par. 4-14 -- No master nameplate has been furnished with either equipment. Where nameplates have been provided, they have been left blank.

(n) Par. 4-21 -- The #16 B&S gauge tinned solid bus wire connections, where used in both equipments, are not color coded. None other than a schematic wiring diagram was furnished with either equipment.

(o) Par. 5-4 -- It is believed that there is inadequate filtering provided in the +B and heater circuits within the receivers to permit their operating in compliance with specifications from batteries in a typical service installation.

(p) Par. 5-9 -- No battery cables or power control cables for interconnecting the mixer unit with the power units have been furnished with either equipment.

(q) Par. 5-16 -- Exception is taken to the lettering on the control nameplates of both equipments as follows:

(1) The frequency limits for the band selector switches are not in agreement with the measured frequencies.
(2) The calibration of the frequency "wobbler" on the high frequency unit does not comply with paragraph 6-27, but does comply with paragraph 5-23. The requirements of these two paragraphs are inconsistent in the specifications.
(3) The toggle and band selector switch markings for the variable attenuators are unsatisfactory in that they do not indicate the proper function of these controls. A new nameplate of the type proposed was furnished by the manufacturer's representative which, if installed in production, will be satisfactory.
(4) A photo-etched escutcheon plate made to replace those furnished with the receivers provided a zero center scale for the wobbler and all trimmer controls. Although this arrangement is not in strict compliance with the specifications, it is believed to be preferable to that furnished on the models.

(r) Par. 5-24 -- The main tuning dial does not comply with specifications in that the rotation is counter-clockwise for an increase

in the final effect. This is not considered as an important defect. However, its design is such that positive identification of the settings when midway between two adjacent numbers is difficult. An improved design as suggested in reference (c) is preferable.

(s) Par. 5-39 -- The telephone jack mounted on the front panel of either receiver and the mixer unit does not comply with specifications RE 13A 481B.

(t) Par. 6-1 -- No allowance for manufacturing tolerances has been given in the case of the sensitivity of the Class I-A receiver, bands 4 and 5 being just within the limits of the specifications.

(u) Par. 6-4 -- In both receivers and at all frequencies complete blocking occurs within the same order of input as for resonant overload. In the case of the Class II-A receiver, the detector overloads at the high frequency end of band 9 to prevent resonant overload measurements being taken, as defined by the specifications.

(v) The high frequency receiver has been improved in that there were no signs of receiver "squeal" prior to the start of oscillations with increase of the regeneration control up to a standard oscillation condition. It was observed, however, on the high frequency end of band 9 that a high pitched "squeal" developed when the regeneration control was advanced near to its maximum and well beyond the standard oscillation position.

(w) Par. 6-17 -- In the case of the Class II-A receiver, an audible "squeal" develops on band 9 at the high frequency end at a point near the maximum regeneration setting and remote from the standard oscillation position.

(x) Par. 6-27 -- No zero center scale is provided for the frequency "wobbler" of the high frequency radio receiver model, but a separate escutcheon plate was provided having a zero centered scale as specified.

(y) Par. 6-28 -- The impedance of the output transformer of each class of radio receiver is 1000 ohms (at 1000 cycles) instead of 600 ohms.

(z) Par. 6-32 -- The frequency stability of the oscillator under conditions of variation of the regeneration control from optimum to standard oscillation does not comply with specifications at the high frequency ends of bands 4, 5 and 6 of the Class I-A radio receiver and bands 1 to 5 inclusive of the II-A receiver.

(aa) Par. 6-39 -- The band pass filter has been replaced by a low pass filter in the Class I-A receiver and therefore does not comply with the governing specifications.

(bb) Par. 6-48 -- The variable attenuators do not pass the governing specifications for a 20 DB attenuation at +150% and -60% of peak frequency points.

(cc) Par. 6-54 -- The requirements of this specification for the Class II-A equipment is that the manual volume control shall attenuate 80 DB's from a 30,000 microvolt input. This appears to be based on a 3 microvolt sensitivity, while above 8 megacycles a 10 microvolt sensitivity is permitted by specification 6-1. The receiver sensitivity at the higher frequencies being above 3 microvolts, it is impossible to comply with this specification.

(dd) Par. 6-67 -- The AVC level control of either receiver does not comply with governing specifications. It is believed, however, that the ranges covered by these controls are more than ample for practical purposes.

(ee) At 23 megacycles there is a serious hum modulation of the detector of the high frequency radio receiver.

(ff) Par. 12-1 to 12-7, inclusive -- No instruction book has been furnished with either equipment.

150. The following improvements have been made in the modified equipment to overcome the defects as listed in reference (c), par.301.

(a) Par. 1-5 -- Voice reception has been improved in the case of the Class I-A receiver by the substitution of a low pass instead of a band pass filter.

(b) Par.1-7(a) -- The maximum noise level in both equipments has been appreciably reduced, as shown on Tables 2 and 15.

(f) Par. 3-13 -- The tunable range of the variable attenuators of both receivers now complies with governing specifications.

(i) Par. 4-3 -- The band switches have been improved by the use of silver contact buttons. A new square shaft has been installed which, it is claimed by the manufacturer's representative, is a superior material and shows no signs of rust or corrosion. The manufacturer claims to have given the samples submitted a salt water spray test over a long period of time with the result that only slight surface oxidization was apparent. There were no signs of pitting.

(j) Par.4-3 -- All windings consisting of 10 x 41 Litz wire have been wax-treated. Similar coils to those furnished in models were provided with a heavy wax coat covering not only the coils but the terminals and terminal leads as well. The immersion tests made indicate that this type of construction is as satisfactory as any known to the Laboratory when wire of this type is used.

(k) Par.4-3 -- The terminal lugs have been wax coated on the sample coils provided which, it is claimed, is the type of construction that will be used in production. This procedure should greatly reduce the possibility of creepage, but the real effectiveness of such treatment can only be determined by service tests. Radio frequency coil terminal leads have been attached to the coil winding in a satisfactory manner. The antenna coupling coil has been wound on the coil form and is spaced from the other windings.

(l) The terminal leads have been run in a direct manner on the radio frequency coils in the Class II-A receiver, thus eliminating to a great extent the possibility of misalignment due to possible disarrangement thereof. The feedback and grid windings of the oscillator coils have been changed to have the same direct current potential and are spaced from each other, both being wound on the isolantite form. It is claimed by the manufacturer's representative that a separate groove will be cut in the tube form for each of the windings.

(m) As mentioned above, all of the coils in the Class I-A receiver and the set covering the 3 lowest frequency bands in the Class II-A receiver have been wax-coated. None of the coils in the 6 highest frequency bands of the Class II-A receiver have been wax-coated.

(n) The coil cans have been provided with 2 holes in their tops into which a wrench may be fitted to facilitate can removal.

(o) The connections from the radio frequency coils to the band selector switch contacts have been solder bonded.

(p) The #16 B&S gauge tin-soldered bus wires used in the Class II-A receiver have been so rearranged as to provide satisfactory clearance between wires and to make most of the parts accessible for servicing.

(q) Par.4-4 -- The soldering and wiring of the new models have been greatly improved over the former. The chassis box fit has been greatly improved so as to make withdrawal or replacement satisfactory.

(r) Par.4-5 -- The washers furnished on the phone jacks and securing nuts for the panel meters have been nickel-plated.

(x) Par.5-10 -- The cable length has been increased to comply with the specifications.

(y) Par.5-14 -- The knurled screws for securing the panels of the several units to their respective boxes have been greatly improved and are satisfactory.

(aa) Par.5-20 -- The radio frequency band selector switches used in both equipments have been improved by the use of silver contacts. No difficulty was experienced during the short period that this receiver was under test at the Laboratory. This type of construction appears to be superior to any previously demonstrated.

(cc) Par.5-30 -- The end plate has been removed from the trimmer condensers. The ground connection of the rotor of these condensers has in some cases been made through the front bearing contact instead of through the contact brushes provided. The manufacturer's representative states that it has been their experience that the connection employed is more satisfactory than if connected through the contact brushes. The Laboratory has had no great experience with this type of condenser and therefore cannot recommend which method is the more desirable.

(dd) Par.5-35 -- There was no form of corrosion on any of the nickel plated copper coil cans in the improved models.

(ee) Par.5-36 -- The 1-watt resistors mounted behind the trimming capacitors have been changed to 1/2-watt units, thus making them somewhat more accessible for removal. It is claimed by the manufacturer's representative that his company is still endeavoring to improve their location to facilitate servicing. All sockets in the case of both units are accessible for removal and servicing. The audio frequency sockets of both units, however, have been riveted to the chassis instead of being bolted. The mica capacitors which were previously riveted to the chassis have been mounted in the subject models with screws and nuts. The accessibility of component parts from the servicing standpoint has been greatly improved over the previous model.

(gg) Par.5-47 -- The range switch used with the output meter has been provided with self-wiping contacts.

(hh) Par.5-49 -- The double pole double throw switch mentioned in reference (c) has been replaced with terminal interconnecting links and engraving to identify their proper positioning for either d.c. or a.c. operation.

(jj) Par.6-3 -- The new models comply with the governing specifications with regard to maximum noise level. Comment made on the previous model relative to a condition where the maximum noise level did not occur at the maximum volume control setting is less applicable in the case of the new models. It has been observed, however, that there is a slight attenuation for the last 5% of the volume control range at some points in each of bands 8 and 9. This condition is not considered to be of any great importance.

(kk) Par.6-4 -- Complete receiver blocking occurs for approximately 1 order greater input voltage than on the previous model in the case of the Class I-A receiver. There has been no appreciable improvement in this respect in the case of the Class II-A receiver.

(ll) Par.6-11 -- A third binding post has been provided for use when the receiver is employed for multiple reception. This additional binding post replaces the former requirement that a lead be unsoldered when such a change was made.

(mm) Par.6-17 -- The regeneration controls of both units function quietly throughout their range. The "squeal" that existed in the original models just prior to the start of oscillation has been eliminated. It has been observed, however, that on the two highest frequency bands of the Class II-A receiver there is a slight high-pitched squeal when the regeneration control is advanced to a position near the end of its range and far above standard oscillation conditions.

(nn) Par.6-18 -- The overall time constant of both receivers when subjected to artificial surges has been improved in these models to meet the governing specifications.

(oo) Par.6-22 -- The sample capacitor, resistor, filter and transformer units which were subjected to the salt water immersion test were found to comply with existing specifications.

(pp) Par.6-27 -- Although no zero center scale was provided for the frequency wobbler in the high frequency receiver model, a sample escutcheon plate was demonstrated which it was claimed will be provided in the production models and which meets the specification requirements.

(rr) Par.6-30 -- The band switch, regeneration control, main tuning capacitor, and volume control which were all reported as noisy in the case of the original receivers have been made to function quietly and satisfactorily.

(tt) Par.6-34 -- The frequency wobbler of the high frequency receiver has been redesigned to incorporate sufficient friction as to assure that it will retain the position to which adjusted under such conditions of vibration as may be expected in the service.

(uu) Par.6-36 -- The modified model Class I-A receiver does not block from its own noise at the maximum volume control position and the criticism previously made on this feature no longer holds.

(vv) Par.6-54 -- The stray coupling between the radio frequency circuits and the detector of the Class II-A receiver has been materially reduced and the governing specifications are met.

(xx) Par.6-58 -- The volume control of the Class II-A receiver has been so improved as to make it continuously variable with rotation, thus eliminating the 25 degree non-effective gap in the center of the range.

(yy) Par.6-60 -- The volume control operates in a quiet manner throughout all bands of the high frequency receiver.

CONCLUSIONS

150. The modified models of the Class I-A and II-A receiving equipments are in general ruggedly constructed and present a pleasing appearance. The materials and workmanship are in general of good quality. With few exceptions, the parts are accessible for servicing. As reported upon in reference (c), the major defects relative to noisy operation from faulty switch and condenser contacts have been remedied to the extent that quiet operation was maintained throughout the duration of the tests. If the recommendations as included in this report are followed relative to the use of solid silver contacts on the main variable condenser rotor assembly, it is considered that this condenser unit is as free from possible service difficulty as any similar unit known to this Laboratory. The band switches are of excellent design and construction and excel any previously tested. Although the switches have functioned perfectly and represent the highest degree of excellence yet tested at this Laboratory, no definite statement can be made prior to long service tests, as regards their useful life. These switches have a decided advantage over any similar gang switch known to the Laboratory in that the several sections can be removed separately for servicing and replacement.

151. The statements made in paragraphs (b) and (c) of the conclusions of reference (c) relative to selectivity for the low frequencies up to 100 Kcs. and to the low levels at which complete receiver blocking occurs are still applicable to the improved models. The low frequency

(Class I-A) receiver has, however, been improved as regards blocking by an average of one order.

152. Several minor changes have been recommended to provide proof against moisture, permanence of performance characteristics and better accessibility of component parts for servicing.

153. It is believed that these receivers with the recommended changes incorporated therein will in general give greatly superior performance to any receivers now in service, with the exception of the Model RAA and RAB series, and are in general well suited to the type of service for which they were designed.

TABLE No. 1

Frequency Range and Sensitivity Range and Average Sensitivity
Class I-A Receiver

| | Revised Model | | | Original Model | | |
|---|---|---|---|---|---|---|
| Band | Freq.Range Kcs. | Sensitivity Range | Microvolts Average | Freq.Range Kcs. | Sensitivity Range | MV Average |
| 1 | 15.00-25.00 | 0.90-2.15 | 1.460 | 15.00-24.34 | 0.95-1.91 | 1.43 |
| 2 | 25.00-43.50 | 0.73-1.52 | 1.105 | 24.34-44.45 | 0.82-1.44 | 1.13 |
| 3 | 43.50-77.50 | 1.33-2.93 | 2.120 | 44.45-81.05 | 1.08-2.08 | 1.58 |
| 4 | 77.50-153.00 | 1.22-3.04 | 2.070 | 81.05-159.25 | 0.98-2.28 | 1.63 |
| 5 | 153.00-307.00 | 1.29-3.03 | 1.960 | 159.25-314.50 | 0.86-1.90 | 1.38 |
| 6 | 307.00-600.00 | 1.32-2.83 | 1.953 | 314.50-600.00 | 0.84-1.55 | 1.20 |

TABLE No. 2

Average Maximum Noise Level and Variation of Each Band
Class I-A Receiver

| | Revised Model | | | Original Model | | |
|---|---|---|---|---|---|---|
| Band | Freq.Range Kcs. | Average Max.Noise Level Microwatts | Max.Variation of Noise Level Decibels | Freq.Range Kcs. | Average Max.Noise Level Microwatts | Max.Variation of Noise Level Decibels |
| 1 | 15.00-25.00 | 2984 | 2.87 | 15.00-24.34 | 63700 | 7.19 |
| 2 | 25.00-43.50 | 6148 | 2.47 | 24.34-44.45 | 130550 | 9.18 |
| 3 | 43.50-77.50 | 9830 | 3.23 | 44.45-81.05 | 6335 | 6.27 |
| 4 | 77.50-153.00 | 6802 | 4.51 | 81.45-159.25 | 249000 | 4.89 |
| 5 | 153.00-307.00 | 5358 | 2.35 | 159.25-314.50 | 64850 | 8.30 |
| 6 | 307.00-600.00 | 4330 | 2.77 | 314.50-600.00 | 9575 | 3.36 |

TABLE No. 3

Frequency Overlap -- Class I-A Receiver

| Bands | Percent Overlap Between Bands Revised Model | Original Model |
|---|---|---|
| L.F. end band 1 to 15 Kcs. | 6.00 | 10.00 |
| 1 and 2 | 7.60 | 5.68 |
| 2 and 3 | 7.40 | 5.85 |
| 3 and 4 | 6.90 | 5.06 |
| 4 and 5 | 7.40 | 6.76 |
| 5 and 6 | 6.90 | 24.70 |
| H.F. end band 6 to 600 Kcs. | 4.50 | 5.00 |

TABLE No. 4

Accuracy of Resetability -- Class I-A Receiver

| Band | Revised Model Frequency Kcs. | Revised Model Change in Output Decibels | Original Model Frequency Kcs. | Original Model Change in Output Decibels |
|---|---|---|---|---|
| 1 | 15.00 | -0.34 | 15.00 | -0.086 |
| 1 | 25.00 | -0.24 | 24.34 | -3.200 |
| 2 | 25.00 | -0.50 | 24.34 | -0.560 |
| 2 | 43.50 | -2.16 | 44.45 | -0.420 |
| 3 | 43.50 | +0.22 | 44.45 | +1.240 |
| 3 | 77.50 | -0.60 | 81.05 | -0.172 |
| 4 | 77.50 | -0.12 | 81.05 | +1.100 |
| 4 | 153.00 | -0.22 | 159.25 | -1.656 |
| 5 | 153.00 | 0.00 | 159.25 | -1.260 |
| 5 | 307.00 | 0.00 | 314.50 | -1.340 |
| 6 | 307.00 | -0.46 | 314.50 | +0.086 |
| 6 | 600.00 | -1.77 | 600.00 | -2.360 |

TABLE No. 5

Resonant Overload - Class I-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| Band | Freq. Kcs. | Microvolts Input for Resonant Overload | Resonant* Overload Milliwatts | Band | Freq. Kcs. | Microvolts Input for Resonant Overload | Resonant* Overload Milliwatts |
| 1 | 15.00 | 24.0 | 327 | 1 | 15.00 | 24.0 | 505 |
| 1 | 25.00 | 11.0 | 400 | 1 | 24.34 | 11.3 | 510 |
| 4 | 77.50 | 35.0 | 375 | 4 | 81.05 | 34.6 | 490 |
| 4 | 153.00 | 15.0 | 375 | 4 | 159.25 | 11.7 | 448 |
| 6 | 307.00 | 30.0 | 312 | 6 | 314.50 | 19.5 | 498 |
| 6 | 600.00 | 17.0 | 375 | 6 | 600.00 | 11.5 | 500 |

* specification limit - 300 milliwatts.

TABLE No. 6

Frequency Stability vs Line Voltage Change
Class I-A Receiver

| Band No. | Frequency Kcs. | Receiver Frequency Change - Cycles* With Ballast Lamp +10% | With Ballast Lamp -10% | Without Ballast Lamp +10% | Without Ballast Lamp -10% |
|---|---|---|---|---|---|
| 1 | 25.0 | -2.0 | -0.5 | -1.5 | +1.0 |
| 2 | 43.5 | 0.0 | +0.5 | -1.0 | +1.5 |
| 3 | 77.5 | 0.0 | +1.0 | -1.5 | +3.5 |
| 4 | 153.0 | -1.5 | +1.5 | -6.0 | +5.5 |
| 5 | 307.0 | 0.0 | +2.5 | -5.5 | +6.0 |
| 6 | 600.0 | 0.0 | +3.0 | -4.0 | +3.0 |

* specification limit - 100 cycles.

TABLE No. 7

Frequency Stability vs Change in Regeneration from Optimum to Standard -- Class I-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| Band No. | Frequency Kcs. | Receiver Freq.Change* Cycles | Percent | Band No. | Frequency Kcs. | Receiver Freq.Change* Cycles | Percent |
| 1 | 25.00 | 12.0 | 0.048 | 1 | 24.34 | 17.2 | 0.0710 |
| 2 | 43.50 | 27.0 | 0.0620 | 2 | 44.45 | 69.0 | 0.1550 |
| 3 | 77.50 | 53.0 | 0.0684 | 3 | 81.05 | 58.5 | 0.0722 |
| 4 | 153.00** | 115.5 | 0.0755 | 4 | 159.25** | 102.5 | 0.0642 |
| 5 | 307.00** | 182.0 | 0.0592 | 5 | 314.50** | 168.0 | 0.0530 |
| 6 | 600.00** | 248.0 | 0.0414 | 6 | 600.00** | 251.0 | 0.0420 |

* specification limits - 0.01% or 100 cycles, whichever is the least exacting.

** outside of limits.

TABLE No. 8

Frequency Stability vs Trimmer Capacitor Settings -- Class I-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| | | Receiver Frequency Change* | | | | Receiver Frequency Change* | |
| Band No. | Freq. Kcs. | Ant. Trimmer | R.F. Trimmer | Band No. | Freq. Kcs. | Ant. Trimmer | R.F. Trimmer |
| 1 | 25.00 | 1.5 cycles | 1.0 cycles | 1 | 24.34 | 0.0 cycles | 0.0 cycles |
| 2 | 43.50 | 1.0 " | 1.0 " | 2 | 44.45 | 0.6 " | 0.6 " |
| 3 | 77.50 | 2.0 " | 4.0 " | 3 | 81.05 | 1.2 " | 3.5 " |
| 4 | 153.00 | 1.0 " | 1.0 " | 4 | 159.25 | 0.5 " | 33.5 " |
| 5 | 307.00 | 0.0% | 0.00150% | 5 | 314.50 | 0.0008% | 0.0185% |
| 6 | 600.00 | 0.00017% | 0.00432% | 6 | 600.00 | 0.0001% | 0.00316% |

* specification limits - 15 to 200 Kcs. - 100 cycles

200 to 600 Kcs. - 0.05%

TABLE No. 9

Frequency Stability vs Change in Input Signal Intensity
Class I-A Receiver

| Revised Model | | | Original Model | | |
|---|---|---|---|---|---|
| Band No. | Frequency Kcs. | Receiver Freq.Change Cycles* | Band No. | Frequency Kcs. | Receiver Freq.Change Cycles* |
| 1 | 25.00 | 1.5 | 1 | 24.34 | 3.7 |
| 2 | 43.50 | 0.0 | 2 | 44.45 | 2.5 |
| 3 | 77.00 | 1.0 | 3 | 81.05 | 4.0 |
| 4 | 153.00 | 1.5 | 4 | 159.25 | 4.3 |
| 5 | 307.00 | 0.0 | 5 | 314.50 | 3.0 |
| 6 | 600.00 | 3.0 | 6 | 600.00 | 11.0 |

* specification limit - 100 cycles.

TABLE No. 10

Frequency Stability vs Change in Volume Control
Setting -- Class I-A Receiver

| Revised Model | | | Original Model | | |
|---|---|---|---|---|---|
| Band No. | Frequency Kcs. | Receiver Freq.Change * | Band No. | Frequency Kcs. | Receiver Freq.Change * |
| 1 | 25.00 | 1.5 cycles | 1 | 24.34 | 15.7 cycles |
| 2 | 43.50 | 3.0 " | 2 | 44.45 | 9.5 " |
| 3 | 77.50 | 9.5 " | 3 | 81.05 | 21.0 " |
| 4 | 153.00 | 6.0 " | 4** | 159.25 | 205.0 " |
| 5 | 307.00 | 0.00766% | 5** | 314.50 | 0.068% |
| 6 | 600.00 | 0.0208% | 6 | 600.00 | 0.0135% |

* specification limits - 15 to 200 Kcs. - 100 cycles

200 to 600 Kcs. - 0.05%

** outside of limits.

TABLE No. 11

Peak Frequencies of Variable Attenuators -- Class I-A Receiver

| Revised Model | | | Original Model | | |
|---|---|---|---|---|---|
| Tap | Frequency Cycles | Attenuation* Decibels | Tap | Frequency Cycles | Attenuation* Decibels |
| Low 1 | 448 | 3.92 | Low 1 | 470 | 5.52 |
| " 2 | 473 | 3.81 | " 2 | 510 | 3.64 |
| " 3 | 504 | 3.52 | " 3 | 540 | 3.86 |
| " 4 | 537 | 3.41 | " 4 | 560 | 3.17 |
| " 5 | 572 | 3.23 | " 5 | 590 | 3.05 |
| " 6 | 611 | 3.05 | " 6 | 640 | 3.17 |
| " 7 | 643 | 2.86 | " 7 | 680 | 3.23 |
| " 8 | 688 | 2.80 | " 8 | 710 | 3.41 |
| " 9 | 728 | 2.48 | " 9 | 770 | 3.23 |
| " 10 | 796 | 2.41 | " 10 | 800 | 2.80 |
| High 1 | 800 | 3.75 | High 1 | 830 | 3.52 |
| " 2 | 845 | 3.41 | " 2 | 880 | 3.75 |
| " 3 | 901 | 3.17 | " 3 | 930 | 3.64 |
| " 4 | 956 | 3.05 | " 4 | 990 | 3.69 |
| " 5 | 1013 | 2.98 | " 5 | 1050 | 3.46 |
| " 6 | 1074 | 2.80 | " 6 | 1100 | 2.86 |
| " 7 | 1142 | 2.67 | " 7 | 1150 | 2.35 |
| " 8 | 1203 | 2.48 | " 8 | 1210 | 2.61 |
| " 9 | 1291 | 2.41 | " 9 | 1250 | 3.86 |
| " 10 | 1393 | 2.28 | " 10 | 1400 | 2.84 |

* Attenuation is measured from zero level at peak frequency.

TABLE No. 12

Attenuation Characteristics of Variable Attenuators
Class I-A Receiver

Revised Model
Attenuation in Decibels for 6 mw output

| Tap | +5% Peak Freq. | -5% Peak Freq. | +150% Peak Freq. | -60% Peak Freq. |
|---|---|---|---|---|
| Low 1 | 1.5 | 1.3 | 22.1 | 24.3 |
| " 5 | 1.4 | 1.3 | 20.6 | 22.7 |
| " 10 | 1.2 | 0.7 | ** 19.3 | ** 19.6 |
| High 1 | 2.2 | 1.2 | 22.2 | 23.5 |
| " 5 | 1.2 | 1.1 | 20.8 | 21.9 |
| " 10 | 1.1 | 1.0 | ** 18.9 | ** 19.3 |

Original Model
Attenuation in Decibels for 6 mw output

| Tap | +5% Peak Freq. | -5% Peak Freq. | +150% Peak Freq. | -60% Peak Freq. |
|---|---|---|---|---|
| Low 1 | 2.7 | 3.0 | 24.2 | 26.0 |
| " 5 | 1.9 | 1.4 | 22.9 | 24.7 |
| " 10 | 1.1 | 1.6 | 22.1 | 22.1 |
| High 1 | 3.0 | 2.5 | 25.5 | 26.0 |
| " 5 | 1.7 | 2.2 | 23.7 | 24.0 |
| " 10 | 0.8 | 1.3 | 20.0 | 21.8 |

** outside of limit.

TABLE No. 13

Range of Manual Volume Control -- Class I-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| Band | Freq. Kcs. | Microvolts Input | Range Decibels | Band | Freq. Kcs. | Microvolts Input | Range Decibels |
| 1 | 15.00 | 500,000 | 107.52 | 1 | 15.00 | 500,000 | 109.3 |
| 1 | 25.00 | " | 115.51 | 1 | 24.34 | " | 111.8 |
| 4 | 77.50 | " | 103.92 | 4 | 81.04 | 462,000* | 106.6 |
| 4 | 153.00 | " | 112.27 | 4 | 159.25 | 500,000 | 114.8 |
| 6 | 307.00 | " | 105.44 | 6 | 314.50 | 370,000* | 110.4 |
| 6 | 600.00 | " | 111.25 | 6 | 600.00 | 468,000* | 114.6 |

* Note detector blocking occurred from an input greater than that given.

TABLE No. 14

Frequency Range, Sensitivity Range, and Average Sensitivity of Each Band -- Class II-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| Band | Freq.Range Kcs. | Sensitivity Microvolts Range | Avg. | Band | Freq.Range Kcs. | Sensitivity Microvolts Range | Avg. |
| 1 | 300-490 | 2.23-2.83 | 2.56 | 1 | 300-482 | 2.18-2.38 | 2.28 |
| 2 | 490-800 | 2.52-2.69 | 2.61 | 2 | 482-806 | 2.02-2.25 | 2.13 |
| 3 | 800-1340 | 2.10-2.48 | 2.28 | 3 | 806-1361 | 1.98-2.10 | 2.04 |
| 4 | 1340-2090 | 1.72-1.92 | 1.87 | 4 | 1361-2180 | 1.57-1.70 | 1.63 |
| 5 | 2090-3420 | 2.02-2.39 | 2.14 | 5 | 2180-3650 | 1.90-2.10 | 2.00 |
| 6 | 3420-5530 | 2.36-2.61 | 2.51 | 6 | 3650-5728 | 2.00-2.30 | 2.15 |
| 7 | 5530-8830 | 2.51-2.80 | 2.63 | 7 | 5728-8595 | 2.32-2.90 | 2.61 |
| 8 | 8830-14300 | 3.45-3.83 | 3.70 | 8 | 8595-14115 | 4.18-4.30 | 4.24 |
| 9 | 14300-23000 | 4.31-5.50 | 3.86 | 9 | 14115-23000 | 7.50-7.80 | 7.65 |

TABLE No. 15

Average Maximum Noise Level and Variation of Each Band, Class II-A Receiver

| | Revised Model | | | Original Model | | |
|---|---|---|---|---|---|---|
| Band | Freq.Range Kcs. | Average Max.Noise Level μW. | Max.Variation of Noise Level Dbs. | Freq.Range Kcs. | Average Max.Noise Level μW. | Max.Variation of Noise Level Dbs. |
| 1 | 350-490 | 15,826 | 10.55 | 300-482 | 217,050 | 6.64 |
| 2 | 490-800 | 30,960 | 11.53 | 482-806 | 100,200 | 4.74 |
| 3 | 800-1340 | 18,150 | 9.54 | 806-1361 | 34,185 | 11.75 |
| 4 | 1340-2090 | 2,766 | 1.04 | 1361-2180 | 225,500 | 3.13 |
| 5 | 2090-3420 | 3,188 | 1.83 | 2180-3650 | 89,550 | 2.54 |
| 6 | 3420-5530 | 4,156 | 3.18 | 3650-5728 | 3,010 | 6.04 |
| 7 | 5530-8830 | 1,078 | 3.14 | 5728-8595 | 23,850 | 2.33 |
| 8 | 8830-14300 | 1,356 | 4.62 | 8595-14115 | 758 | 3.01 |
| 9 | 14300-23000 | 586 | 5.71 | 14115-23000 | 28 | 2.25 |

TABLE No. 16

Frequency Overlap — Class II-A Receiver

| Bands | Percent Overlap Between Bands Revised Model | Original Model |
|---|---|---|
| LF end of Band 1 to 300 Kcs. | 3.10 | 4.40 |
| 1 and 2 | 7.96 | 6.02 |
| 2 and 3 | 7.62 | 7.20 |
| 3 and 4 | 7.23 | 5.50 |
| 4 and 5 | 7.65 | 7.79 |
| 5 and 6 | 6.87 | 7.93 |
| 6 and 7 | 7.34 | 14.67 |
| 7 and 8 | 7.93 | 5.82 |
| 8 and 9 | 6.50 | 7.02 |
| HF end of Band 9 to 23 megacycles. | 3.25 | 5.27 |

TABLE No. 17

Accuracy of Resetability -- Class II-A Receiver

| Band | Revised Model Freq. Kcs. | Revised Model Change in Output DB's or % | Original Model Freq. Kcs. | Original Model Change in Output % |
|---|---|---|---|---|
| 1 | 300 | 1.06 DB | 300 | 0.01670 |
| 1 | 490 | 3.54 DB | 482 | 0.00726 |
| 2 | 490 | 1.25 DB | 482 | 0.01350 |
| 2 | 800 | 0.0340% | 806 | 0.00186 |
| 3 | 800 | 0.0107% | 806 | 0.00632 |
| 3 | 1340 | 0.0015% | 1361 | 0.00434 |
| 4 | 1340 | 0.0034% | 1361 | 0.00434 |
| 4 | 2090 | 0.0138% | 2180 | 0.00138 |
| 5 | 2090 | 0.0076% | 2180 | 0.00422 |
| 5 | 3420 | 0.0127% | 3650 | 0.00370 |
| 6 | 3420 | 0.0073% | 3650 | 0.00357 |
| 6 | 5530 | 0.0102% | 5728 | 0.00361 |
| 7 | 5530 | 0.0080% | 5728 | 0.00485 |
| 7 | 8830 | 0.0078% | 8595 | 0.00239 |
| 8 | 8830 | 0.0016% | 8595 | 0.00211 |
| 8 | 14300 | 0.0052% | 14115 | 0.00106 |
| 9 | 14300 | 0.0013% | 14115 | 0.00374 |
| 9 | 23000 | 0.0013% | 23000 | 0.00261 |

TABLE No. 18

Resonant Overload -- Class II-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| Band | Freq. Kcs. | Microvolts Input for Resonant Overload | Resonant Overload Milliwatts* | Band | Freq. Kcs. | Microvolts Input for Resonant Overload | Resonant Overload Milliwatts* |
| 1 | 300 | 32 | 444 | 1 | 300 | 23.5 | 314 |
| 1 | 490 | 40 | 482 | 1 | 482 | 23.5 | 314 |
| 2 | 490 | 35 | 505 | 2 | 482 | 30.0 | 417 |
| 2 | 800 | 35 | 505 | 2 | 806 | 19.0 | 375 |
| 3 | 800 | 25 | 452 | 3 | 806 | 26.0 | 417 |
| 3 | 1340 | 25 | 452 | 3 | 1361 | 25.0 | 428 |
| 4 | 1340 | 21 | 464 | 4 | 1361 | 24.0 | 428 |
| 4 | 2090 | 21 | 464 | 4 | 2180 | 25.0 | 428 |
| 5 | 2090 | 28 | 540 | 5 | 2180 | 28.0 | 375 |
| 5 | 3420 | 25 | 493 | 5 | 3650 | 28.0 | 375 |
| 6 | 3420 | 29 | 482 | 6 | 3650 | 40.0 | 455 |
| 6 | 5530 | 34 | 528 | 6 | 5728 | 29.0 | 375 |
| 7 | 5530 | 36 | 508 | 7 | 5728 | 31.0 | 375 |
| 7 | 8830 | 35 | 540 | 7 | 8595 | 35.0 | 360 |
| 8 | 8830 | 57 | 482 | 8 | 8595 | 45.0 | 350 |
| 8 | 14300 | 57 | 482 | 8 | 14115 | 62.0 | 360 |
| 9 | 14300 | 72 | 493 | 9 | 14115 | 93.0 | 428 |
| 9** | 23000 | | | 9 | 23000 | 95.0 | 360 |

* specification limits - 300 milliwatts

** detector blocking occurs prior to resonant overload.

TABLE No. 19

Frequency Stability vs Line Voltage Change
Class II-A Receiver

| Band | Freq.Kcs. | Beat Note Frequency Change - Cycles* With Ballast Lamp +10% | With Ballast Lamp -10% | Without Ballast Lamp +10% | Without Ballast Lamp -10% |
|---|---|---|---|---|---|
| 1 | 500 | +2.0 | -2.0 | +4.0 | +4.0 |
| 2 | 800 | -5.0 | -6.0 | +18.0 | -3.0 |
| 3 | 1300 | +1.0 | +3.0 | +43.5 | -17.0 |
| 4 | 2100 | -19.0 | -16.0 | +24.0 | +21.0 |
| 5 | 3400 | +5.0 | -22.5 | +92.0 | -18.0 |
| 6 | 5500 | -37.0 | -69.0 | +202.0 | -130.0 |
| 7 | 8800 | +109.0 | -157.0 | +345.5 | -279.0 |
| 8 | 14400 | -145.0 | -281.0 | +680.0 | -613.0 |
| 9 | 23000 | -231.0 | +113.0 | +579.0 | +107.0 |

* specification limits 0.01% or 100 cycles.

TABLE No. 20

Frequency Stability vs. Change in Regeneration from Optimum to Standard, Class II-A Receiver.

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| | | Change in Oscillator Frequency* | | | | Change in Oscillator Frequency* | |
| Band | Freq. Kcs. | Cycles | PerCent | Band | Freq. Kcs. | Cycles | Percent |
| 1 | 490 | 120.0 | 0.0245** | 1 | 482 | 75 | 0.01550 |
| 2 | 800 | 166.0 | 0.0208** | 2 | 806 | 104 | 0.01290** |
| 3 | 1340 | 152.0 | 0.0113** | 3 | 1361 | 255 | 0.01670** |
| 4 | 2090 | 258.0 | 0.0123** | 4 | 2180 | 331 | 0.01520** |
| 5 | 3420 | 361.0 | 0.0105** | 5 | 3650 | 289 | 0.00790 |
| 6 | 5530 | 497.0 | 0.0090 | 6 | 5728 | 412 | 0.00720 |
| 7 | 8830 | 575.0 | 0.0065 | 7 | 8595 | 217 | 0.00254 |
| 8 | 14300 | 460.0 | 0.0032 | 8 | 14115 | 482 | 0.00342 |
| 9 | 23000 | 400.0 | 0.0017 | 9 | 23000 | 330 | 0.00143 |

* specification limits 0.01% or 100 cycles.

** outside of limits.

TABLE No. 21

Frequency Range of Wobbler -- Class II-A Receiver

| | Revised Model | | | Original Model | | |
|---|---|---|---|---|---|---|
| Band | Freq. Kcs. | Range of Freq. Wobbler, Kcs.* | % Rec. Freq. | Freq. Kcs. | Range of Freq. Wobbler, Kcs.* | % Rec. Freq. |
| 1 | 490 | 1.43 | 0.292 | 482 | 1.31 | 0.272 |
| 2 | 800 | 2.43 | 0.304 | 806 | 2.30 | 0.285 |
| 3 | 1340 | 4.16 | 0.310 | 1361 | 2.50 | 0.147 |
| 4 | 2090 | 5.38 | 0.257 | 2180 | 4.08 | 0.187 |
| 5 | 3420 | 9.87 | 0.288 | 3650 | 10.32 | 0.283 |
| 6 | 5530 | 15.18 | 0.293 | 5728 | 15.00 | 0.262 |
| 7 | 8830 | 26.11 | 0.296 | 8595 | 21.30 | 0.248 |
| 8 | 14300 | 45.10 | 0.315 | 14115 | 42.50 | 0.301 |
| 9 | 23000 | 74.40 | 0.324 | 23000 | 55.00 | 0.239 |

* specification limits not less than 0.05 nor more than 0.35%.

TABLE No. 22

Frequency Stability vs. Change in Input Signal Intensity
Class II-A Receiver

| Revised Model | | | Original Model | | |
|---|---|---|---|---|---|
| Band | Freq.Kcs. | Freq.Change Cycles* | Band | Freq.Kcs. | Freq.Change Cycles* |
| 7 | 8830 | 17 | 7 | 8595 | 130 |
| 8 | 14300 | 113 | 8 | 14115 | 226 |
| 9 | 23000 | 235 | 9 | 23000 | 258 |

Other bands negligible change.

* specification limits - not over 300 cycles.

TABLE No. 23

Summary of Attenuation Characteristics of Band Pass Filter, Class II-A Receiver

Revised Model

| | |
|---|---|
| Frequency of Min. Attenuation..... | 1,000 Cycles* |
| Band Width at -6 Db Attenuation..... | 845 Cycles |
| Band Width at -40 Db Attenuation..... | 1,190 Cycles |
| Output Level..... | 6 milliwatts |

Original Model

| | |
|---|---|
| Frequency of Min. Attenuation..... | 800 Cycles |
| Band Width at -6 Db Attenuation..... | 820 Cycles |
| Band Width at -40 Db Attenuation..... | 1,135 Cycles |
| Output Level..... | 6 milliwatts |

Specification Limits: Min.Attenuation (centered) at 800 Cycles ± 10%.

Total Band Width at -6 Db's -- not less than 800 Cycles.

Total Band Width at -40 Db's -- not more than 1,300 Cycles.

*
Attenuation at 1,000 cycles is but 0.2 Db less than at 800 cycles, within the error of measurement. The geometric mean of the frequencies at which the attenuation is 20 Db's below the peak is 825 cycles.

TABLE No. 24

Peak Frequencies of Variable Attenuator
Class II-A Receiver

| Revised Model | | | | Original Model | | | |
|---|---|---|---|---|---|---|---|
| | Tap | Freq. Cycles | Attenuation* Db's | | Tap | Freq. Cycles | Attenuation* Db's |
| Low | 1 | 444 | 2.51 | Low | 1 | 470 | 5.52 |
| | 2 | 475 | 2.57 | | 2 | 510 | 3.64 |
| | 3 | 502 | 2.49 | | 3 | 540 | 3.86 |
| | 4 | 533 | 2.40 | | 4 | 560 | 3.17 |
| | 5 | 566 | 2.38 | | 5 | 590 | 3.05 |
| | 6 | 601 | 2.37 | | 6 | 640 | 3.17 |
| | 7 | 638 | 2.36 | | 7 | 680 | 3.23 |
| | 8 | 678 | 2.33 | | 8 | 710 | 3.41 |
| | 9 | 718 | 2.29 | | 9 | 770 | 3.23 |
| | 10 | 781 | 2.25 | | 10 | 800 | 2.80 |
| High | 1 | 783 | 3.41 | High | 1 | 830 | 3.52 |
| | 2 | 825 | 3.43 | | 2 | 880 | 3.75 |
| | 3 | 890 | 3.29 | | 3 | 930 | 3.64 |
| | 4 | 938 | 3.14 | | 4 | 990 | 3.69 |
| | 5 | 995 | 2.96 | | 5 | 1050 | 3.46 |
| | 6 | 1055 | 2.92 | | 6 | 1100 | 2.86 |
| | 7 | 1127 | 2.80 | | 7 | 1150 | 2.35 |
| | 8 | 1194 | 2.70 | | 8 | 1210 | 12.01 |
| | 9 | 1258 | 2.57 | | 9 | 1250 | 3.86 |
| | 10 | 1356 | 2.41 | | 10 | 1400 | 12.84 |

* Attenuation is measured from zero level at peak frequency.

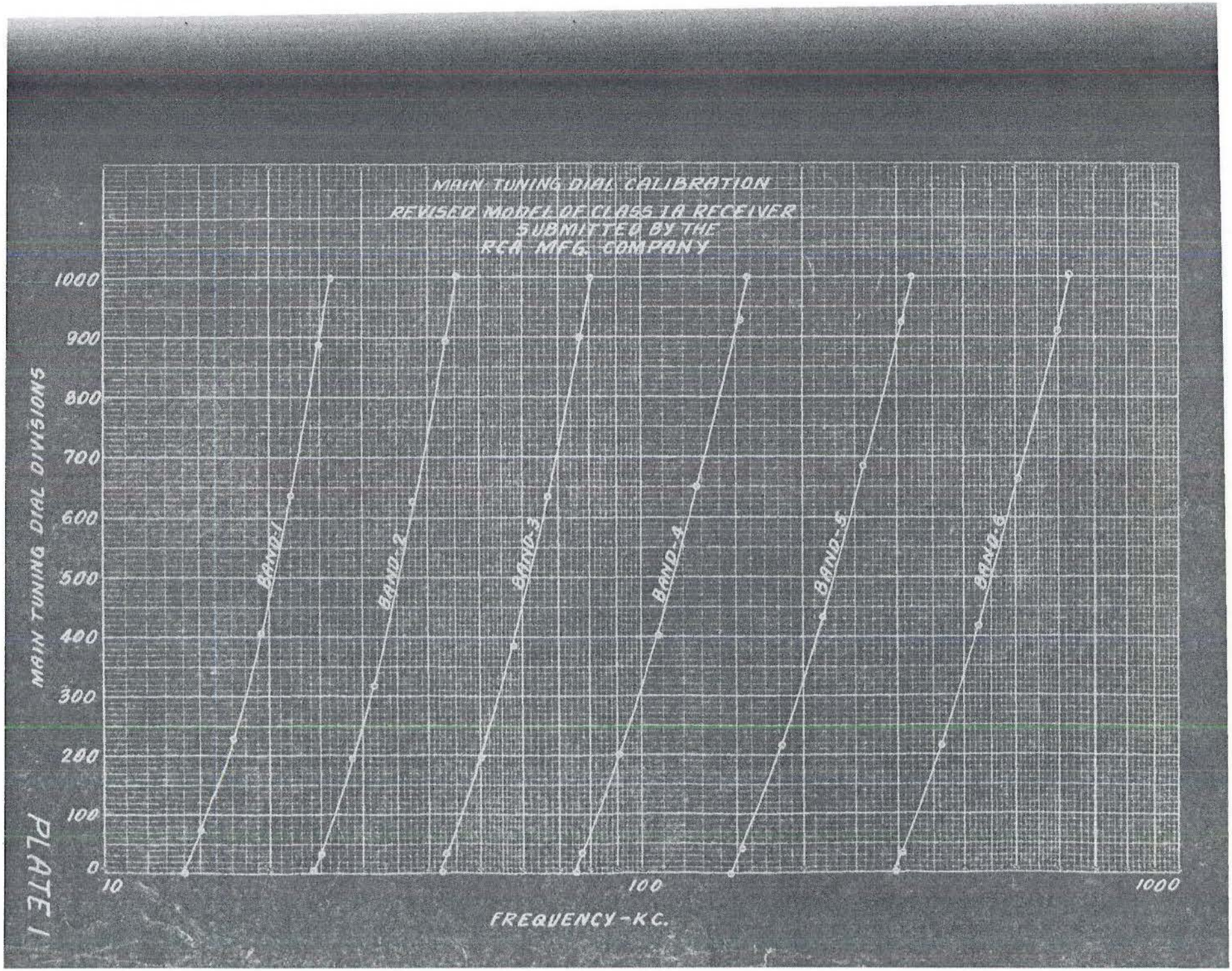

MAIN TUNING DIAL CALIBRATION
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
MAIN TUNING DIAL DIVISIONS
1000
900
800
700
600
500
400
300
200
100
0
BAND-1
BAND-2
BAND-3
BAND-4
BAND-5
BAND-6
10
100
1000
FREQUENCY - K.C.

