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# **A Study of UHF Television Receiver Interference Immunities**

## **Executive Summary**

The Commission has established minimum mileage separations between full power television transmitters for certain UHF channel combinations. These restrictions, known as UHF taboos, restrict assignments of UHF television stations. These taboos are intended to protect receivers from interference and are based on UHF receiver performance when subjected to signals on UHF taboo channels. Such restrictions do not apply to VHF assignments except for adjacent channel mileage separations.

This study, documenting UHF receiver interference immunities on the "taboo" channels, has been conducted in two phases. The first phase, consisting of 13 conventional color television receivers and 12 VCR's, was completed in 1990. The second phase, consisting of 25 conventional color television receivers, has recently been completed. The total sample data for 50 receivers are essentially normal and generally meet our goal of 0.94 for the Wilks-Shapiro normality statistic. The data for this study has been compared to the data for the last two studies, and a more rigorous comparison with the 1983 data has been made for the worst case desired level. The 1988 data was not useful for this comparison because of missing data elements and normalization problems.

The receivers in the study were selected and obtained through our sampling program. A computer controlled test environment was used to improve the test procedure and the data collection process, and included three new controllers, racks, and distribution system.

Preliminary comparisons of the data in this report with data for receivers, 1983, indicate little improvement for intermodulation and picture image. Adjacent channel data appears worse than previous data. Cross modulation, however, has improved along with sound image. IF Beat channels  $n\pm 7$ , and  $n\pm 8$  have made substantial gains. The median sample data do not reflect these gains and much of the improvement in population statistics comes from the narrowed range of population statistics which result from a large sample of normal data.

We will continue testing of a sample of 13 VCR's in order to perform a planned comparison between the interference immunities for one tuner (the VCR) and two tuner (VCR and television) modes of operation. The information gained by this effort should be useful in determining how VCR's and conventional receivers operated in tandem should be treated with respect to the taboos.

## **Introduction**

The FCC has established minimum mileage separations between full power television transmitters for certain UHF channel combinations. These restrictions have become known as UHF taboos. Assignments of UHF television stations are restricted through application of mileage separations imposed by each of the six taboos. Television receiver interference immunities and local oscillator radiation were the bases of the UHF taboos, which were

formulated in the Sixth Report and Order, 1952.<sup>1</sup> From time to time additional UHF receiver data have been obtained to evaluate the UHF taboos.<sup>2</sup> This paper adds to the data base of UHF receiver performance, examines the contribution of VCR's to primary television interference immunities, and compares recent population and sample data to the results of this study.

The receiver data base for this study was chosen to represent the electronic tuner technology, circa 1988 to 1990. This study to document UHF receiver interference immunities on the "taboo" channels has been conducted in two phases. The first phase, consisting of 13 conventional color television receivers and 12 VCR's, was completed in 1990. Analysis of the receiver/VCR comparisons from the first phase revealed that the differences were generally small. Because we were unable to obtain reliable information on viewer usage of VCR's for reception were dropped VCR's from the second phase based on our survey of available information indicating that 12 VCR's for the total receiver sample of 50 is appropriate representation. The second phase, consisting of 25 conventional color television receivers, has recently been completed.

Forty-seven of the receivers, including all the VCRs, had electronic tuners while only three of the receivers had mechanical tuners. As mechanically tuned receivers have decreased in numbers, we have naturally reduced their number in our test samples. Not all the mechanically tuned receivers remaining on the market generally appear to be non-primary receivers.

#### Test Procedure

The first half of the study involved 11 receivers with UHF inputs requiring a balun to couple the RF signal into the receiver. Since the Laboratory had only two conventional baluns, we examined inexpensive commercial baluns for performance across the UHF TV band. The inexpensive commercial baluns exhibited dramatic attenuation in the frequency range we use for taboo testing and were therefore not acceptable. "Coaxial baluns" based roughly upon the "Roberts Antenna" balun method were fabricated and tested.<sup>3</sup> The fabricated baluns are slightly better than the laboratory grade baluns previously used for this testing but only in the specific frequency range used for taboo testing (i.e. VSWR of 1.4 to 1.5). All of the fabricated baluns were within one dB when swept over the frequency range of interest. The additional

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<sup>1</sup> Sixth Report and Order, Docket Numbers 8736, 8975, 8976, and 9175, Federal Communications Commission, April 11, 1952.

<sup>2</sup> A Study of the Characteristics of Typical Television Receivers Relative to the UHF Taboos, W. K. Roberts, Laboratory Project Number 2229-63, Federal Communications Commission, June 1974, National Technical Information Service Number PB-235057. A Study into the Relevance of Existing UHF-TV Allocation Criteria in the Light of Current Receiver Performance, A.G. Day, prepared for Department of Communications, Ottawa, Ontario, Project 7611, June 1977.

<sup>3</sup> A New Wide-Band Balun, W. K. Roberts, Proceeding of the IRE, December 1957, pp. 1628-31.

test, n+2, by both the old method (off-the-air video) and the new method (NTSC color bars synchronized to the desired signal). The results appeared identical within the normal test tolerances even though we have observed an unusual intermodulation interference effect for one of the tests, which may be related to cross-modulation. Frame synchronization between the desired and undesired signals means that an observer need not to wait for the cross modulation interference effect to appear as is the case for off-the-air video testing. For tests with two undesired signals, the video of the second undesired signal originated off-the-air.

As usual, the visual carrier of the desired signal was video modulated with a 50% average picture level full-screen pedestal with color burst. The aural carrier was unmodulated.

### Comments About the Data

Brief descriptions of the taboos are given in Appendix A. Tabulations of the receiver data are given in Appendix B. "Just perceptible" interference signal levels are shown for various combinations of undesired channels. "Just perceptible" interference is a threshold condition used to improve data reproducibility. It does not directly correlate with interference to conventional viewing of program material. Our taboo test methods generally indicate greater interference perceptibility than would be obtained using program material for the desired signal.

Only a few UHF channels were used as the desired channel. This could lead to an uncertainty of several decibels, for the channels most removed from channels in the study, according to A. G. Day.<sup>4</sup> Day's analysis was, however, primarily related to mechanical tuners.

The data tables have the letter "M" indicated when no data was obtainable. Only for receivers 10 and 30, which overloaded at desired level -15 dBm, does "M" indicate inoperable. For all other measurements the "M" indicates that, with the undesired signal at a level of 0 dBm, no interference was observed by at least two observers. While the missing data complicates the analysis, it gives clear evidence of high interference immunity by the subject receiver.

### Conclusion

This paper presents data regarding the UHF taboo performance of a sample of television receivers. The data supplements similar information given previously. This is, however, the first large (N > 30) sample of electronically tuned receivers.

From the curves in Appendix B one may observe that as the desired level goes down by 10 dB the median undesired level is reduced by less than 10 dB for most measurements and never more than 10 dB. In general, the higher the undesired level for a given desired level, the higher the receiver interference immunity and consequently the higher will be the normalized undesired/desired ratios, U/D. Conversion to U/D ratios is necessary to compare

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<sup>4</sup> A Study into the Relevance of Existing UHF-TV Allocation Criteria in the Light of Current Receiver Performance, A. G. Day, prepared for Department of Communications, Ottawa, Ontario, Project 7611, June 1977.

normalized) limited confidence interval which reduces the conservative choices necessary with smaller samples.