PLATE 1

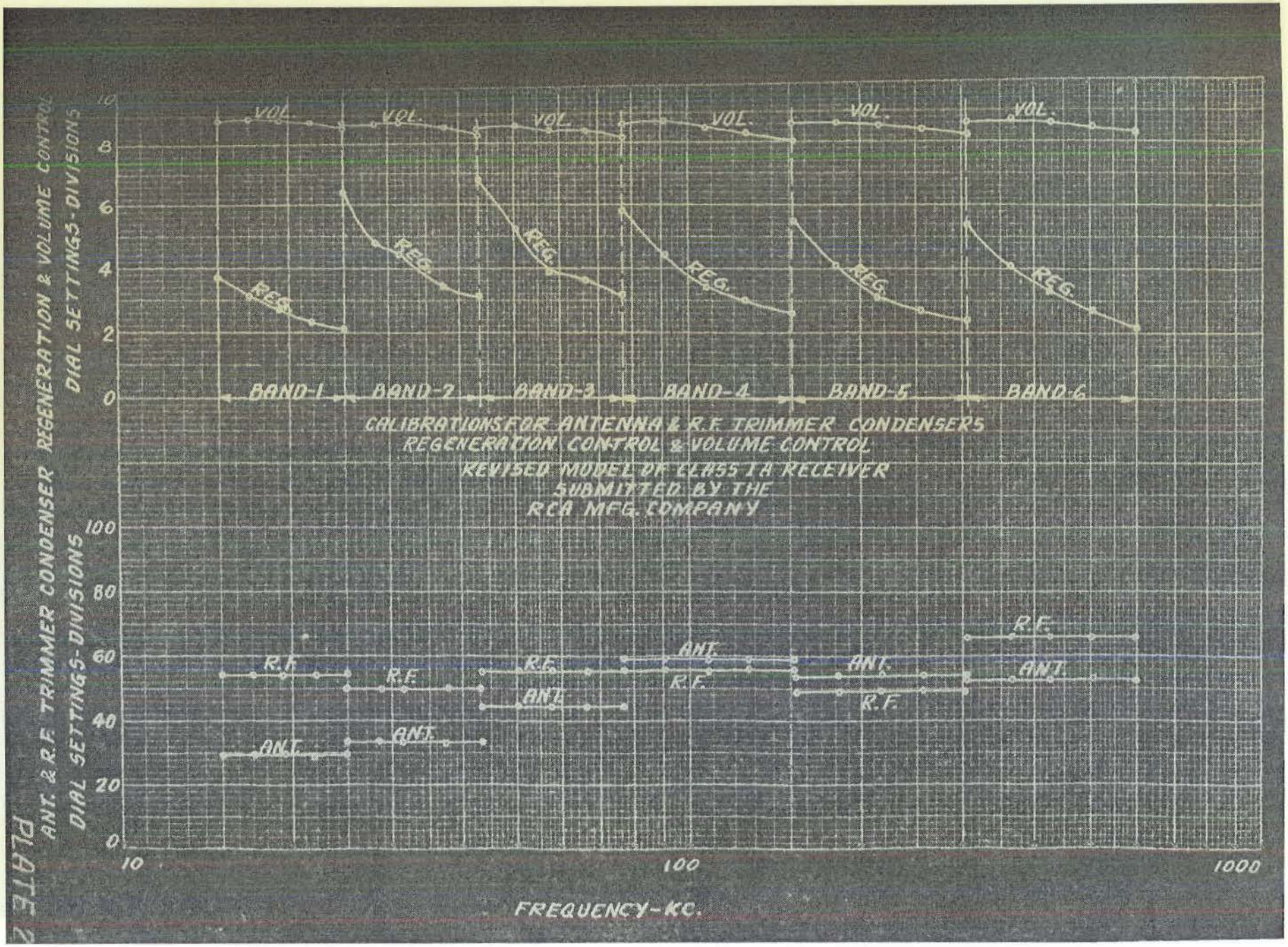


PLATE 2
ANT. & R.F. TRIMMER CONDENSER REGENERATION & VOLUME CONTROL
DIAL SETTINGS-DIVISIONS
DIAL SETTINGS-DIVISIONS
VOL.
REG.
BAND-1
BAND-2
BAND-3
BAND-4
BAND-5
BAND-6
CALIBRATIONS FOR ANTENNA & R.F. TRIMMER CONDENSERS
REGENERATION CONTROL & VOLUME CONTROL
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
R.F.
ANT.
FREQUENCY-KC.

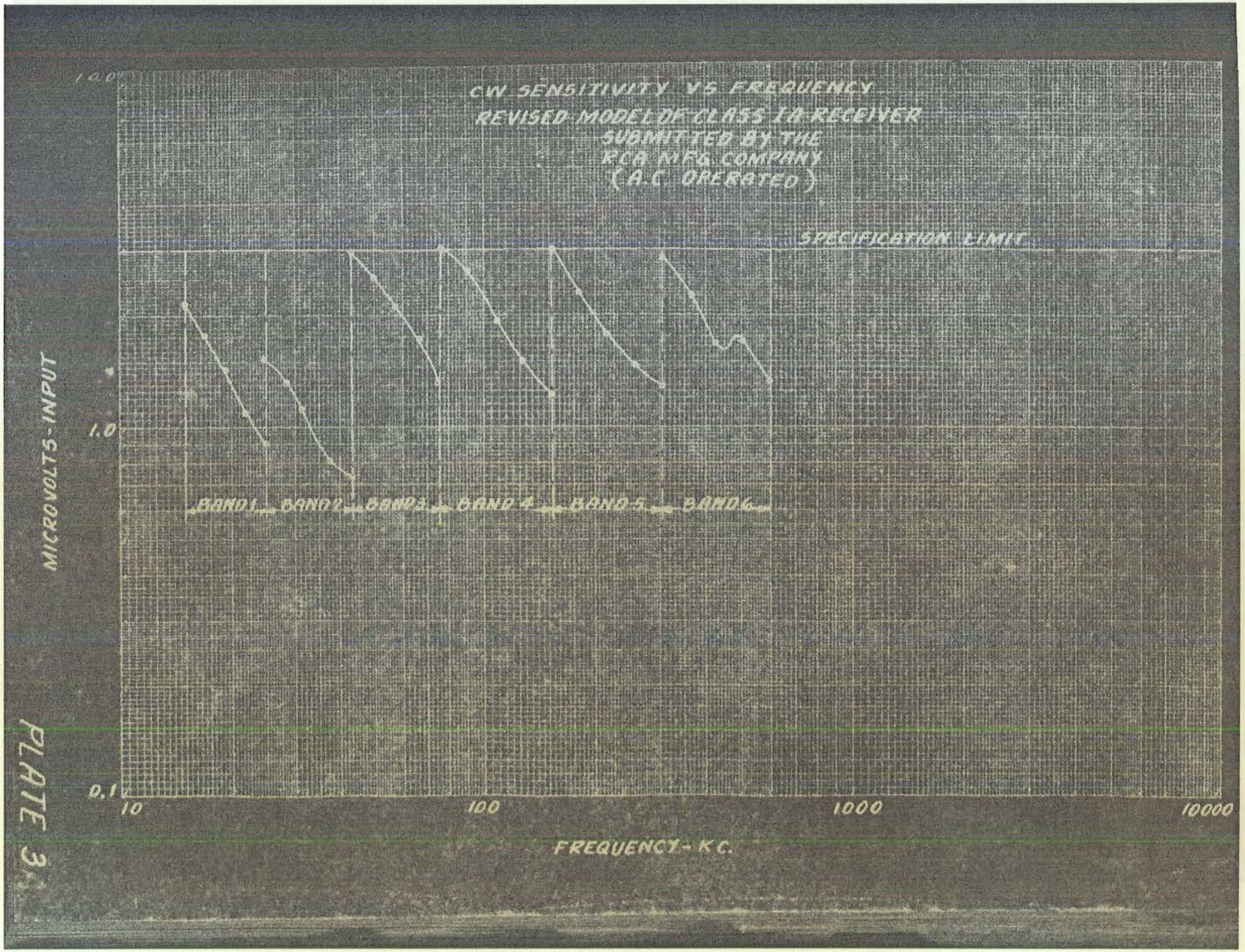

CW SENSITIVITY VS FREQUENCY
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
(A.C. OPERATED)
SPECIFICATION LIMIT
BAND 1
BAND 2
BAND 3
BAND 4
BAND 5
BAND 6
10.0
1.0
0.1
MICROVOLTS-INPUT
10
100
1000
10000
FREQUENCY - K.C.

PLATE 3

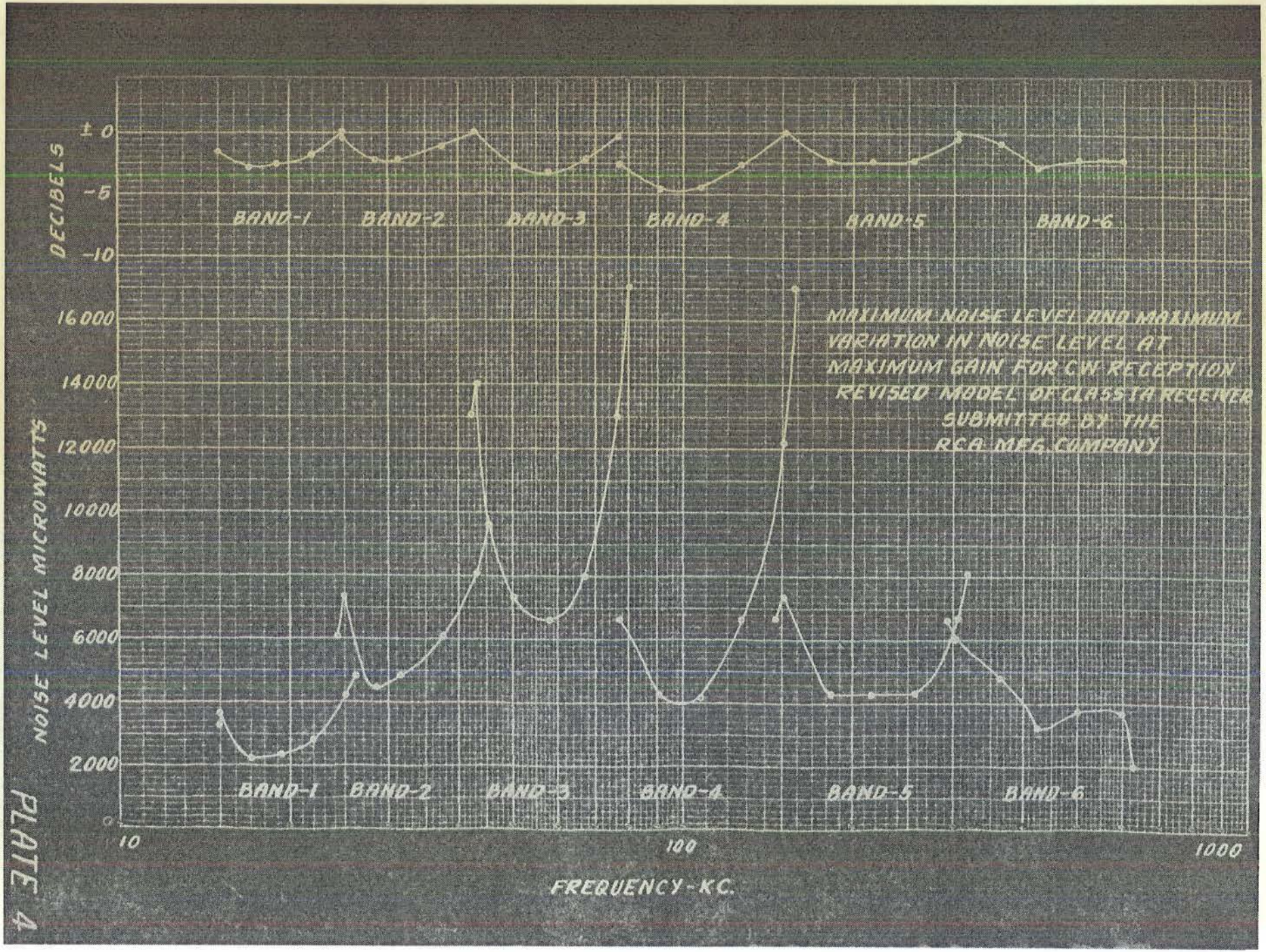
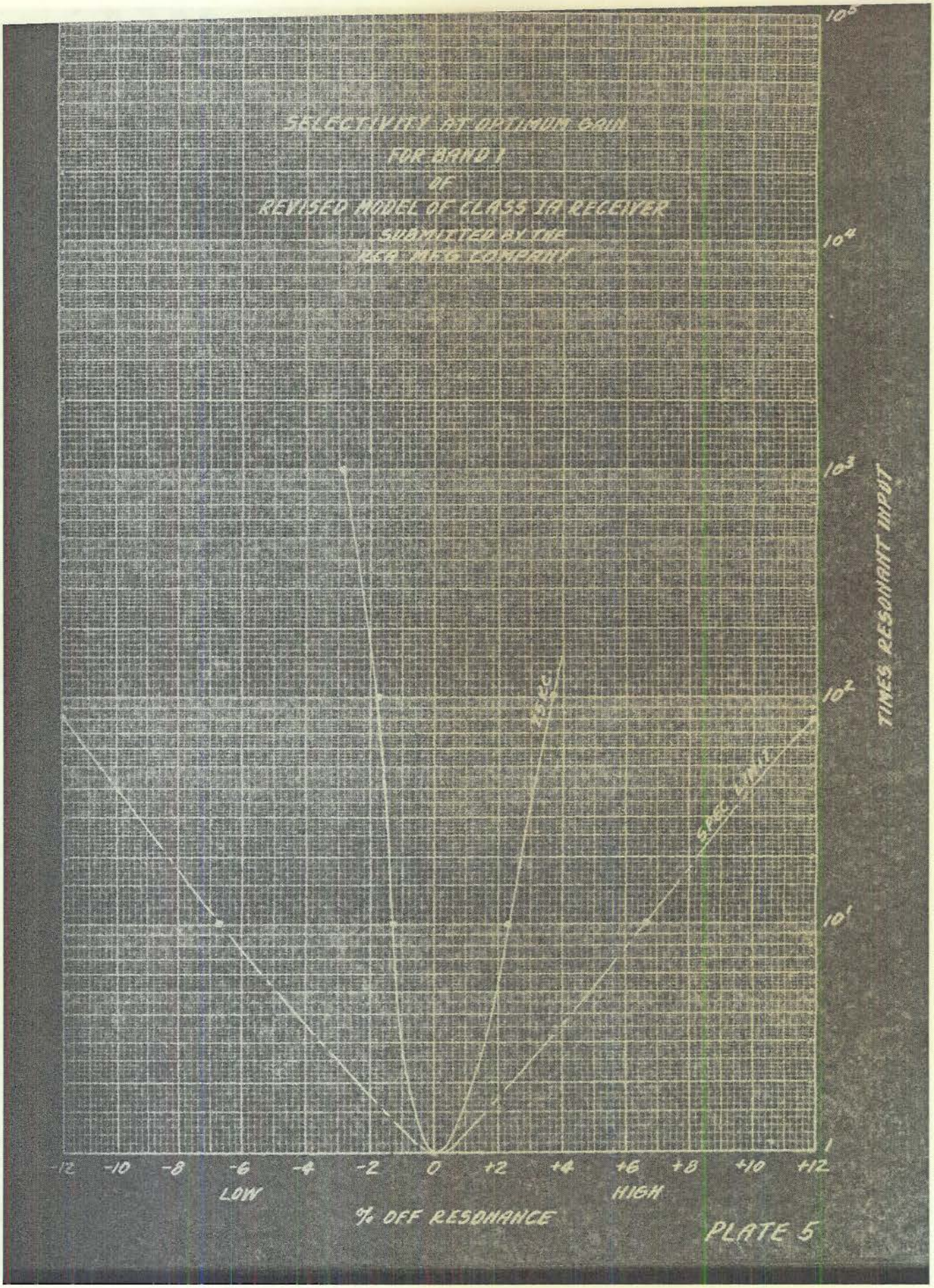
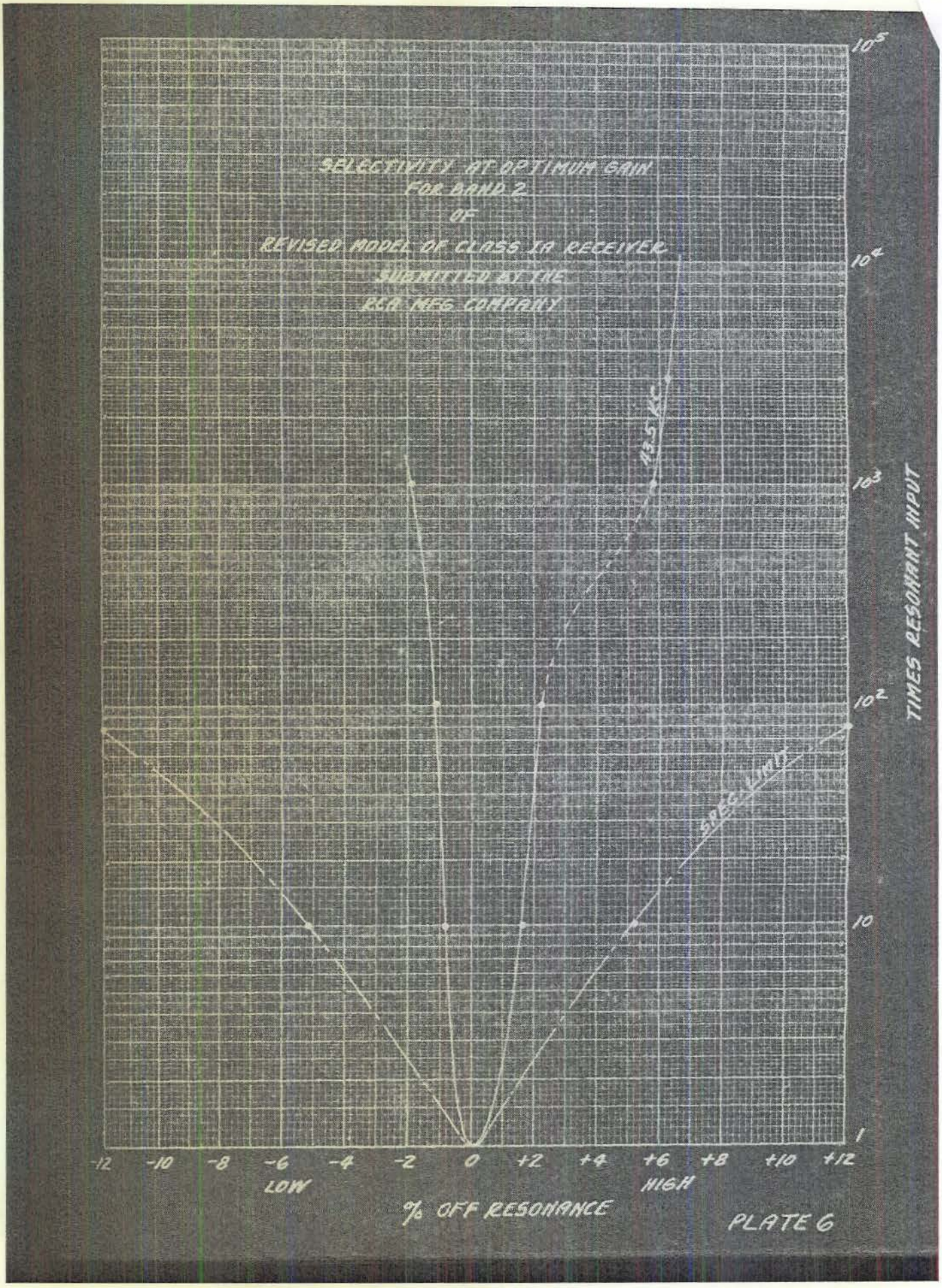
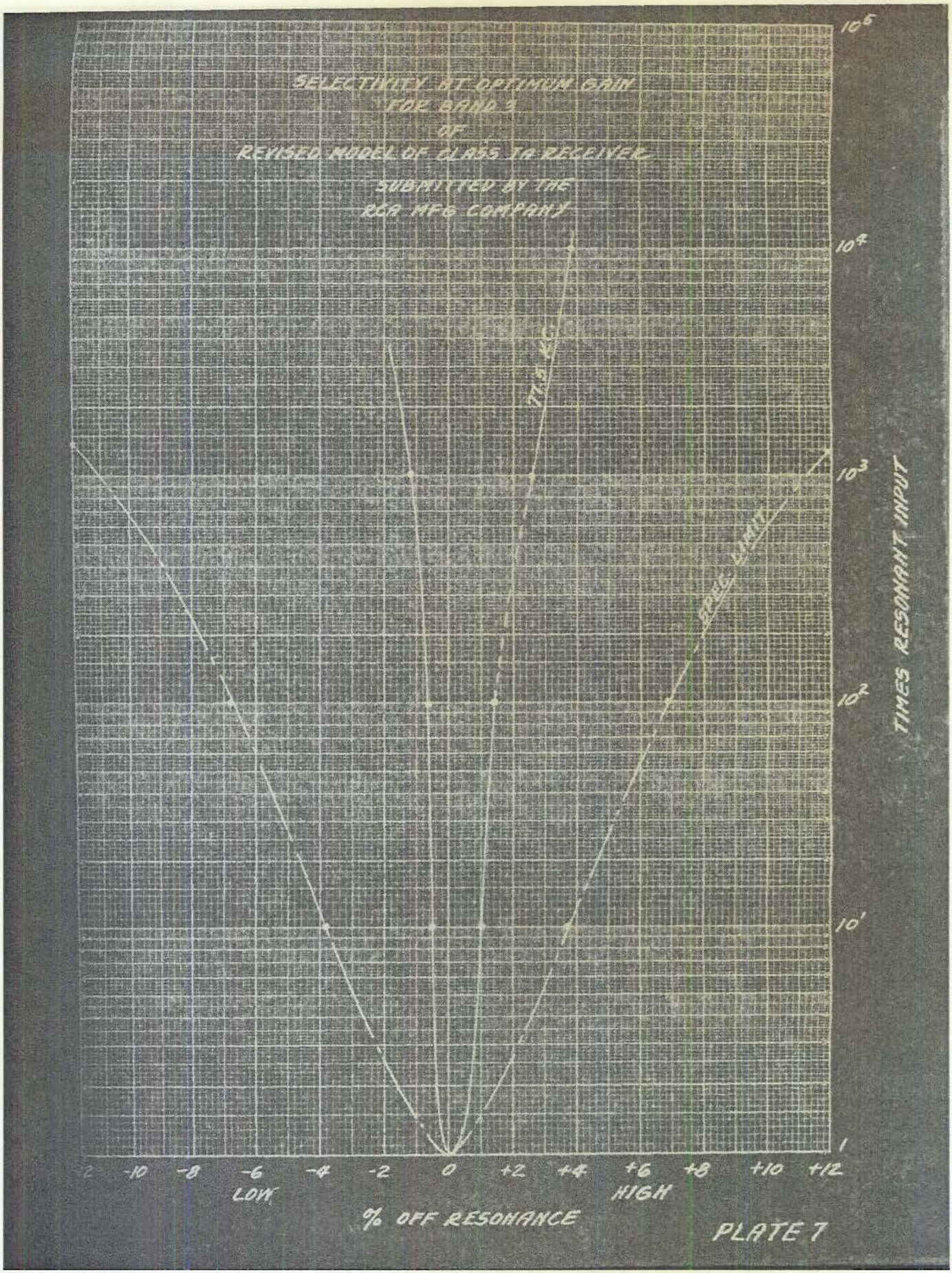
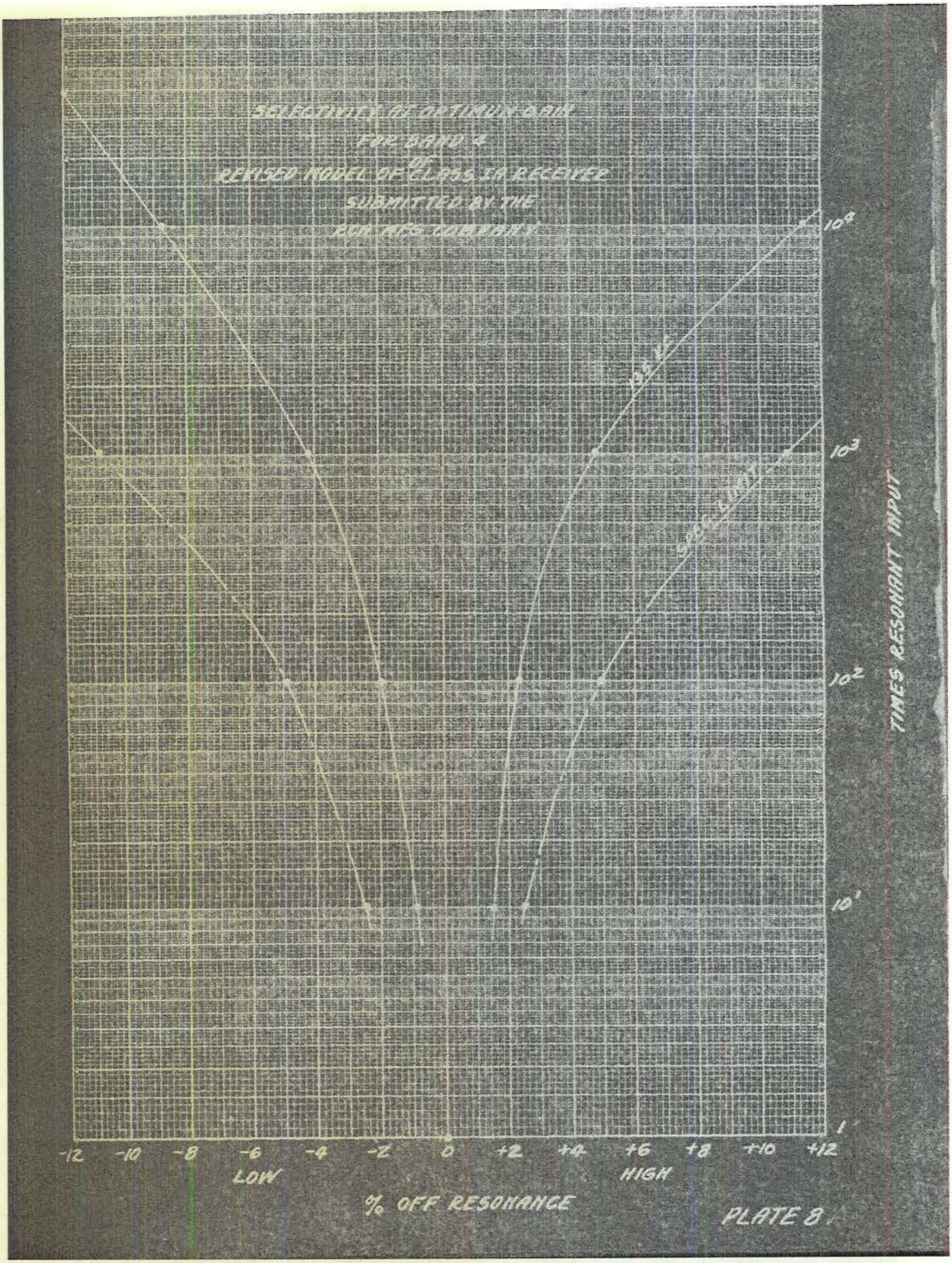

± 0
-5
-10
DECIBELS
BAND-1
BAND-2
BAND-3
BAND-4
BAND-5
BAND-6
MAXIMUM NOISE LEVEL AND MAXIMUM VARIATION IN NOISE LEVEL AT MAXIMUM GAIN FOR CW RECEPTION REVISED MODEL OF CLASS 1A RECEIVER SUBMITTED BY THE RCA MFG. COMPANY
16000
14000
12000
10000
8000
6000
4000
2000
0
NOISE LEVEL MICROWATTS
BAND-1
BAND-2
BAND-3
BAND-4
BAND-5
BAND-6
10
100
1000
FREQUENCY-KC.

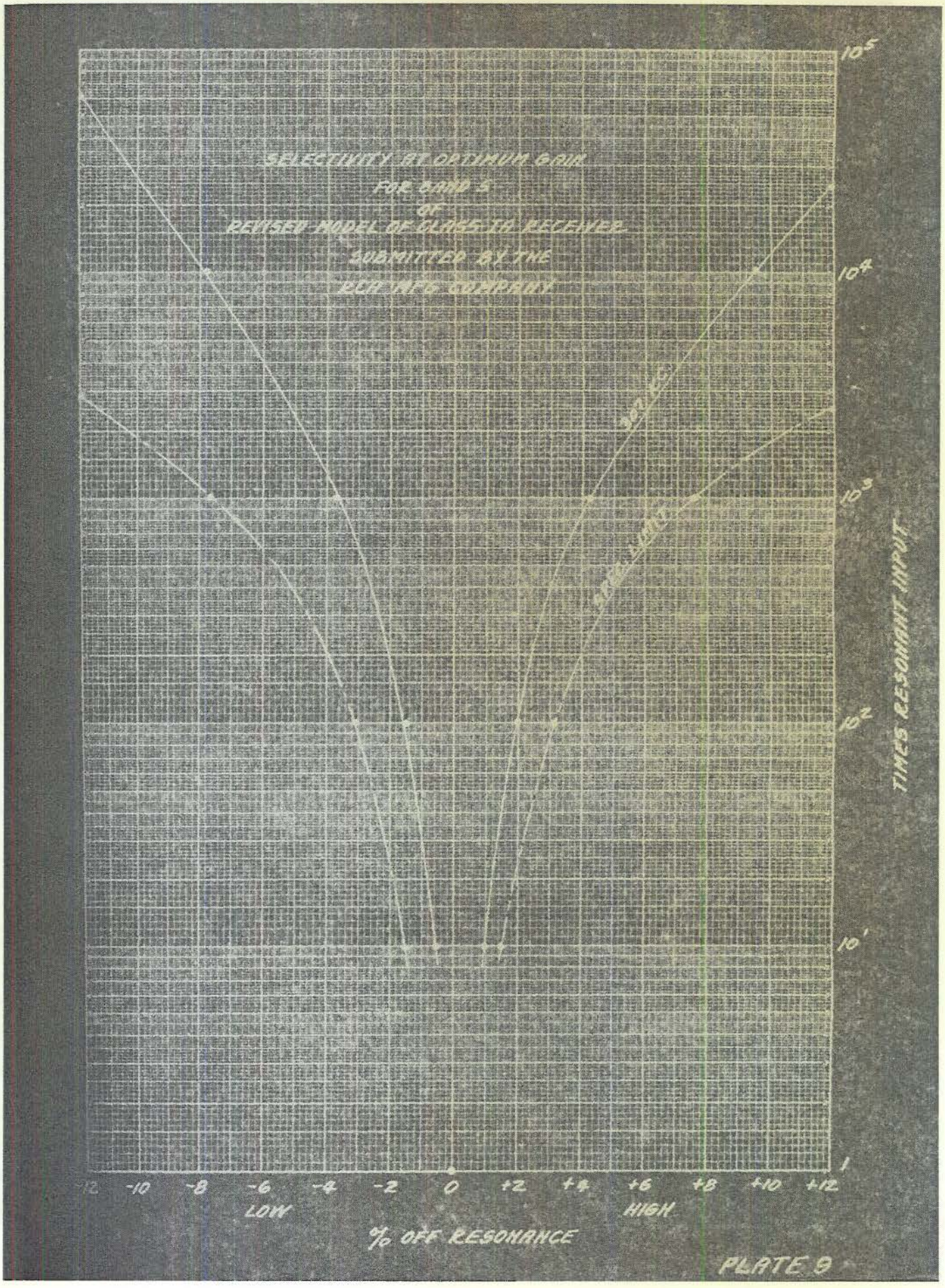
PLATE 4

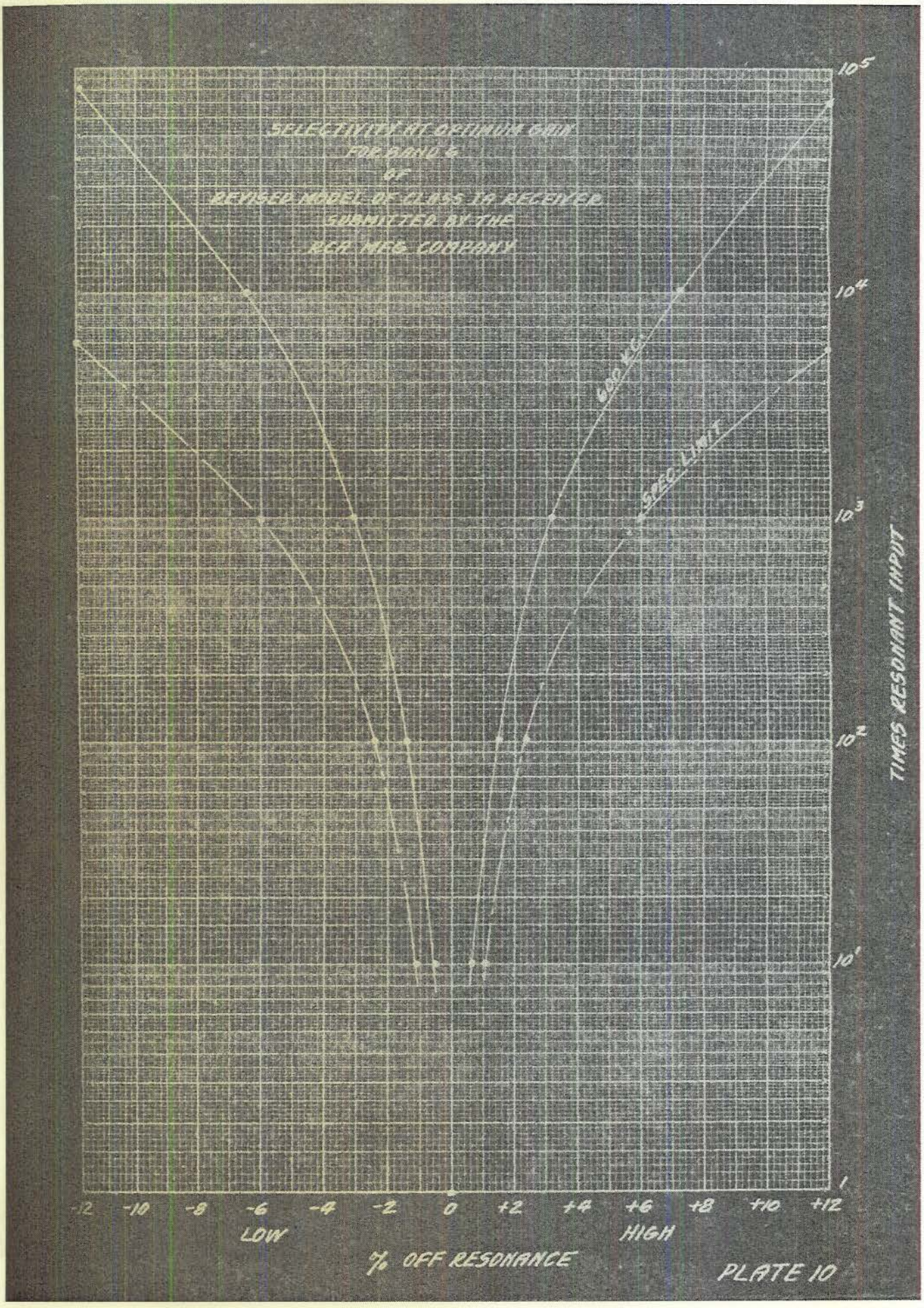

SELECTIVITY AT OPTIMUM GAIN
FOR BAND I
OF
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
10⁵
10⁴
10³
10²
10¹
1
TIMES RESONANT INPUT
SPEC. LIMIT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 5

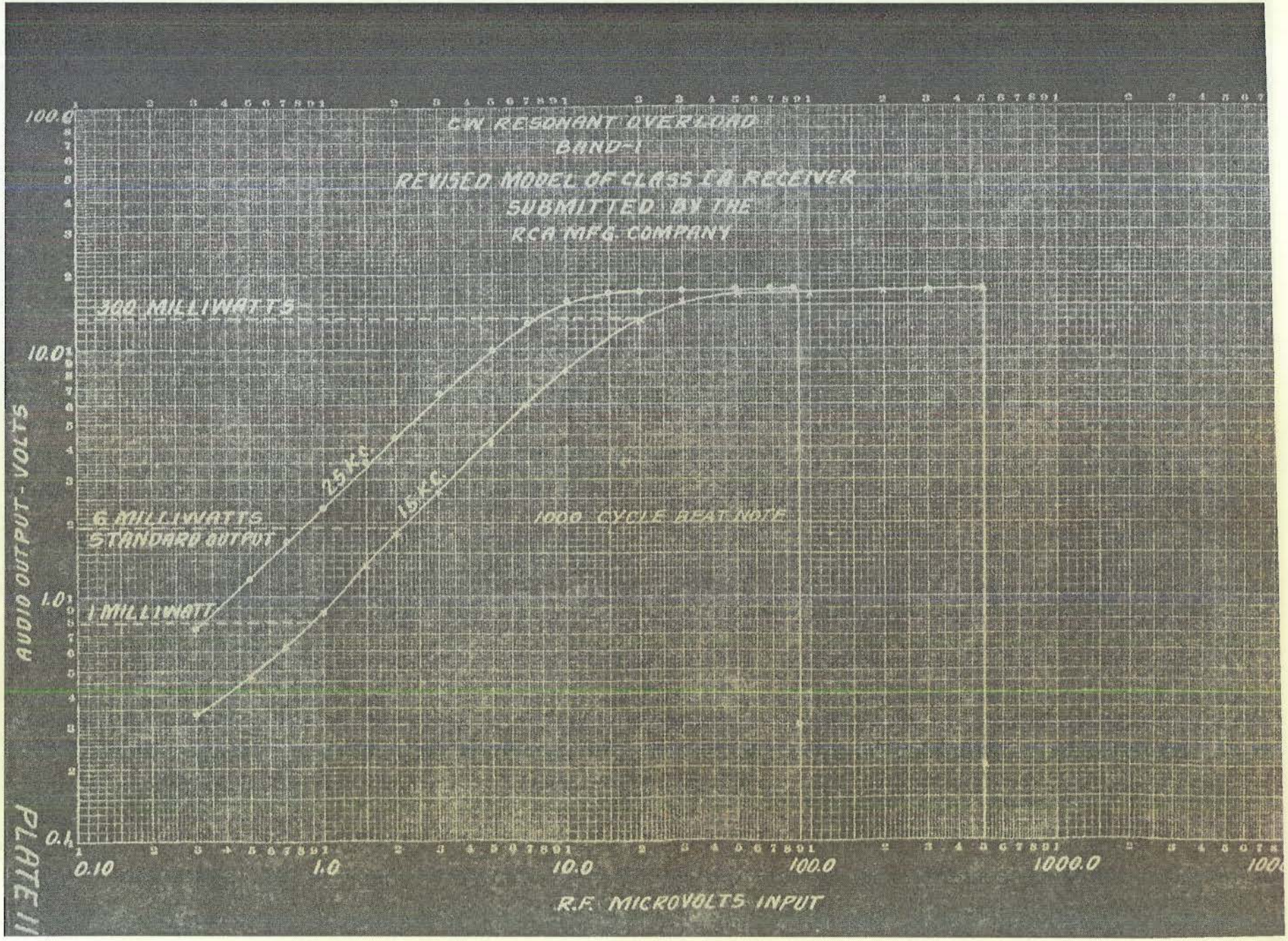

SELECTIVITY AT OPTIMUM GAIN
FOR BAND 2
OF
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
13.5 KC
SPECIFIED
$10^5$
$10^4$
$10^3$
$10^2$
10
1
TIMES RESONANT INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 6

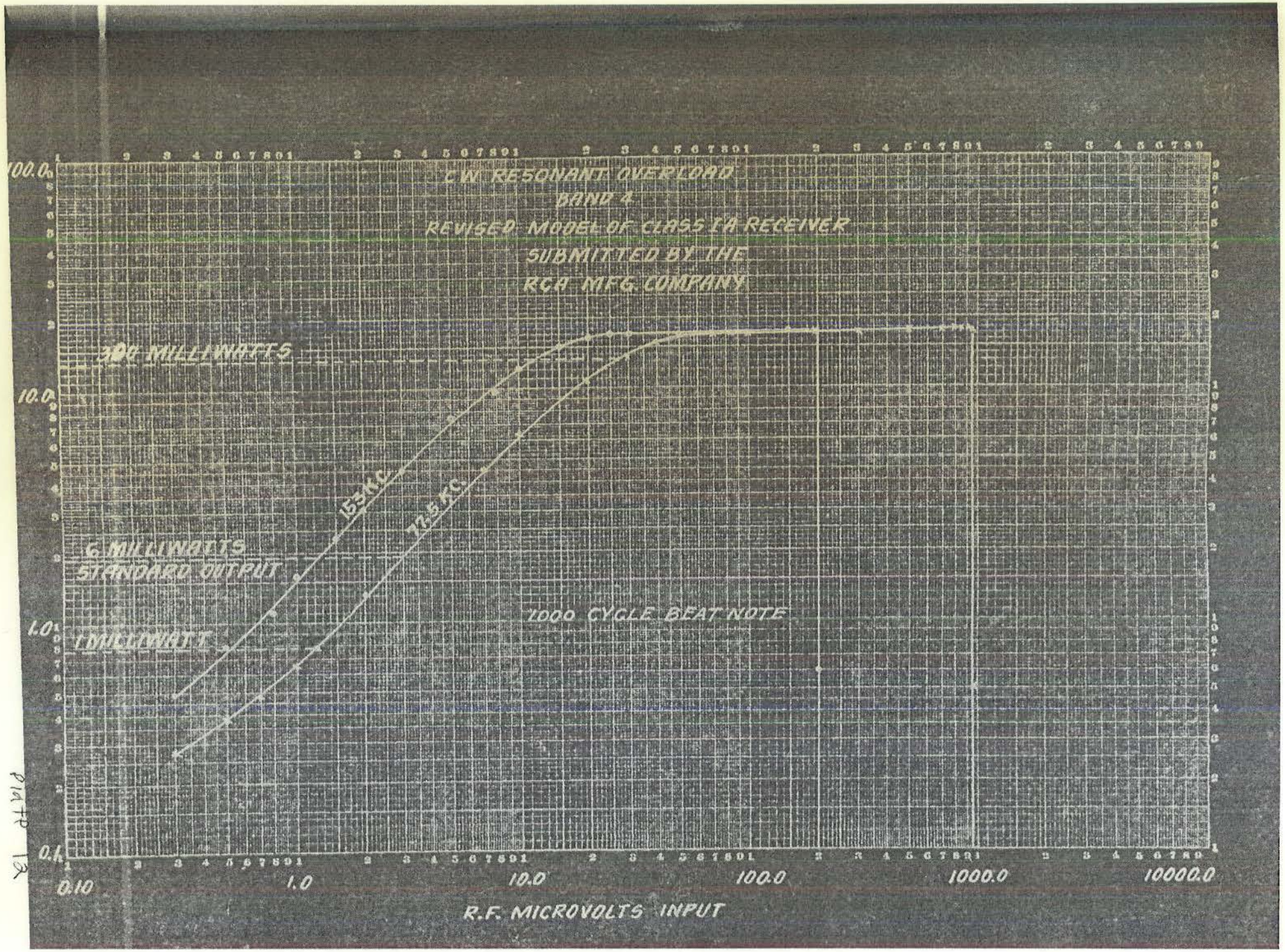

SELECTIVITY AT OPTIMUM GAIN
FOR BAND 3
OF
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
10⁵
10⁴
10³
10²
10¹
1
TIMES RESONANT INPUT
-12
-10
-8
-6
-4
-2
0
+2
+4
+6
+8
+10
+12
LOW
HIGH
% OFF RESONANCE
PLATE 7

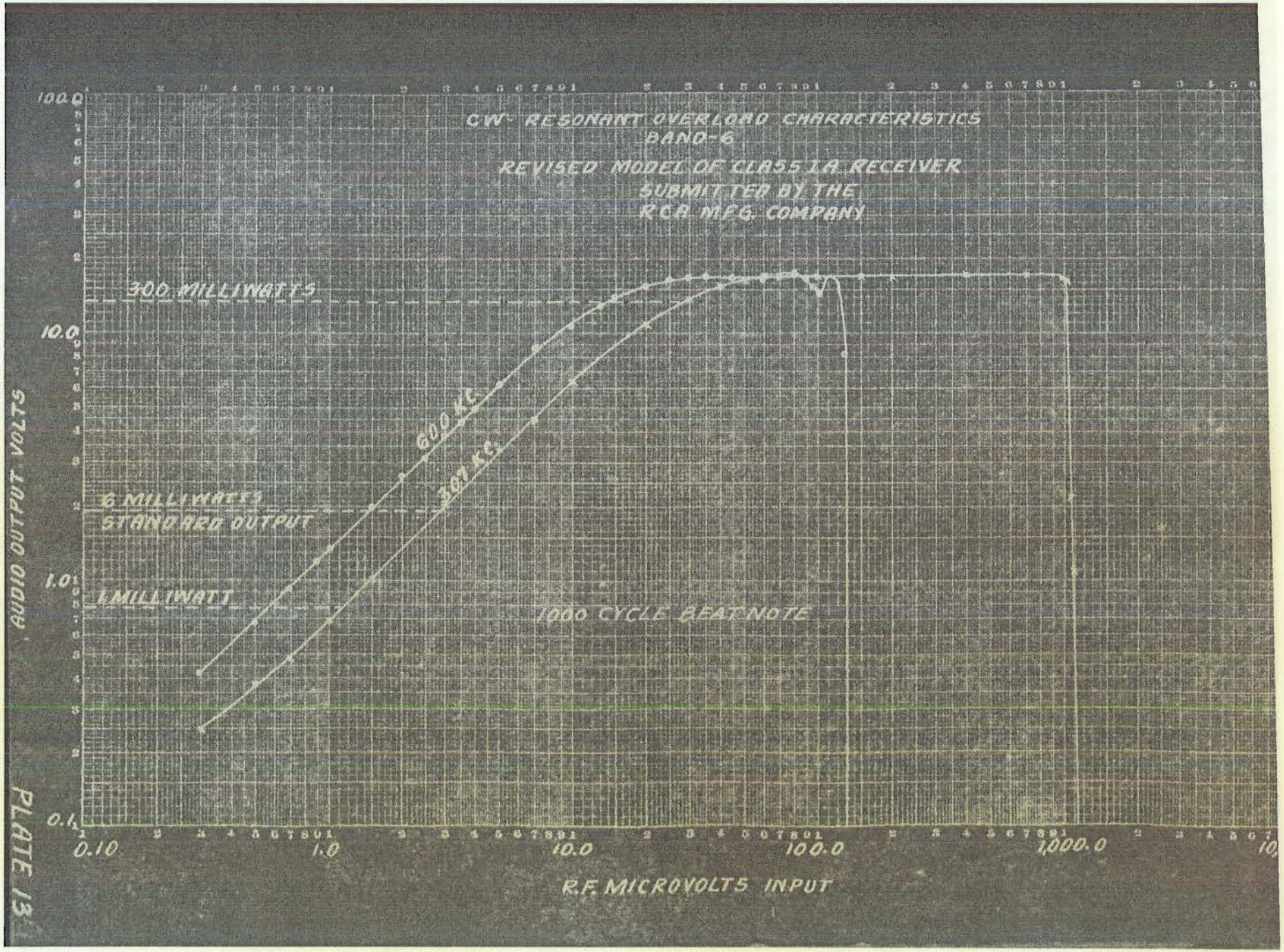

SELECTIVITY AT OPTIMUM GAIN
FOR BAND 4
OF
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
10⁴
10³
10²
10¹
1
TIMES RESONANT INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 8

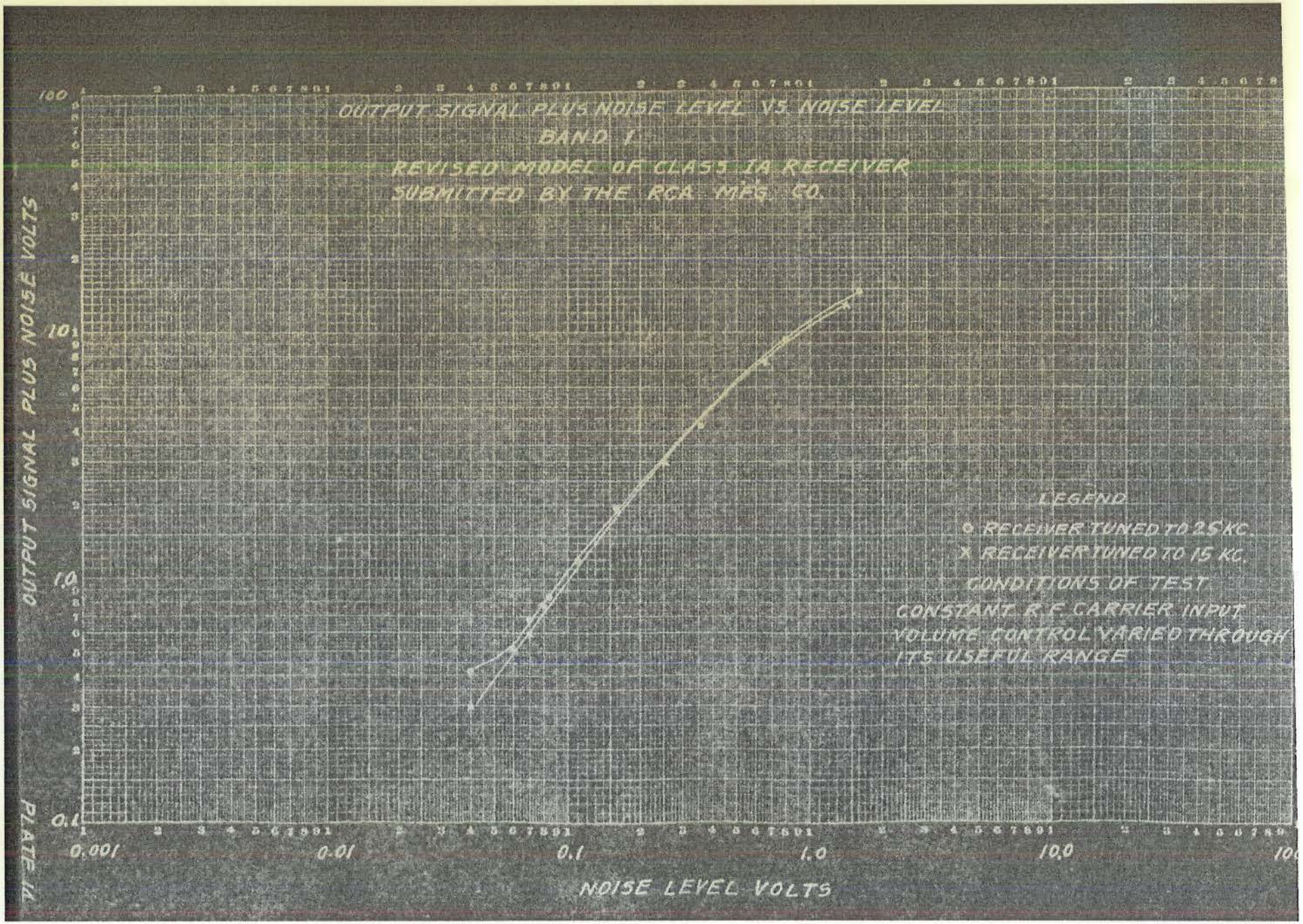

SELECTIVITY AT OPTIMUM G BIAS
FOR BAND 5
OF
REVISED MODEL OF CLASS 7H RECEIVER
SUBMITTED BY THE
RCA INFO. COMPANY
10^5
10^4
10^3
10^2
10^1
1
TIMES RESONANT INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 9

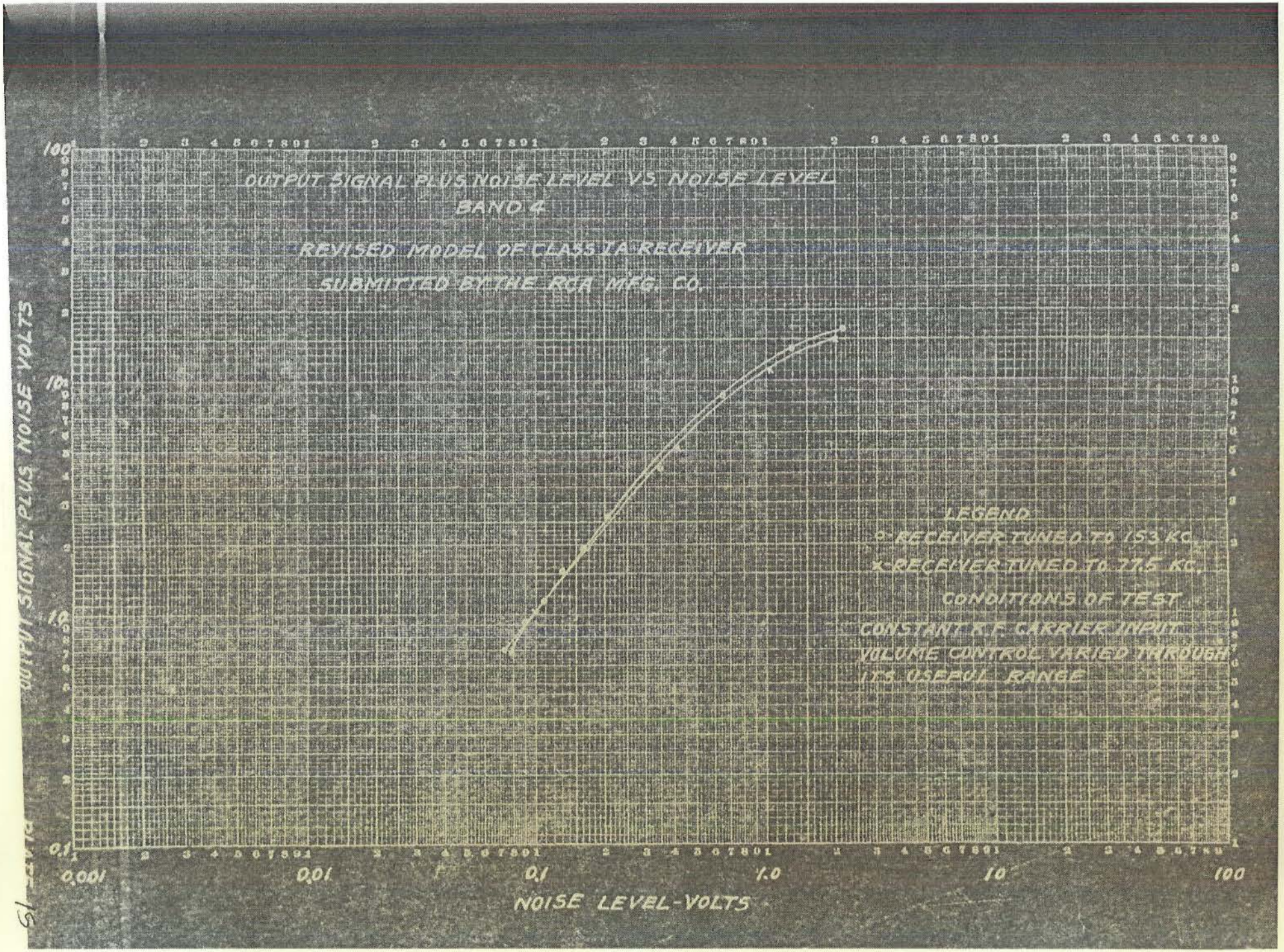

SELECTIVITY AT OPTIMUM GAIN
FOR BAND 4
OF
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
60 DB
SPEC. LIMIT
$10^5$
$10^4$
$10^3$
$10^2$
$10^1$
1
TIMES RESONANT INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 10

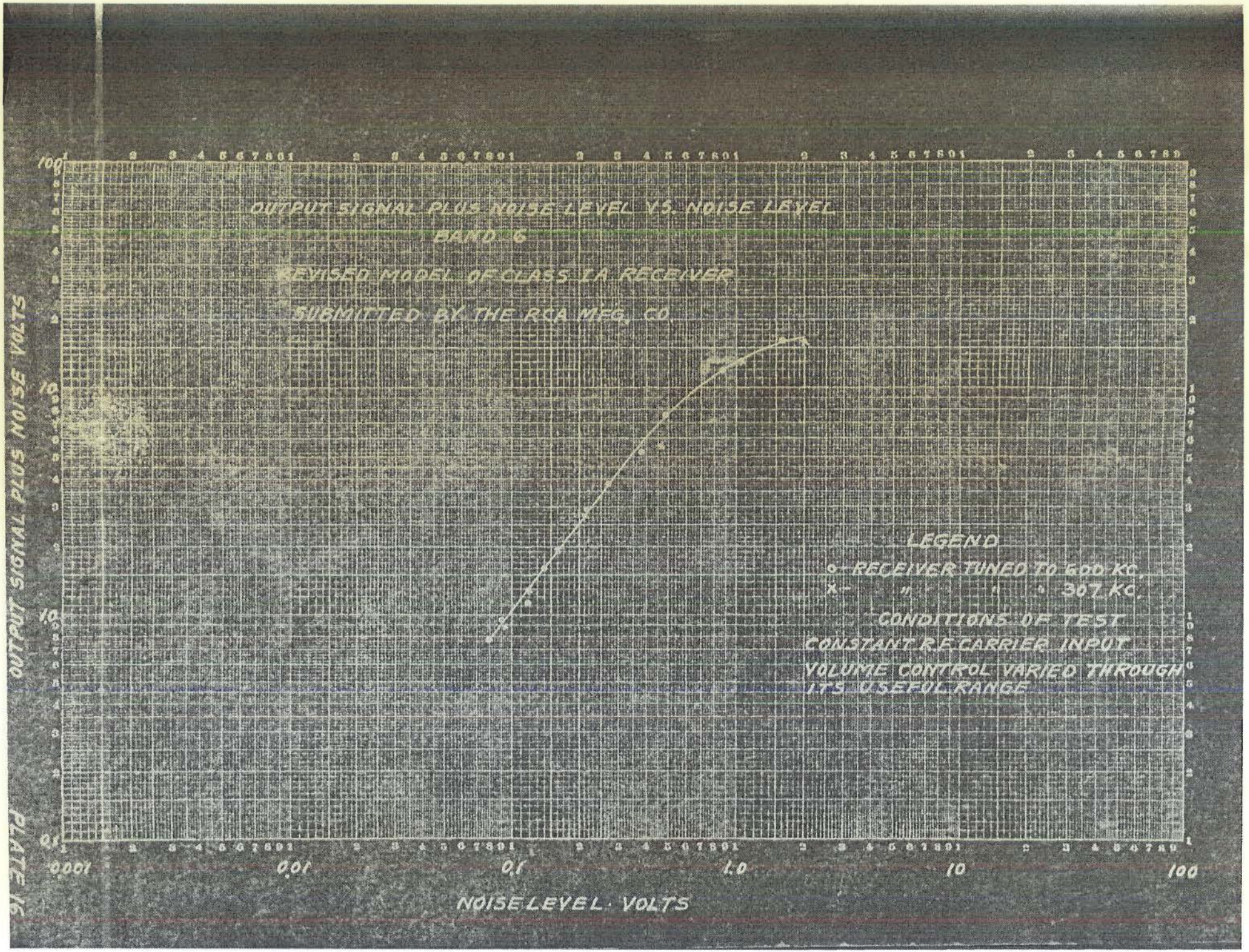

C.W. RESONANT OVERLOAD
BAND-1
REVISED MODEL OF CLASS I-A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
100 MILLIWATTS
6 MILLIWATTS
STANDARD OUTPUT
1 MILLIWATT
2.5 K.C.
1.5 K.C.
1000 CYCLE BEAT NOTE
AUDIO OUTPUT - VOLTS
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT
PLATE II

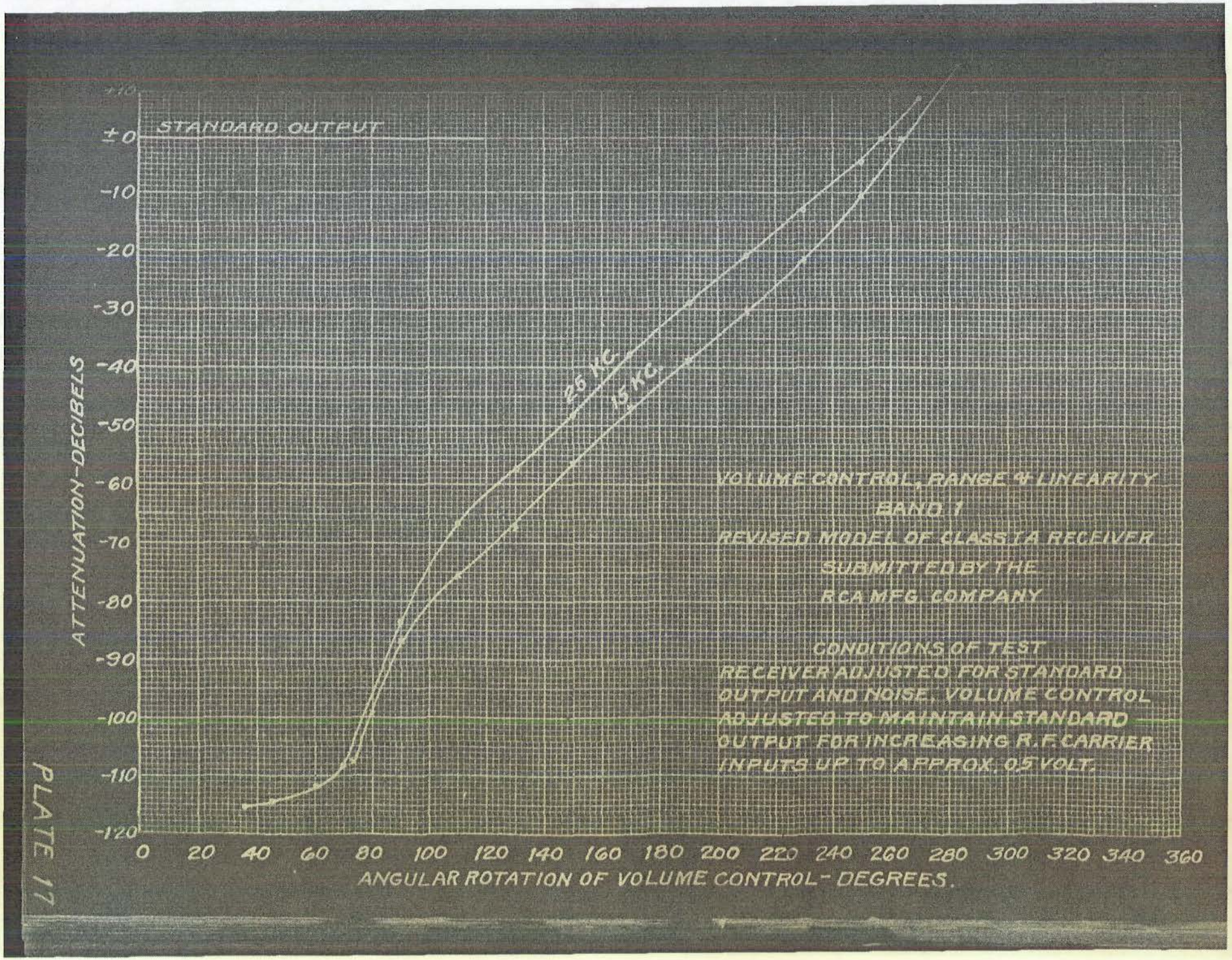

C.W. RESONANT OVERLOAD
BAND 4
REVISED MODEL OF CLASS I A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
300 MILLIWATTS
6 MILLIWATTS
STANDARD OUTPUT
1 MILLIWATT
1000 CYCLE BEAT NOTE
15 K.C.
17.5 K.C.
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
10000.0
R.F. MICROVOLTS INPUT

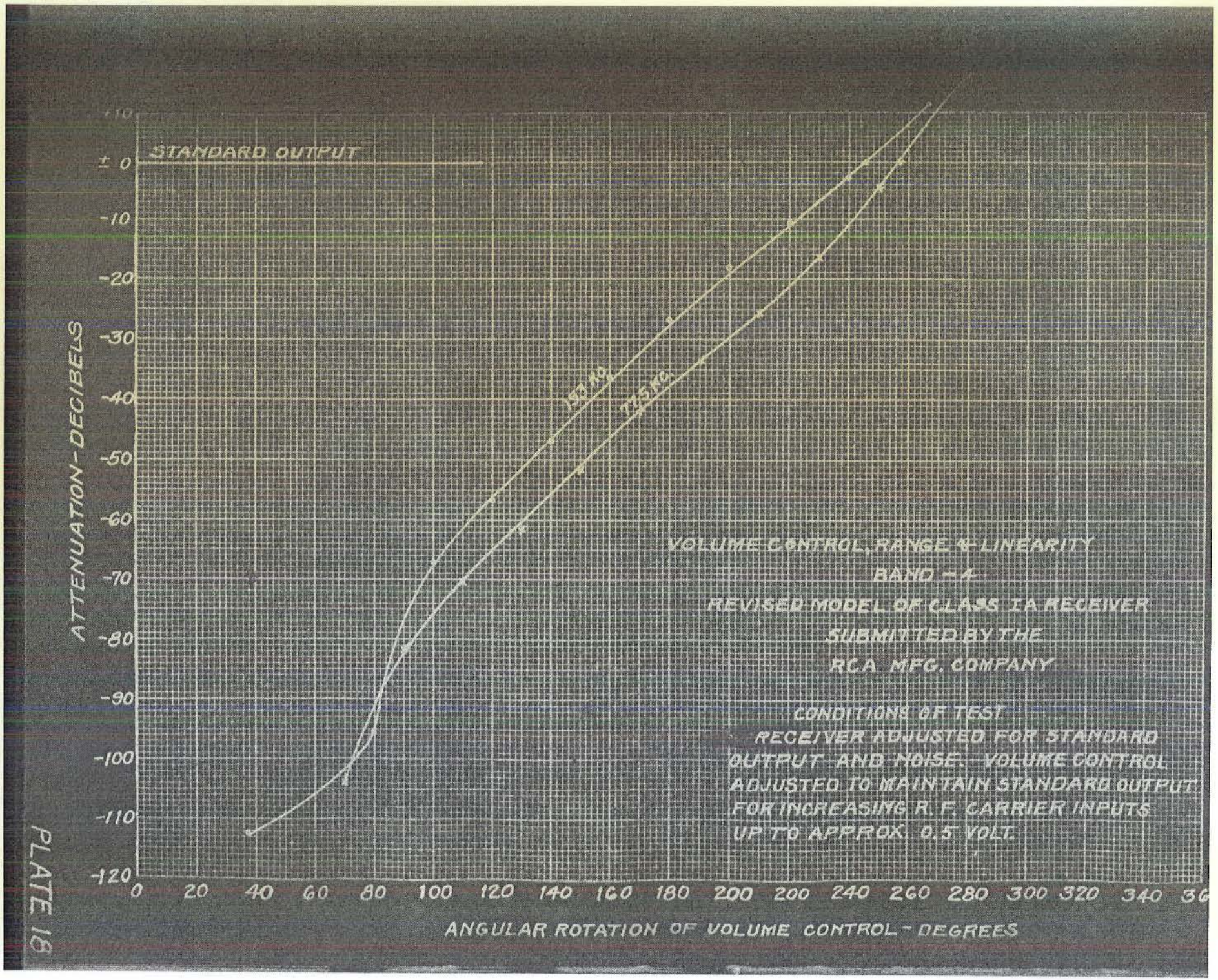

CW- RESONANT OVERLOAD CHARACTERISTICS
BAND-6
REVISED MODEL OF CLASS I A RECEIVER
SUBMITTED BY THE
R.C.A. M.F.G. COMPANY
300 MILLIWATTS
6 MILLIWATTS
STANDARD OUTPUT
1 MILLIWATT
600 KC.
301 KC.
1000 CYCLE BEAT NOTE
AUDIO OUTPUT VOLTS
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1,000.0
R.F. MICROVOLTS INPUT
PLATE 13

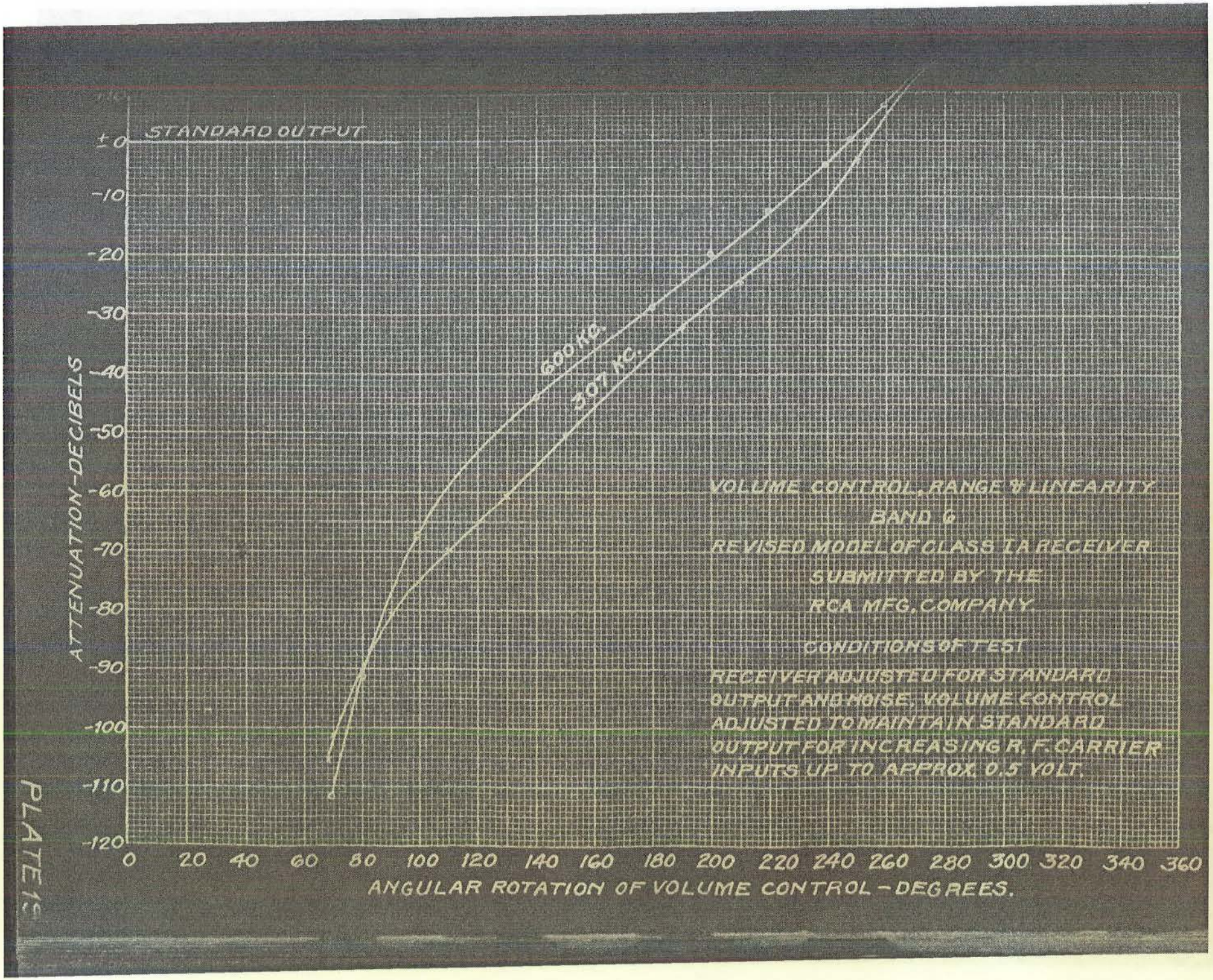

OUTPUT SIGNAL PLUS NOISE LEVEL VS. NOISE LEVEL
BAND I
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE RCA MFG. CO.
OUTPUT SIGNAL PLUS NOISE VOLTS
100
10
1.0
0.1
NOISE LEVEL VOLTS
0.001
0.01
0.1
1.0
10.0
LEGEND
RECEIVER TUNED TO 2.5 KC.
X RECEIVER TUNED TO 15 KC.
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT
VOLUME CONTROL VARIED THROUGH
ITS USEFUL RANGE
PLATE IV


OUTPUT SIGNAL PLUS NOISE LEVEL VS. NOISE LEVEL
BAND 4
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE RCA MFG. CO.
LEGEND
○- RECEIVER TUNED TO 153 KC.
×-RECEIVER TUNED TO 77.5 KC.
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT
VOLUME CONTROL VARIED THROUGH
U.S. USEFUL RANGE
OUTPUT SIGNAL PLUS NOISE VOLTS
NOISE LEVEL-VOLTS
0.001
0.01
0.1
1.0
10
100


OUTPUT SIGNAL PLUS NOISE LEVEL VS. NOISE LEVEL
BAND 6
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE RCA MFG. CO.
LEGEND
o- RECEIVER TUNED TO 600 KC.
X- " " " 307 KC.
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT
VOLUME CONTROL VARIED THROUGH
ITS USEFUL RANGE
PLATE 15
OUTPUT SIGNAL PLUS NOISE VOLTS
NOISE LEVEL - VOLTS
0.001
0.01
0.1
1.0
10
100


STANDARD OUTPUT
±0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
ATTENUATION-DECIBELS
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES.
1500 KC
600 KC
VOLUME CONTROL, RANGE & LINEARITY
BAND 1
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE. VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUTS UP TO APPROX. 0.5 VOLT.
PLATE 11


STANDARD OUTPUT
± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
ATTENUATION - DECIBELS
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
1500 KC
1725 KC
VOLUME CONTROL, RANGE & LINEARITY
BAND - A
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD OUTPUT AND NOISE. VOLUME CONTROL ADJUSTED TO MAINTAIN STANDARD OUTPUT FOR INCREASING R. F. CARRIER INPUTS UP TO APPROX. 0.5 VOLT.
PLATE 18


STANDARD OUTPUT
± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
ATTENUATION-DECIBELS
600 KC.
1071 KC.
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES.
VOLUME CONTROL, RANGE & LINEARITY
BAND G
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE. VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R. F. CARRIER
INPUTS UP TO APPROX. 0.5 VOLT.
PLATE 15

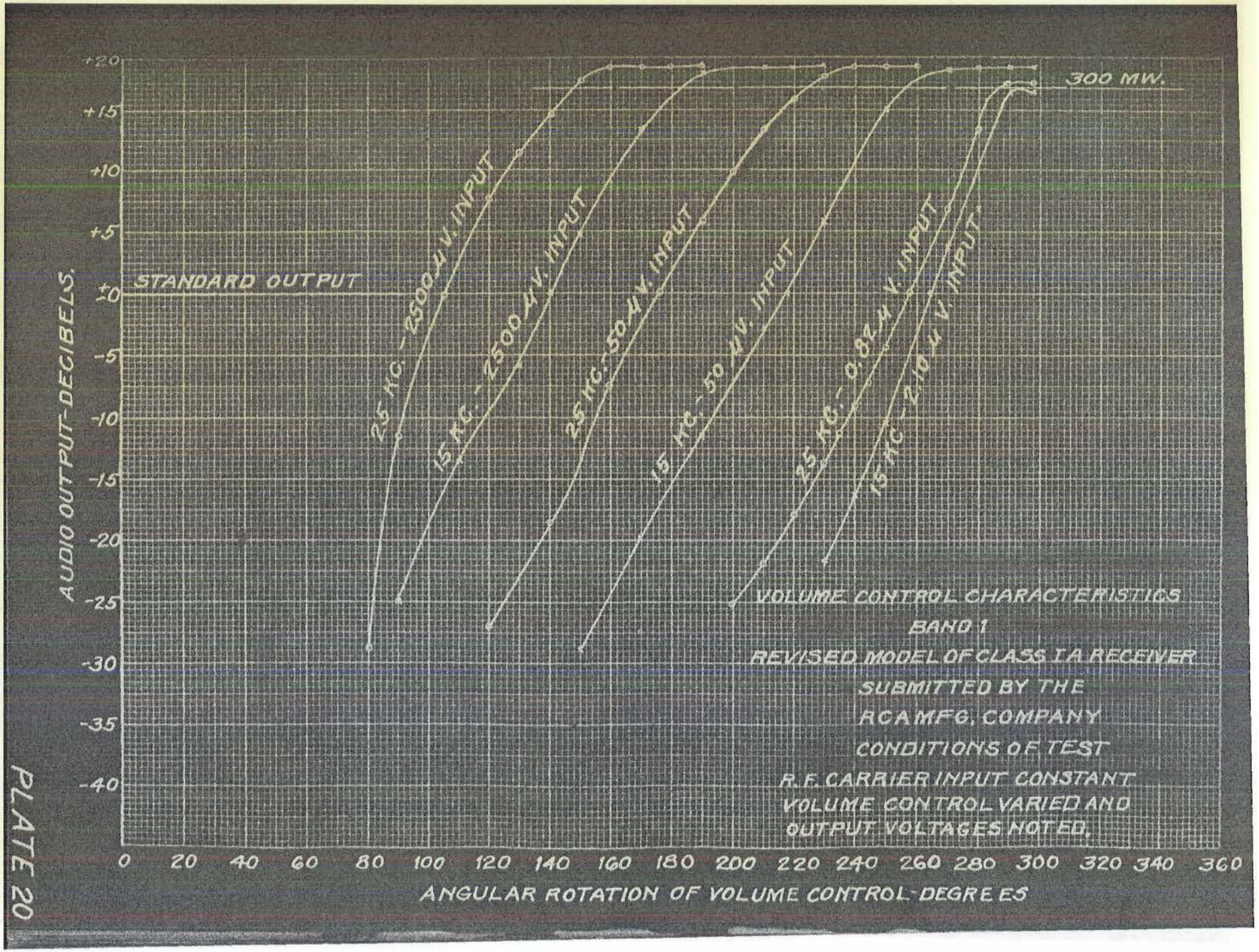
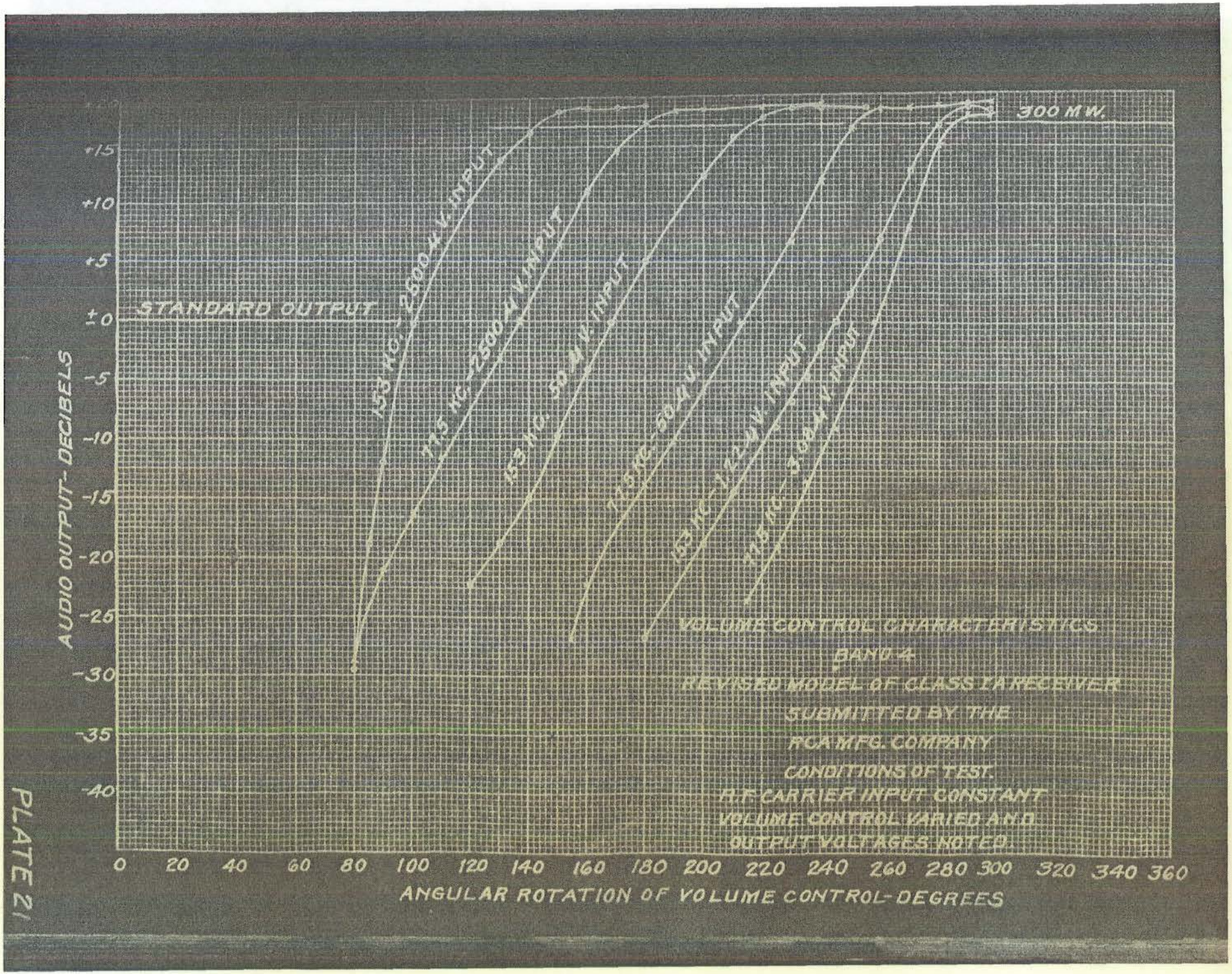

+20
+15
+10
+5
±0
-5
-10
-15
-20
-25
-30
-35
-40
AUDIO OUTPUT-DECIBELS.
STANDARD OUTPUT
300 MW.
25 MC. - 2500 μ V. INPUT
15 MC. - 2500 μ V. INPUT
25 MC. - 50 μ V. INPUT
15 MC. - 50 μ V. INPUT
25 MC. - 0.82 μ V. INPUT
15 MC. - 2.10 μ V. INPUT.
VOLUME CONTROL CHARACTERISTICS
BAND 1
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
R.F. CARRIER INPUT CONSTANT
VOLUME CONTROL VARIED AND
OUTPUT VOLTAGES NOTED.
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL-DEGREES

PLATE 20


300 MW.
+15
+10
+5
± 0
-5
-10
-15
-20
-25
-30
-35
-40
STANDARD OUTPUT
AUDIO OUTPUT - DECIBELS
1500 KC. 2500 μV. INPUT
1215 KC. 2500 μV. INPUT
1500 KC. 50 μV. INPUT
1215 KC. 50 μV. INPUT
1500 KC. 5 μV. INPUT
1215 KC. 5 μV. INPUT
VOLUME CONTROL CHARACTERISTICS
BAND 4
REVISED MODEL OF GLASS TA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST.
R.F. CARRIER INPUT CONSTANT
VOLUME CONTROL VARIED AND
OUTPUT VOLTAGES NOTED.
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
PLATE 21

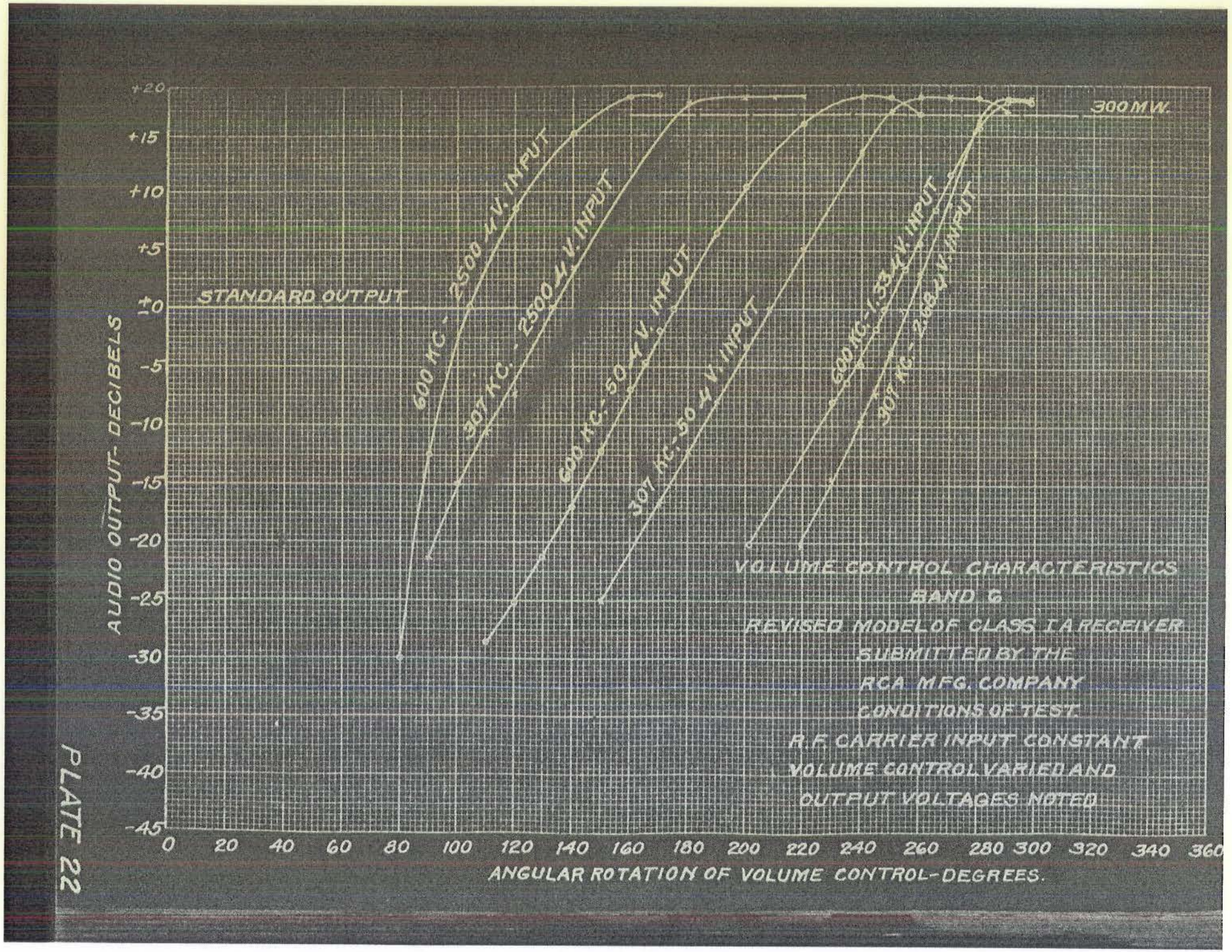
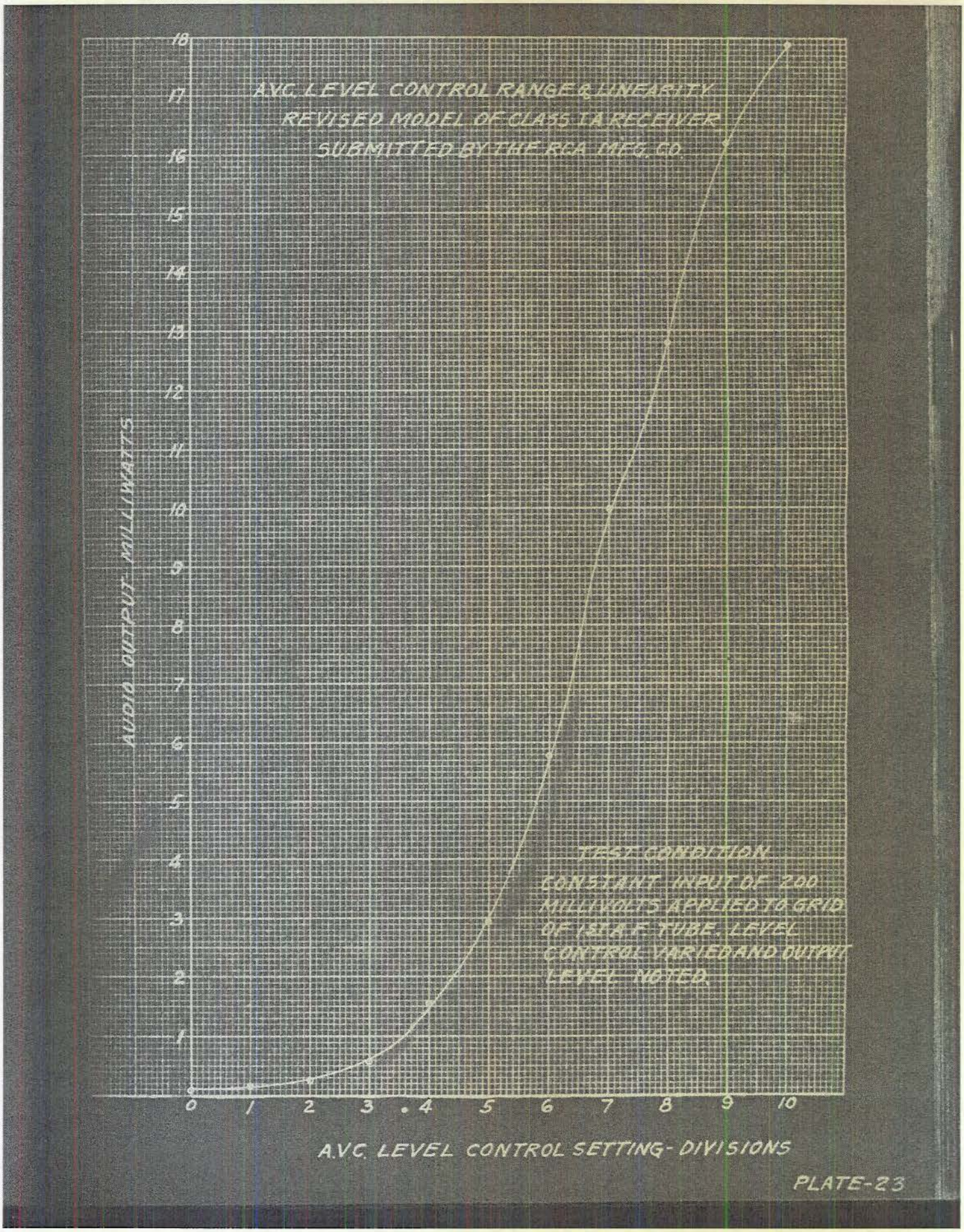

+20
+15
+10
+5
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
AUDIO OUTPUT- DECIBELS
STANDARD OUTPUT
300 M.W.
600 KC. - 2500 μV. INPUT
307 KC. - 2500 μV. INPUT
600 KC. - 50 μV. INPUT
307 KC. - 50 μV. INPUT
600 KC. - 1.33 μV. INPUT
307 KC. - 2.66 μV. INPUT
VOLUME CONTROL CHARACTERISTICS
BAND C
REVISED MODEL OF CLASS I A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
R.F. CARRIER INPUT CONSTANT
VOLUME CONTROL VARIED AND
OUTPUT VOLTAGES NOTED
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL- DEGREES.