It would not be surprising if the combined total sample for all electronic tuners were to meet the normality requirements. Such a condition would help determine whether only the present population is described in Table 2 or the entire electronically tuned population is represented by the present interference immunity data. We plan to include such an analysis in a future study.

The tables and curves in Appendix B give a partial answer to the question of VCR and conventional color television receiver similarities or differences regarding interference immunity. For most levels, for all of the tests, the differences are slight. Not all differences are insignificant, however, although most noticeable differences occur with low levels of desired signal and relatively high levels of undesired signal. This also will be a topic for future study.

TABLE 1

**SUMMARY OF RESULTS OF PREVIOUS RECEIVER IMMUNITY STUDY  
BASED ON 1983 SAMPLES OF 16 RECEIVERS**

Estimated Thresholds of Undesired to Desired  
Signal Ratios Needed to Protect 90 and 50 Percent of  
The Electronically Tuned Color Receiver Population

Undesired Test Signal	Desired Signal Strength (-15 dBm)		
	90%	50% (mean)	Std. Dev.
Upper Adjacent Channel (n+1)	-6 dB	-1 dB	4 dB
Lower Adjacent Channel (n-1)	-6 dB	-1 dB	4 dB
Intermodulation Channels (n-2,n-4)	-4 dB	1 dB	4 dB
Intermodulation Channels (n+2, n+4)	-6 dB	0 dB	5 dB
Cross Modulation Channel (n+2)	-4 dB	3 dB	5 dB
Cross Modulation Channel (n-2)	*		
Cross Modulation Channel (n-4)	*		
Half - IF (n+4)	-5 dB	1 dB	5 dB
IF Beat Channel (LO) (n+7)	-14 dB	0 dB	11 dB
IF Beat Channel (LO) (n-7)	-12 dB	2 dB	11 dB
IF Beat Channel (n+8)	-17 dB	-2 dB	12 dB
IF Beat Channel (n-8)	-10 dB	2 dB	9 dB
Sound Image Channel (n+14)	-6 dB	2 dB	6 dB
Picture Image Channel (n+15)	-26 dB	-19 dB	5 dB

\* Not normalizable, better than n+2

The present data, median curves, and some statistics are included in Appendix B. A more direct analysis was available for the present data including the -15 dBm desired signal level case since the data was essentially normal. The results are presented in Table 2.

TABLE 2

SUMMARY OF RESULTS OF PRESENT RECEIVER IMMUNITY STUDY  
 BASED ON 1990-1991 SAMPLE OF 50 RECEIVERS

Estimated Thresholds of Undesired to Desired  
 Signal Ratios Needed to Protect 90 and 50 Percent of  
 The Electronically Tuned Color Receiver Population

Undesired Test Signal	Desired Signal Strength (-15 dBm)		
	90%	50% (mean)	Std. Dev.
Upper Adjacent Channel (n+1)	-7 dB	-3 dB	4 dB
Lower Adjacent Channel (n-1)	-10 dB	-3 dB	5 dB
Intermodulation Channels (n-2,n-4)	-4 dB	1 dB	4 dB
Intermodulation Channels (n+2, n+4)	-2 dB	3 dB	3 dB
Cross Modulation Channel (n+2)	1 dB	7 dB	4 dB
Cross Modulation Channel (n-2)	-1 dB	5 dB	5 dB
Cross Modulation Channel (n-4)	0 dB	7 dB	5 dB
Half - IF (n+4)	-2 dB	4 dB	5 dB
IF Beat Channel (LO) (n+7)	0 dB	9 dB	5 dB
IF Beat Channel (LO) (n-7)	1 dB	7 dB	5 dB
IF Beat Channel (n+8)*	1 dB	9 dB	6 dB
IF Beat Channel (n-8)	2 dB	7 dB	5 dB
Sound Image Channel (n+14)	-1 dB	6 dB	5 dB
Picture Image Channel (n+15)	-23 dB	-11 dB	10 dB

\* Normalized

Table 3 summarizes the results of a comparison between Table 1 and Table 2. Although less rigorous from a statistical standpoint than the data from the Tables, we have compared the median data from the two studies in the graphs in Appendix C.

TABLE 3

SUMMARY TABLE OF RESULTS OF COMPARISONS OF  
PREVIOUS 1983 STUDY VERSUS PRESENT 1991 STUDY

<u>TABOO</u>	<u>REQUIRED MIN. SEPARATION</u>	<u>RESULTS FOR -15 DBM DESIRED SIGNAL</u>
Picture Image n ± 15	120 km (75 mi)	n + 15: Present study better by 3 dB.
Sound Image n ± 14	100 km (60 mi)	n + 14: Present study better by 4 dB.
IF (Oscillator) Taboo n ± 7	100 km (60 mi)	n ± 7: Present study better by 5 to 13 dB.
Adjacent Channel n ± 1	90 km (55 mi)	n ± 1: Present study worse by 2 to 4 dB.
Intermodulation n ± 2, 4	30 km (20 mi)	n + 2, n + 4: Present study better by 3 to 5 dB. n - 2, n - 4: Present study same. n - 2: Present study better by 3 dB. n - 4: No previous data, see n-2. n + 2: Present study better by 3 dB. n + 4: Present study better by 3 dB.
IF Beat n ± 8	30 km (20 mi)	n + 8: Present study better by 7 to 18 dB. n - 8: Present study better by 5 to 8 dB.



## APPENDIX A

### Brief Descriptions of the UHF Taboo Phenomena as Described in the FCC's Rules ("n" is the number of the tuned channel)

#### Adjacent Channel (n + or - 1 channel)

Adjacent channel minimum mileage separations also apply to VHF television. All receivers are more or less susceptible to signals immediately adjacent to their intended passband.

#### Intermodulation (n + or - 2, 3, 4, 5 channels)

Intermodulation from a combination of input signals produces a spurious signal or signals within the tuned channel. For example in television, a spurious signal on a desired visual carrier frequency could arise from the combination,  $2f_a - f_b$ , where  $f_a$  is the visual carrier frequency of one undesired channel and  $f_b$  is the visual carrier frequency of another.

Interference that could occur from channel  $n+4$  is included in the channels listed above. This is called half-IF interference and is attributed to a combination of the undesired signal's visual carrier and a receiver's local oscillator.

Cross modulation interference channels are also included above. In television interference the phenomenon typically involves the transfer of the modulation of an undesired visual carrier to the desired visual carrier. Usually, the vertical and horizontal boundaries of the undesired picture are seen first.

#### Oscillator (n + or - 7 channels)

A UHF television receiver's local oscillator frequency for a tuned channel "n" is located in channel  $n+7$ . Therefore, local oscillator radiation from a receiver tuned to channel n could cause co-channel interference to another nearby receiver tuned to channel  $n+7$ . The co-channel local oscillator signal is nominally at 3.75 MHz above the lower edge of channel  $n+7$ . This is a region of receiver vulnerability to co-channel interference. Protection against such interference is based on the principle of preventing overlapping Grade A service areas of full power UHF stations seven channels apart, so that receivers within the Grade A service area of one such station would not normally be tuned to receive service from the other station that would not be as good in quality. IF beat interference, described below, could also occur for the above channel separations.