PLATE 22


A.V.C. LEVEL CONTROL RANGE & LINEARITY
REVISED MODEL OF CLASS I A RECEIVER
SUBMITTED BY THE RCA MFG. CO.
AUDIO OUTPUT-MILLIWATTS
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
TEST CONDITION
CONSTANT INPUT OF 200
MILLIVOLTS APPLIED TO GRID
OF 1ST A.F. TUBE. LEVEL
CONTROL VARIED AND OUTPUT
LEVEL NOTED.
0 1 2 3 .4 5 6 7 8 9 10
A.V.C. LEVEL CONTROL SETTING - DIVISIONS
PLATE-23

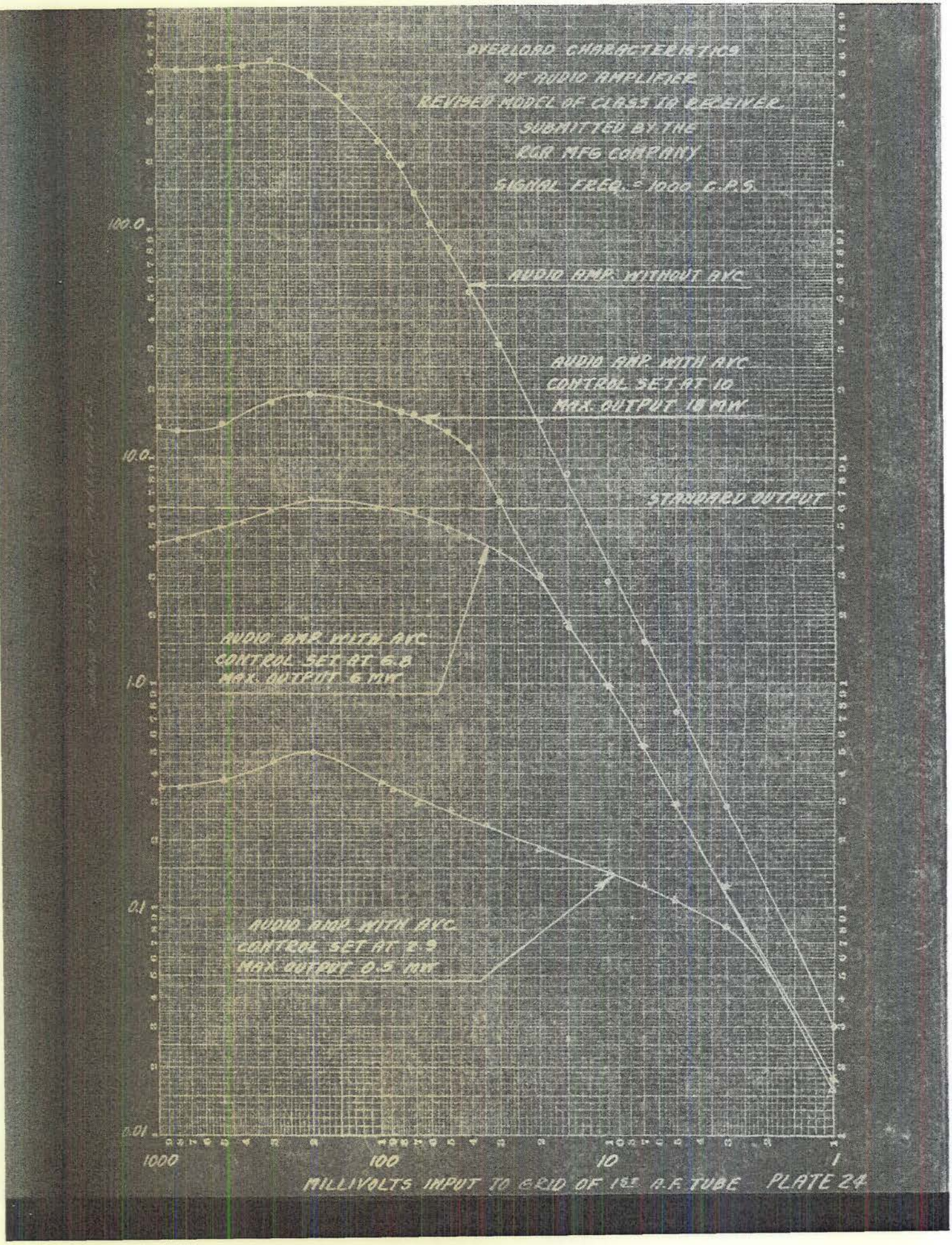
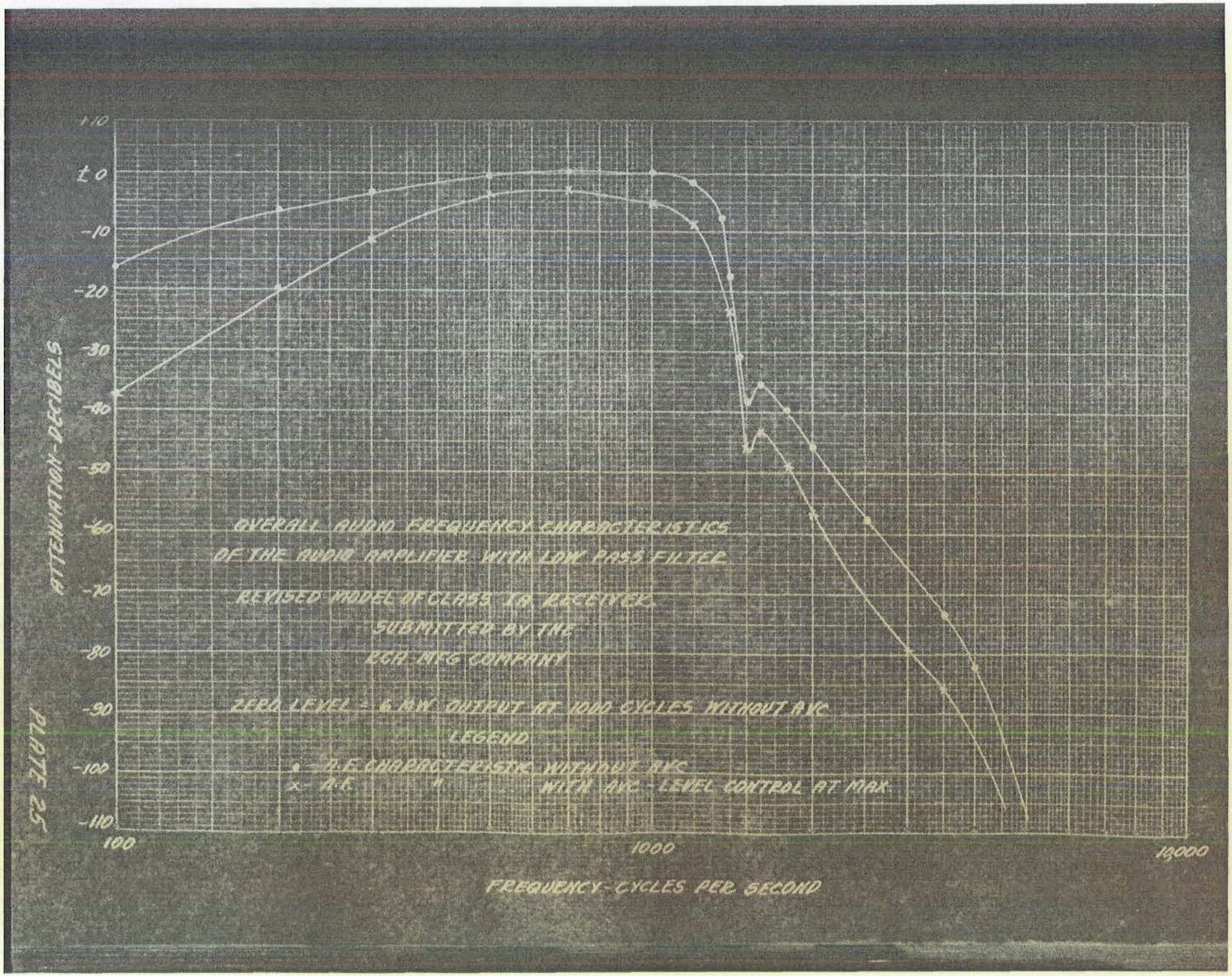

OVERLOAD CHARACTERISTICS
OF AUDIO AMPLIFIER
REVISED MODEL OF CLASS 1Q RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
SIGNAL FREQ. = 1000 C.P.S.
AUDIO AMP. WITHOUT AVC
AUDIO AMP. WITH AVC
CONTROL SET AT 10
MAX. OUTPUT 10 MW
STANDARD OUTPUT
AUDIO AMP. WITH AVC
CONTROL SET AT 6.8
MAX. OUTPUT 6 MW
AUDIO AMP. WITH AVC
CONTROL SET AT 2.9
MAX. OUTPUT 0.5 MW
100.0
10.0
1.0
0.1
0.01
1000
100
10
1
MILLIVOLTS INPUT TO GRID OF 1ST R.F. TUBE

PLATE 24


+10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
ATTENUATION-DECIBELS
100
1000
10,000
FREQUENCY-CYCLES PER SECOND
OVERALL AUDIO FREQUENCY CHARACTERISTICS
OF THE AUDIO AMPLIFIER WITH LOW PASS FILTER
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
ECA MFG COMPANY
ZERO LEVEL = 6 M.W. OUTPUT AT 1000 CYCLES WITHOUT A.V.C.
LEGEND
• - A.F. CHARACTERISTIC WITHOUT A.V.C.
x - A.F. " WITH A.V.C. LEVEL CONTROL AT MAX.
PLATE 25

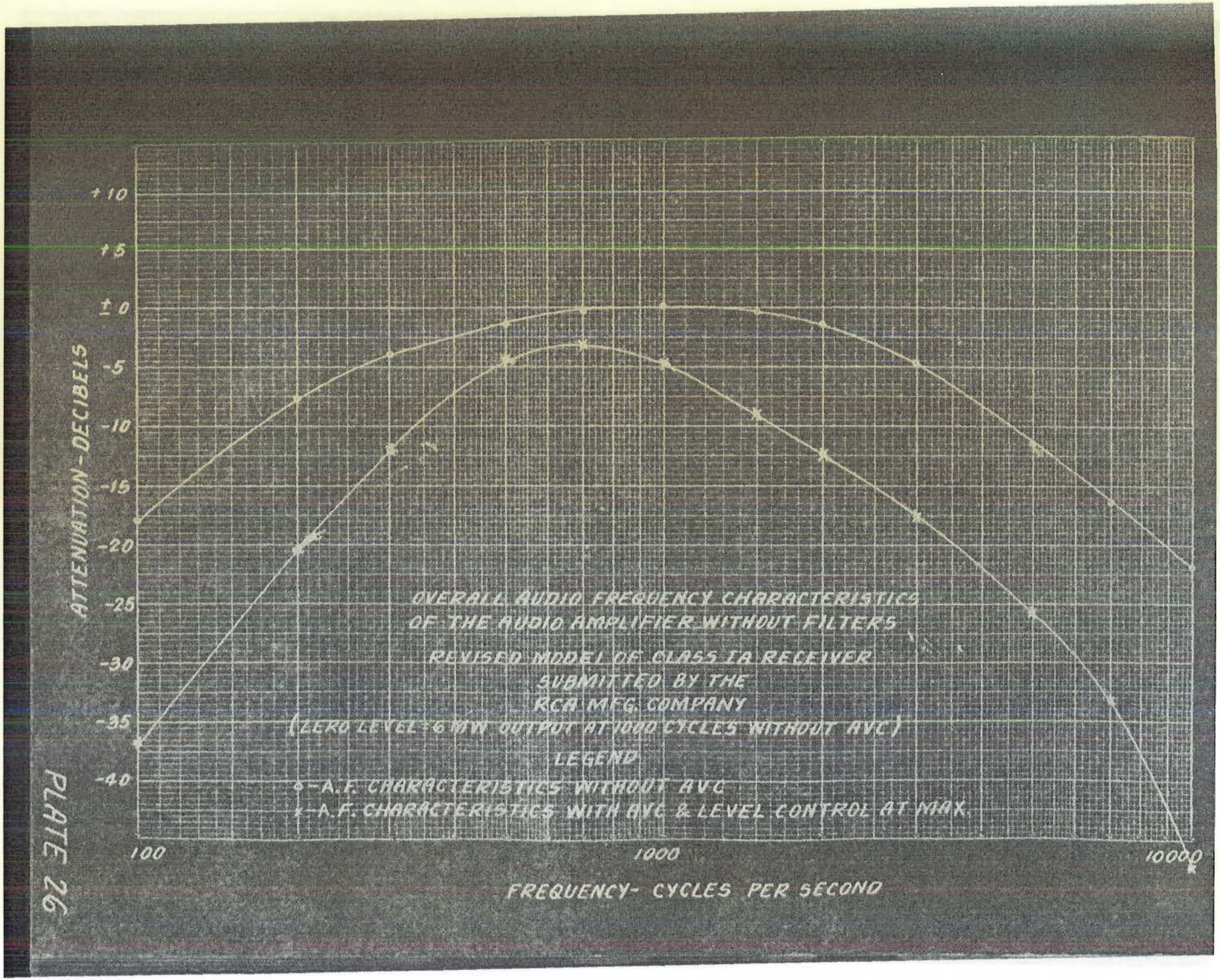
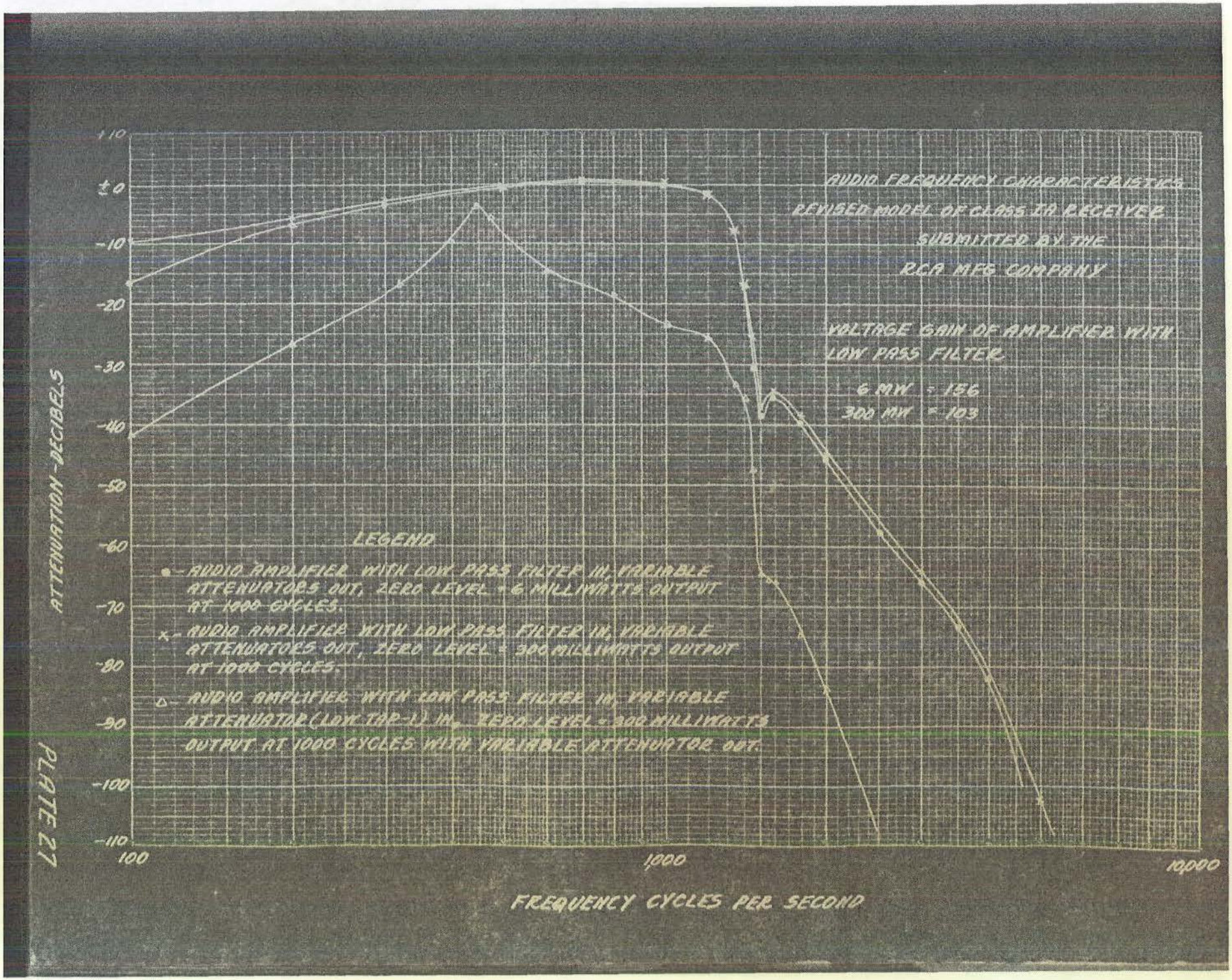
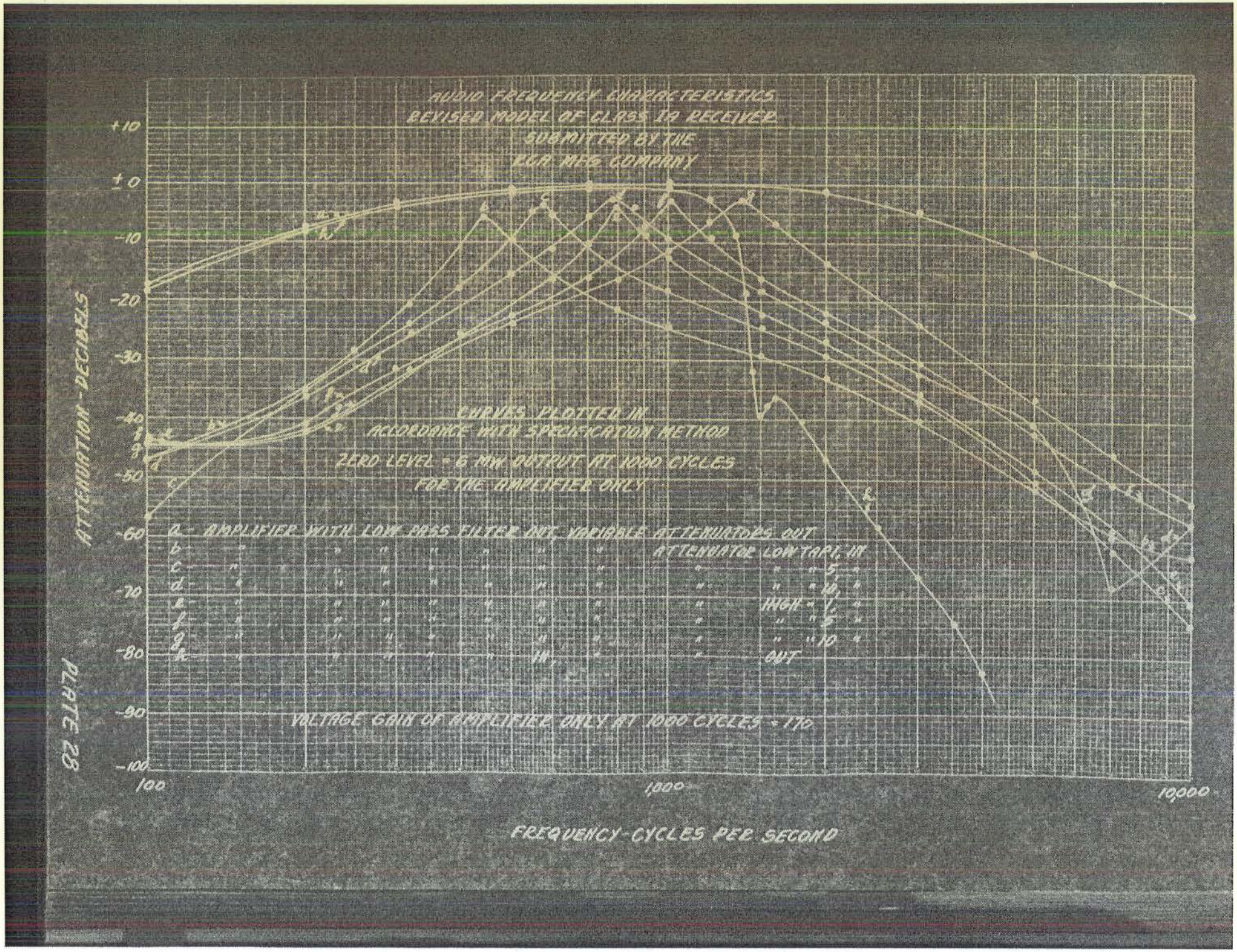
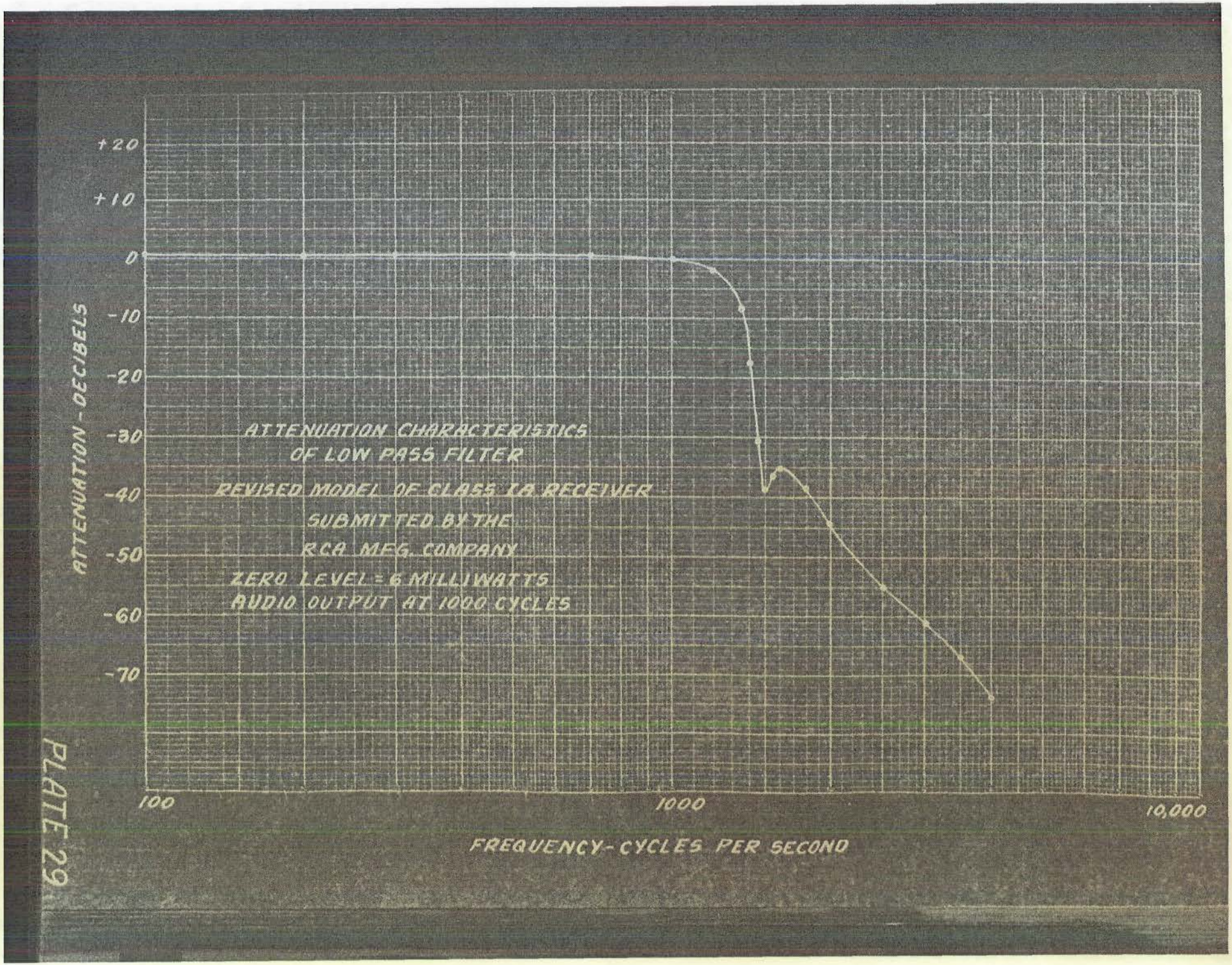
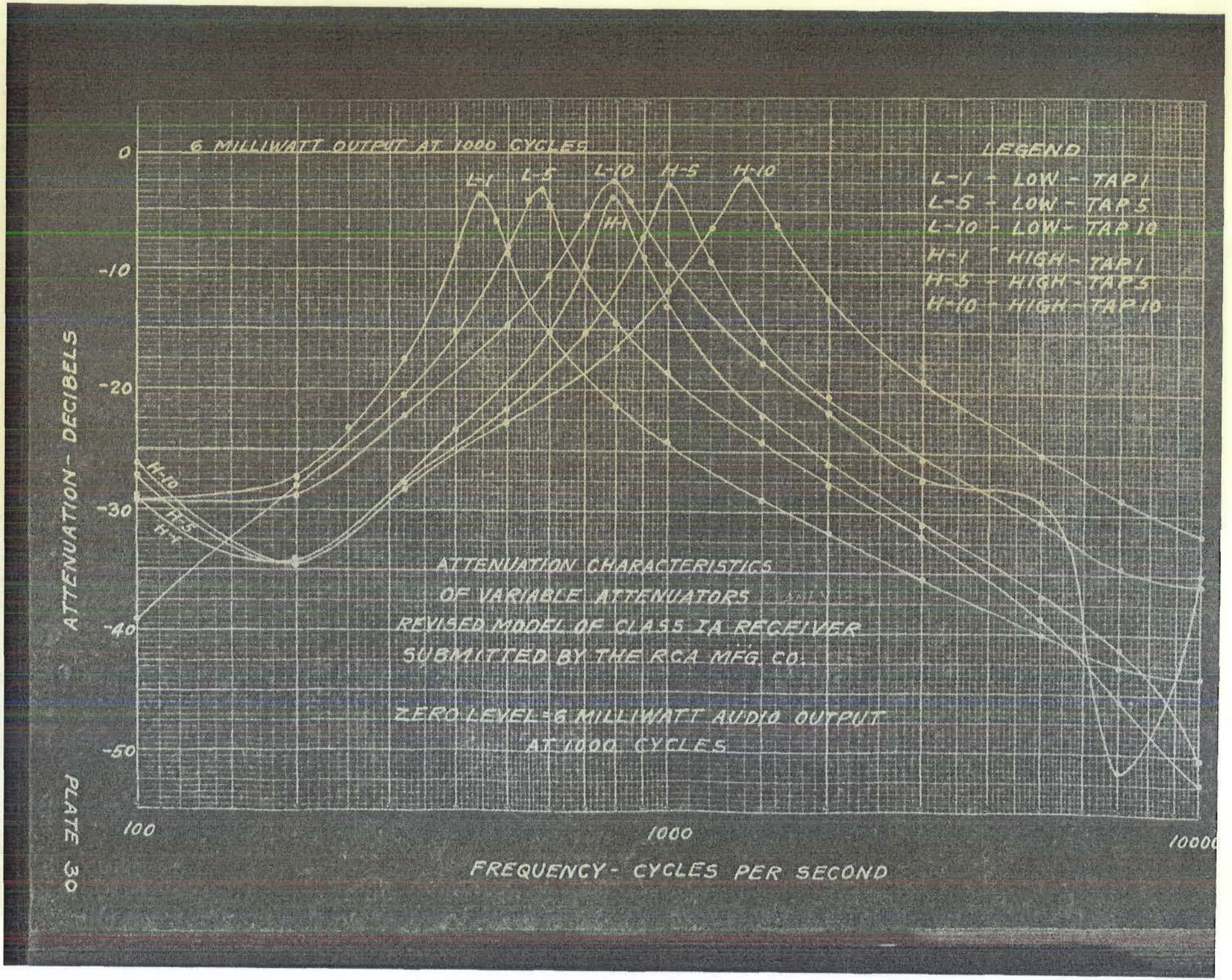


PLATE 26
ATTENUATION-DECIBELS
+10
+5
±0
-5
-10
-15
-20
-25
-30
-35
-40
100
1000
10000
FREQUENCY- CYCLES PER SECOND
OVERALL AUDIO FREQUENCY CHARACTERISTICS
OF THE AUDIO AMPLIFIER WITHOUT FILTERS
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
(ZERO LEVEL = 6 MW OUTPUT AT 1000 CYCLES WITHOUT AVC)
LEGEND
o—A.F. CHARACTERISTICS WITHOUT AVC
x—A.F. CHARACTERISTICS WITH AVC & LEVEL CONTROL AT MAX.


AUDIO FREQUENCY CHARACTERISTICS
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
VOLTAGE GAIN OF AMPLIFIER WITH
LOW PASS FILTER
6 MW = 156
300 MW = 103
+10
±0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
ATTENUATION - DECIBELS
LEGEND
●- AUDIO AMPLIFIER WITH LOW PASS FILTER IN, VARIABLE ATTENUATORS OUT, ZERO LEVEL = 6 MILLIWATTS OUTPUT AT 1000 CYCLES.
×- AUDIO AMPLIFIER WITH LOW PASS FILTER IN, VARIABLE ATTENUATORS OUT, ZERO LEVEL = 300 MILLIWATTS OUTPUT AT 1000 CYCLES.
△- AUDIO AMPLIFIER WITH LOW PASS FILTER IN, VARIABLE ATTENUATOR (LOW TAP-1) IN, ZERO LEVEL = 300 MILLIWATTS OUTPUT AT 1000 CYCLES WITH VARIABLE ATTENUATOR OUT.
100
1,000
10,000
FREQUENCY CYCLES PER SECOND
PLATE 27


AUDIO FREQUENCY CHARACTERISTICS
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
+10
± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
ATTENUATION - DECIBELS
CURVES PLOTTED IN
ACCORDANCE WITH SPECIFICATION METHOD
ZERO LEVEL = 6 MW OUTPUT AT 1000 CYCLES
FOR THE AMPLIFIER ONLY
a - AMPLIFIER WITH LOW PASS FILTER OUT VARIABLE ATTENUATORS OUT
ATTENUATOR LOW TAP, IN
HIGH - "
OUT
VOLTAGE GAIN OF AMPLIFIER ONLY AT 1000 CYCLES = 170
100
1,000
10,000
FREQUENCY - CYCLES PER SECOND
PLATE 28


+20
+10
0
-10
-20
-30
-40
-50
-60
-70
ATTENUATION - DECIBELS
ATTENUATION CHARACTERISTICS
OF LOW PASS FILTER
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
ZERO LEVEL = 6 MILLIWATTS
AUDIO OUTPUT AT 1000 CYCLES
100
1000
10,000
FREQUENCY - CYCLES PER SECOND
PLATE 29


6 MILLIWATT OUTPUT AT 1000 CYCLES
0
-10
-20
-30
-40
-50
L-1
L-5
L-10
H-5
H-10
H-1
H-10
H-5
H-1
LEGEND
L-1 - LOW - TAP 1
L-5 - LOW - TAP 5
L-10 - LOW - TAP 10
H-1 - HIGH - TAP 1
H-5 - HIGH - TAP 5
H-10 - HIGH - TAP 10
ATTENUATION CHARACTERISTICS
OF VARIABLE ATTENUATORS
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE RCA MFG. CO.
ZERO LEVEL = 6 MILLIWATT AUDIO OUTPUT
AT 1000 CYCLES
ATTENUATION - DECIBELS
100
1000
10000
FREQUENCY - CYCLES PER SECOND
PLATE 30

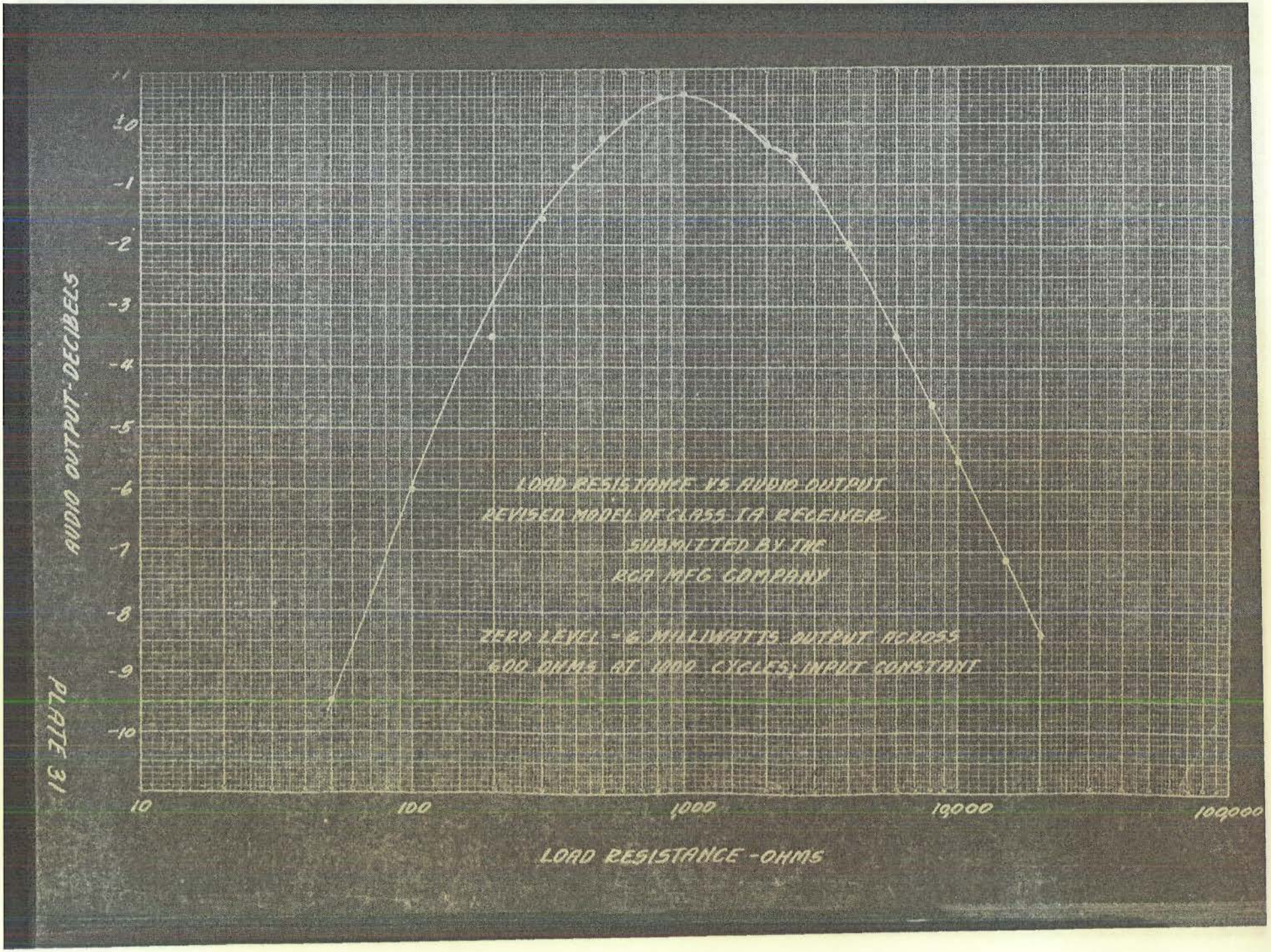
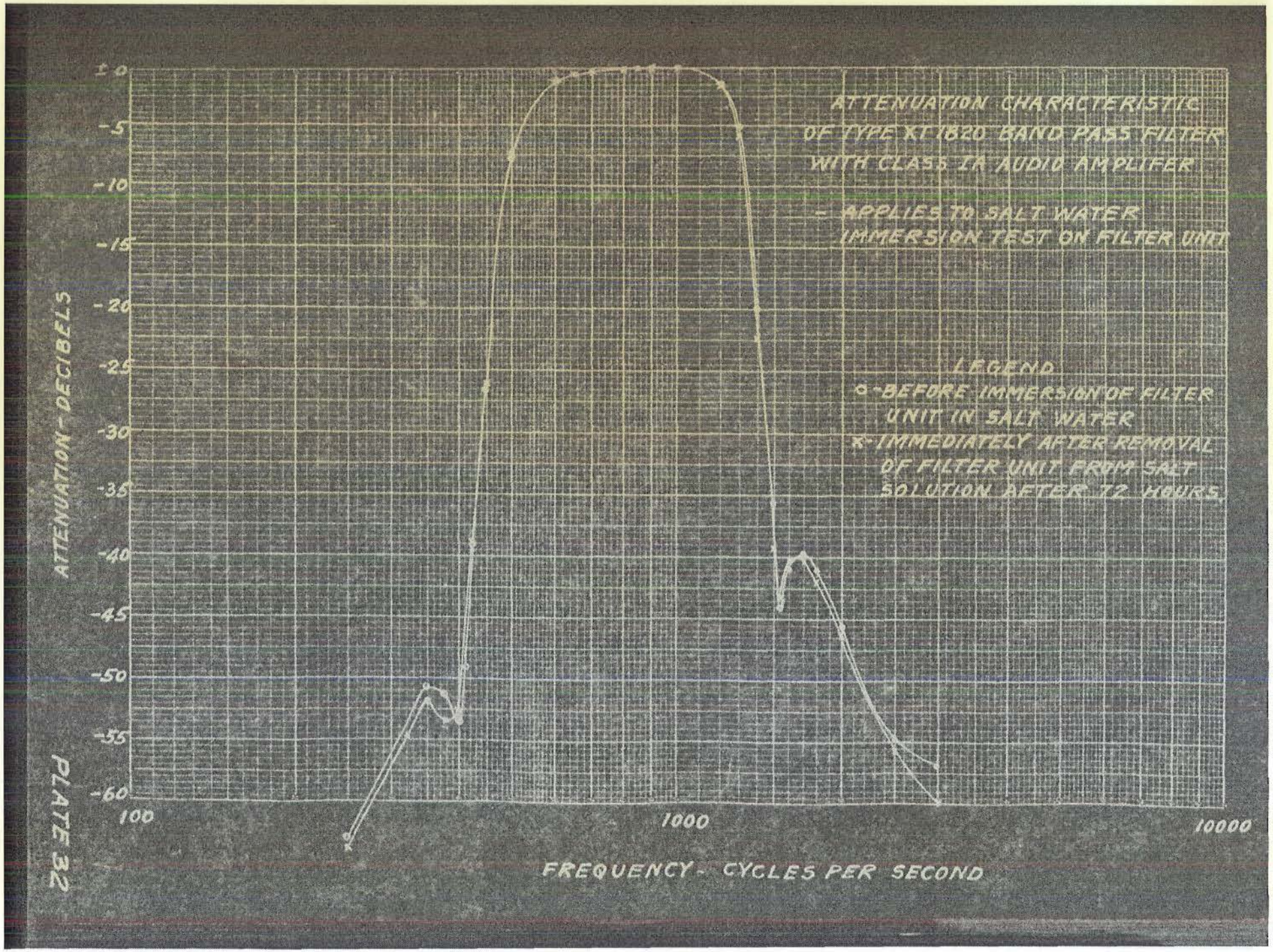
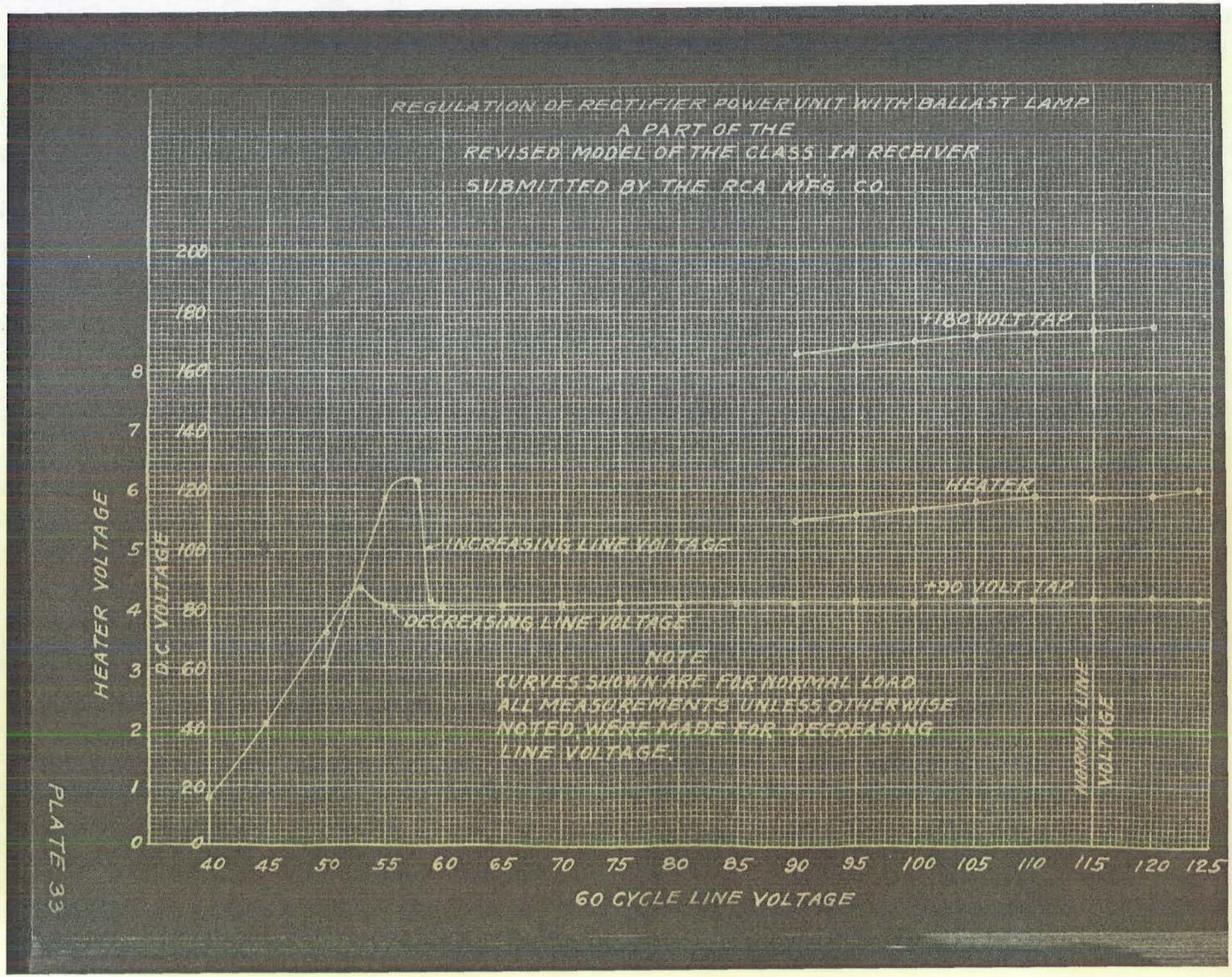
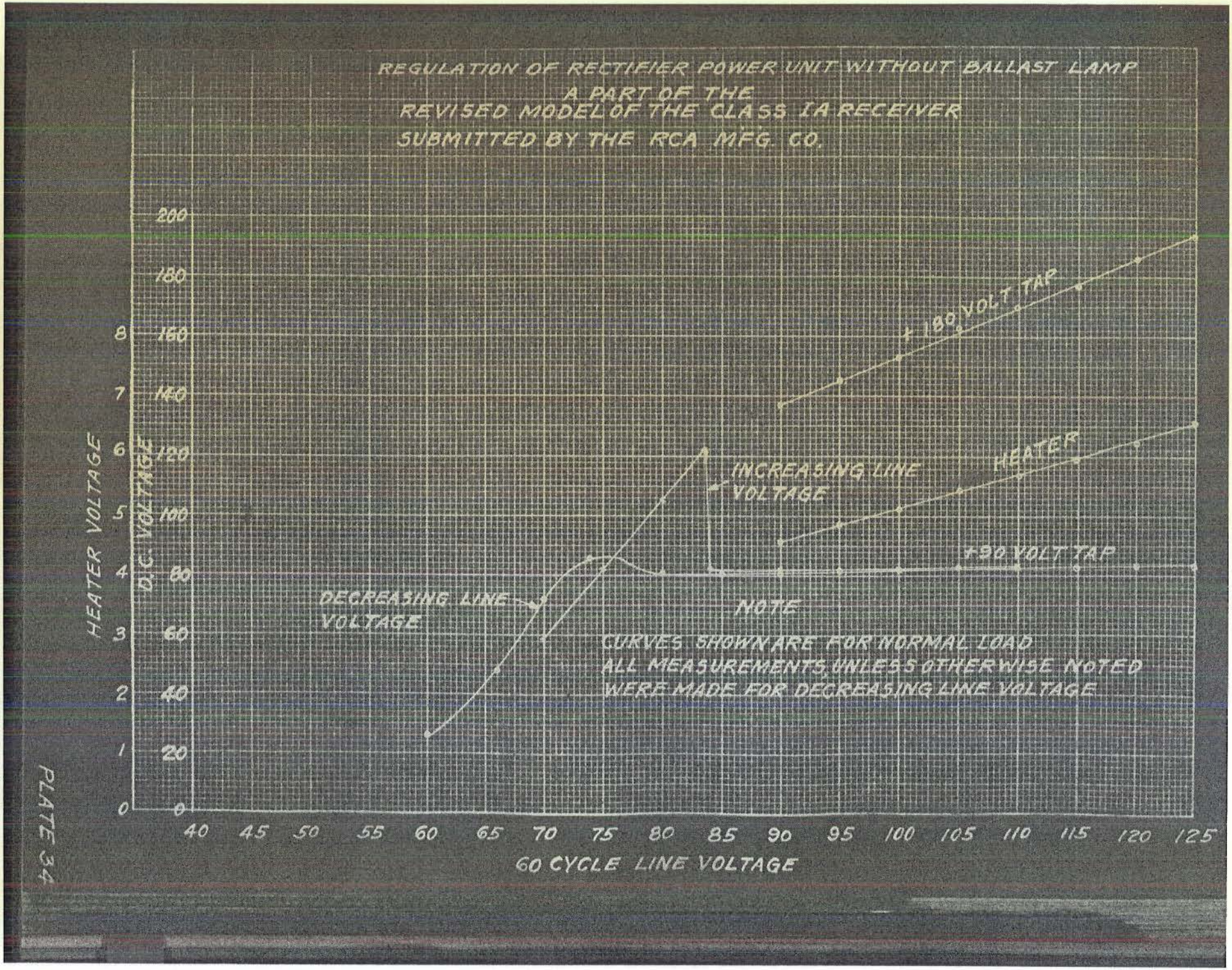
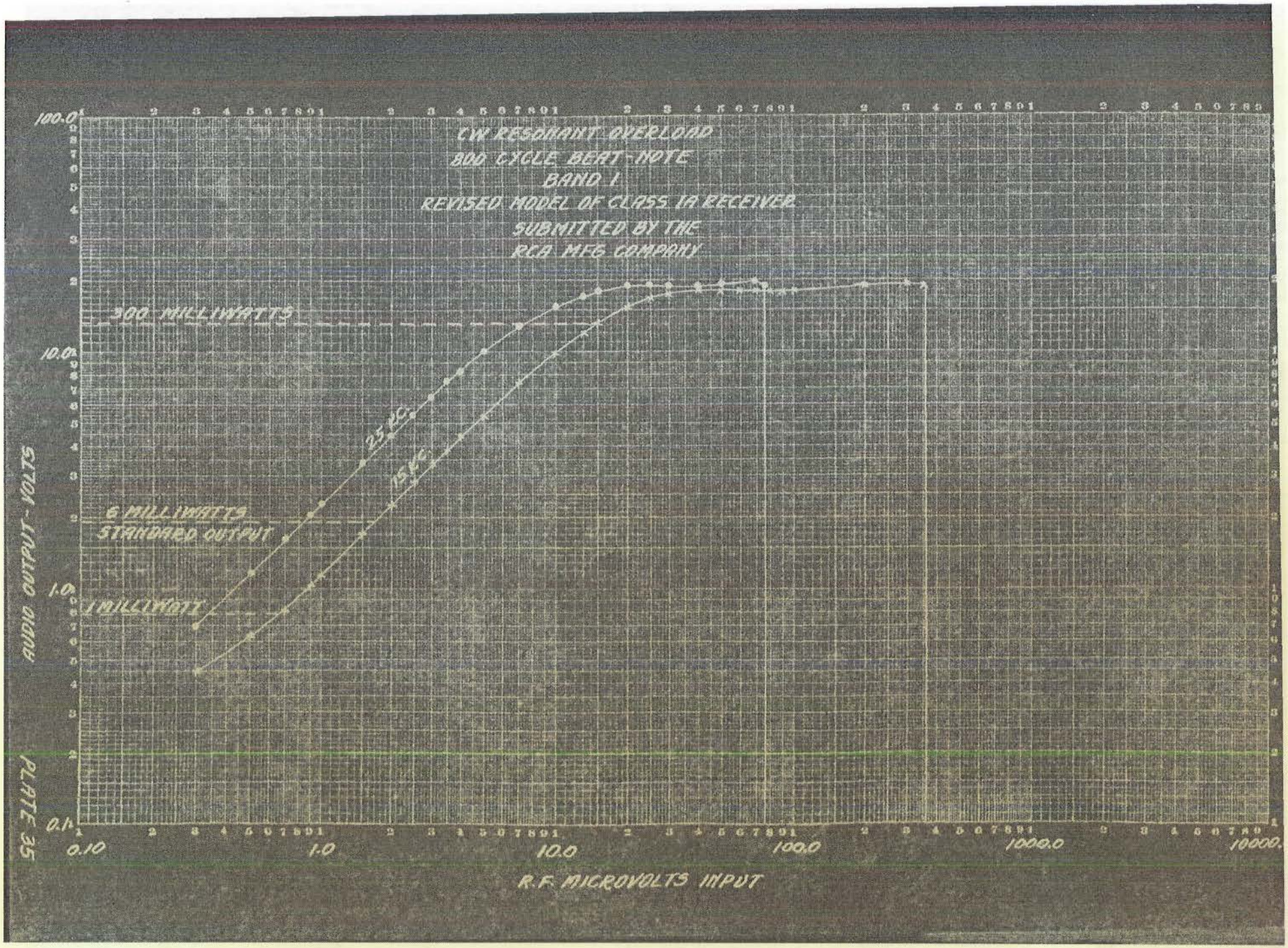


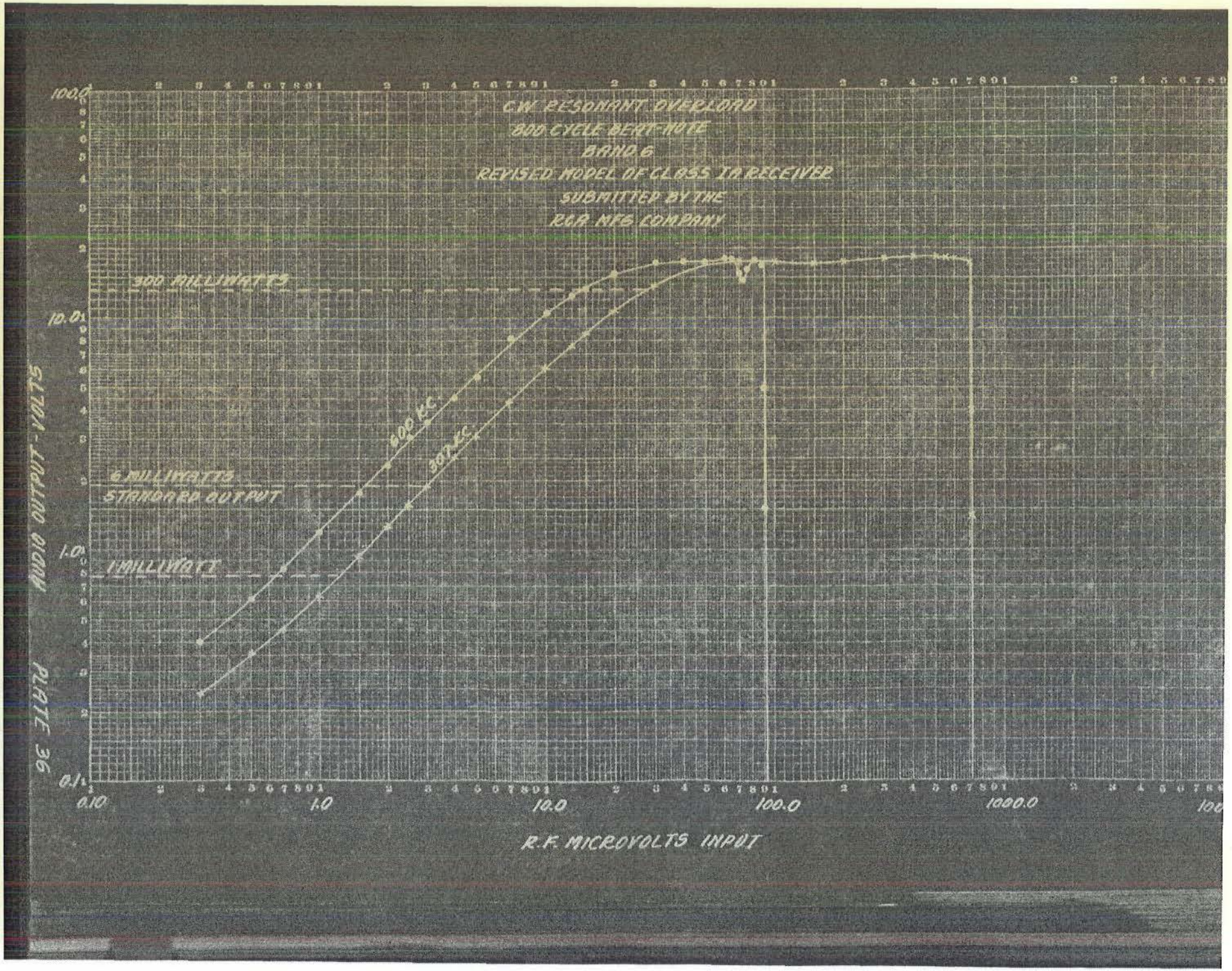
PLATE 31
AUDIO OUTPUT-DECIBELS
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
LOAD RESISTANCE VS AUDIO OUTPUT
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
ZERO LEVEL = 6 MILLIWATTS OUTPUT ACROSS
600 OHMS AT 1000 CYCLES; INPUT CONSTANT
10
100
1,000
10,000
100,000
LOAD RESISTANCE - OHMS

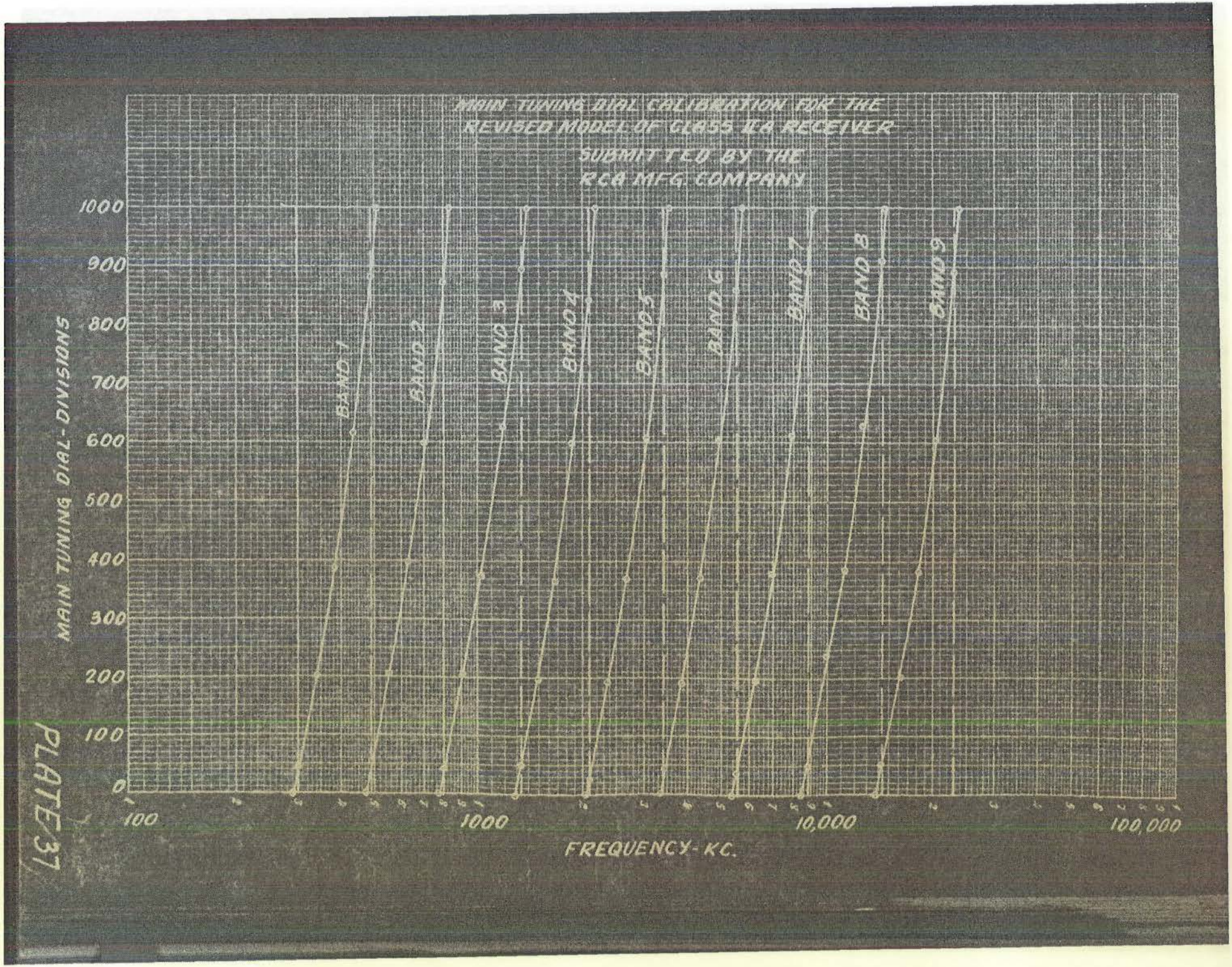

ATTENUATION CHARACTERISTIC
OF TYPE XT 1820 BAND PASS FILTER
WITH CLASS IA AUDIO AMPLIFER
- APPLIES TO SALT WATER
IMMERSION TEST ON FILTER UNIT
LEGEND
O - BEFORE IMMERSION OF FILTER
UNIT IN SALT WATER
X - IMMEDIATELY AFTER REMOVAL
OF FILTER UNIT FROM SALT
SOLUTION AFTER 72 HOURS.
ATTENUATION - DECIBELS
± 0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
100
1000
10000
FREQUENCY - CYCLES PER SECOND
PLATE 82


REGULATION OF RECTIFIER POWER UNIT WITH BALLAST LAMP
A PART OF THE
REVISED MODEL OF THE CLASS IA RECEIVER
SUBMITTED BY THE RCA MFG. CO.
HEATER VOLTAGE
D.C VOLTAGE
60 CYCLE LINE VOLTAGE
+180 VOLT TAP
HEATER
INCREASING LINE VOLTAGE
+90 VOLT TAP
DECREASING LINE VOLTAGE
NOTE
CURVES SHOWN ARE FOR NORMAL LOAD
ALL MEASUREMENTS UNLESS OTHERWISE
NOTED WERE MADE FOR DECREASING
LINE VOLTAGE.
PLATE 33

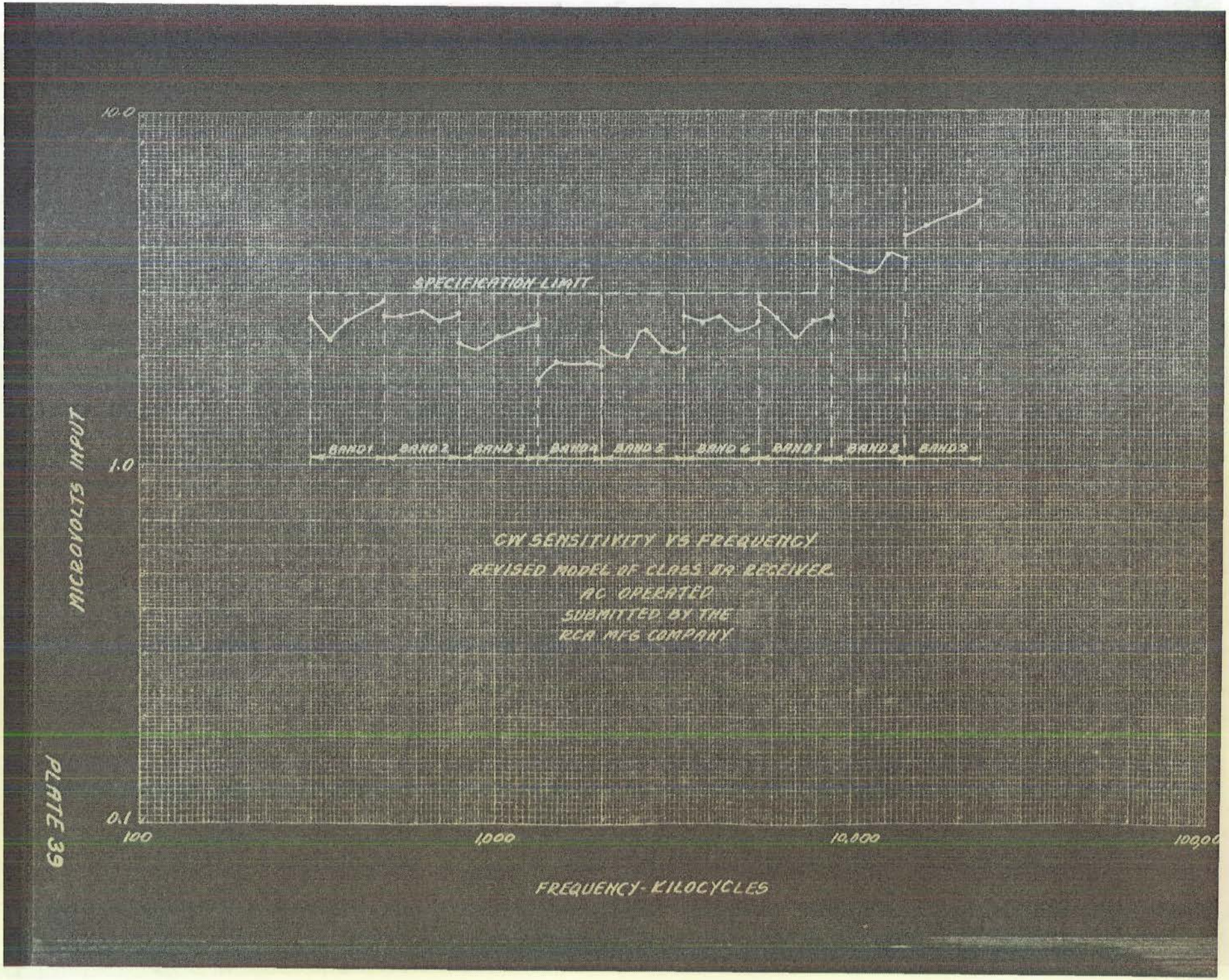

REGULATION OF RECTIFIER POWER UNIT WITHOUT BALLAST LAMP
A PART OF THE
REVISED MODEL OF THE CLASS IA RECEIVER
SUBMITTED BY THE RCA MFG. CO.
HEATER VOLTAGE
D.C. VOLTAGE
0
1
2
3
4
5
6
7
8
0
20
40
60
80
100
120
140
160
180
200
180 VOLT TAP
INCREASING LINE VOLTAGE
HEATER
90 VOLT TAP
DECREASING LINE VOLTAGE
NOTE
CURVES SHOWN ARE FOR NORMAL LOAD
ALL MEASUREMENTS, UNLESS OTHERWISE NOTED
WERE MADE FOR DECREASING LINE VOLTAGE
40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125
60 CYCLE LINE VOLTAGE
PLATE 34


CW RESONANT OVERLOAD
800 CYCLE BEAT-NOTE
BAND I
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
300 MILLIWATTS
6 MILLIWATTS
STANDARD OUTPUT
1 MILLIWATT
25 MC.
15 MC.
AUDIO OUTPUT-VOLTS
PLATE 35
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
10000.
R.F. MICROVOLTS INPUT


C.W. RESONANT OVERLOAD
800 CYCLE BEAT-NOTE
BAND 6
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
300 MILLIWATTS
6 MILLIWATTS
STANDARD OUTPUT
1 MILLIWATT
600 KC.
30? KC.
AUDIO OUTPUT-VOLTS
PLATE 36
100.0
10.01
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT


MAIN TUNING DIAL CALIBRATION FOR THE
REVISED MODEL OF G1855 RCA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
MAIN TUNING DIAL-DIVISIONS
1000
900
800
700
600
500
400
300
200
100
0
BAND 1
BAND 2
BAND 3
BAND 4
BAND 5
BAND 6
BAND 7
BAND 8
BAND 9
100
1000
10,000
100,000
FREQUENCY-KC.
PLATE 37

BHT & R.F. TRIMMER CONDENSER
DIAL SETTINGS - DIVISIONS
REGENERATION & VOLUME CONTROL
DIAL SETTINGS - DIVISIONS
FREQUENCY - KILOCYCLES
PLATE 38


10.0
1.0
0.1
MICROVOLTS INPUT
SPECIFICATION LIMIT
BAND 1
BAND 2
BAND 3
BAND 4
BAND 5
BAND 6
BAND 7
BAND 8
BAND 9
CW SENSITIVITY VS FREQUENCY
REVISED MODEL OF CLASS BA RECEIVER
AC OPERATED
SUBMITTED BY THE
RCA MFG COMPANY
100
1,000
10,000
100,00
FREQUENCY - KILOCYCLES
PLATE 39

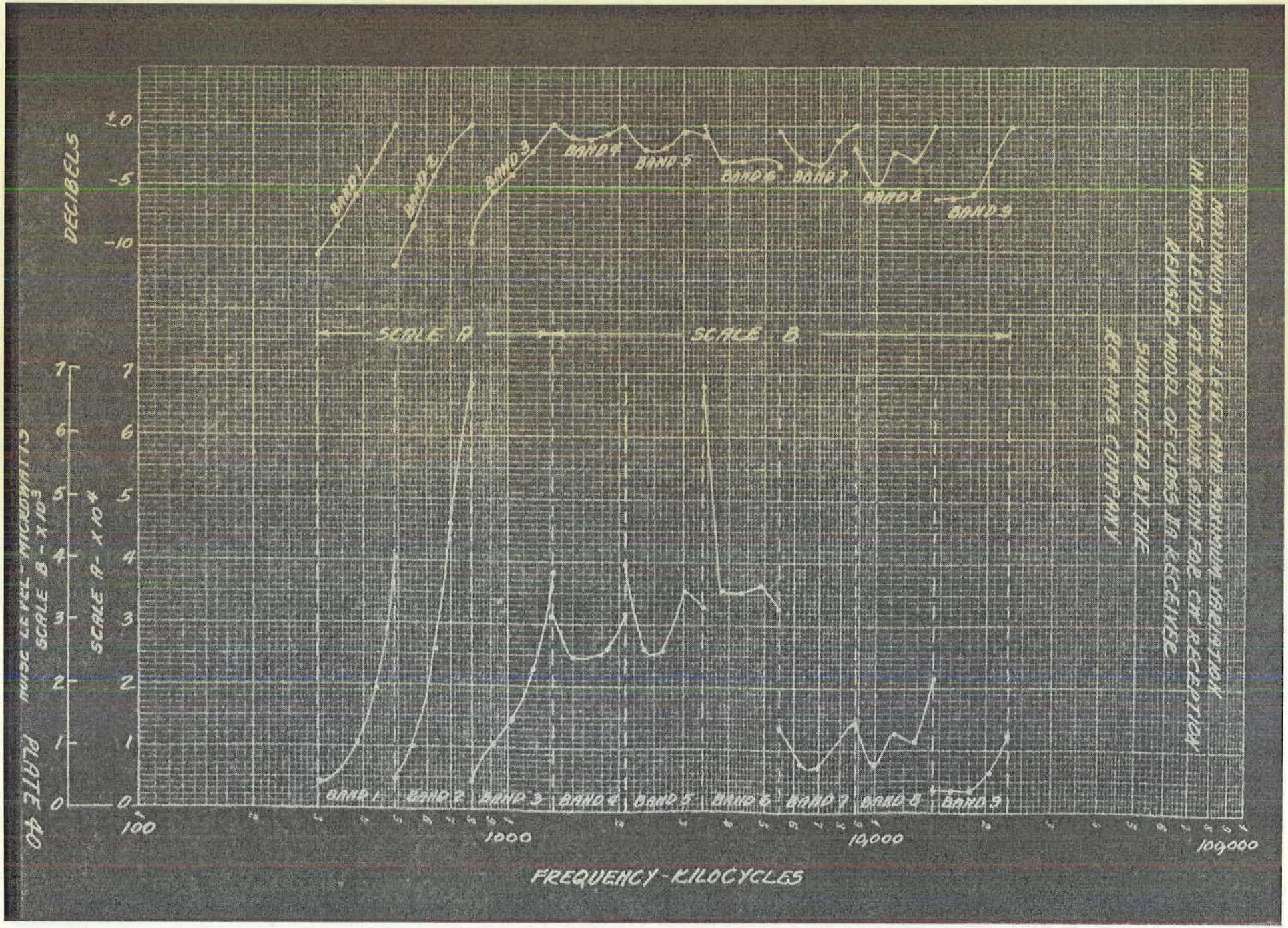
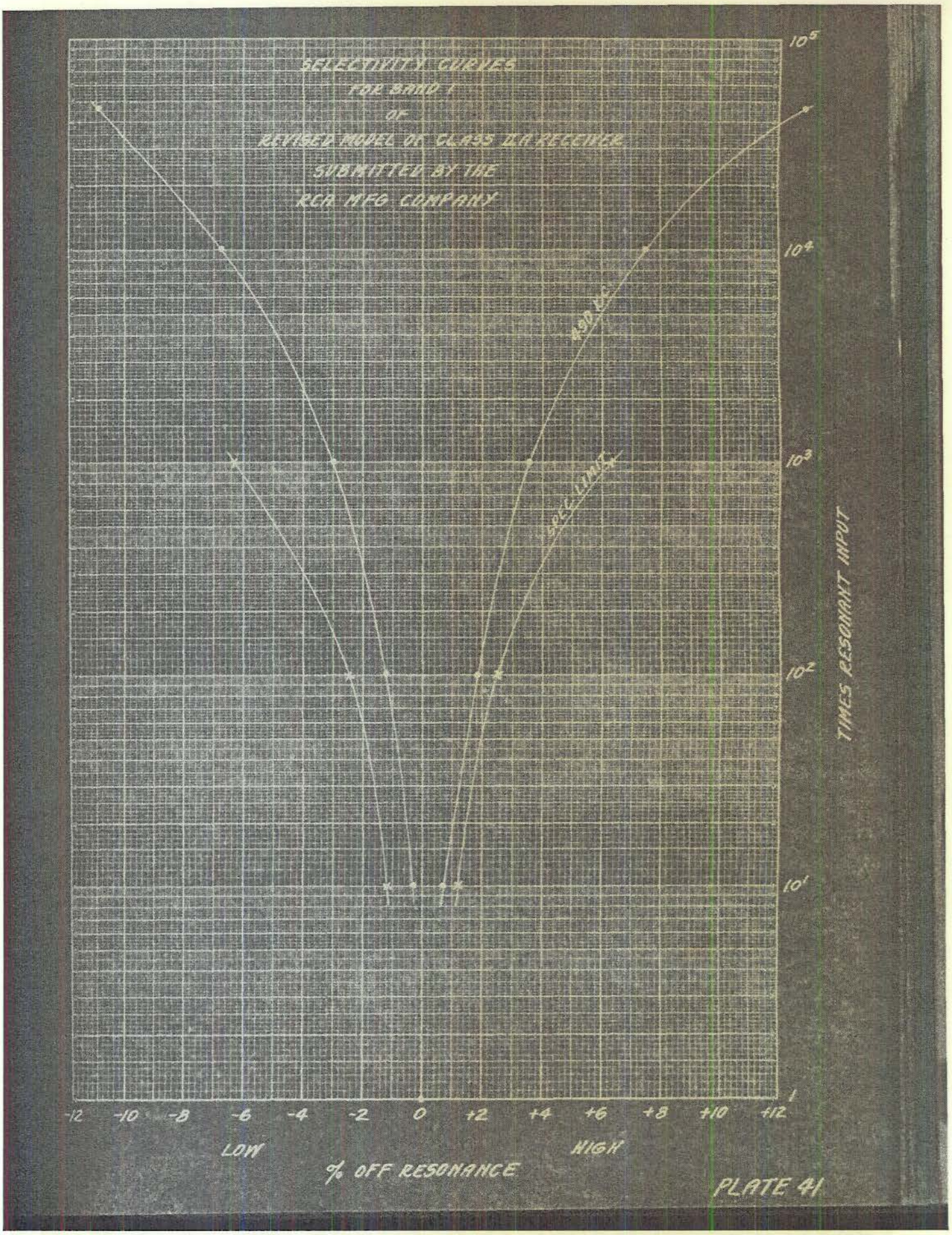
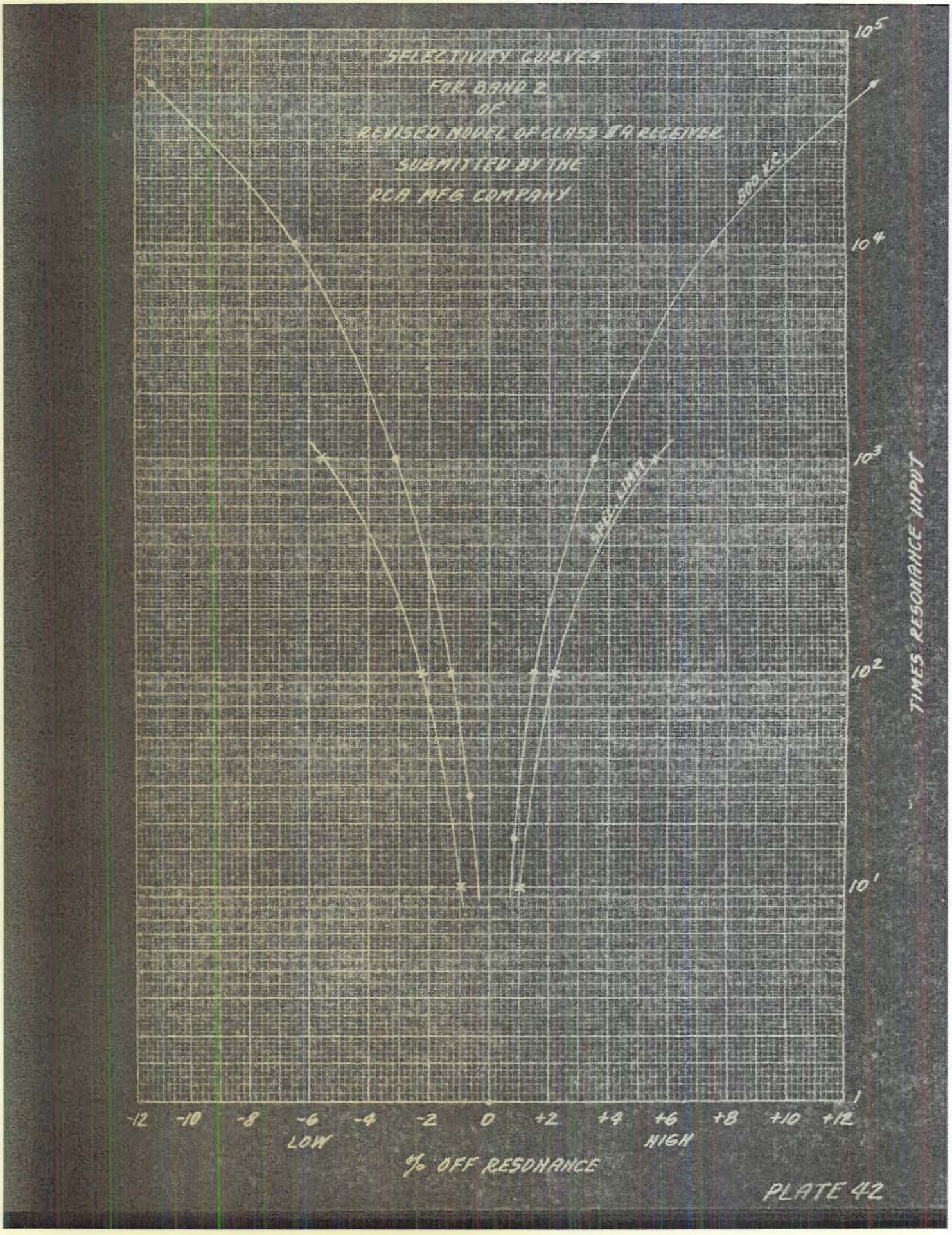
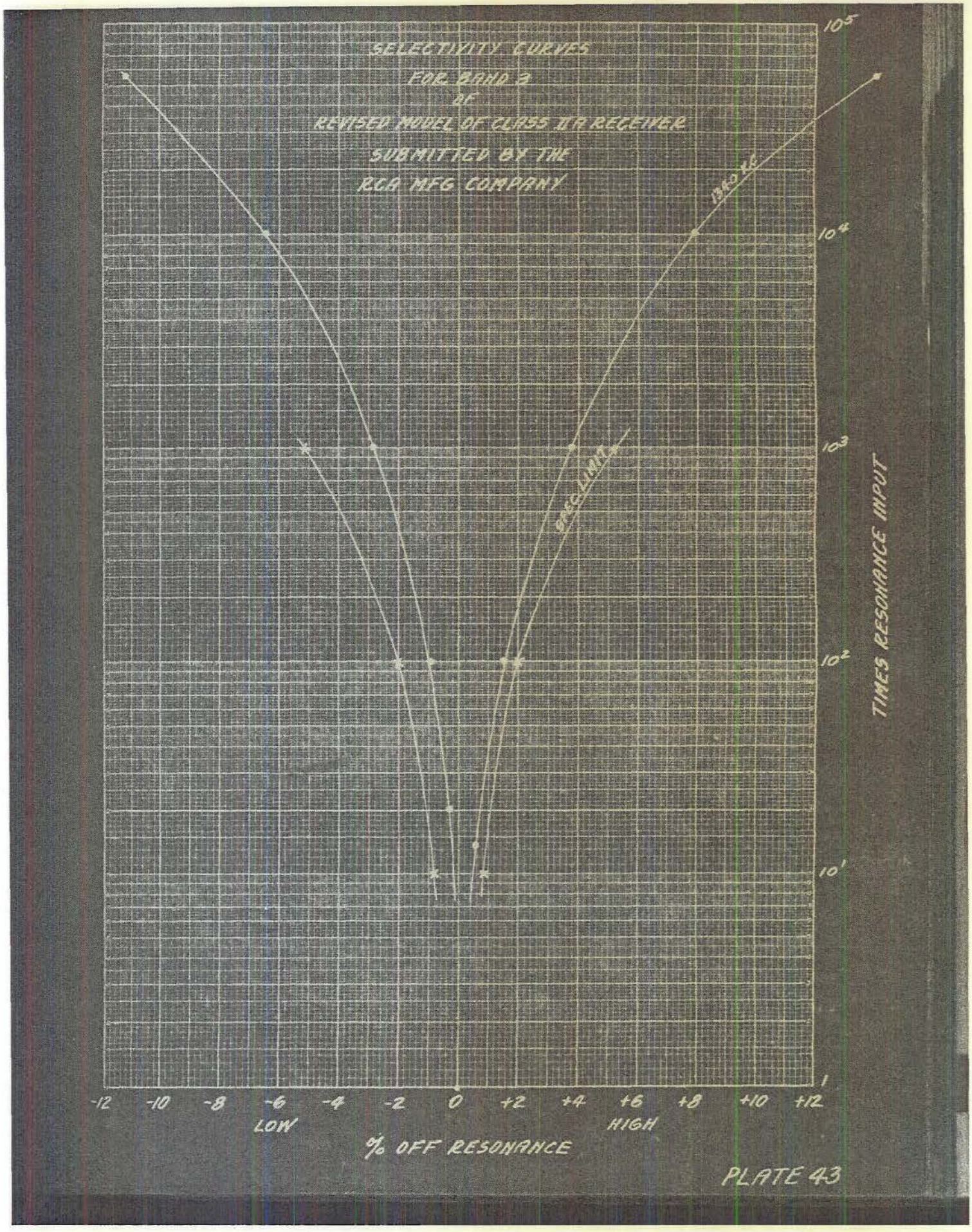
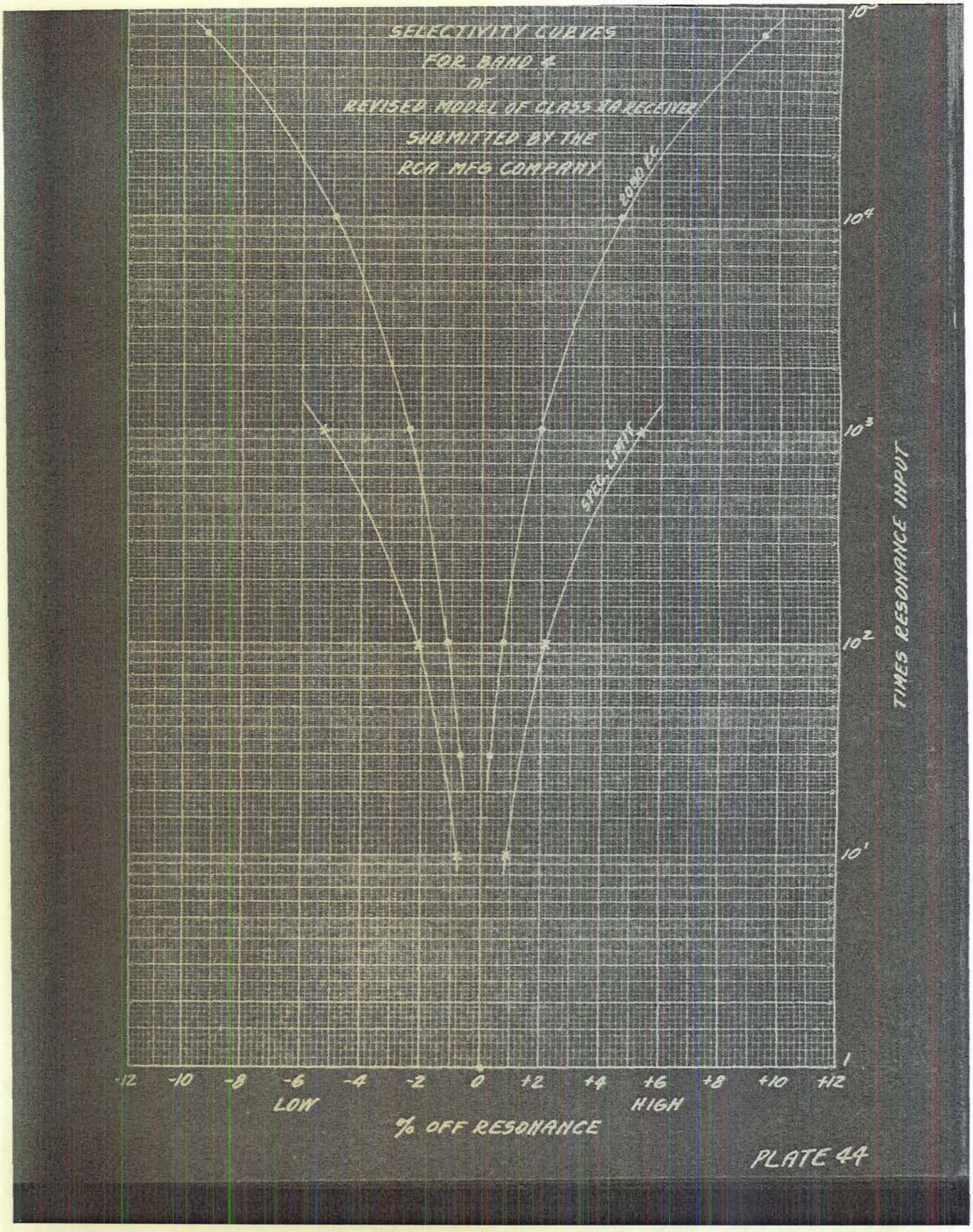


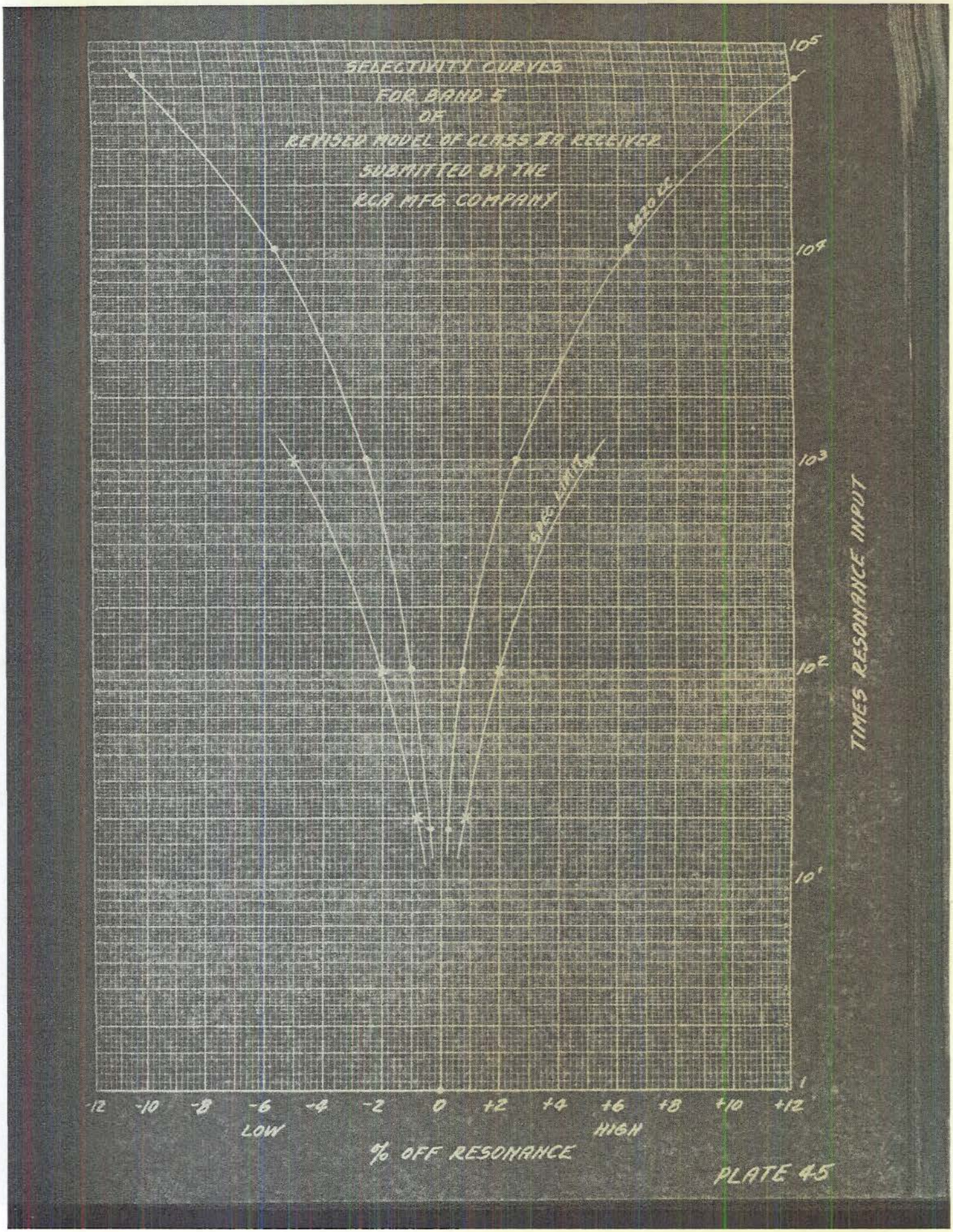
PLATE 40
NOISE LEVEL - MICROVOLTS
SCALE B - X 10³
SCALE A - X 10⁴
DECIBELS
+10
-5
-10
BAND 1
BAND 2
BAND 3
BAND 4
BAND 5
BAND 6
BAND 7
BAND 8
BAND 9
SCALE A
SCALE B
100
1000
10,000
100,000
FREQUENCY - KILOCYCLES
GROUND NOISE LEVEL AND MINIMUM VARIATION IN NOISE LEVEL AT MAXIMUM GAIN FOR CW RECEPTION
ADVISED MODEL OF CURVE IN RECEIVE SUBMITTED BY THE
RCA RIES COMPANY

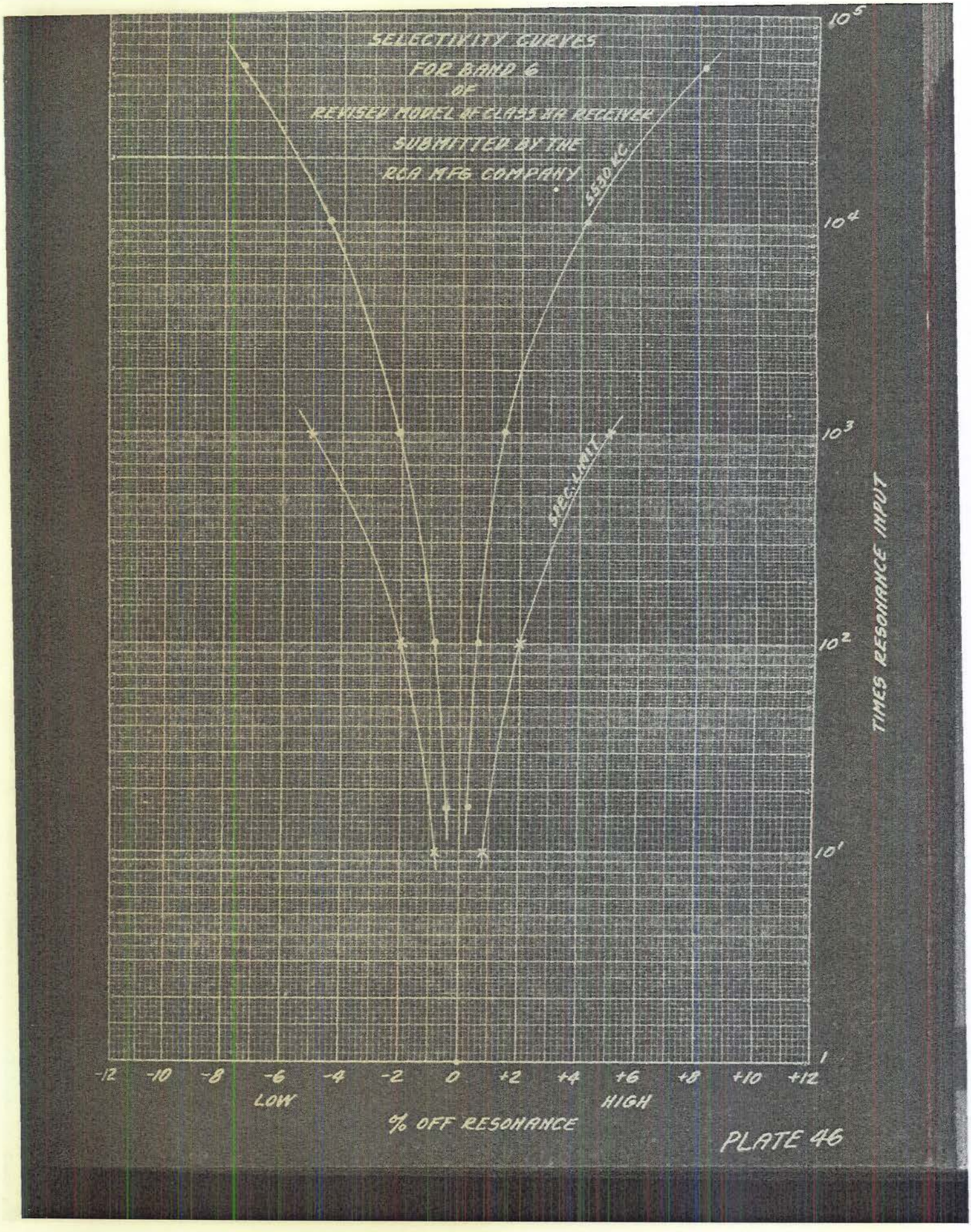

SELECTIVITY CURVES
FOR BAND I
OF
REVISED MODEL OF CLASS 2A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
10⁵
10⁴
10³
10²
10¹
1
TIMES RESONANT INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 41

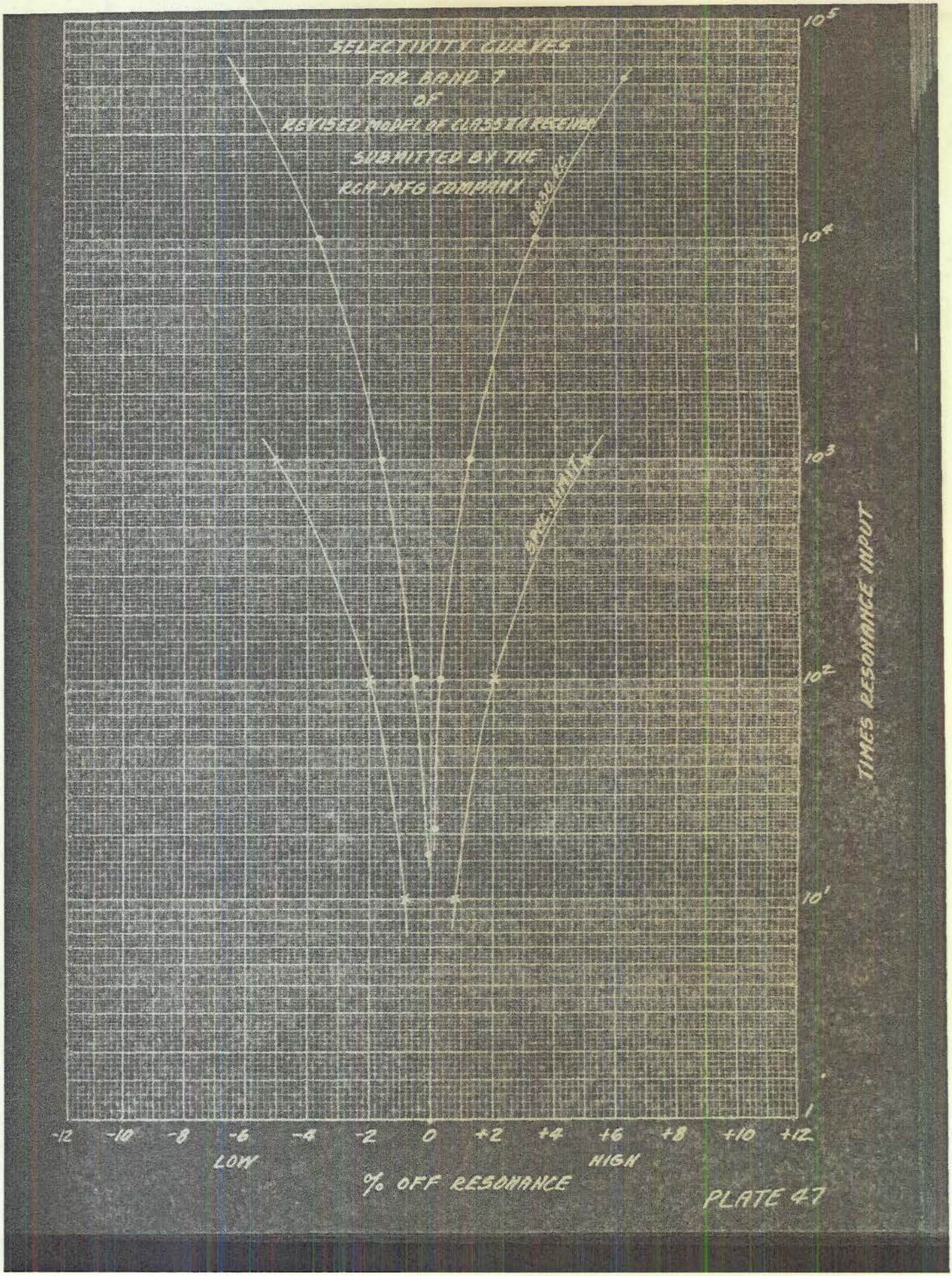

SELECTIVITY CURVES
FOR BAND 2
OF
REVISED MODEL OF CLASS CA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
800 KC
LIMIT
$10^5$
$10^4$
$10^3$
$10^2$
$10^1$
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 42