### IF Beat (n + or - 8 channels)

When two stations are separated by a receiver's intermediate frequency (IF), it is possible that the two stations' signals will combine to produce a beat signal that will be picked up by a receiver's IF amplifier. Where a 45.75 MHz IF is in use (present NTSC format), such signals may exist for channels that are separated by seven or eight channels from the desired station's channel. (The seven channel separation is subsumed by the restriction based on receiver oscillator radiation.)

### Sound Image (n + or - 14 channels)

### Picture Image (n + or - 15 channels)

Image interference arises from signals in a receiver's image channel band. This band is located as much above a receiver's local oscillator frequency as the desired channel is below it. One frequency in the image channel is the aural carrier frequency of the sound image channel (n+14). Another is the visual carrier frequency of the picture image channel (n+15).

The visual carrier frequency of the picture image channel is in a more vulnerable part of a receiver's image channel than the aural carrier of the sound image channel. The lower amplitude of a television channel's aural carrier compared to its visual carrier also reduces interference effects of the sound image channel compared to the picture image channel. The aural carrier is adjusted to ten decibels below the visual carrier for testing and the resulting interference levels for sound versus picture image immunities reflect that ten dB difference.

## APPENDIX B

### Receiver Data Tables and Graphs

#### Notes:

1. Receiver numbers 1 to 13 and 26 to 50 were color television receivers. Numbers 14 to 25 were VCR receivers.
2. Receivers 6, 8, and 47 had mechanical tuners.
3. Except for receivers 10 and 30, entries of "M" indicate that no data was reported. This means that no interference was obtained with a 0 dBm undesired signal present. Entries of "M" for receivers 10 and 30 for a desired signal level of -15 dBm indicate that the receiver was overdriven at the level. The number of "CASES" equals 50 minus the numbers of "M's". The word "CASES" refers to the number of reported observations.

Television Interference Type: Intermodulation

Undesired Signal Levels (dBm) for "Just  
Perceptible" Interference from Channels: N+2, N+4

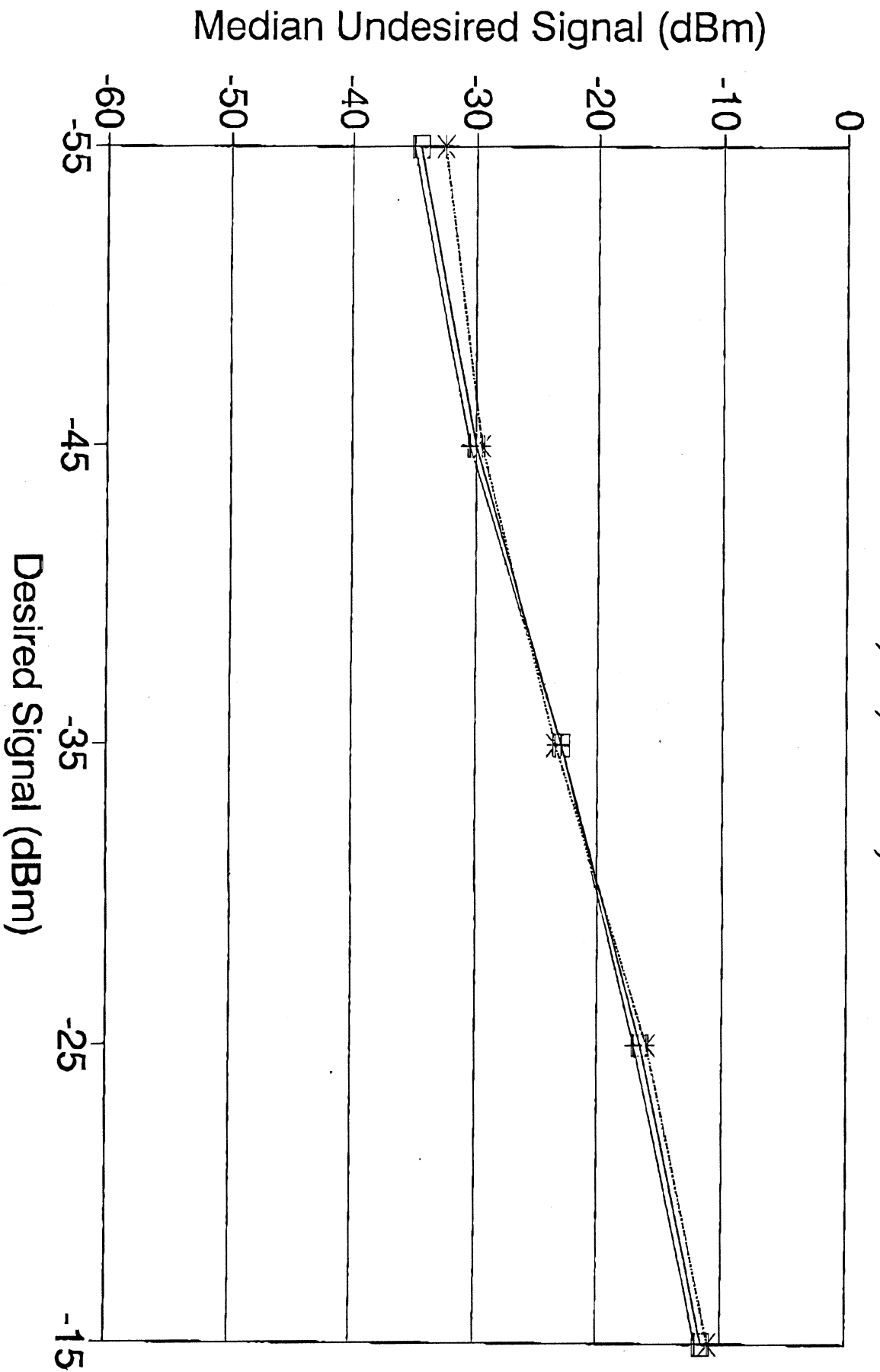
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Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-8	-20	-28	-39	-41
2	-12	-17	-28	-41	-44
3	-12	-12	-16	-23	-28
4	-10	-8	-20	-28	-32
5	-5	-15	-20	-28	-32
6	-13	-17	-22	-26	-37
7	-17	-16	-25	-33	-41
8	-13	-14	-21	-27	-33
9	-5	-10	-17	-25	-32
10	M	-12	-15	-24	-31
11	M	-3	-10	-19	-29
12	-9	-20	-26	-34	-38
13	-9	-18	-25	-33	-38
14	-12	-14	-22	-26	-35
15	-13	-16	-28	-37	-41
16	-11	-15	-25	-31	-36
17	-8	-14	-22	-30	-33
18	-16	-20	-23	-31	-32
19	-13	-19	-21	-25	-28
20	-8	-11	-15	-23	-30
21	-10	-22	-28	-29	-32
22	-11	-17	-26	-29	-31
23	-10	-16	-25	-35	-39
24	-8	-14	-15	-18	-22
25	-13	-21	-24	-33	-35
26	-13	-18	-22	-32	-39
27	-20	-24	-26	-38	-42