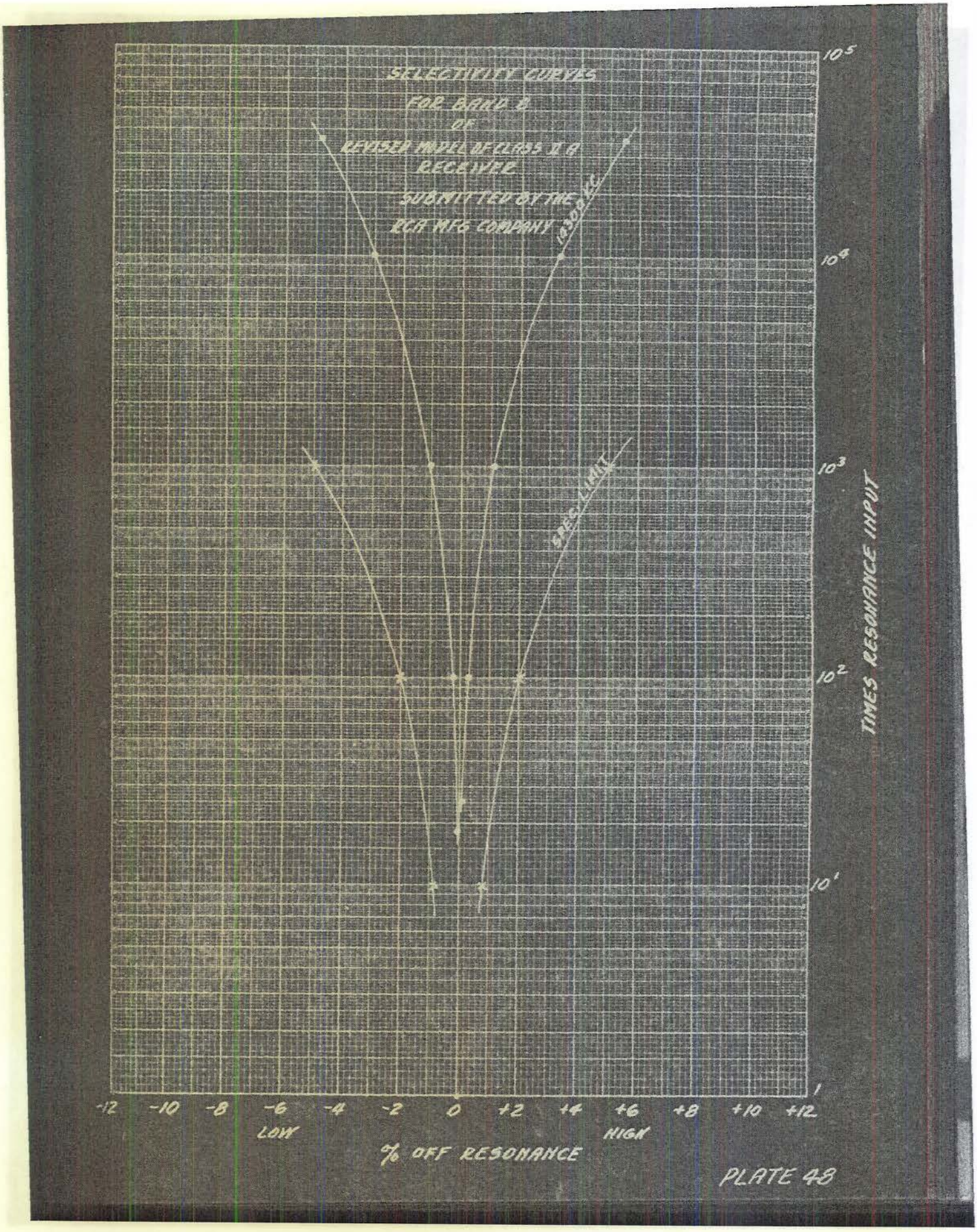

SELECTIVITY CURVES
FOR BAND 3
OF
REVISED MODEL OF CLASS D RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
1340 KC
SPEC. LIMIT
10⁵
10⁴
10³
10²
10¹
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 43

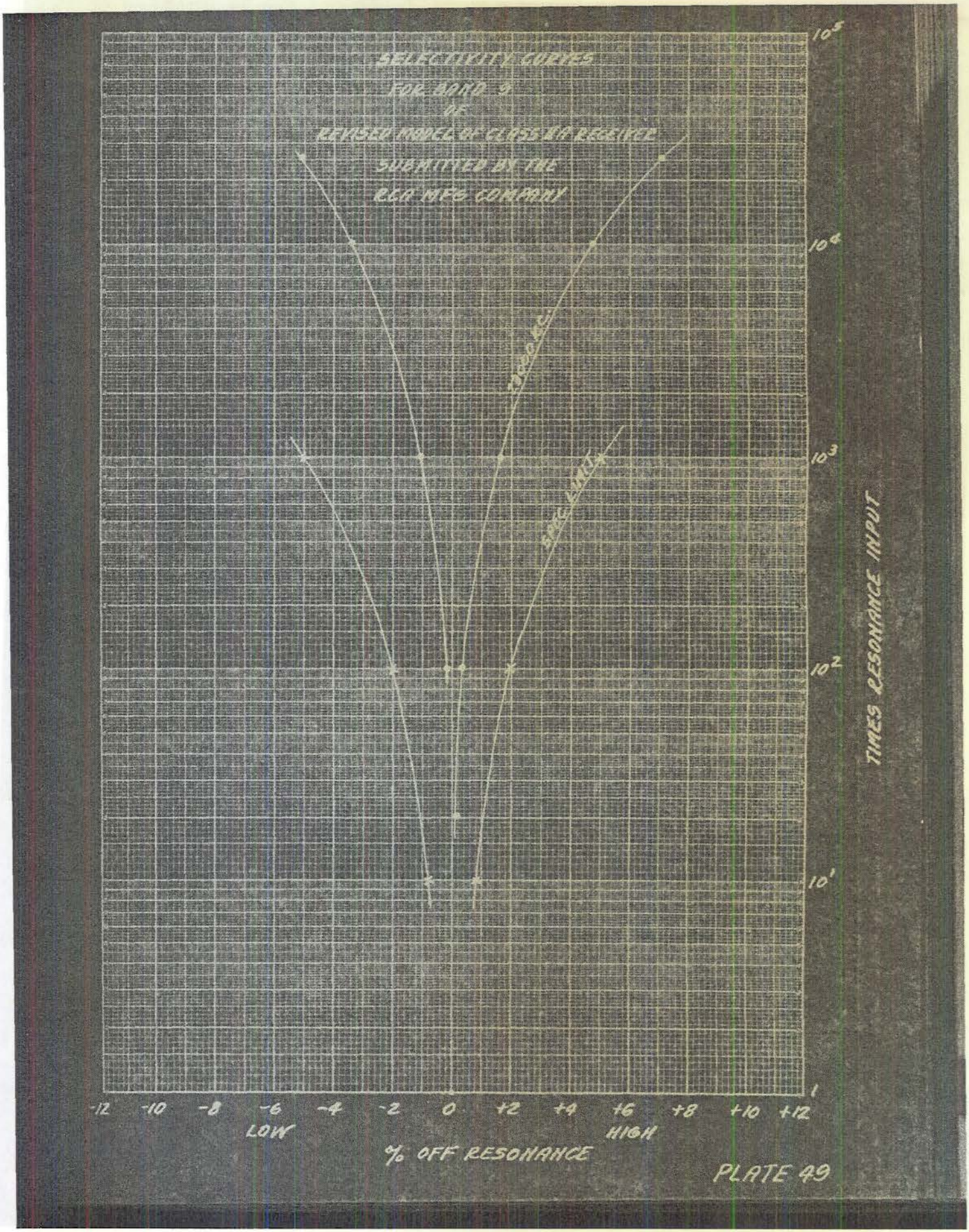

SELECTIVITY CURVES
FOR BAND 4
OF
REVISED MODEL OF CLASS 2A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
1000 Cs
SPEC. LIMIT
$10^4$
$10^3$
$10^2$
$10^1$
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 44

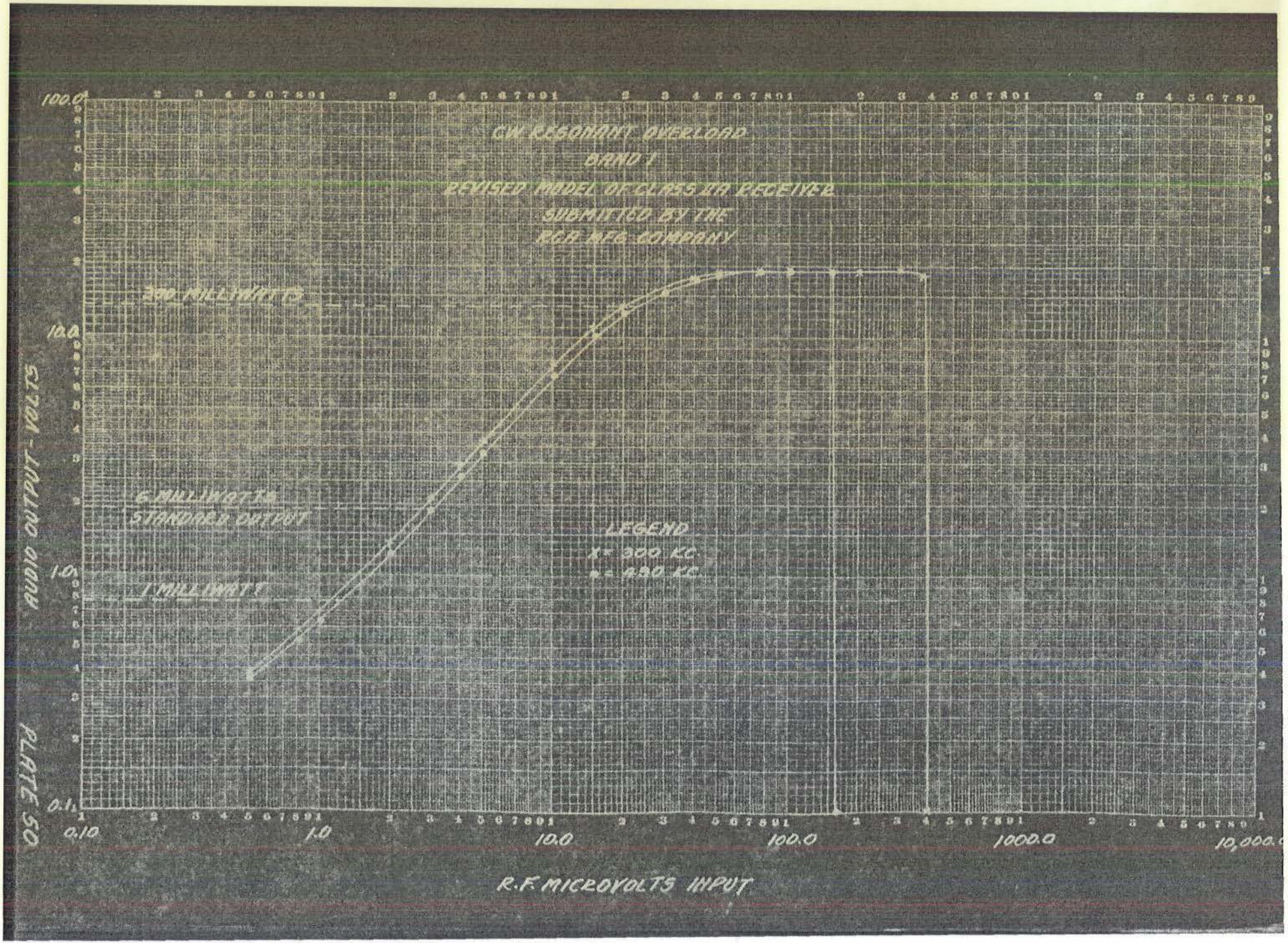

SELECTIVITY CURVES
FOR BAND 5
OF
REVISED MODEL OF CLASS II-A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
1420 KC
STATIC LIMIT
10^5
10^4
10^3
10^2
10^1
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 45


SELECTIVITY CURVES
FOR BAND 6
OF
REVISED MODEL AF CLASS 3A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
1530 K.C.
SPECIFIED
$10^5$
$10^4$
$10^3$
$10^2$
$10^1$
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 46


SELECTIVITY CURVES
FOR BAND 7
OF
REVISED MODEL OF CLASS A-1 RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
830 KC.
1040 KC.
$10^5$
$10^4$
$10^3$
$10^2$
$10^1$
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 47


SELECTIVITY CURVES
FOR BAND 2
OF
REVISED MODEL OF CLASS II A
RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
1830 KC
SPEC. LIMIT
$10^5$
$10^4$
$10^3$
$10^2$
$10^1$
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 48


SELECTIVITY CURVES
FOR BAND 2
OF
REVISED MODEL OF CLASS B RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
10⁵
10⁴
10³
10²
10¹
1
TIMES RESONANCE INPUT
-12 -10 -8 -6 -4 -2 0 +2 +4 +6 +8 +10 +12
LOW
HIGH
% OFF RESONANCE
PLATE 49


C.W. RESONANT OVERLOAD
BAND I
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
300 MILLIWATTS
6 MILLIWATTS
STANDARD OUTPUT
1 MILLIWATT
LEGEND
X = 300 KC.
• = 490 KC.
AUDIO OUTPUT - VOLTS
PLATE 50
R.F. MICROVOLTS INPUT
0.10
1.0
10.0
100.0
1000.0
10,000.0

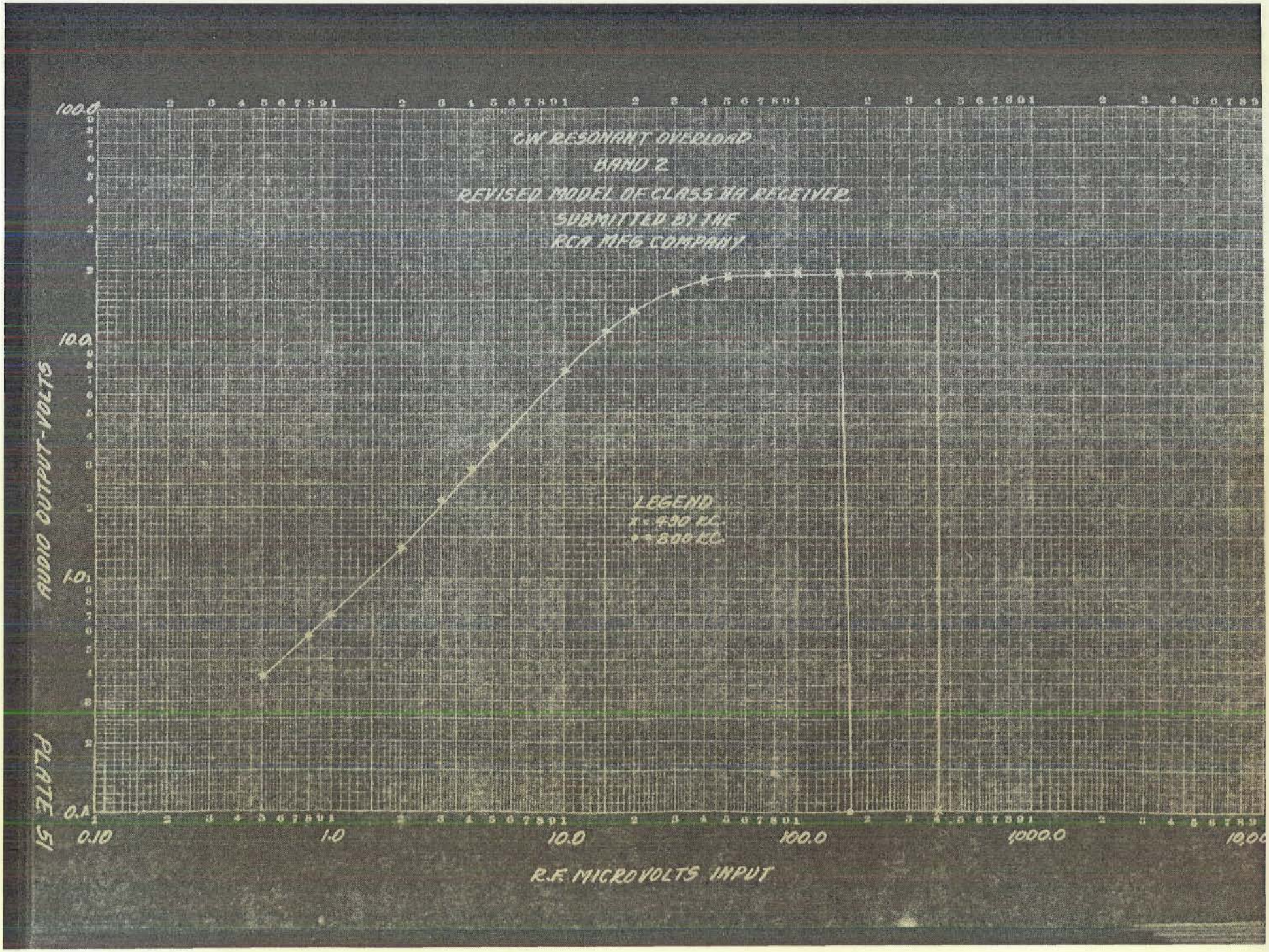
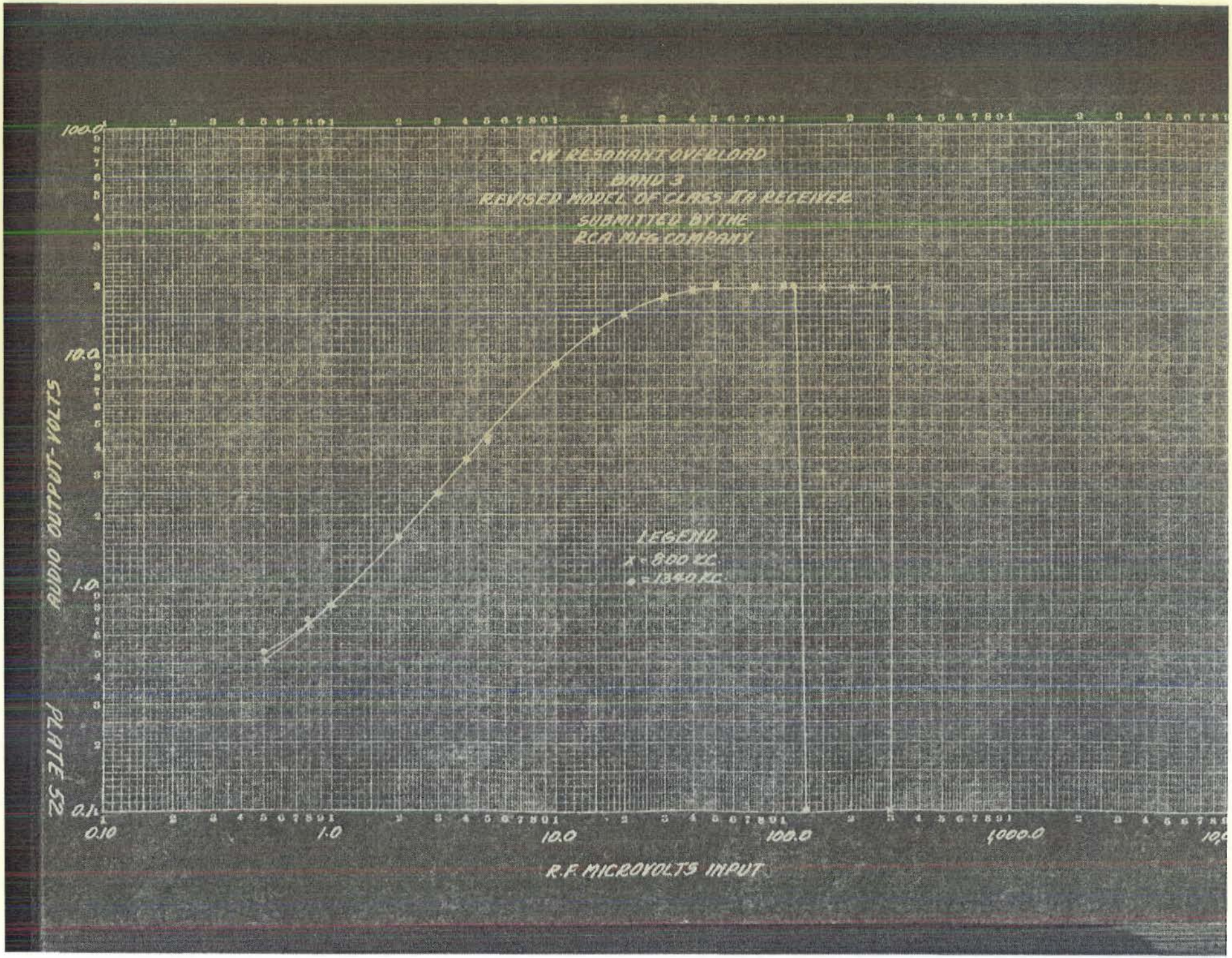
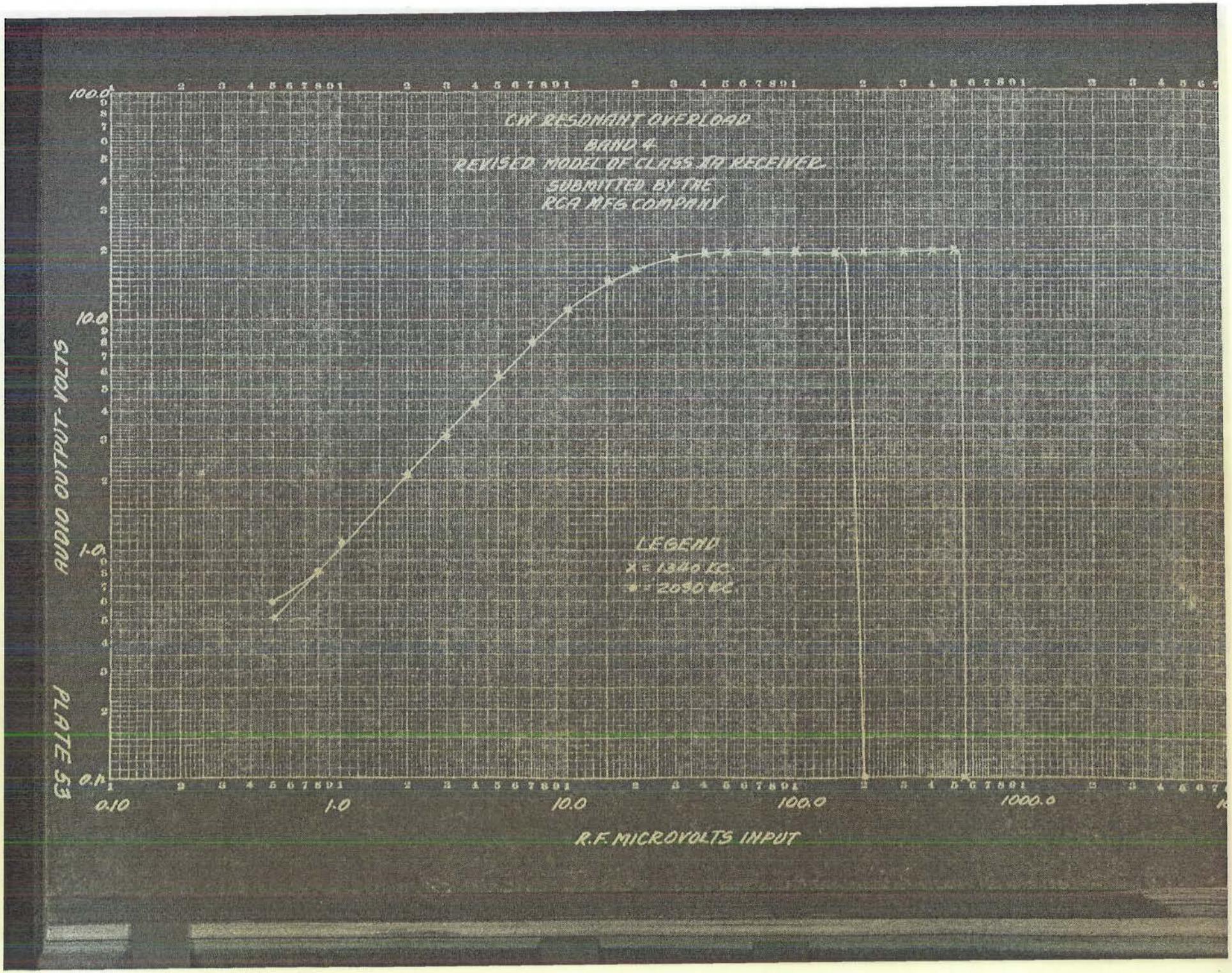
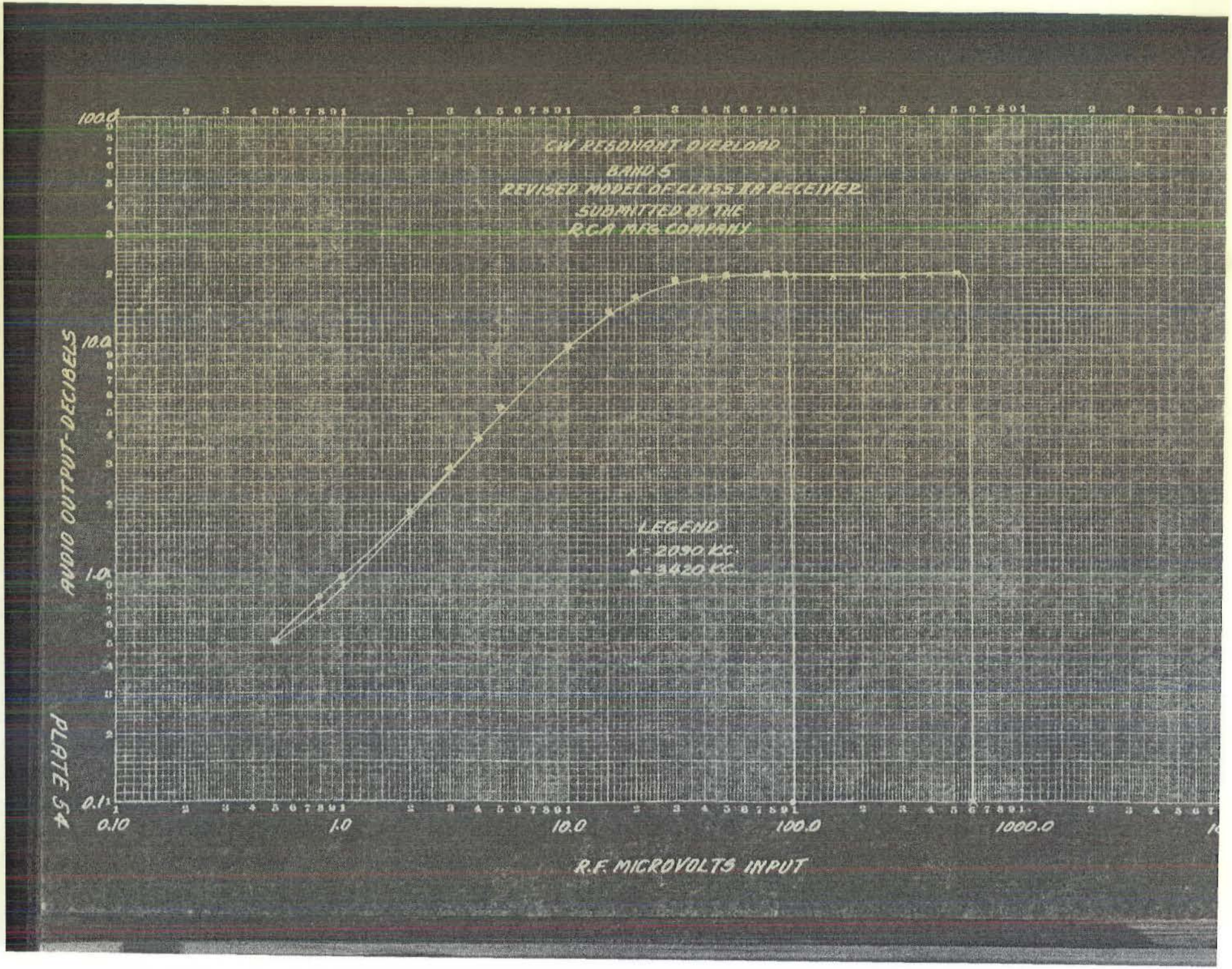
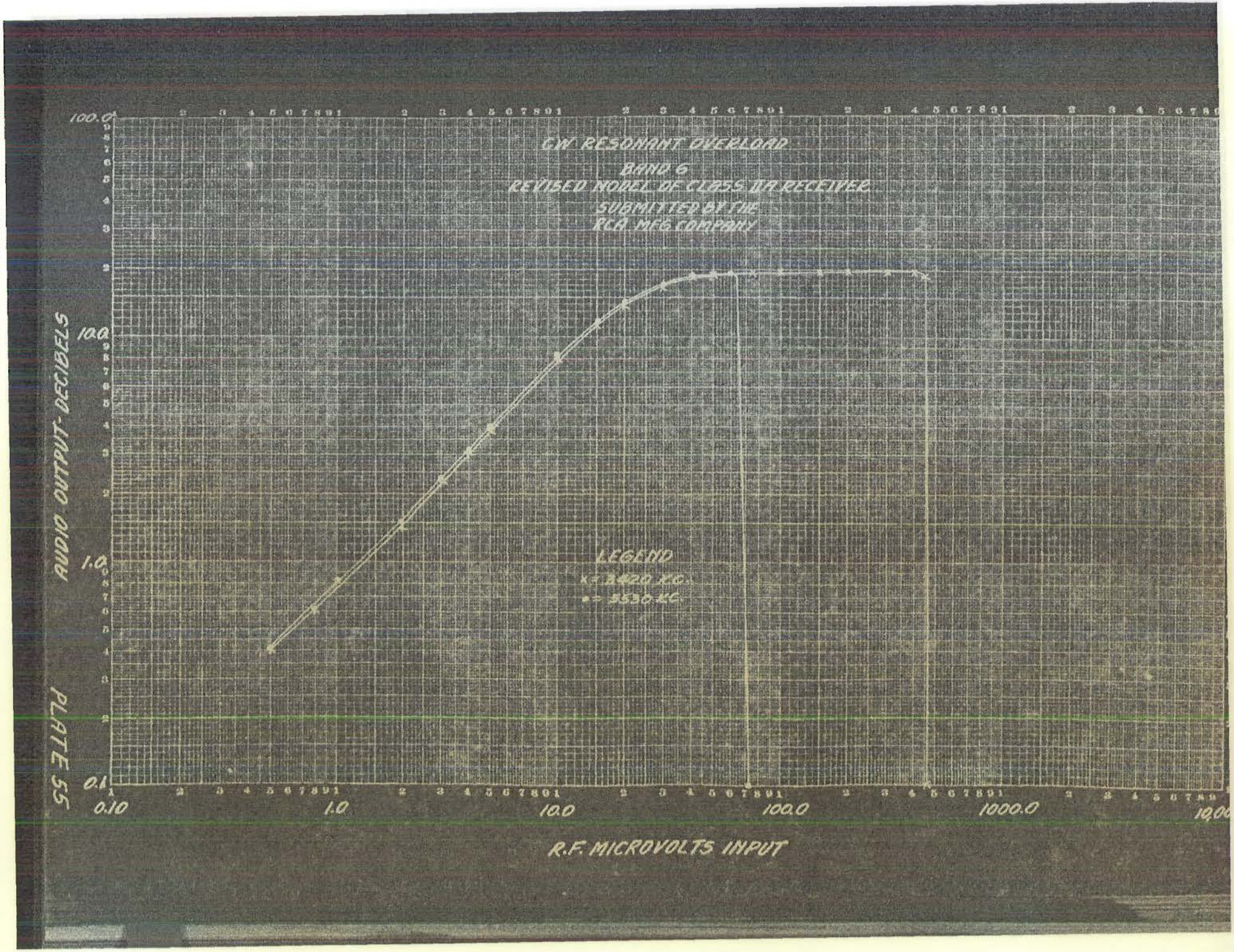

C.W. RESONANT OVERLOAD
BAND 2
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
LEGEND
x - 9.50 KC.
• - 8.00 KC.
AUDIO OUTPUT-VOLTS
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1,000.0
R.F. MICROVOLTS INPUT

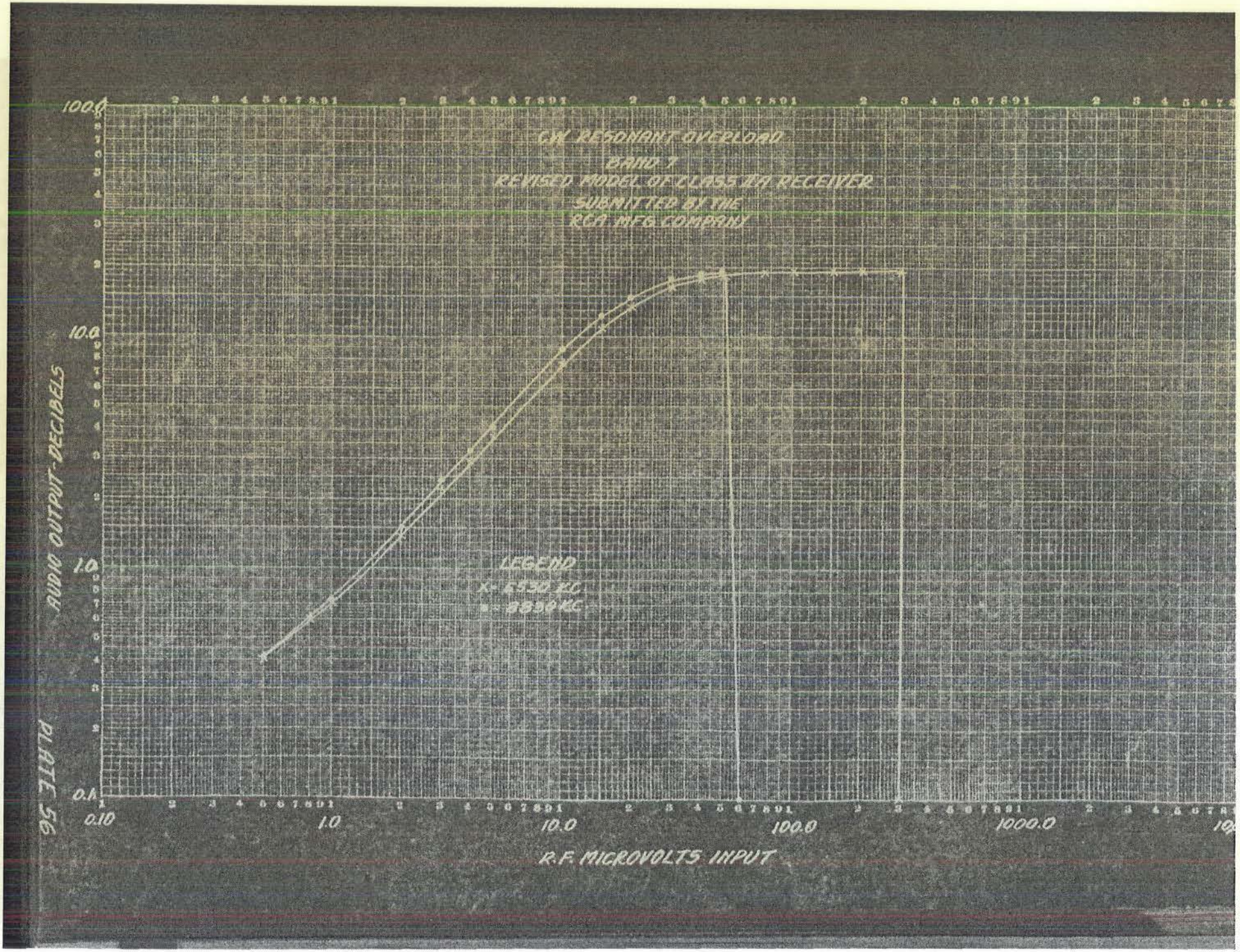
PLATE 51

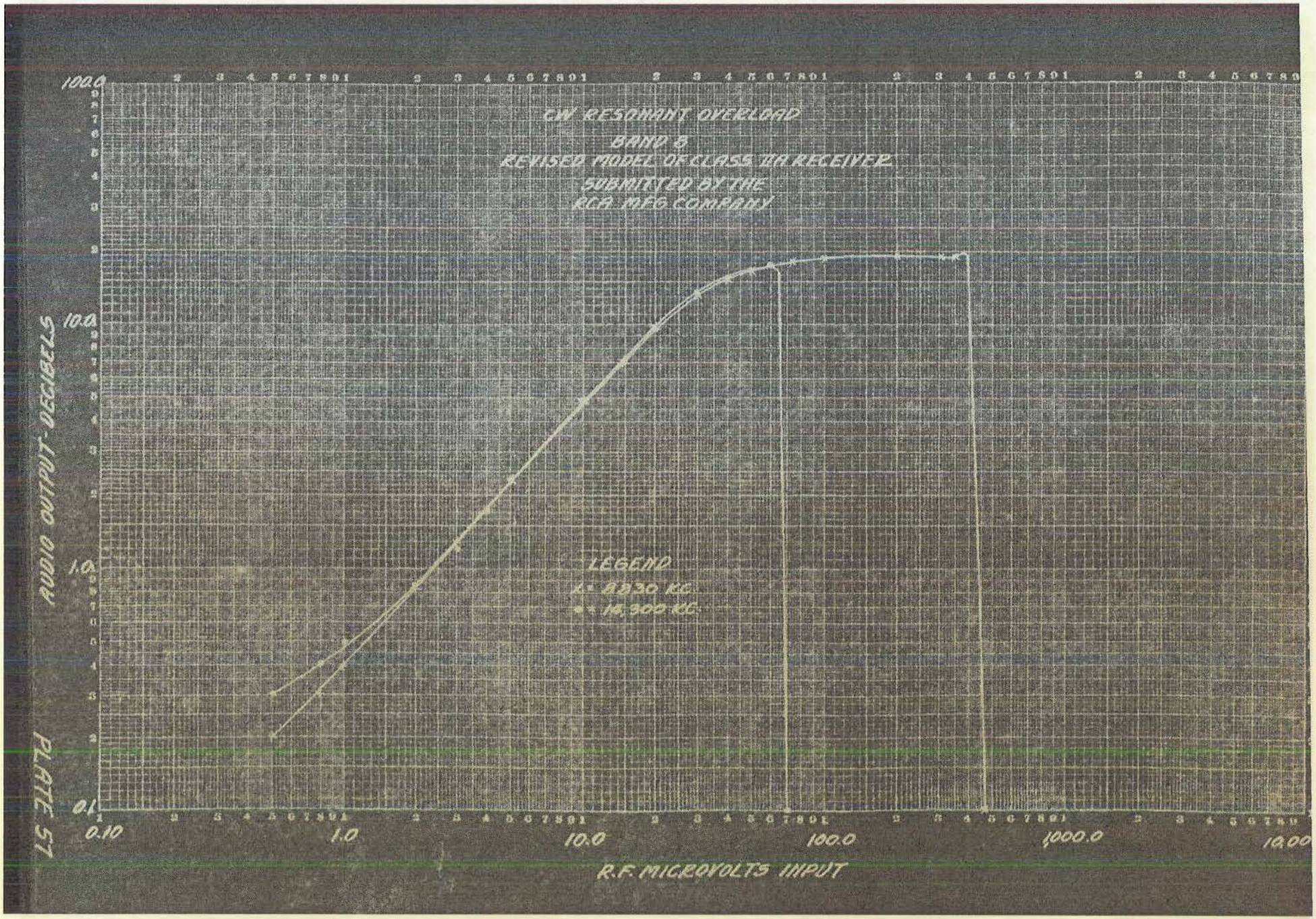

CW RESONANT OVERLOAD
BAND 3
REVISED MODEL OF CLASS II-D RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
LEGEND
x - 600 KC
• - 1340 KC
AUDIO OUTPUT-VOLTS
PLATE 52
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT

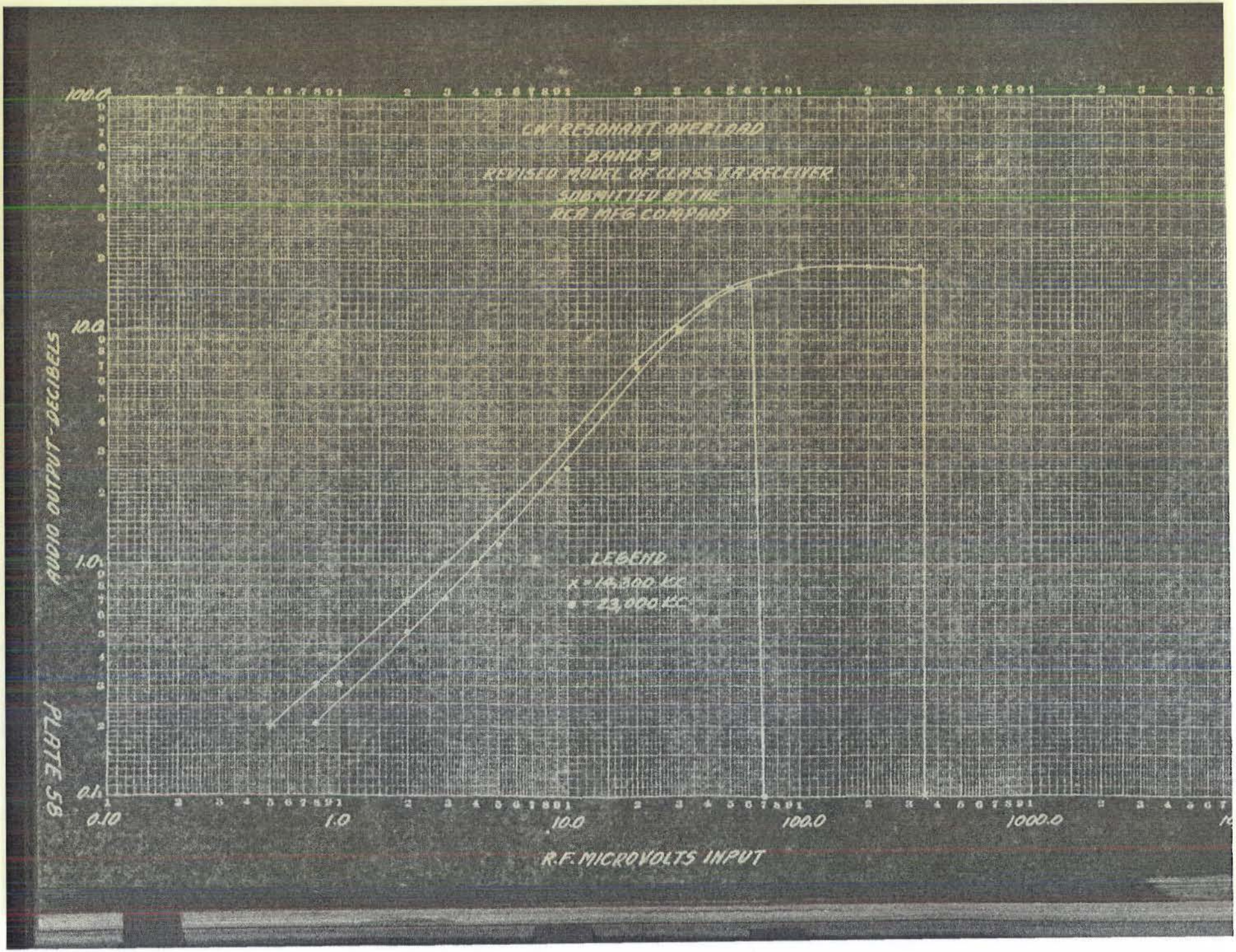

CW RESONANT OVERLOAD
BAND 4
REVISED MODEL OF CLASS AA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
LEGEND
X = 1340 KC.
• = 2090 KC.
AUDIO OUTPUT - VOLTS
PLATE 53
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT

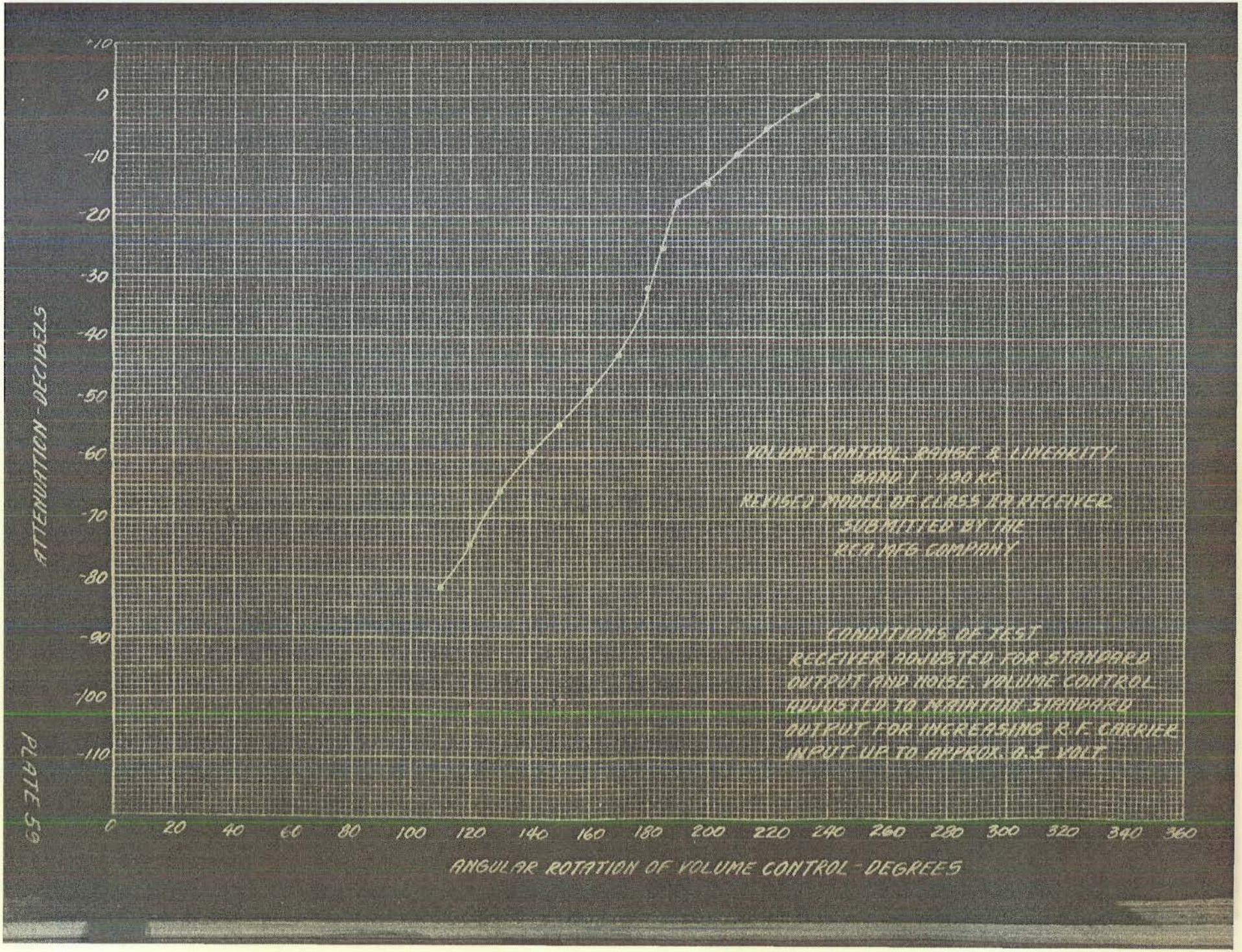

C.W. RESONANT OVERLOAD
BAND 5
REVISED MODEL OF CLASS 7B RECEIVER
SUBMITTED BY THE
R.C.A. MFG. COMPANY
LEGEND
x = 2090 KC.
• = 3420 KC.
AUDIO OUTPUT-DECIBELS
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT
PLATE 54