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
28	-10	-19	-21	-28	-30
29	-10	-13	-23	-32	-40
30	-7	-11	-20	-27	-35
31	-11	-17	-26	-34	-37
32	M	-10	-14	-16	-20
33	M	-15	-22	-23	-24
34	-10	-14	-21	-24	-27
35	M	-9	-19	-20	-22
36	-12	-19	-29	-35	-42
37	-13	-23	-33	-42	-46
38	-10	-14	-23	-26	-32
39	-14	-18	-28	-30	-32
40	-17	-16	-24	-32	-37
41	-14	-17	-22	-31	-36
42	-21	-32	-41	-49	-52
43	-12	-18	-25	-33	-33
44	-13	-21	-26	-29	-35
45	-9	-17	-27	-36	-38
46	-13	-24	-33	-40	-40
47	-11	-15	-22	-25	-30
48	M	-8	-19	-27	-34
49	-16	-23	-25	-32	-34
50	-9	-20	-29	-34	-40

DESIRED SIG dBm	-15	-25	-35	-45	-55
CASES	21	25	25	25	25
MEAN	-12.62	-17.40	-24.80	-31.00	-35.08
S.D.	3.542	5.401	5.500	7.095	7.274
MEDIAN	-12.00	-17.00	-24.00	-32.00	-35.00
MINIMUM	-21.00	-32.00	-41.00	-49.00	-52.00
MAXIMUM	-7.000	-8.000	-14.00	-16.00	-20.00

# UHF IM, N, N+2, N+4



Television Interference Type: Intermodulation

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N-2, N-4

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Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-13	-19	-27	-34	-38
2	-17	-18	-24	-29	-30
3	-15	-20	-29	-38	-41
4	-13	-20	-31	-39	-41
5	-10	-19	-25	-28	-32
6	-21	-22	-27	-31	-35
7	-13	-18	-25	-29	-31
8	-8	-9	-12	-20	-22
9	-11	-13	-21	-29	-33
10	M	-9	-17	-26	-39
11	-6	-10	-20	-31	-37
12	-17	-26	-30	-34	-36
13	-17	-24	-30	-36	-40
14	-11	-16	-27	-29	-32
15	-10	-20	-25	-30	-34
16	-9	-16	-25	-32	-35
17	-7	-18	-26	-29	-31
18	-20	-19	-28	-31	-33
19	-15	-14	-21	-25	-26
20	-10	-13	-21	-25	-29
21	-14	-22	-25	-27	-29
22	-15	-21	-24	-26	-29
23	-8	-21	-25	-33	-35
24	-13	-19	-20	-22	-23
25	-15	-19	-26	-31	-32
26	-20	-26	-30	-39	-45
27	-17	-22	-27	-37	-40
28	-14	-23	-27	-34	-38
29	-9	-12	-19	-26	-35
30	-7	-12	-22	-30	-39

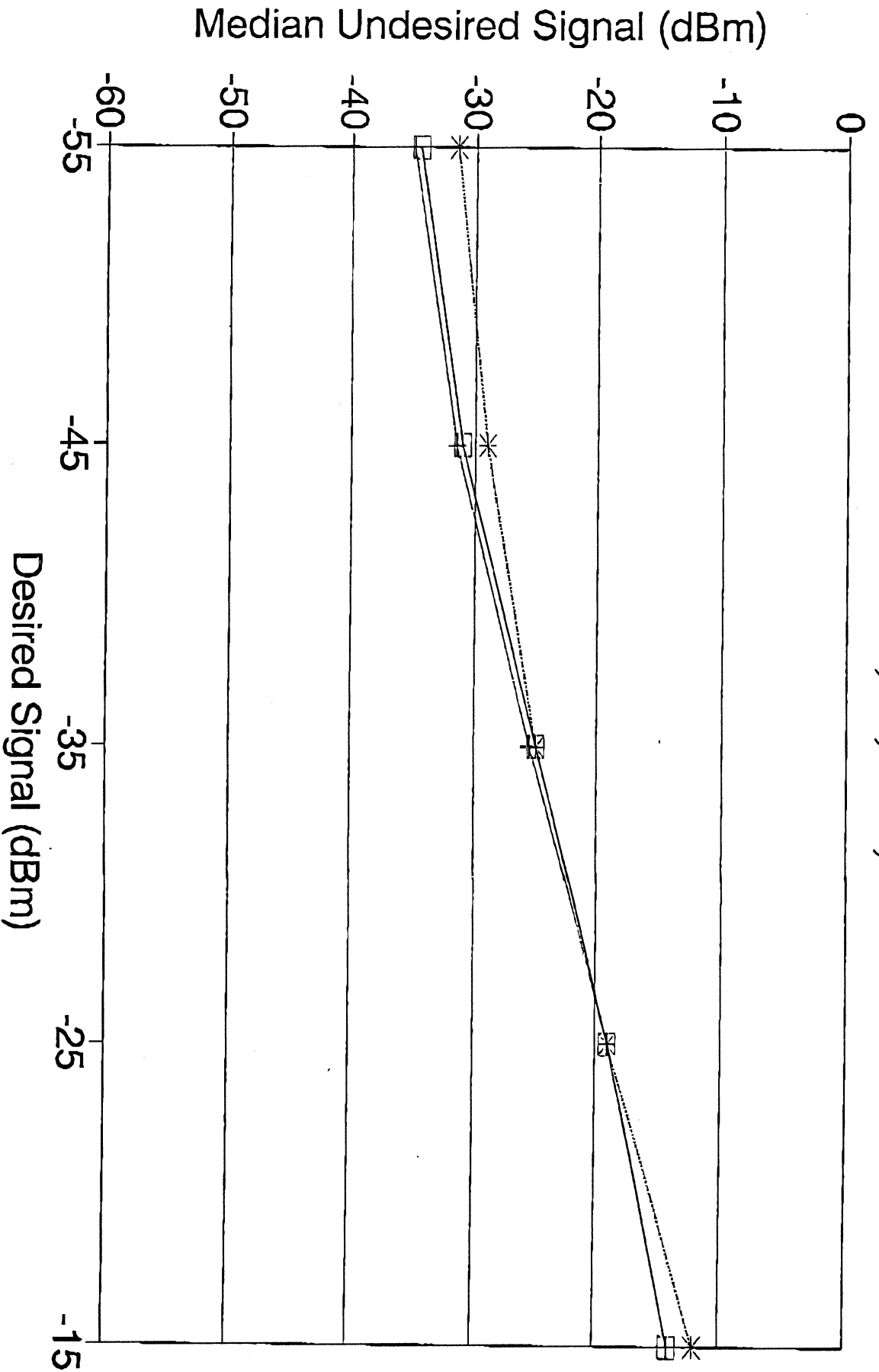
Rcvr. Desired Signal Levels (dBm) for Channel N  
 No. -15 -25 -35 -45 -55

31	-16	-15	-22	-32	-36
32	-15	-22	-27	-30	-32
33	-6	-15	-20	-27	-29
34	-14	-20	-22	-29	-32
35	-14	-21	-26	-29	-33
36	-9	-15	-23	-26	-34
37	-9	-16	-24	-32	-39
38	-7	-10	-21	-28	-34
39	-21	-26	-33	-33	-32
40	-14	-15	-25	-31	-32
41	-16	-16	-27	-35	-36
42	-17	-20	-27	-33	-37
43	-12	-19	-27	-32	-33
44	-11	-19	-25	-25	-36
45	-16	-26	-33	-40	-41
46	-14	-21	-28	-34	-35
47	-9	-15	-19	-25	-33
48	-16	-18	-26	-32	-35
49	-15	-23	-26	-33	-35
50	-12	-18	-25	-34	-37

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	49	50	50	50	50
MEAN	-13.02	-18.20	-24.84	-30.60	-34.22
S.D.	3.950	4.417	4.017	4.333	4.496
MEDIAN	-14.00	-19.00	-25.00	-31.00	-34.50
MINIMUM	-21.00	-26.00	-33.00	-40.00	-45.00
MAXIMUM	-6.000	-9.000	-12.00	-20.00	-22.00



# UHF IM, N, N-2, N-4



Television Interference Type: Cross Modulation

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N-2

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-2	-12	-25	-30	-30
2	-9	-9	-17	-26	-24
3	-14	-17	-27	-34	-32
4	-5	-15	-25	-25	-25
5	-5	-12	-12	-26	-26
6	-21	-23	-23	-31	-34
7	-7	-8	-12	-22	-22
8	-6	-7	-9	-20	-23
9	-7	-7	-14	-26	-29
10	M	-3	-10	-21	-32
11	-4	-6	-15	-26	-30
12	-13	-20	-21	-23	-22
13	-13	-18	-27	-34	-34
14	-5	-7	-12	-22	-22
15	-2	-11	-17	-25	-24
16	-3	-7	-16	-23	-26
17	M	-9	-20	-22	-21
18	-14	-10	-19	-22	-20
19	-7	-7	-16	-17	-15
20	-4	-5	-9	-20	-21
21	-7	-14	-18	-21	-19
22	-10	-12	-21	-21	-19
23	-2	-10	-15	-25	-23
24	-8	-14	-17	-17	-15
25	-6	-5	-18	-20	-19
26	-15	-19	-25	-34	-39
27	-17	-20	-25	-35	-32
28	-12	-20	-21	-30	-32
29	-5	-5	-14	-27	-33
30	-7	-10	-18	-29	-38

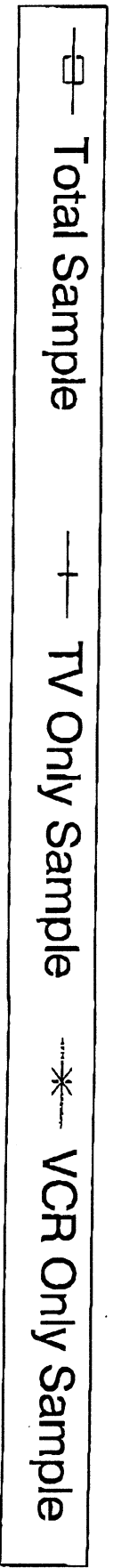
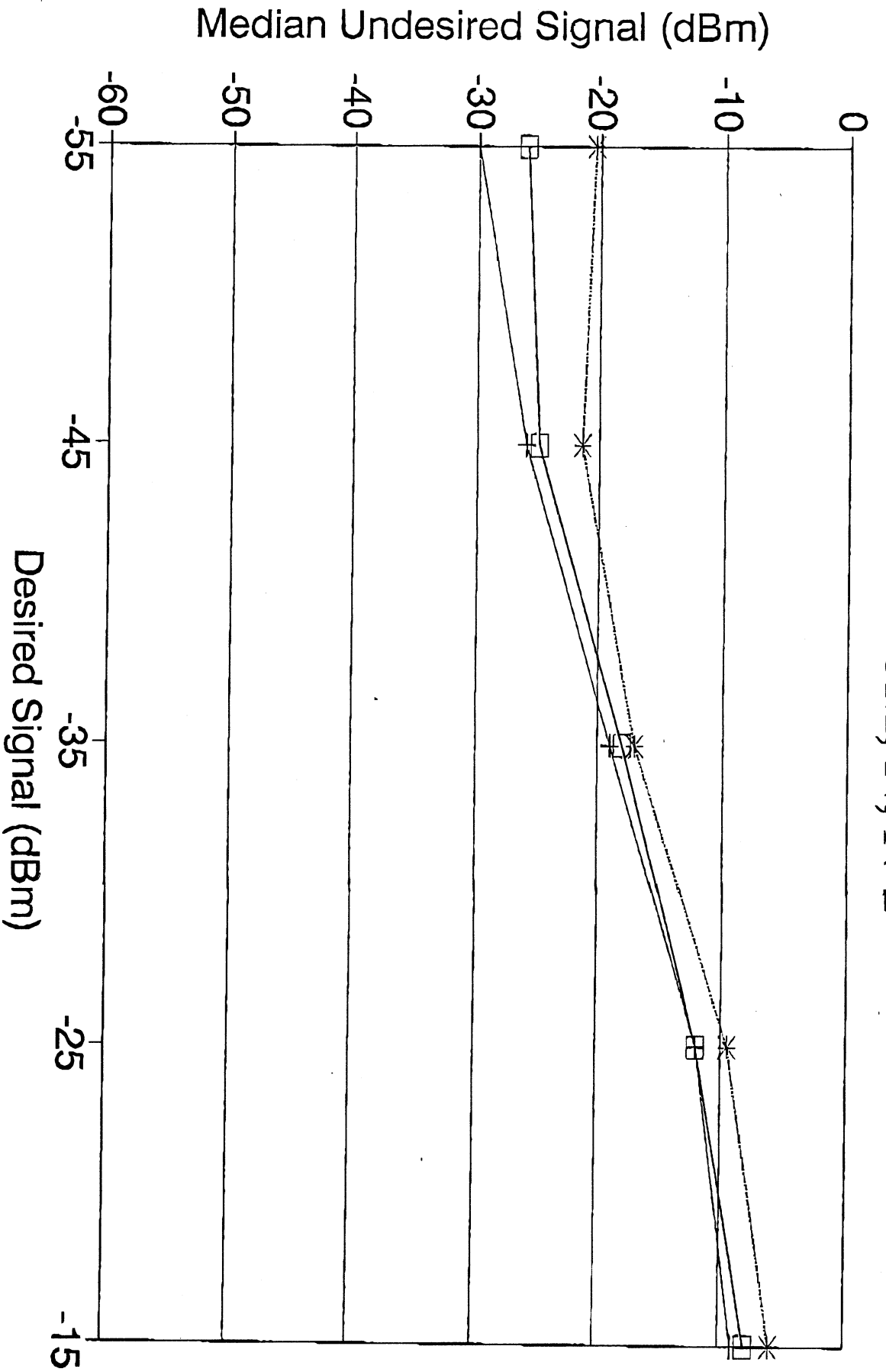
Rcvr.            Desired Signal Levels (dBm) for Channel N  
 No.            -15            -25            -35            -45            -55