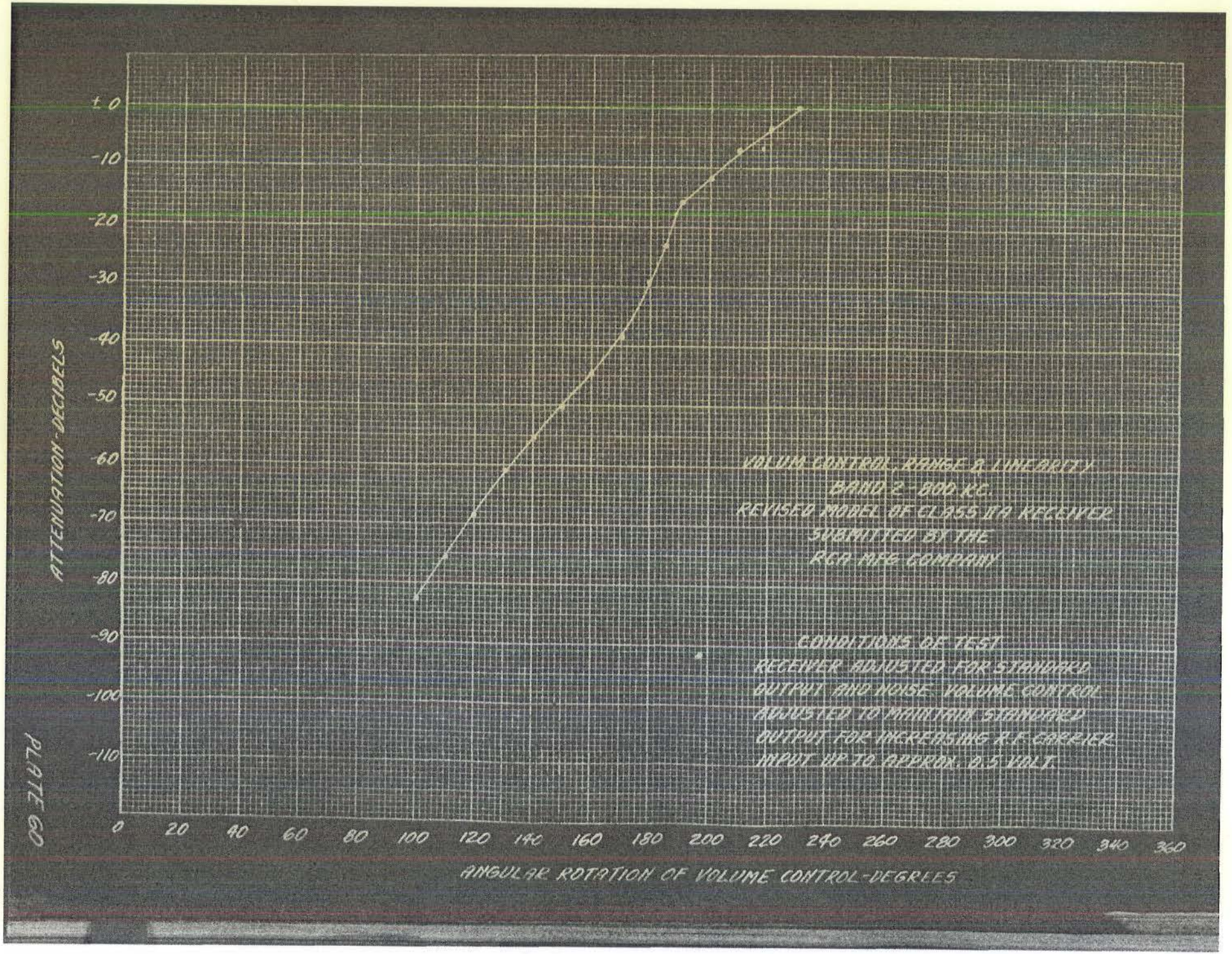

C.W. RESONANT OVERLOAD
BAND 6
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
LEGEND
X = 1420 KC.
• = 3530 KC.
AUDIO OUTPUT-DECIBELS
PLATE 55
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT


C.W. RESONANT OVERLOAD
BAND 1
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
LEGEND
X= 450 KC.
•= 8550 KC.
AUDIO OUTPUT-DECIBELS
PLATE 56
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT


CW RESONANT OVERLOAD
BAND 8
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
LEGEND
x = 8930 KC.
• = 14,900 KC.
AUDIO OUTPUT-DECIBELS
PLATE 57
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
10,000
R.F. MICROVOLTS INPUT


CW RESONANT OVERLOAD
BAND 3
REVISED MODEL OF CLASS 1A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
LEGEND
x = 14,300 KC
• = 23,000 KC
AUDIO OUTPUT - DECIBELS
PLATE 56
100.0
10.0
1.0
0.1
0.10
1.0
10.0
100.0
1000.0
R.F. MICROVOLTS INPUT


+10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
ATTENUATION - DECIBELS
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL RANGE & LINEARITY
BAND I 1400 KC
REVISED MODEL OF CLASS AA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE. VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT
PLATE 59
R-7416


ATTENUATION-DECIBELS
± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
PLATE 60
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL-DEGREES
VOLUM CONTROL RANGE & LINEARITY
BAND 2 - 800 KC.
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA Mfg COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE. VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT

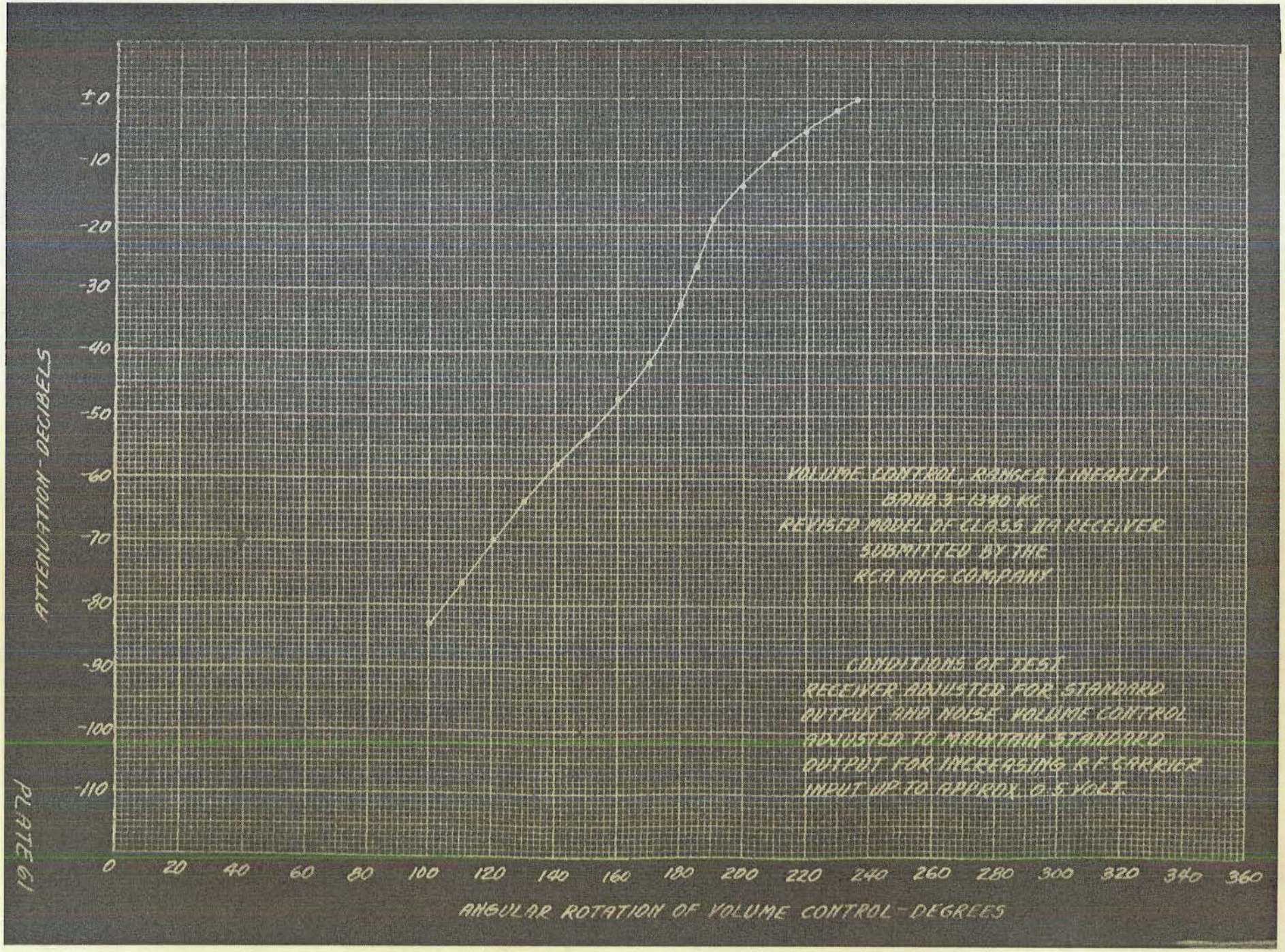

±0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
ATTENUATION - DECIBELS
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL, RANGE & LINEARITY
BAND 3 - 1340 KC
REVISED MODEL OF CLASS 3A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT

PLATE 61

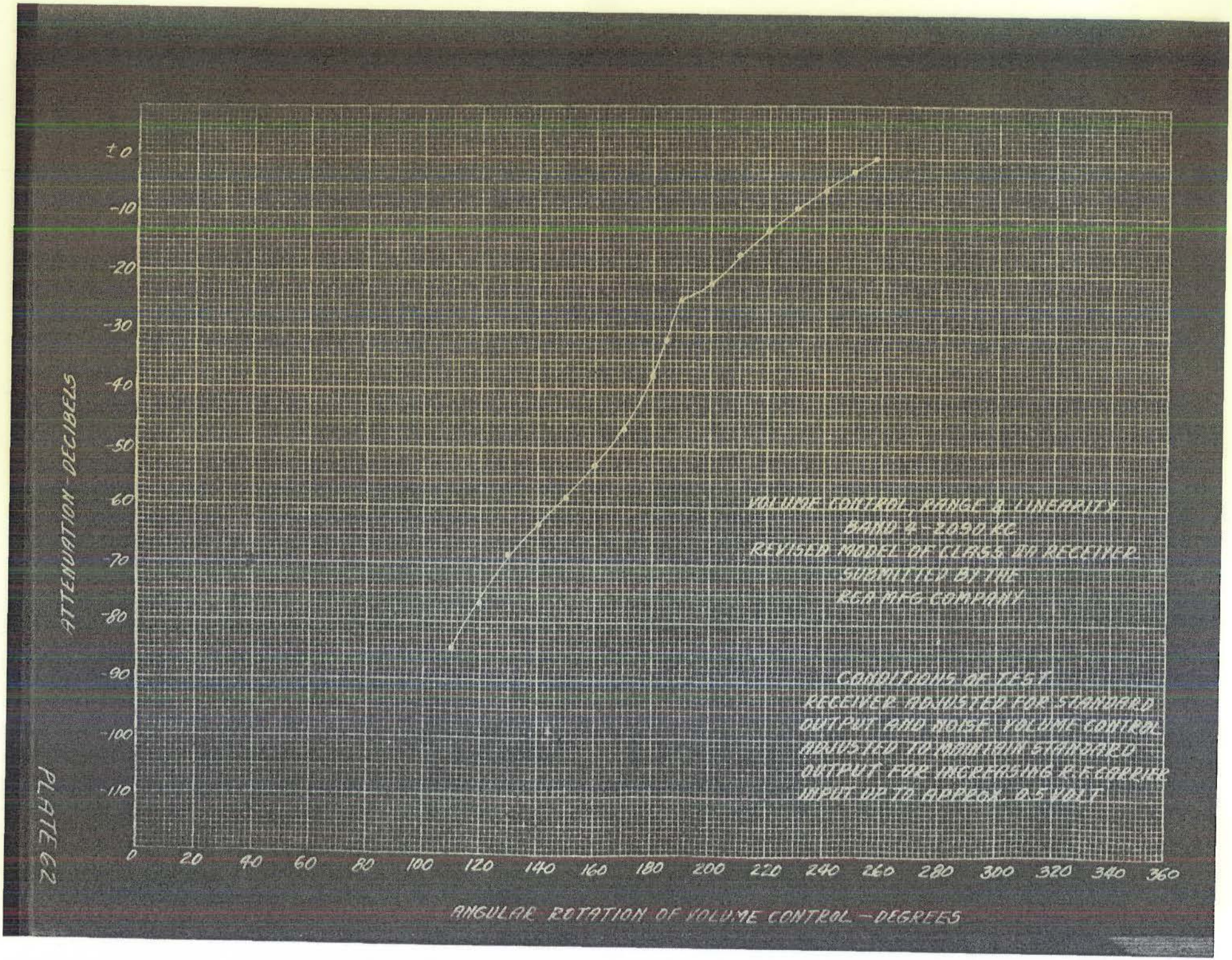
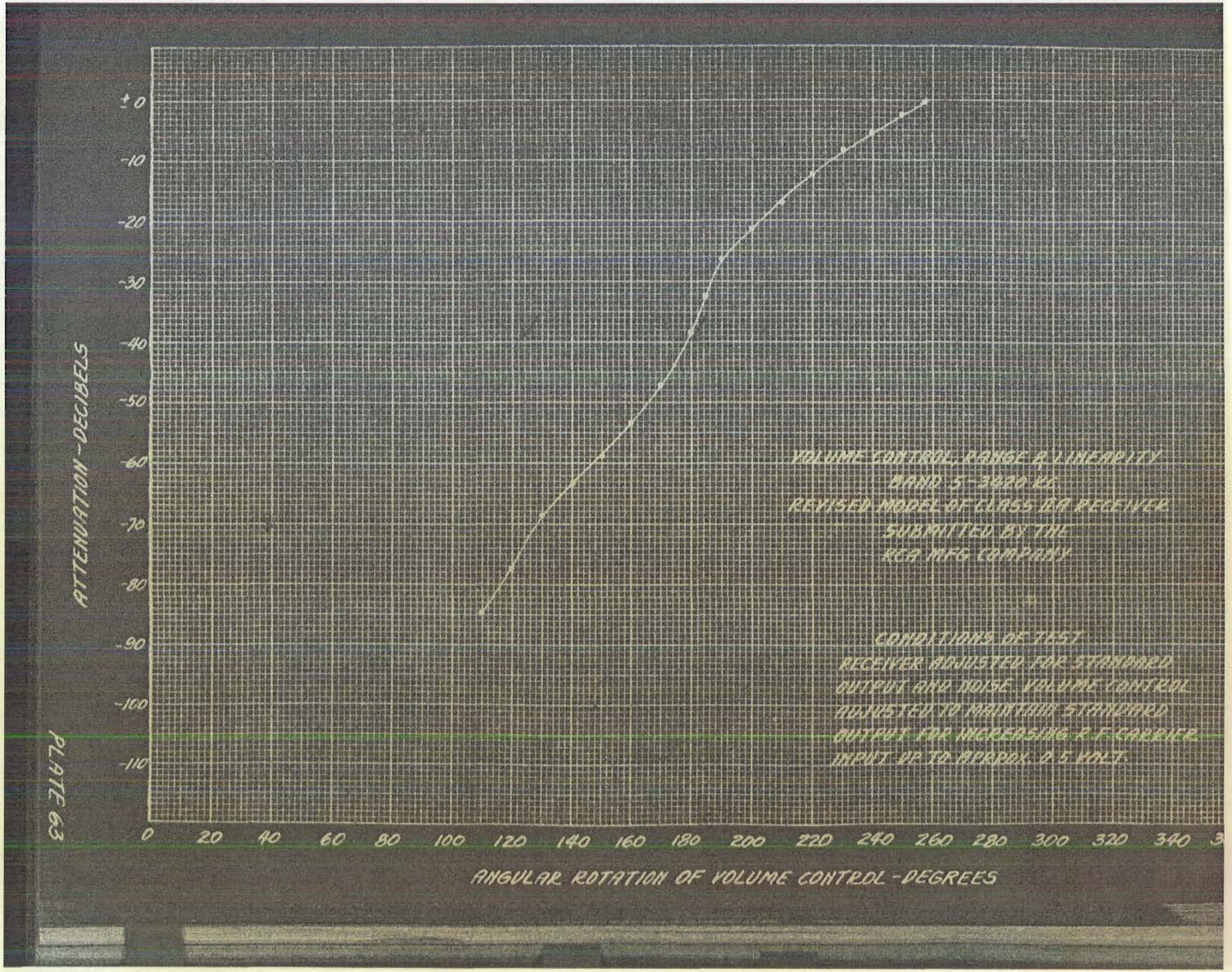


PLATE 62
ATTENUATION - DECIBELS
±0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL — DEGREES
VOLUME CONTROL RANGE & LINEARITY
BAND 4 - 2090 KC
REVISED MODEL OF CLASS BB RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE VOLUME CONTROL
ADJUSTED TO OBTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT


ATTENUATION - DECIBELS
± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL RANGE & LINEARITY
BAND 5 - 3820 KC
REVISED MODEL OF CLASS 8AT RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F CARRIER
INPUT UP TO APPROX. 0.5 VOLT
PLATE 63

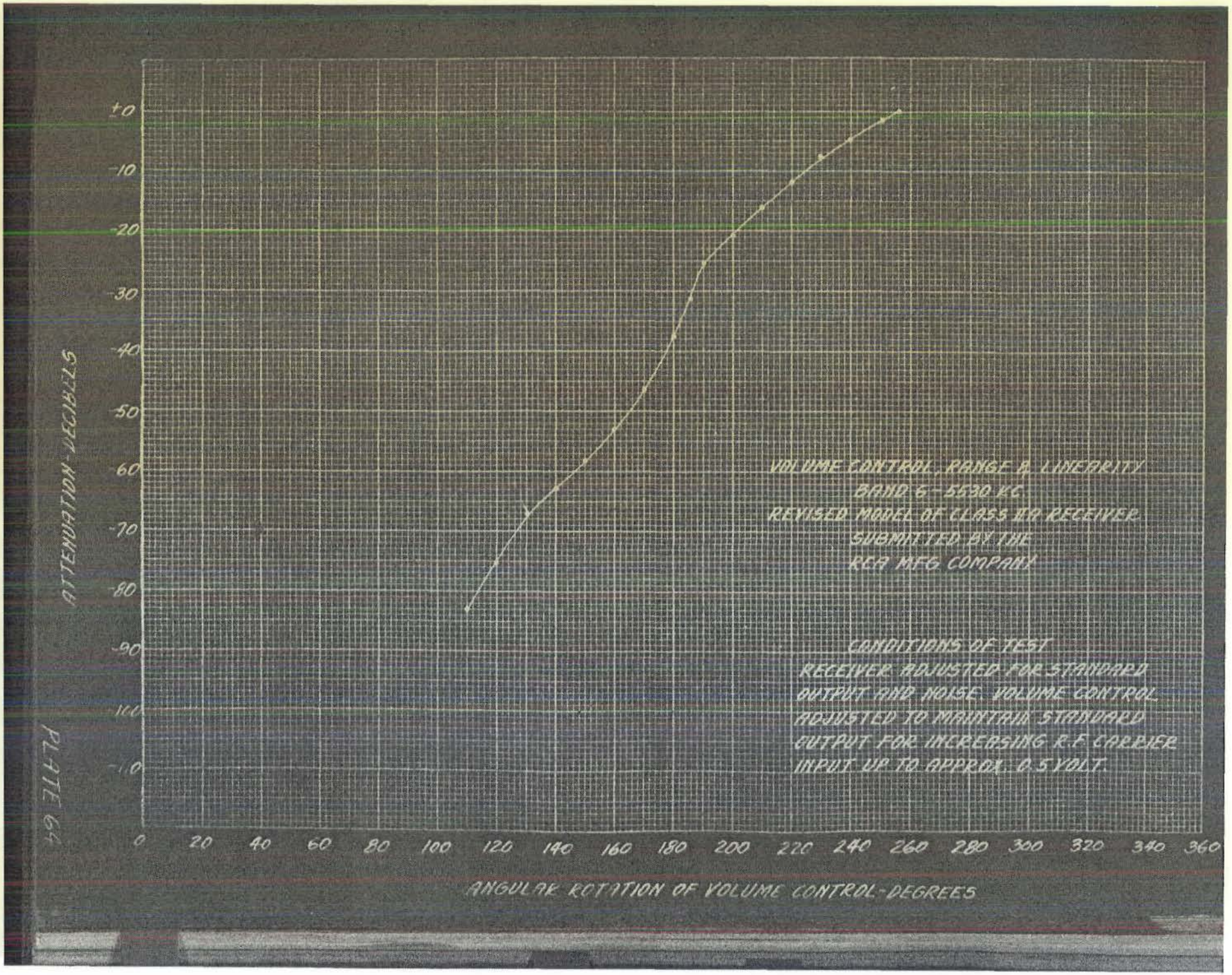


PLATE 64
ATTENUATION-DECIBELS
+0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL-DEGREES
VOLUME CONTROL, RANGE & LINEARITY
BAND 6 - 5530 KC
REVISED MODEL OF CLASS AR RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT.

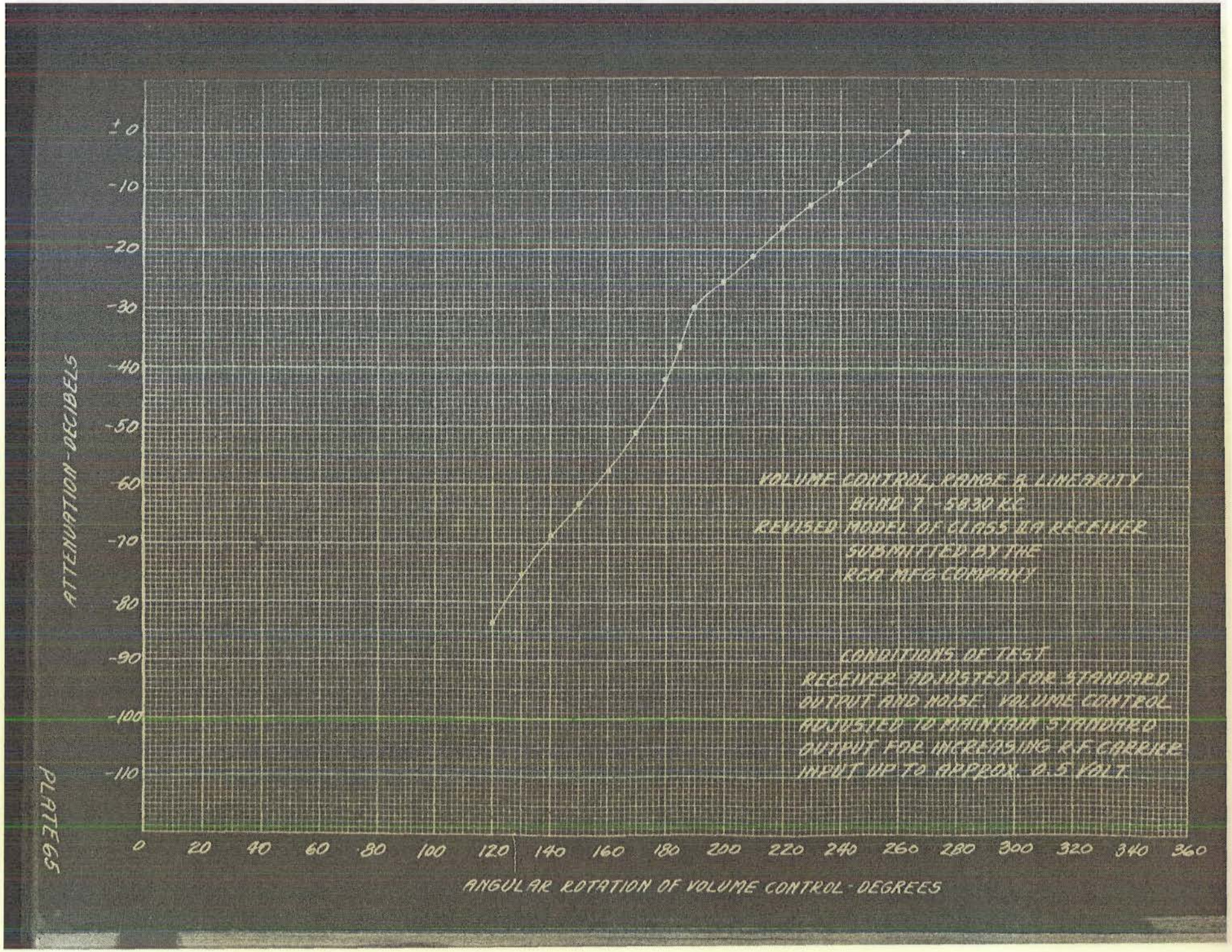

± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
ATTENUATION - DECIBELS
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL, RANGE & LINEARITY
BAND 1 - 5830 KC
REVISED MODEL OF GLASS WA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE. VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT.

PLATE 65

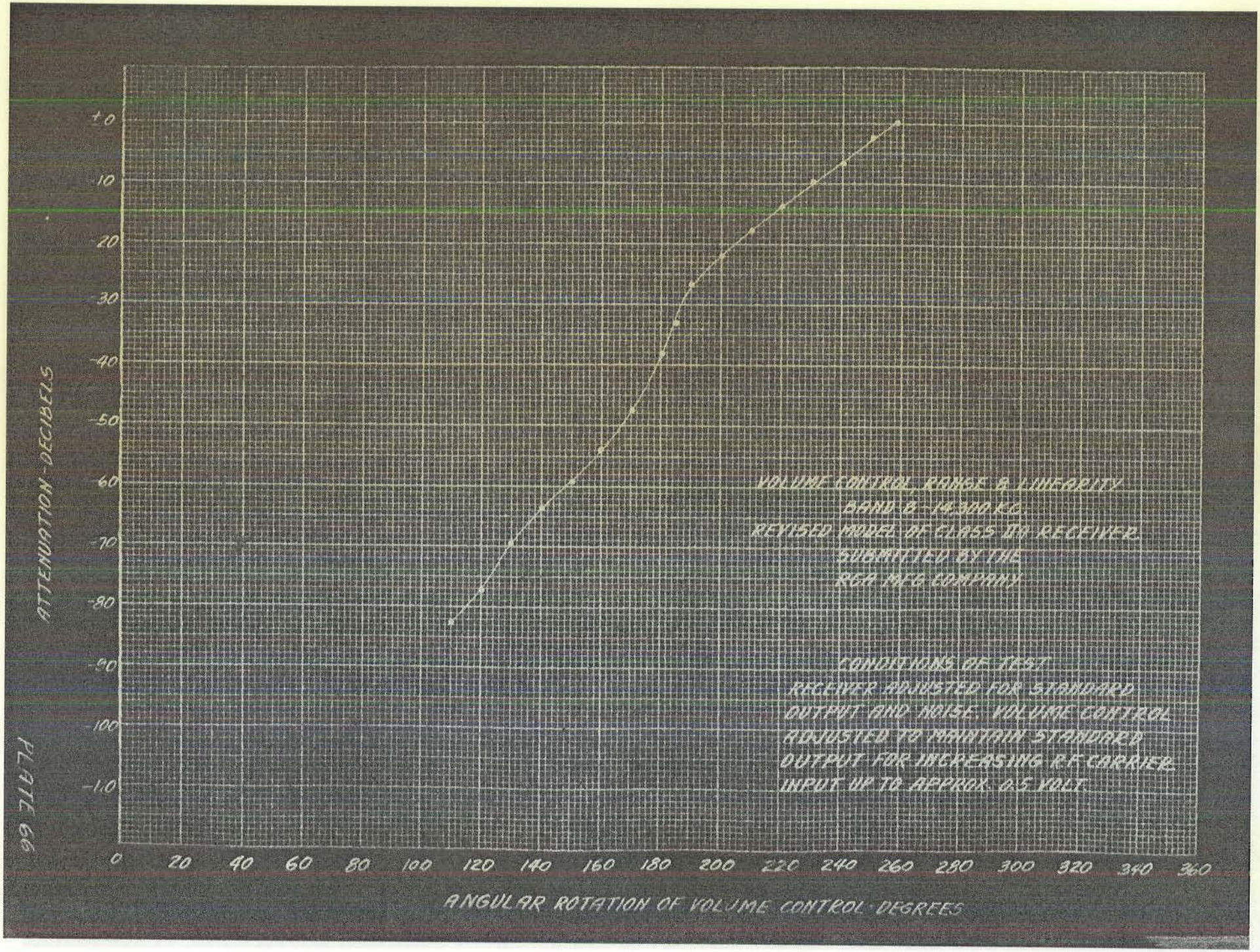


PLATE 66
ATTENUATION - DECIBELS
+0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL RANGE & LINEARITY
BAND B 16,300 KC.
REVISED MODEL OF CLASS AB RECEIVER
SUGGESTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE. VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT.

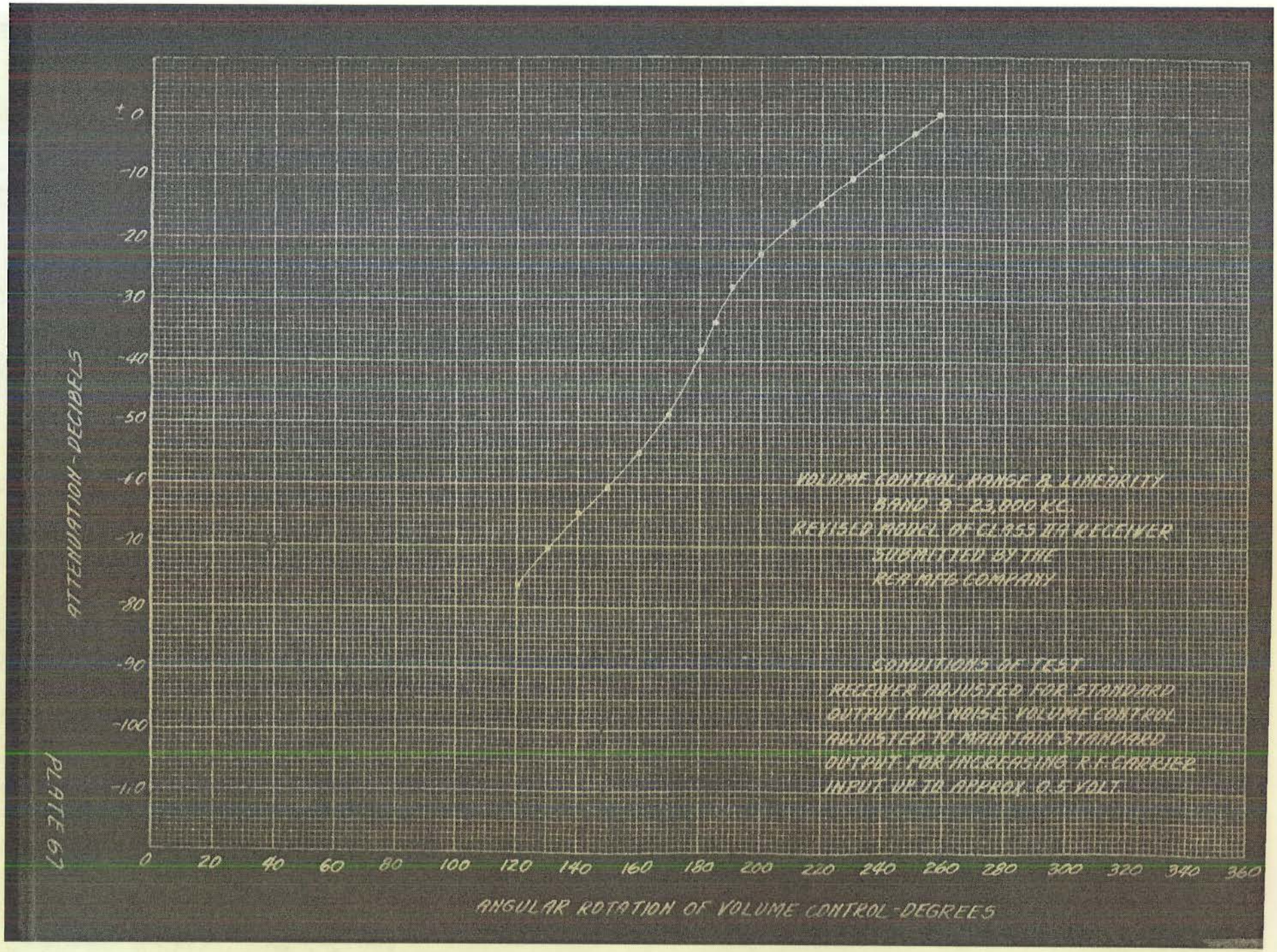
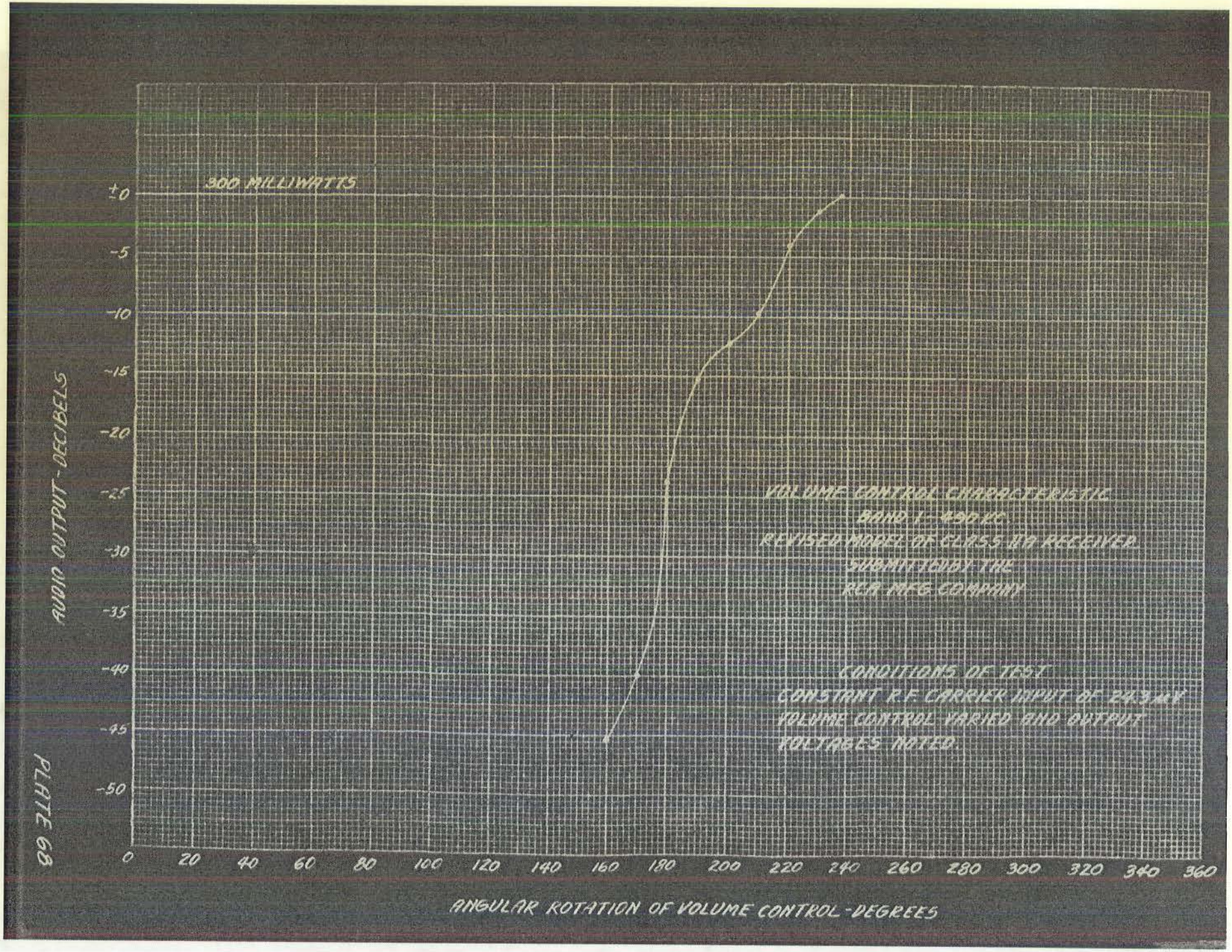

ATTENUATION-DECIBELS
± 0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL-DEGREES
VOLUME CONTROL RANGE & LINEARITY
BAND 9 23,000 KC
REVISED MODEL OF CL-55 RA-II RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
RECEIVER ADJUSTED FOR STANDARD
OUTPUT AND NOISE VOLUME CONTROL
ADJUSTED TO MAINTAIN STANDARD
OUTPUT FOR INCREASING R.F. CARRIER
INPUT UP TO APPROX. 0.5 VOLT

PLATE 67


300 MILLIWATTS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
AUDIO OUTPUT - DECIBELS
PLATE 68
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND I - 550 KC
REVISED MODEL OF 6BS5 AS RECEIVED
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 24.3 MV
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.

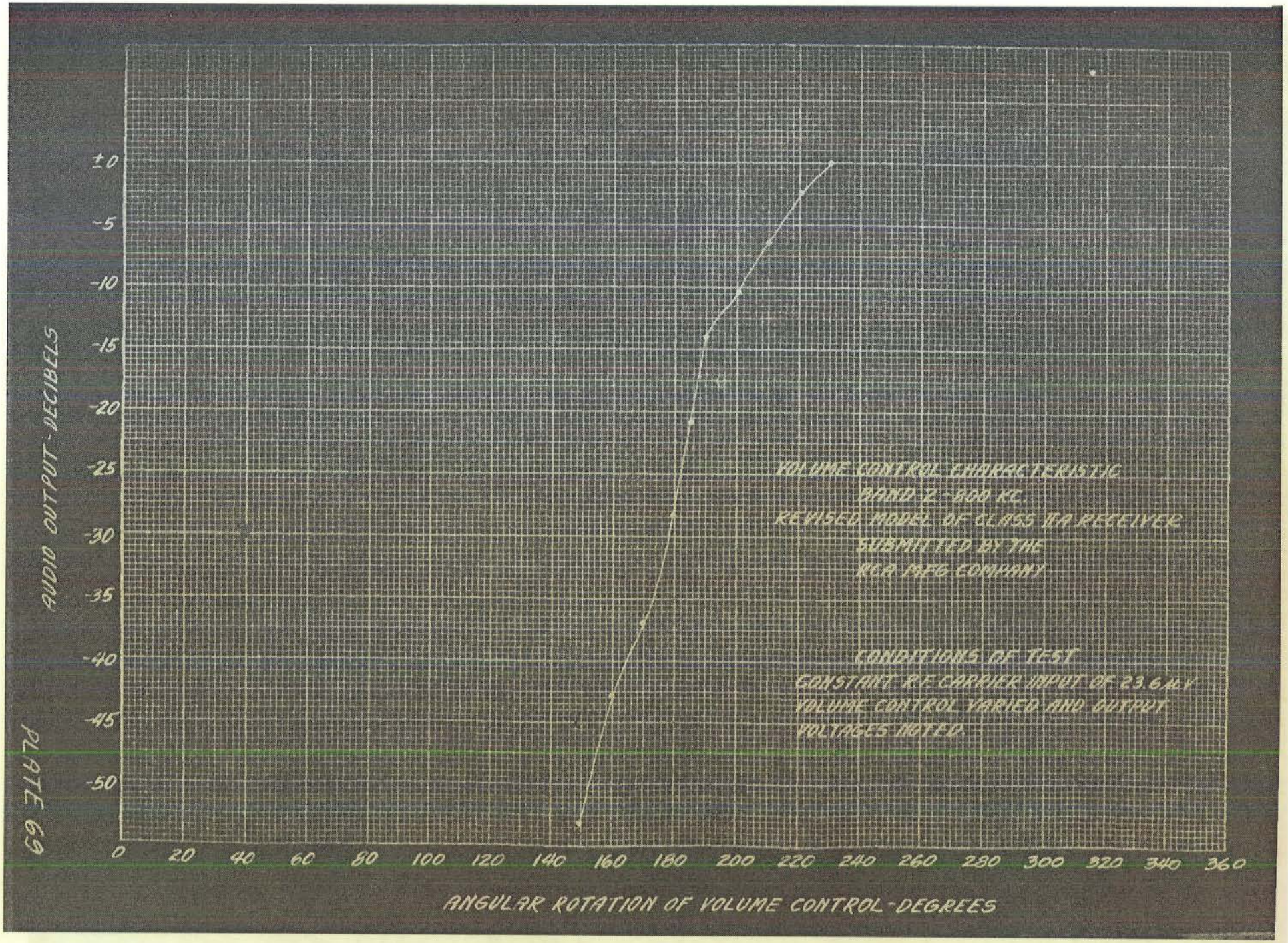


PLATE 69
AUDIO OUTPUT - DECIBELS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 2 - 600 KC.
REVISED MODEL OF GLASS TRF RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 23.6 M.V.
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.

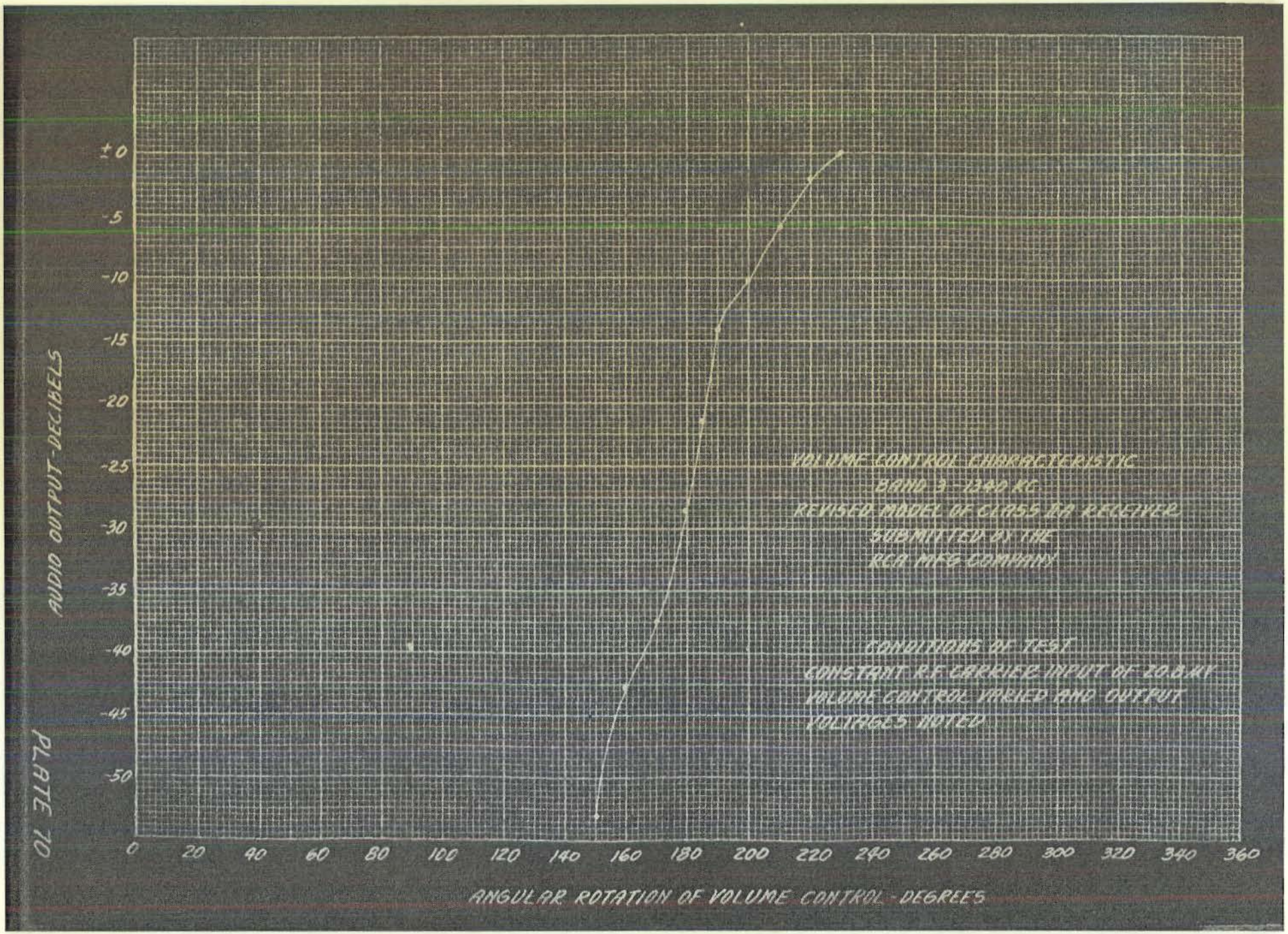

AUDIO OUTPUT-DECIBELS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 3 - 1240 KC
REVISED MODEL OF CL455 AA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 20.8 MV
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED

PLATE 10

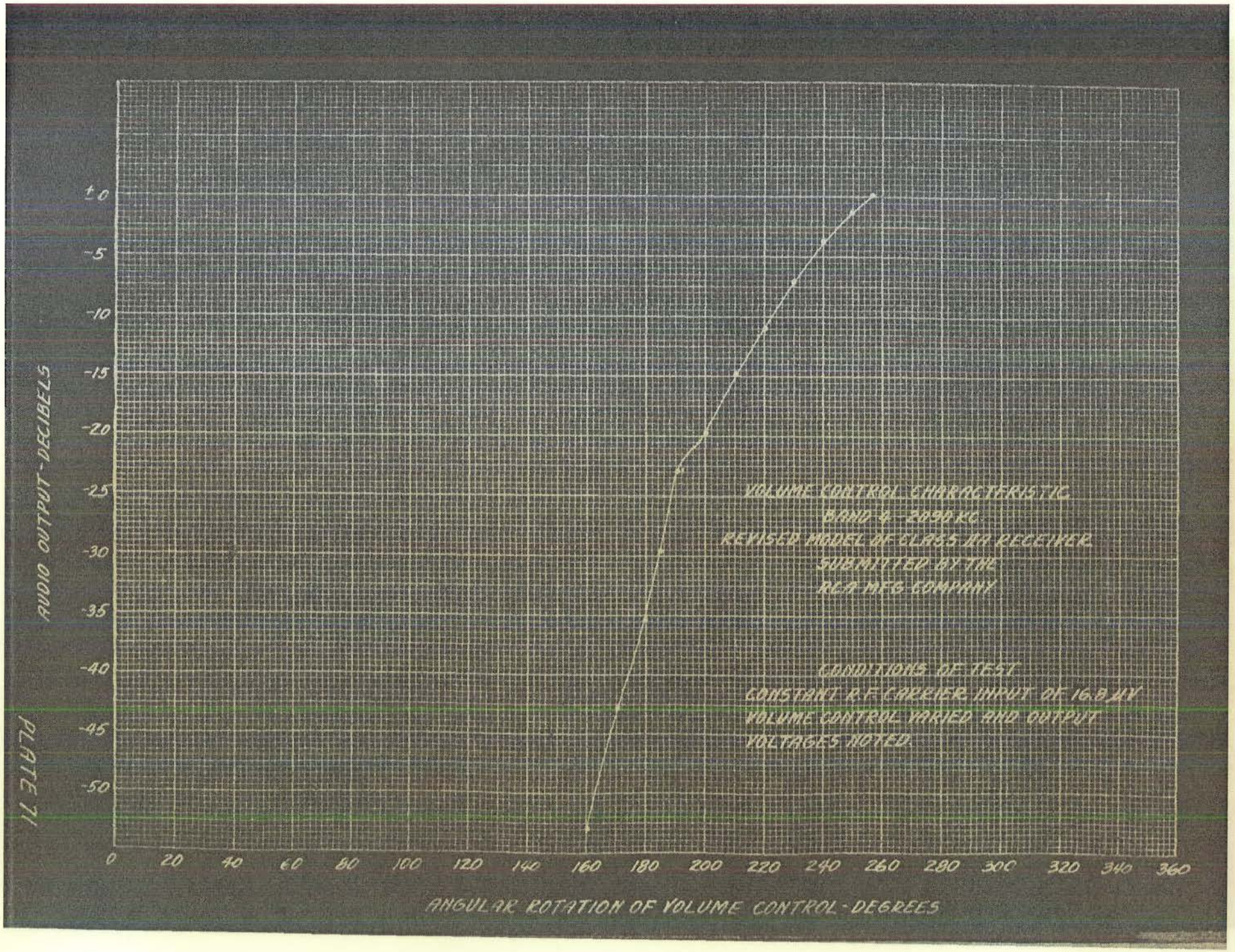


PLATE 71
AUDIO OUTPUT - DECIBELS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 4 - 2030 KC.
REVISED MODEL OF CLASS AA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 16.0 MV
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.