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31	-12	-12	-20	-29	-29
32	-10	-14	-20	-24	-25
33	-4	-9	-14	-22	-21
34	-9	-13	-20	-22	-24
35	-8	-13	-18	-21	-21
36	-2	-6	-16	-22	-29
37	-8	-5	-14	-25	-30
38	-5	-6	-12	-13	-23
39	-20	-24	-33	-34	-32
40	-15	-9	-16	-26	-32
41	-18	-12	-21	-34	-35
42	-11	-16	-20	-24	-23
43	-9	-17	-21	-23	-26
44	-7	-14	-18	-25	-30
45	-16	-25	-35	-39	-39
46	-12	-20	-25	-34	-31
47	-9	-11	-14	-21	-32
48	-7	-2	-15	-21	-27
49	-10	-15	-19	-27	-26
50	-2	-12	-19	-25	-32

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	48	50	50	50	50
MEAN	-8.833	-11.94	-18.56	-25.30	-26.96
S.D	4.905	5.629	5.522	5.399	5.928
MEDIAN	-8.000	-12.00	-18.00	-25.00	-26.00
MINIMUM	-21.00	-25.00	-35.00	-39.00	-39.00
MAXIMUM	-2.000	-2.000	-9.000	-13.00	-15.00

# UHF CM, N, N-2



Television Interference Type: Cross Modulation

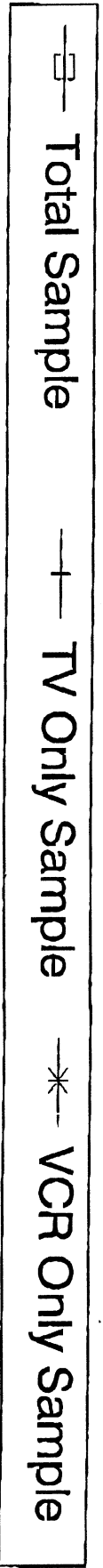
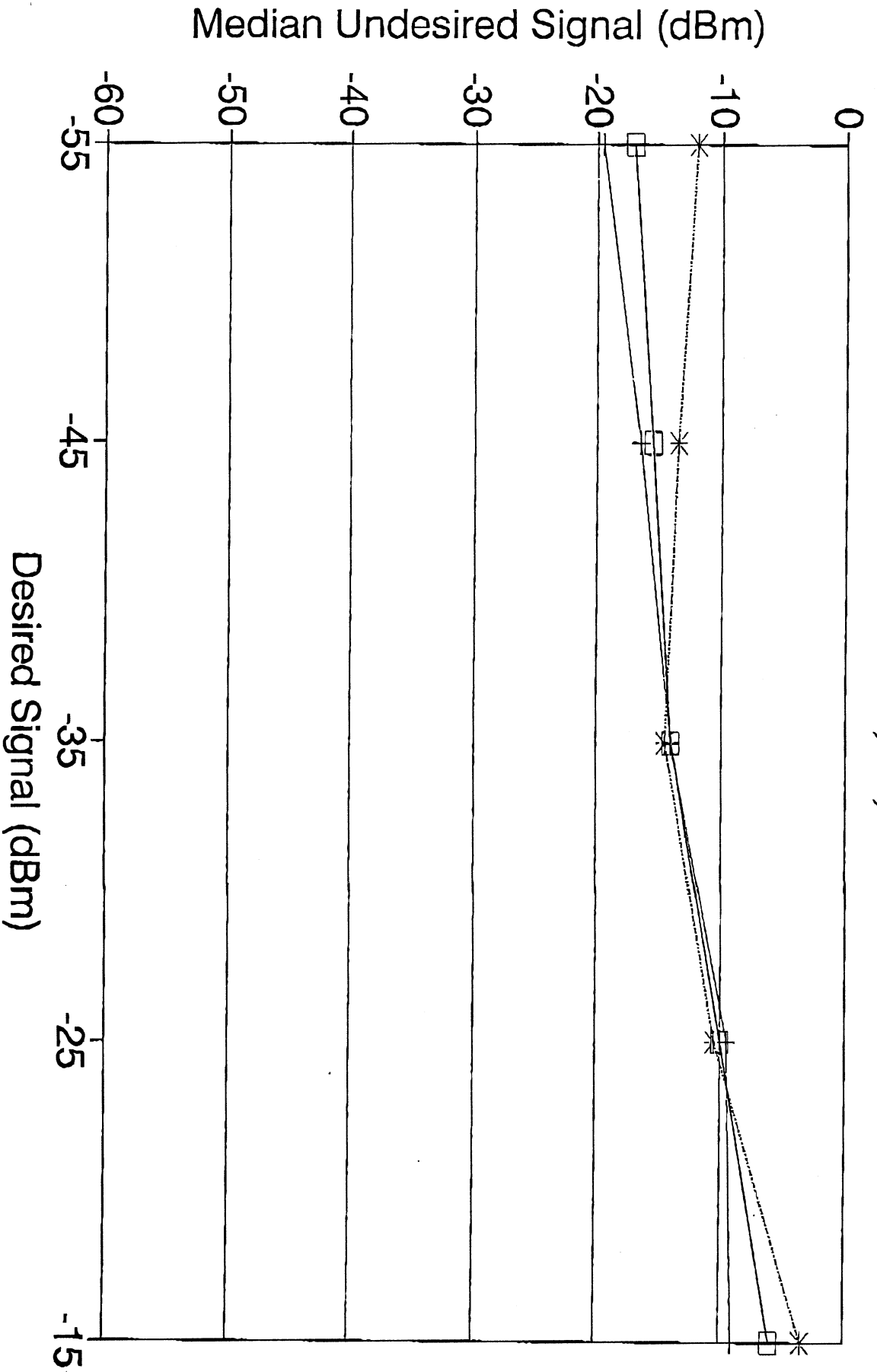
Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N-4

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-4	-12	-17	-23	-22
2	-6	-6	-12	-14	-14
3	-11	-8	-12	-21	-23
4	M	-4	-16	-15	-13
5	-1	-10	-13	-17	-17
6	M	-1	-3	-1	M
7	-3	-10	-15	-15	-14
8	M	M	M	M	M
9	-4	-2	-12	-15	-17
10	M	M	-2	-11	-23
11	M	M	-7	-15	-20
12	-12	-20	-20	-18	-16
13	-14	-21	-27	-32	-33
14	-3	-9	-16	-18	-17
15	0	-12	-16	-18	-18
16	0	-7	-15	-19	-18
17	M	-10	-13	-13	-12
18	-14	-11	-15	-14	-12
19	-7	0	-8	-7	-7
20	-2	-2	-10	-9	-8
21	-4	-13	-15	-16	-15
22	-8	-12	-14	-13	-11
23	M	-12	-15	-19	-17
24	-3	-10	-12	-11	-9
25	-7	-11	-14	-13	-12
26	-15	-17	-18	-25	-29
27	-16	-18	-14	-25	-26
28	-11	-20	-20	-24	-25
29	M	M	-9	-12	-23
30	M	M	-9	-19	-29

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-10	-8	-14	-25	-24
32	-5	-9	-12	-9	-11
33	M	-2	-8	-6	-3
34	-5	-8	-13	-13	-13
35	-1	-6	-11	-9	-11
36	0	-5	-11	-13	-19
37	-5	-5	-15	-19	-23
38	-2	0	-9	-11	-16
39	-18	-20	-25	-24	-24
40	-11	-5	-13	-11	-19
41	-13	0	-17	-21	-21
42	-11	-11	-18	-16	-15
43	-10	-18	-17	-20	-20
44	-5	-10	-15	-10	-21
45	-12	-22	-20	-25	-25
46	-9	-20	-22	-20	-17
47	M	M	M	M	-7
48	-4	0	-10	-12	-14
49	-10	-15	-14	-18	-17
50	-1	-10	-18	-23	-24

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	39	44	48	48	48
MEAN	-7.103	-9.818	-13.98	-16.19	-17.58
S.D.	5.004	6.348	4.818	6.045	6.368
MEDIAN	-6.000	-10.00	-14.00	-15.50	-17.00
MINIMUM	-18.00	-22.00	-27.00	-32.00	-33.00
MAXIMUM	0.000	0.000	-2.000	-1.000	-3.000

# UHF CM, N, N-4



Television Interference Type: Half IF

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+4

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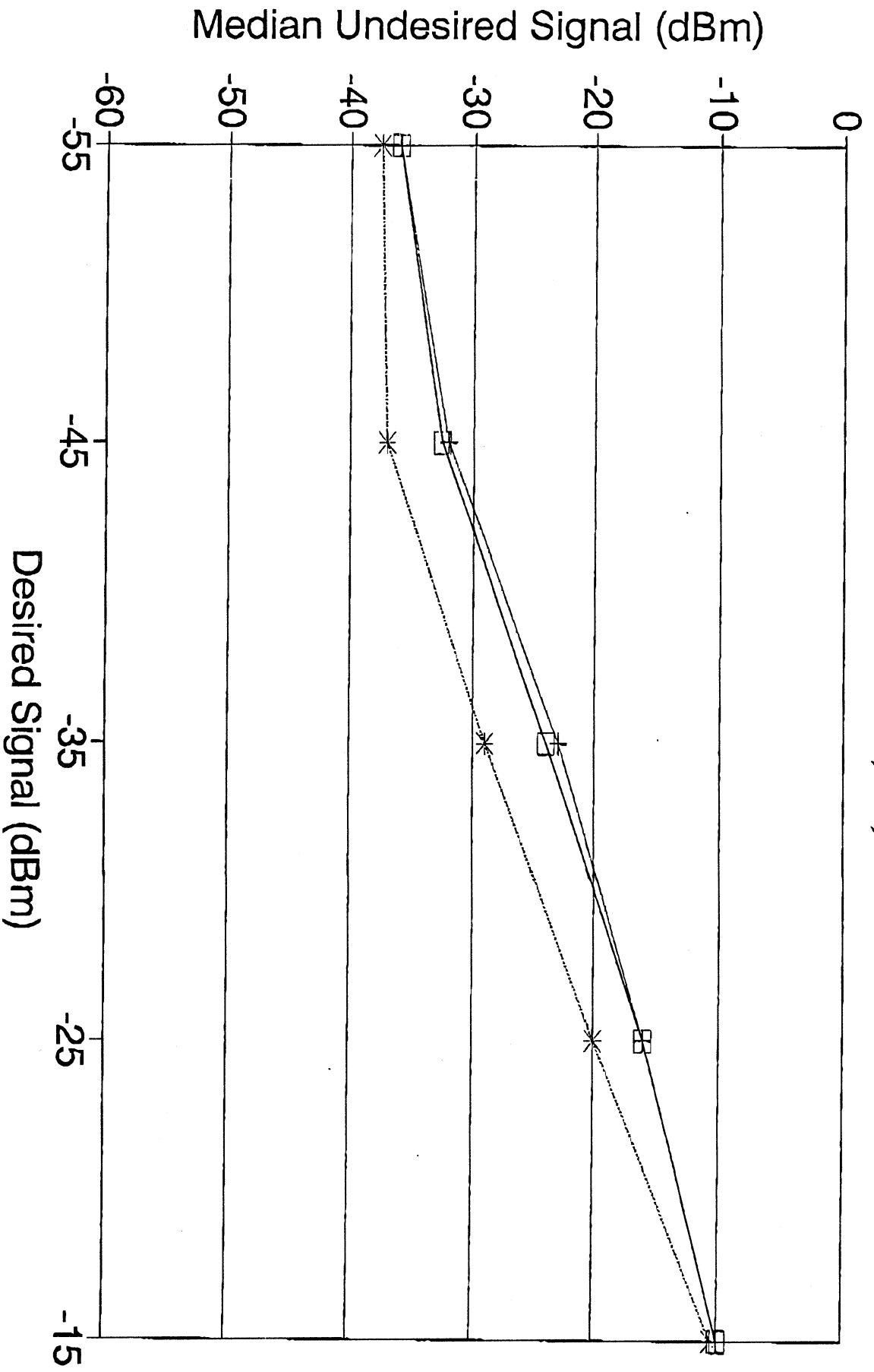
Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-10	-18	-28	-37	-40
2	-14	-26	-37	-50	-54
3	-8	-10	-22	-30	-31
4	-4	-14	-24	-33	-34
5	-9	-14	-23	-35	-37
6	-16	-21	-23	-27	-39
7	-16	-25	-34	-43	-49
8	-20	-24	-30	-33	-40
9	-13	-16	-24	-33	-37
10	M	-6	-16	-26	-34
11	M	-3	-11	-21	-30
12	-16	-24	-33	-38	-43
13	-9	-19	-28	-36	-36
14	-10	-20	-30	-39	-42
15	-13	-22	-29	-39	-42
16	-11	-20	-29	-37	-42
17	-14	-21	-31	-37	-38
18	-14	-23	-31	-38	-37
19	-10	-13	-24	-28	-30
20	-7	-11	-18	-25	-32
21	-10	-15	-20	-24	-25
22	-9	-15	-25	-29	-29
23	-12	-21	-29	-38	-40
24	-2	-10	-18	-24	-25
25	-13	-22	-32	-38	-39
26	-11	-13	-18	-29	-37
27	-14	-19	-24	-34	-39
28	-3	-12	-18	-26	-30
29	-5	-9	-17	-27	-36
30	M	-8	-17	-26	-36



Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-10	-17	-25	-35	-37
32	0	0	-7	-13	-17
33	-1	-1	-9	-13	-18
34	-1	-1	-10	-14	-18
35	M	-1	-7	-19	-21
36	-11	-18	-26	-36	-42
37	-15	-23	-33	-42	-47
38	-2	-3	-9	-17	-26
39	-12	-19	-27	-31	-32
40	-16	-18	-25	-35	-41
41	-13	-16	-23	-32	-38
42	-19	-30	-40	-51	-52
43	-5	-16	-25	-33	-36
44	-5	-10	-17	-24	-32
45	-11	-18	-26	-34	-36
46	-1	-13	-20	-32	-35
47	-10	-16	-22	-27	-30
48	-3	-8	-17	-27	-34
49	-9	-15	-22	-30	-33
50	-13	-20	-28	-35	-40