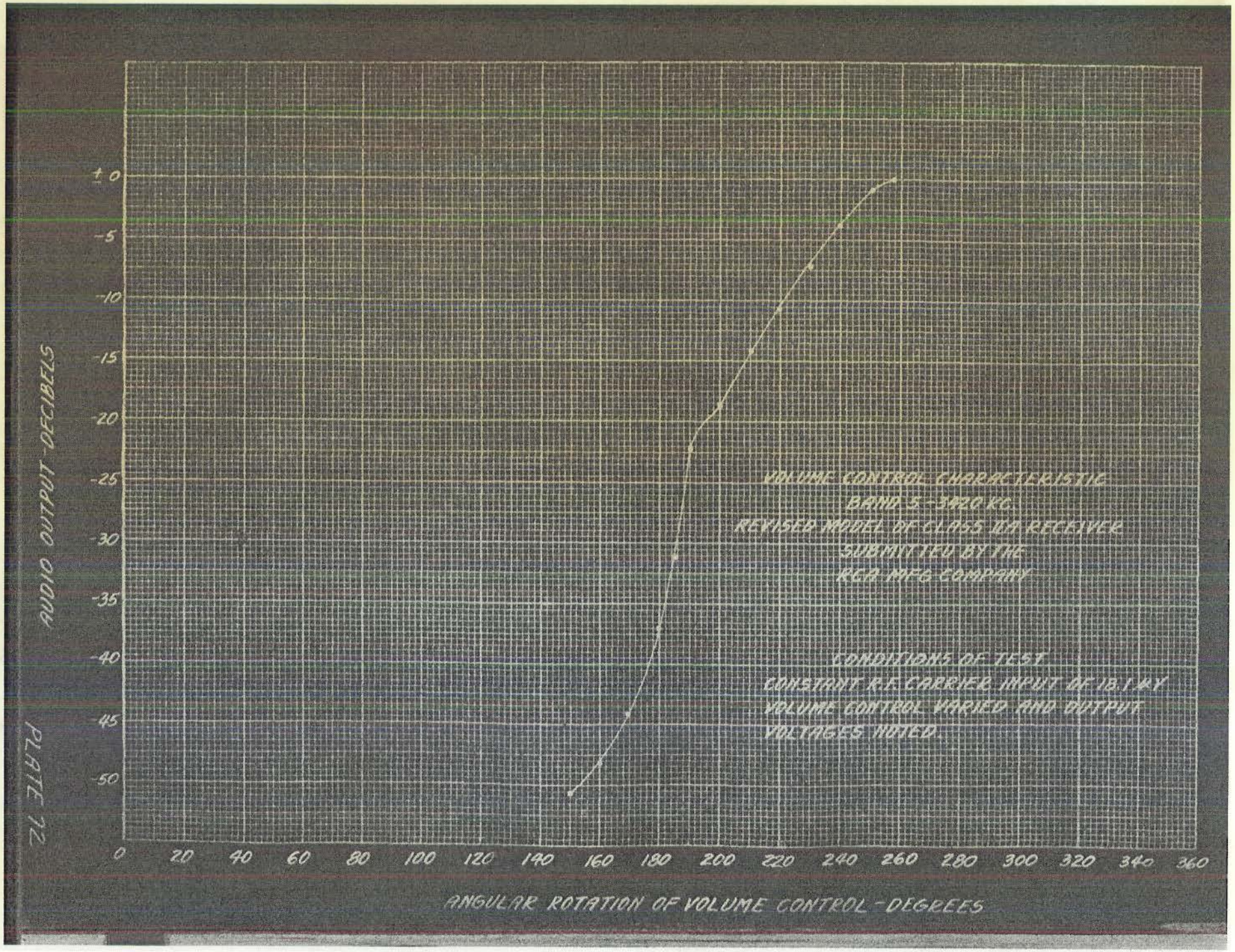


PLATE 12
AUDIO OUTPUT-DECIBELS
+0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 5 - 3920 KC.
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 18.1 MV
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.

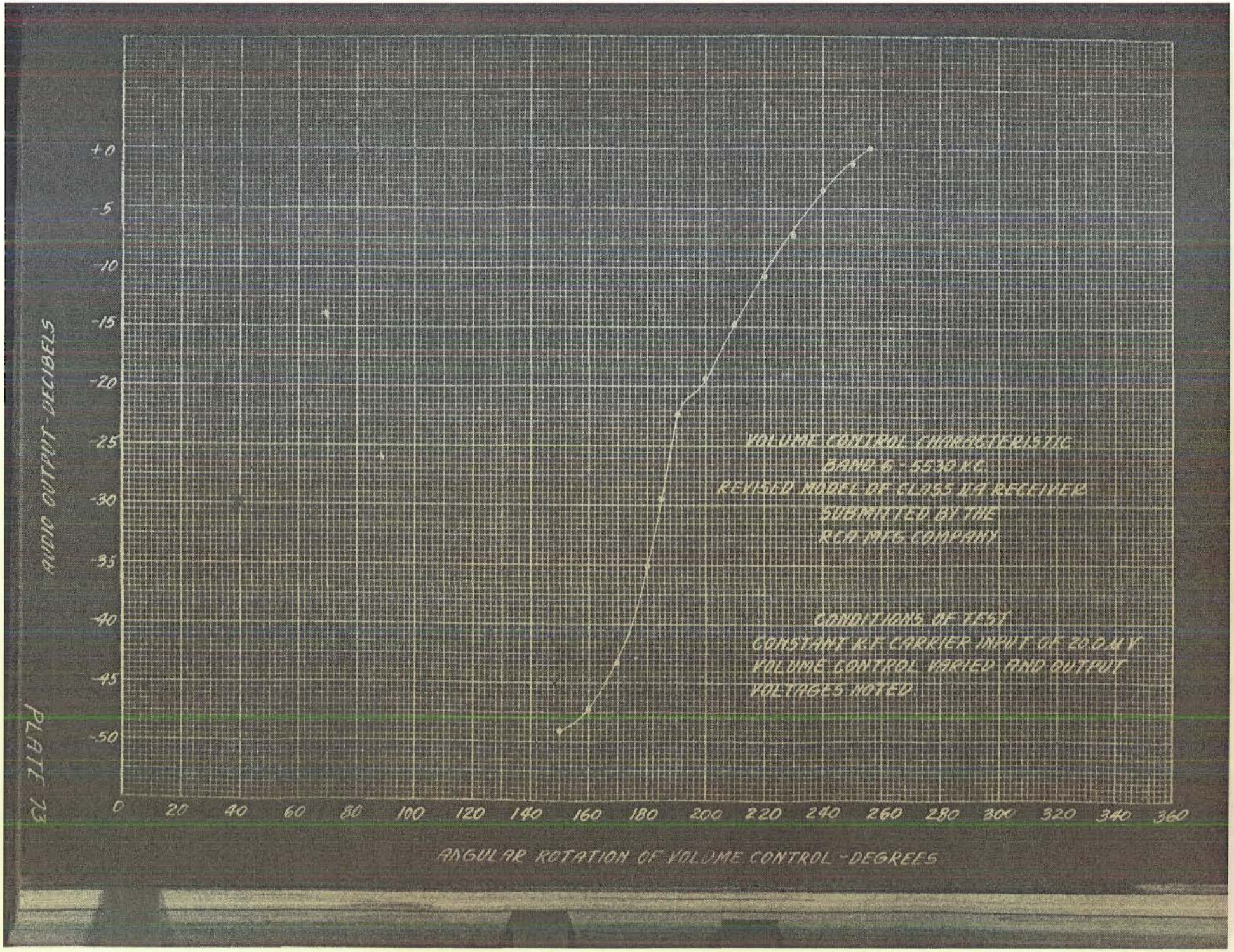
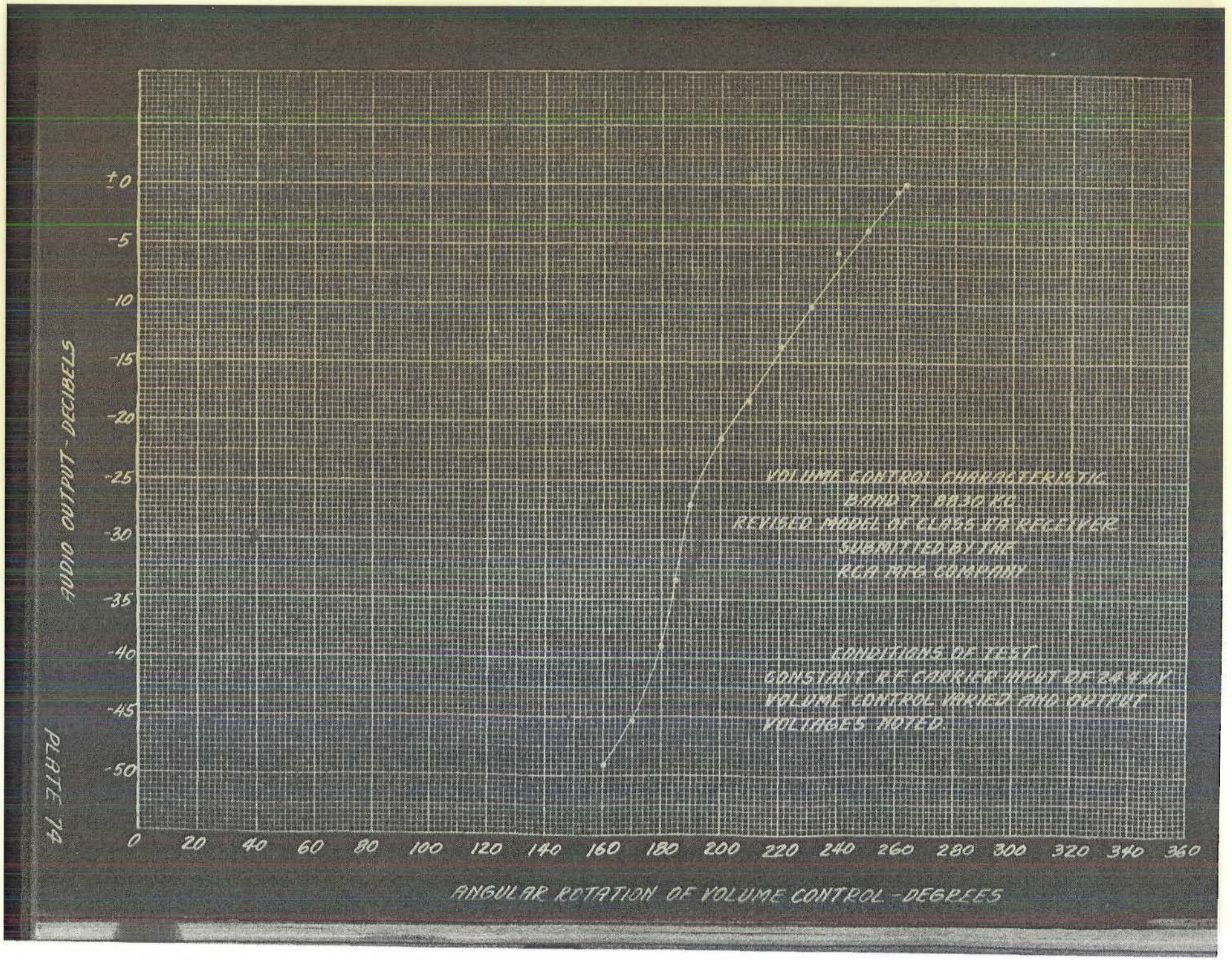


PLATE 13
AUDIO OUTPUT - DECIBELS
+0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 6 - 5530 KC
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 20.0 M V
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.


±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
AUDIO OUTPUT - DECIBELS
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
ANGULAR ROTATION OF VOLUME CONTROL - DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 7 - 88.30 KC
REVISED MODEL OF CLASS 7A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 24 E.M.F.
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.
PLATE 74

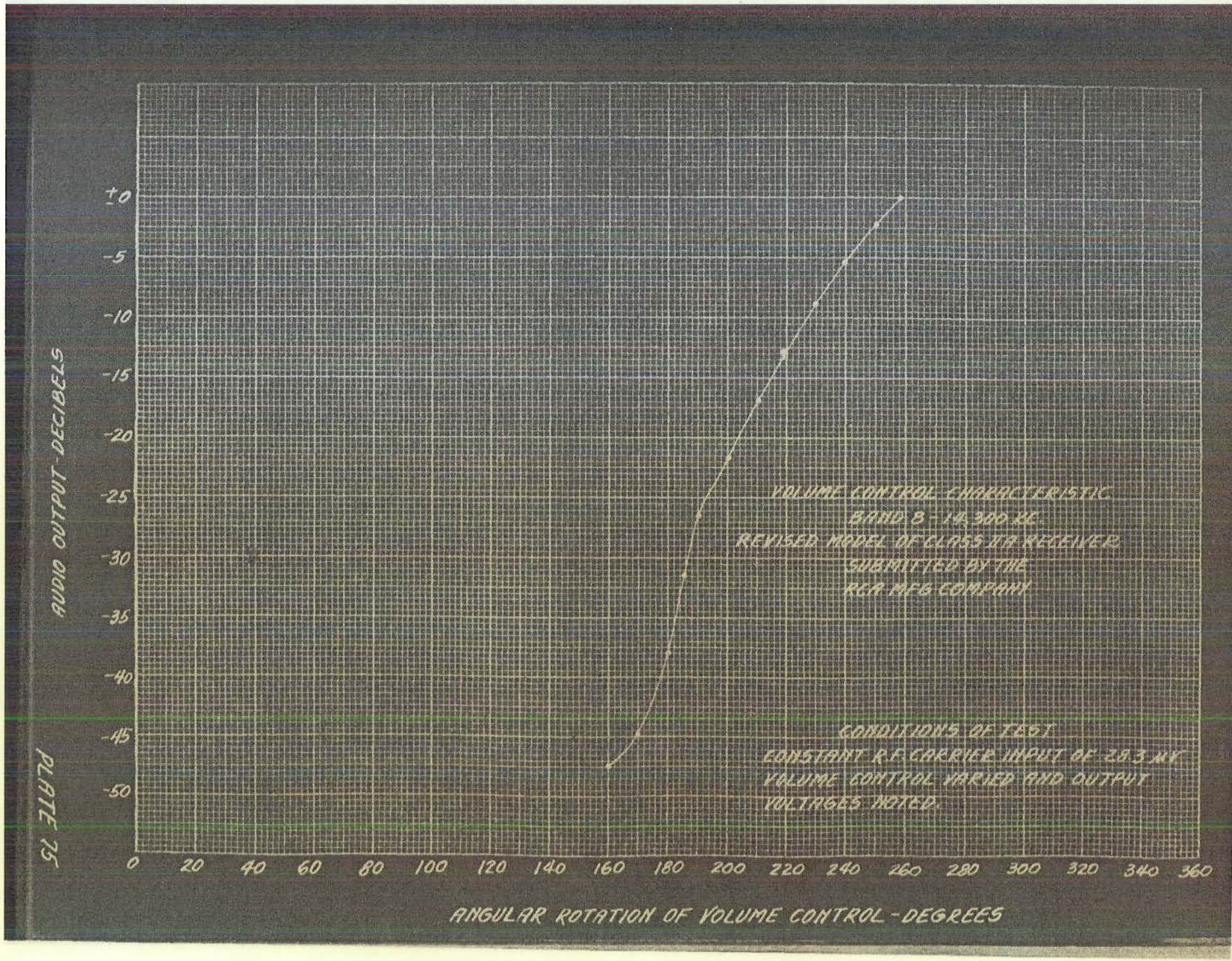


PLATE 15
AUDIO OUTPUT-DECIBELS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL-DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND B - 14,300 KC
REVISED MODEL OF CLASS IIA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 20.3 MV
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.

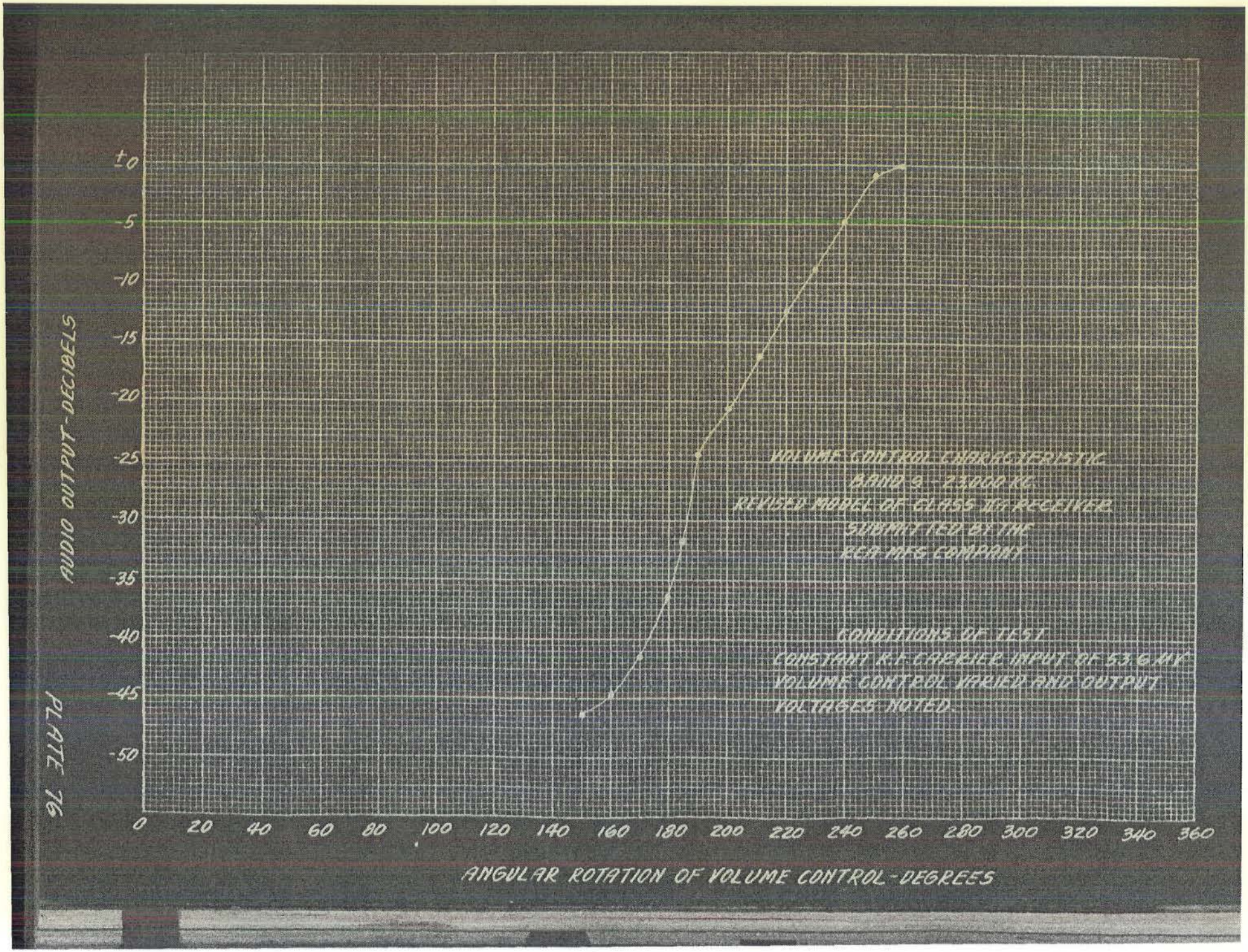


PLATE 76
AUDIO OUTPUT-DECIBELS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
ANGULAR ROTATION OF VOLUME CONTROL-DEGREES
VOLUME CONTROL CHARACTERISTIC
BAND 2 2300 KC
REVISED MODEL OF CLASS "A" RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
CONDITIONS OF TEST
CONSTANT R.F. CARRIER INPUT OF 53.6 MV
VOLUME CONTROL VARIED AND OUTPUT
VOLTAGES NOTED.

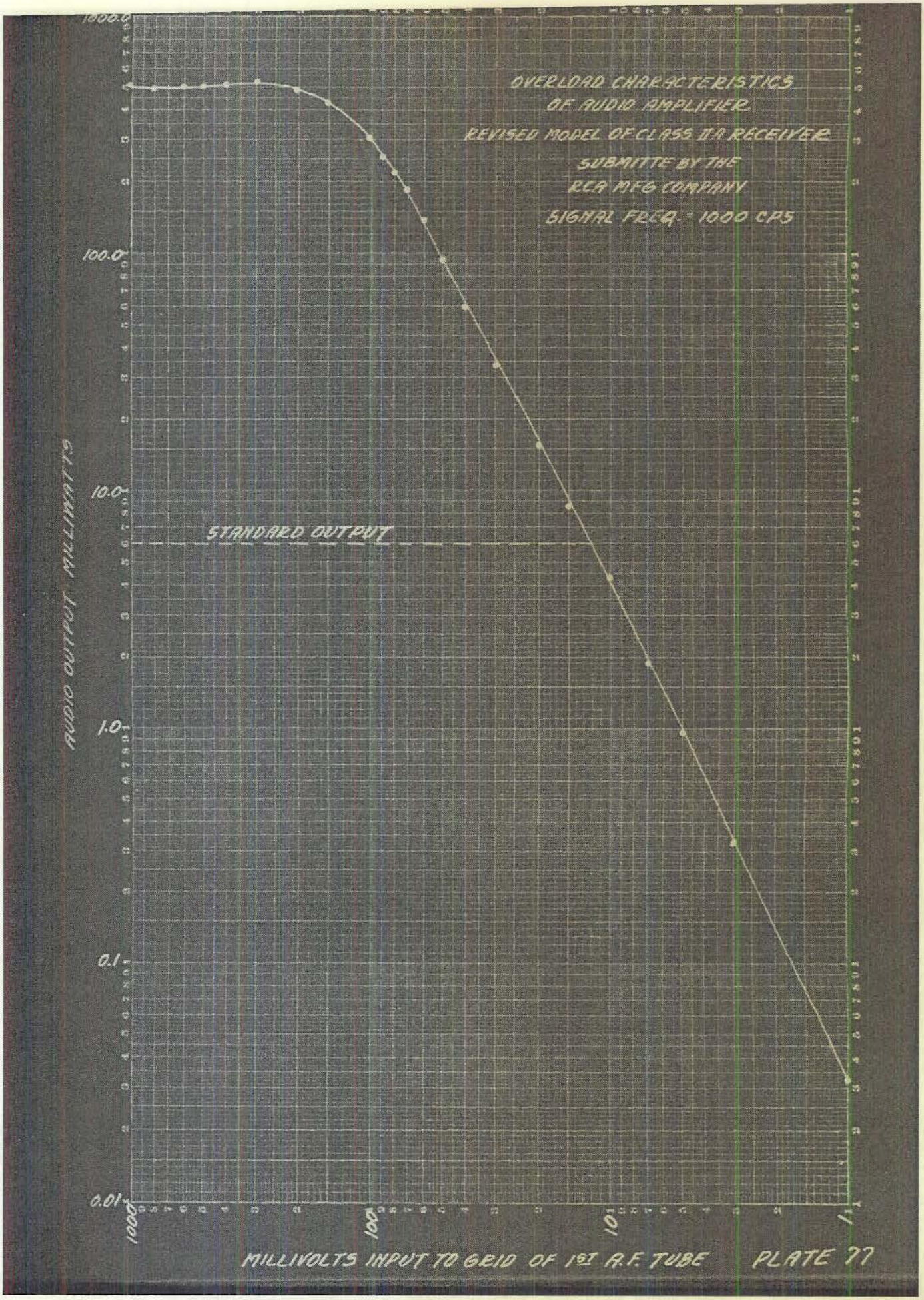
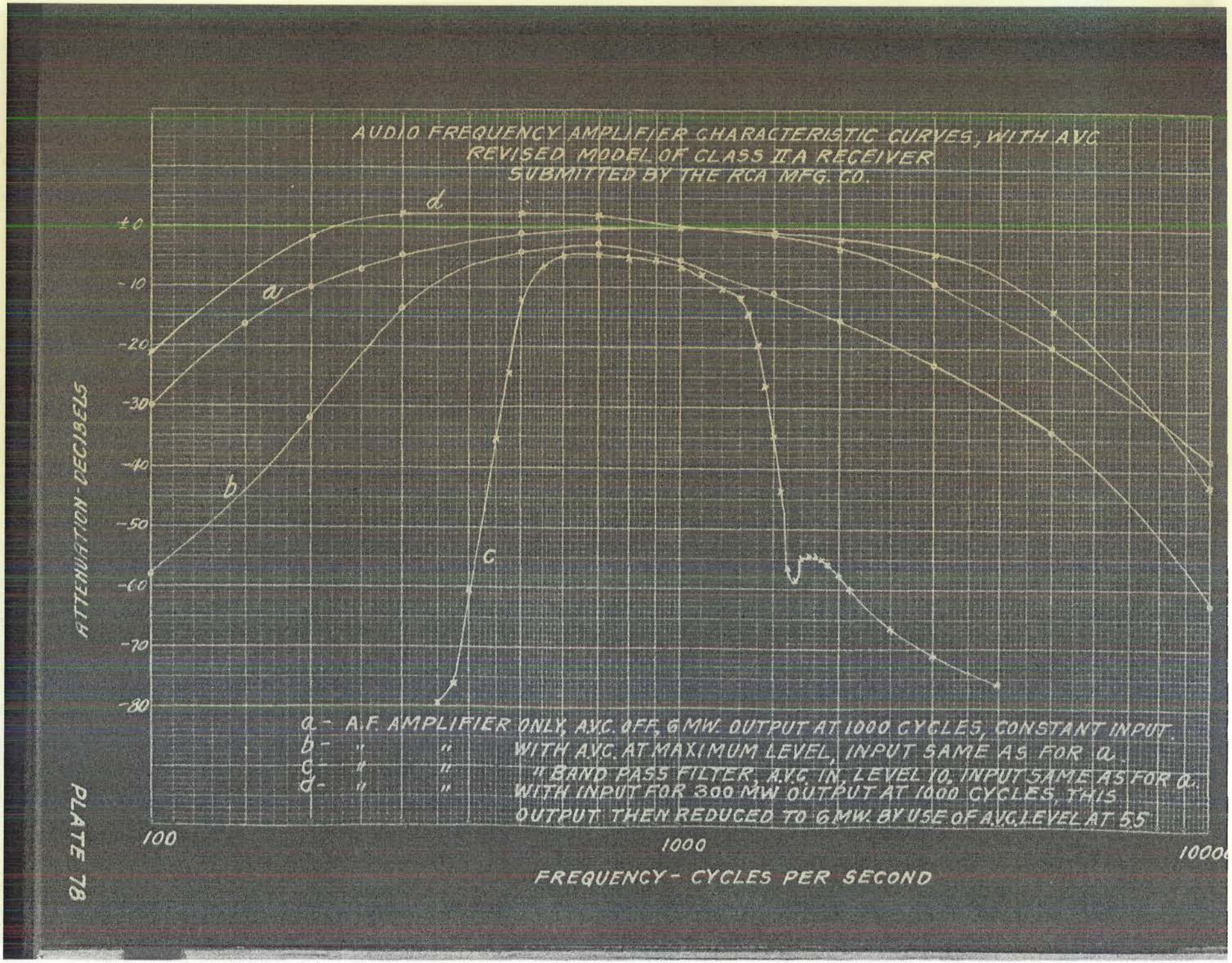
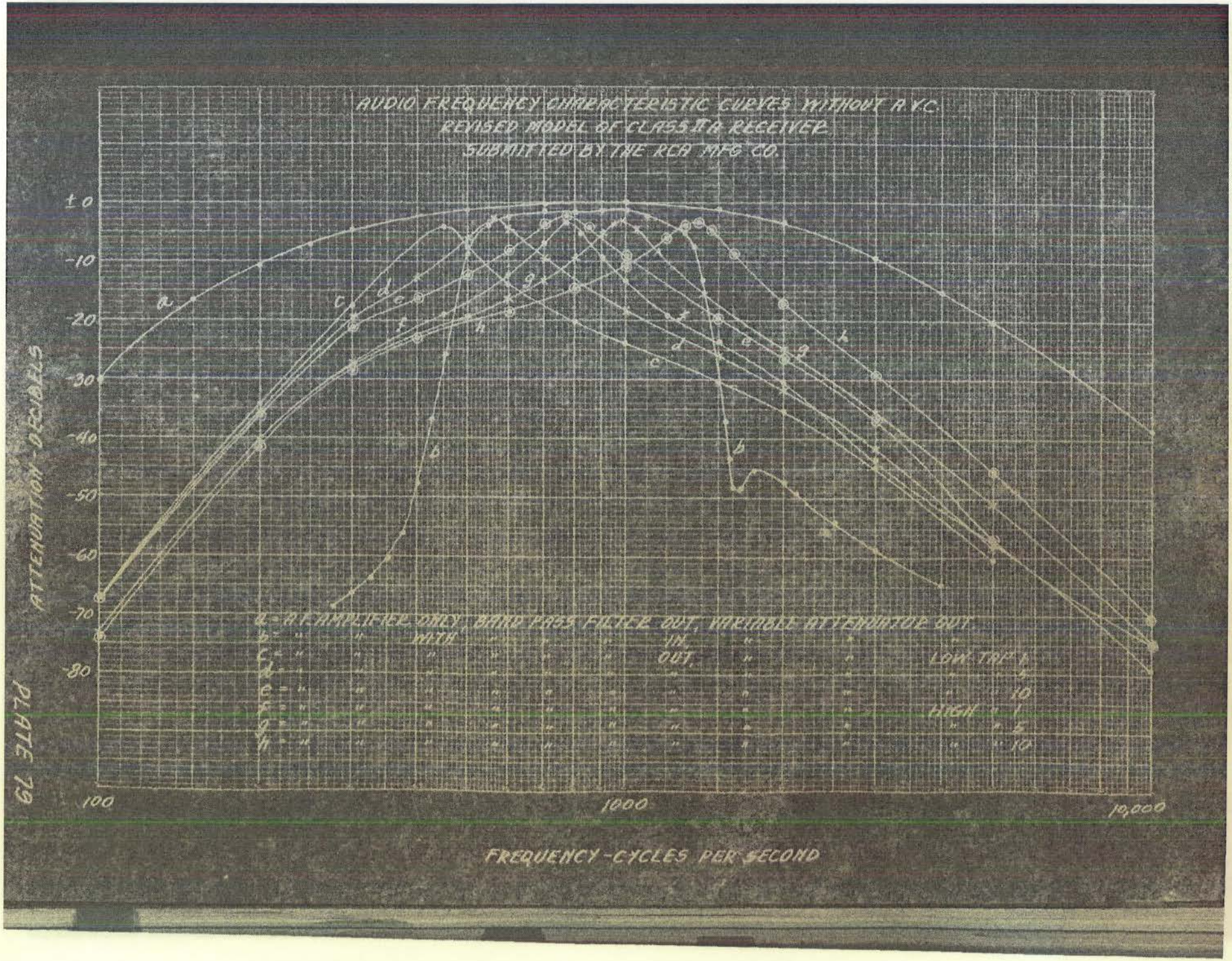
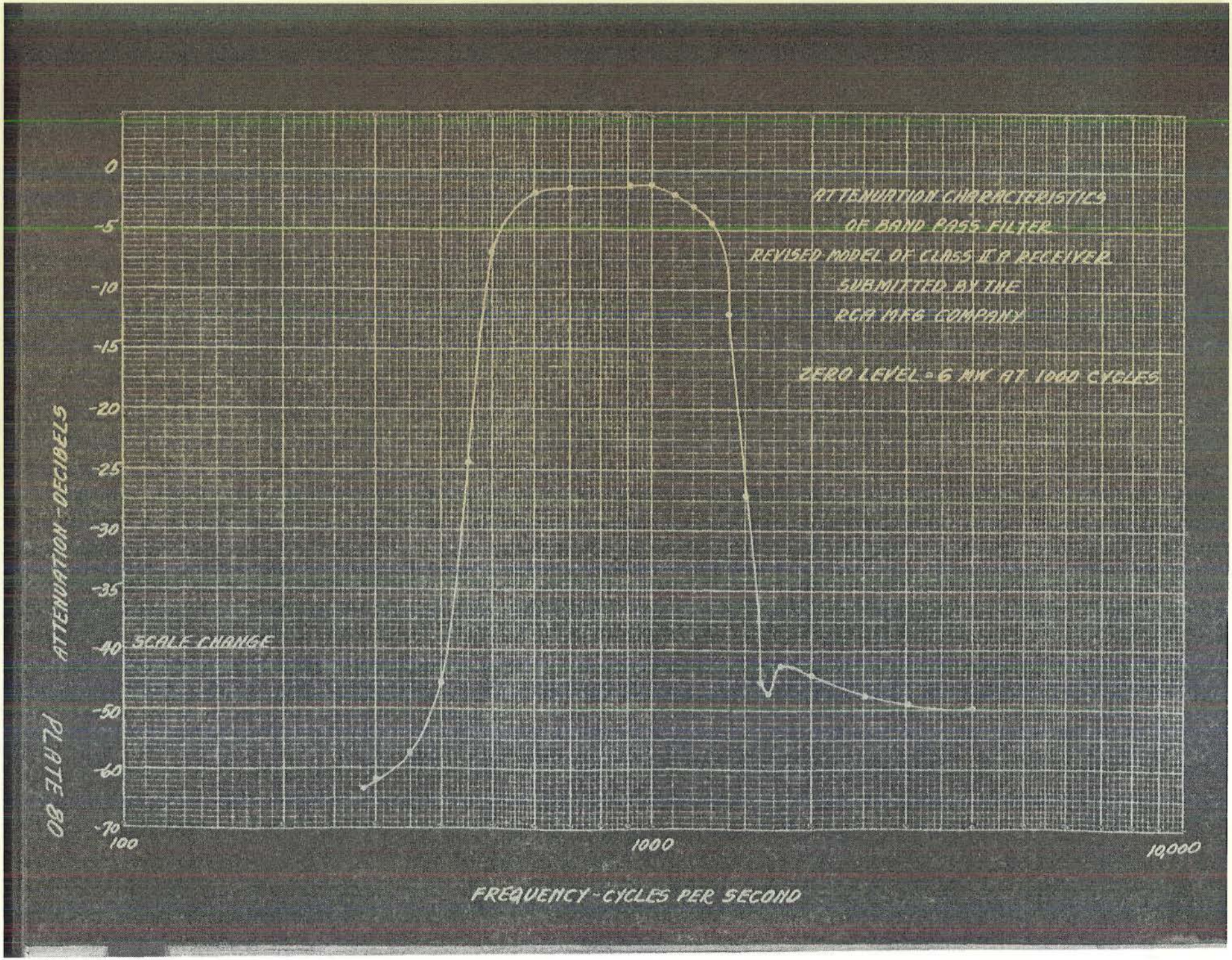

OVERLOAD CHARACTERISTICS
OF AUDIO AMPLIFIER
REVISED MODEL OF CLASS II A RECEIVER
SUBMITTE BY THE
RCA MFG COMPANY
SIGNAL FREQ. = 1000 CPS
STANDARD OUTPUT
AUDIO OUTPUT MILLIWATTS
1000.0
100.0
10.0
1.0
0.1
0.01
1000
100
10
1
MILLIVOLTS INPUT TO GRID OF 1ST R.F. TUBE

PLATE 77


AUDIO FREQUENCY AMPLIFIER CHARACTERISTIC CURVES, WITH A.V.C.
REVISED MODEL OF CLASS II A RECEIVER
SUBMITTED BY THE RCA MFG. CO.
ATTENUATION - DECIBELS
+0
-10
-20
-30
-40
-50
-60
-70
-80
a
b
c
d
a - A.F. AMPLIFIER ONLY, A.V.C. OFF, 6 MW. OUTPUT AT 1000 CYCLES, CONSTANT INPUT.
b - " " " WITH A.V.C. AT MAXIMUM LEVEL, INPUT SAME AS FOR a.
c - " " " BAND PASS FILTER, A.V.C. IN, LEVEL 10, INPUT SAME AS FOR a.
d - " " " WITH INPUT FOR 300 MW OUTPUT AT 1000 CYCLES, THIS OUTPUT THEN REDUCED TO 6 MW. BY USE OF A.V.C. LEVEL AT 55
100
1000
10000
FREQUENCY - CYCLES PER SECOND
PLATE 78


AUDIO FREQUENCY CHARACTERISTIC CURVES WITHOUT A.V.C.
REVISED MODEL OF CLASS II A RECEIVER
SUBMITTED BY THE RCA MFG CO.
± 0
-10
-20
-30
-40
-50
-60
-70
-80
ATTENUATION-DECIBELS
PLATE 19
a - A.F. AMPLIFIER ONLY, BAND PASS FILTER OUT, VARIABLE ATTENUATOR OUT.
b - " " WITH " " " " " "
c - " " " " IN " " "
d - " " " " OUT " " "
e - " " " " " " "
f - " " " " " " LOW TAP
g - " " " " " " HIGH "
h - " " " " " "
100
1000
10,000
FREQUENCY - CYCLES PER SECOND


ATTENUATION CHARACTERISTICS
OF BAND PASS FILTER
REVISED MODEL OF CLASS II A RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
ZERO LEVEL = 6 MW AT 1000 CYCLES
SCALE CHANGE
0
-5
-10
-15
-20
-25
-30
-35
-40
-50
-60
-70
100
1000
10,000
FREQUENCY - CYCLES PER SECOND
ATTENUATION - DECIBELS
PLATE 80

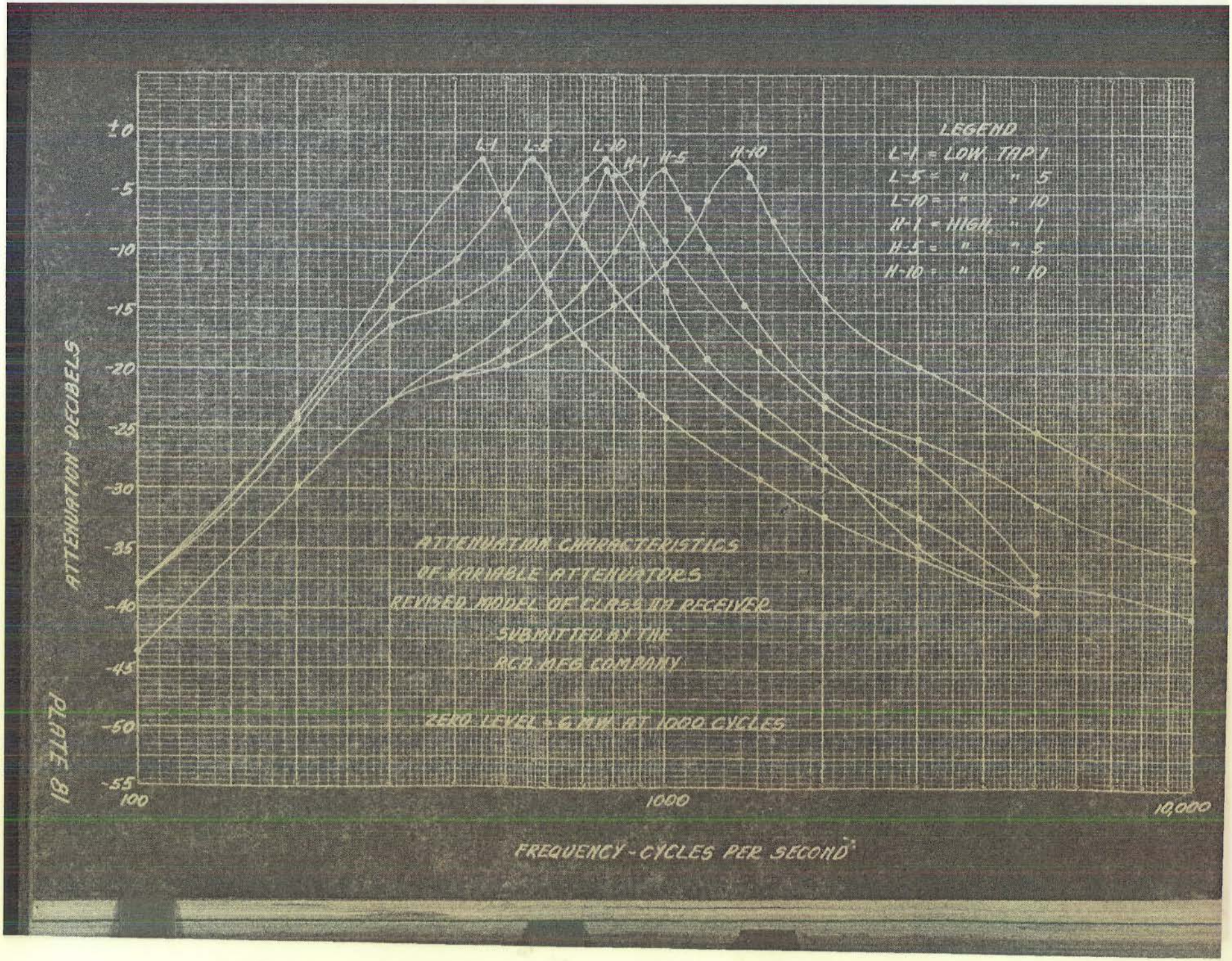
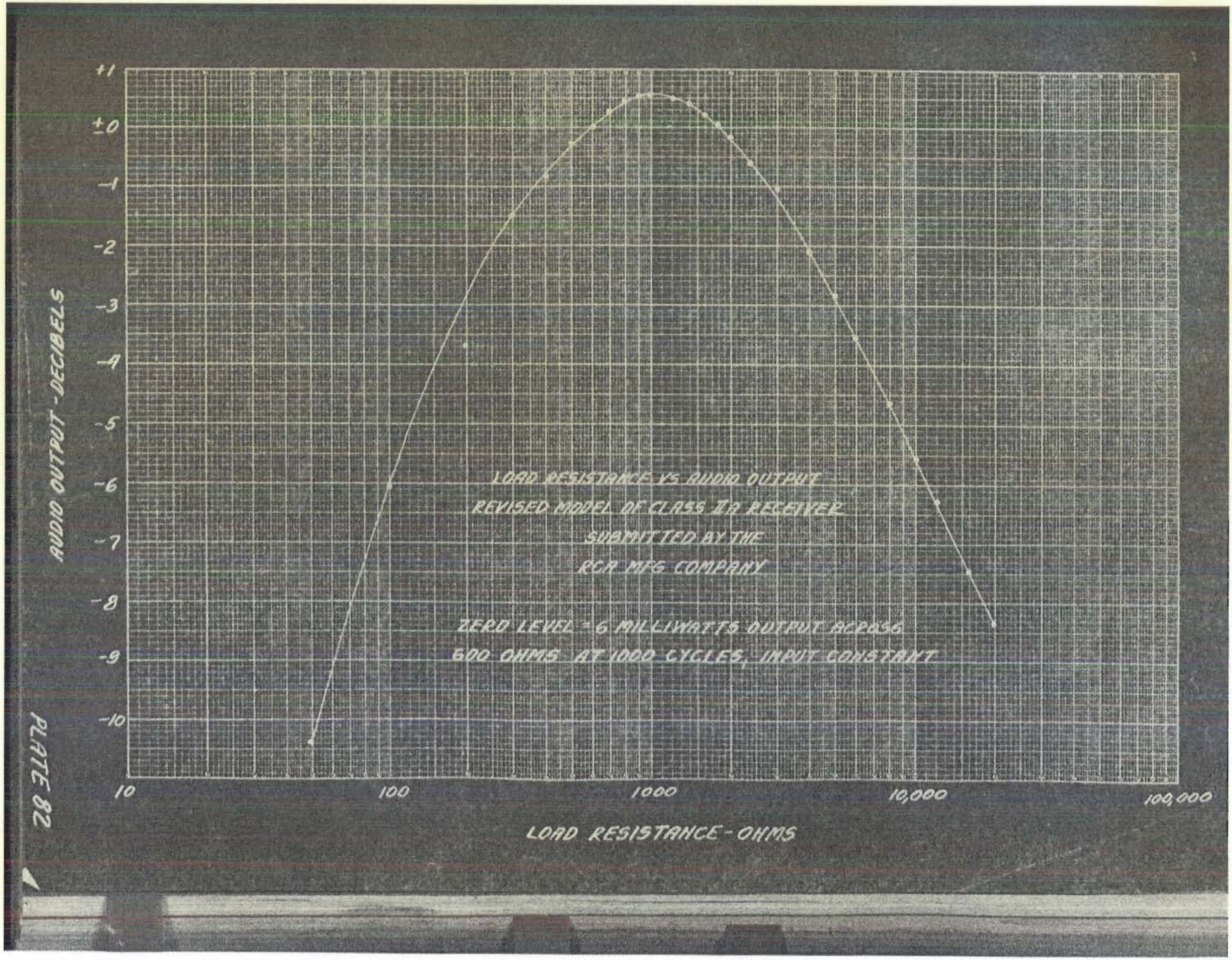


PLATE 81
ATTENUATION - DECIBELS
±0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
100
1000
10,000
FREQUENCY - CYCLES PER SECOND
L-1
L-5
L-10
H-1
H-5
H-10
LEGEND
L-1 = LOW. TAP 1
L-5 = " " 5
L-10 = " " 10
H-1 = HIGH. " 1
H-5 = " " 5
H-10 = " " 10
ATTENUATION CHARACTERISTICS
OF VARIABLE ATTENUATORS
REVISED MODEL OF CLASS 11A RECEIVER
SUBMITTED BY THE
RCA MFG. COMPANY
ZERO LEVEL = 6 MW AT 1000 CYCLES


+1
±0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
AUDIO OUTPUT - DECIBELS
LOAD RESISTANCE VS AUDIO OUTPUT
REVISED MODEL OF CLASS IA RECEIVER
SUBMITTED BY THE
RCA MFG COMPANY
ZERO LEVEL = 6 MILLIWATTS OUTPUT ACROSS
500 OHMS AT 1000 CYCLES, INPUT CONSTANT
10
100
1000
10,000
100,000
LOAD RESISTANCE - OHMS
PLATE 82