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	46	50	50	50	50
MEAN	-9.783	-15.14	-23.22	-31.20	-35.36
S.D.	5.090	7.197	7.665	8.236	7.871
MEDIAN	-10.00	-16.00	-24.00	-32.50	-36.00
MINIMUM	-20.00	-30.00	-40.00	-51.00	-54.00
MAXIMUM	0.000	0.000	-7.000	-13.00	-17.00

# UHF Half IF, N, N+4



—■— Total Sample    —+— TV Only Sample    -\*- VCR Only Sample

Television Interference Type: Cross Modulation

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+2

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-9	-19	-31	-38	-38
2	-8	-15	-28	-38	-37
3	-11	-6	-9	-22	-22
4	-4	-3	-11	-19	-18
5	-2	-13	-14	-24	-24
6	-10	-12	-10	-26	-36
7	-11	-11	-17	-31	-32
8	M	0	-2	-15	-20
9	-2	-4	-12	-21	-24
10	M	-4	-10	-20	-31
11	M	M	-7	-18	-26
12	-12	-18	-17	-25	-24
13	-9	-15	-23	-30	-31
14	-6	-5	-13	-26	-27
15	-5	-6	-17	-28	-28
16	-4	-3	-13	-24	-29
17	-4	-9	-21	-25	-23
18	-12	-7	-19	-22	-20
19	-10	-9	-20	-19	-19
20	-1	-1	-7	-17	-20
21	-5	-14	-12	-19	-18
22	-10	-12	-24	-24	-22
23	-3	-9	-14	-28	-26
24	-3	-8	-11	-12	-12
25	-9	-13	-10	-18	-16
26	-13	-13	-16	-26	-36
27	-18	-21	-27	-38	-39
28	-5	-13	-16	-21	-24
29	-9	-15	-23	-33	-41
30	M	-9	-18	-27	-37

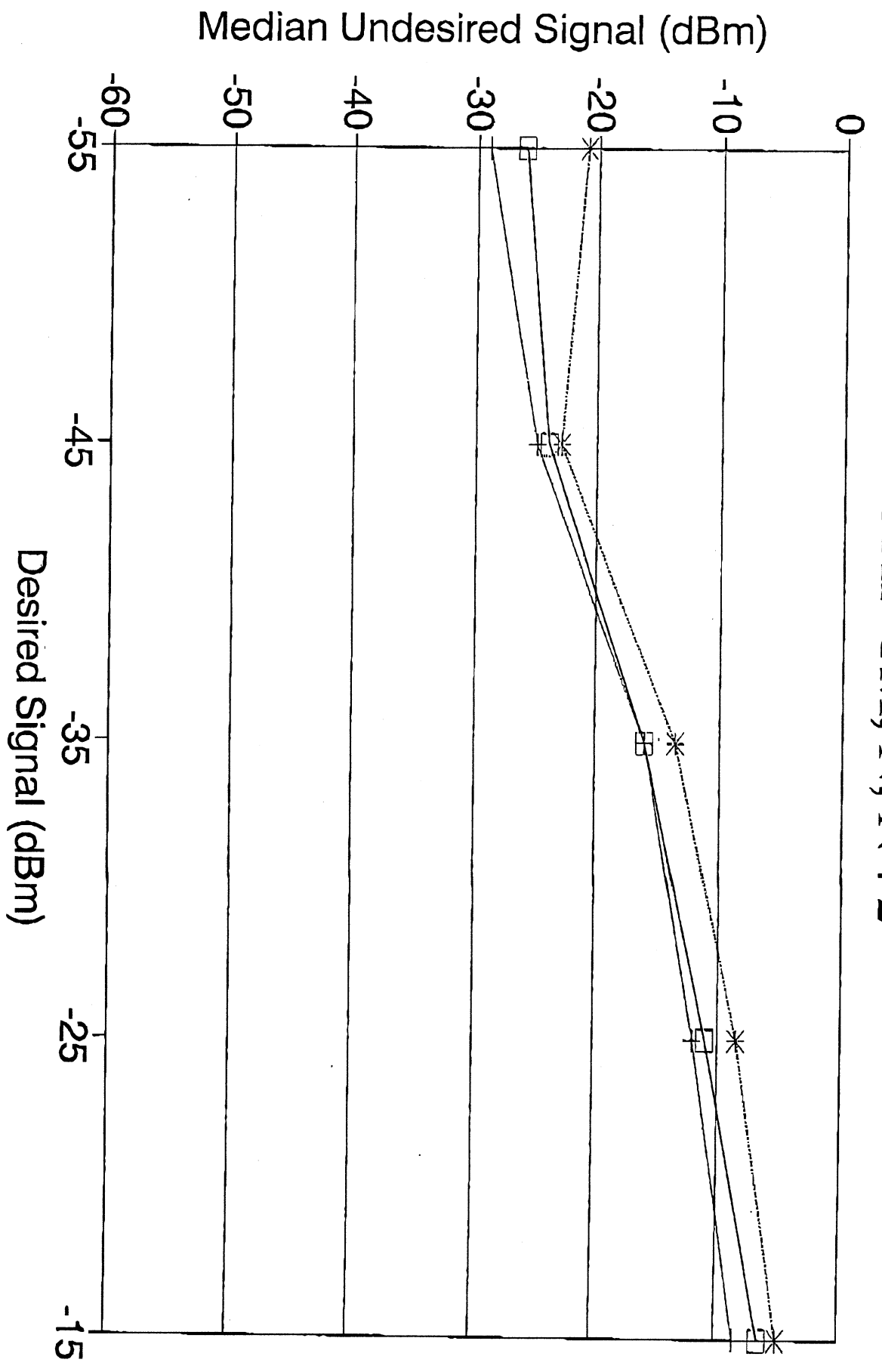
Rcvr. Desired Signal Levels (dBm) for Channel N  
 No. -15 -25 -35 -45 -55

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31	-13	-11	-18	-27	-27
32	-1	-3	-10	-13	-13
33	-4	-3	-9	-19	-22
34	-3	-5	-14	-17	-19
35	0	-4	-10	-11	-11
36	-5	-12	-23	-28	-32
37	-6	-7	-17	-25	-30
38	-3	-2	-10	-14	-24
39	-12	-11	-24	-27	-25
40	-15	-13	-8	-23	-30
41	-12	-12	-15	-27	-29
42	-11	-17	-25	-34	-32
43	-6	-13	-16	-26	-25
44	-9	-13	-18	-16	-29
45	-7	-14	-25	-35	-33
46	-10	-16	-28	-39	-37
47	-3	-3	-5	-14	-23
48	-2	-3	-10	-20	-29
49	-10	-17	-17	-20	-20
50	-6	-10	-20	-28	-37

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	46	49	50	50	50
MEAN	-7.239	-9.714	-15.88	-23.94	-26.54
S.D.	4.217	5.284	6.638	7.061	7.335
MEDIAN	-6.500	-11.00	-16.00	-24.00	-26.00
MINIMUM	-18.00	-21.00	-31.00	-39.00	-41.00
MAXIMUM	0.000	0.000	-2.000	-11.00	-11.00

# UHF CM, N, N+2



Television Interference Type: IF

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+8

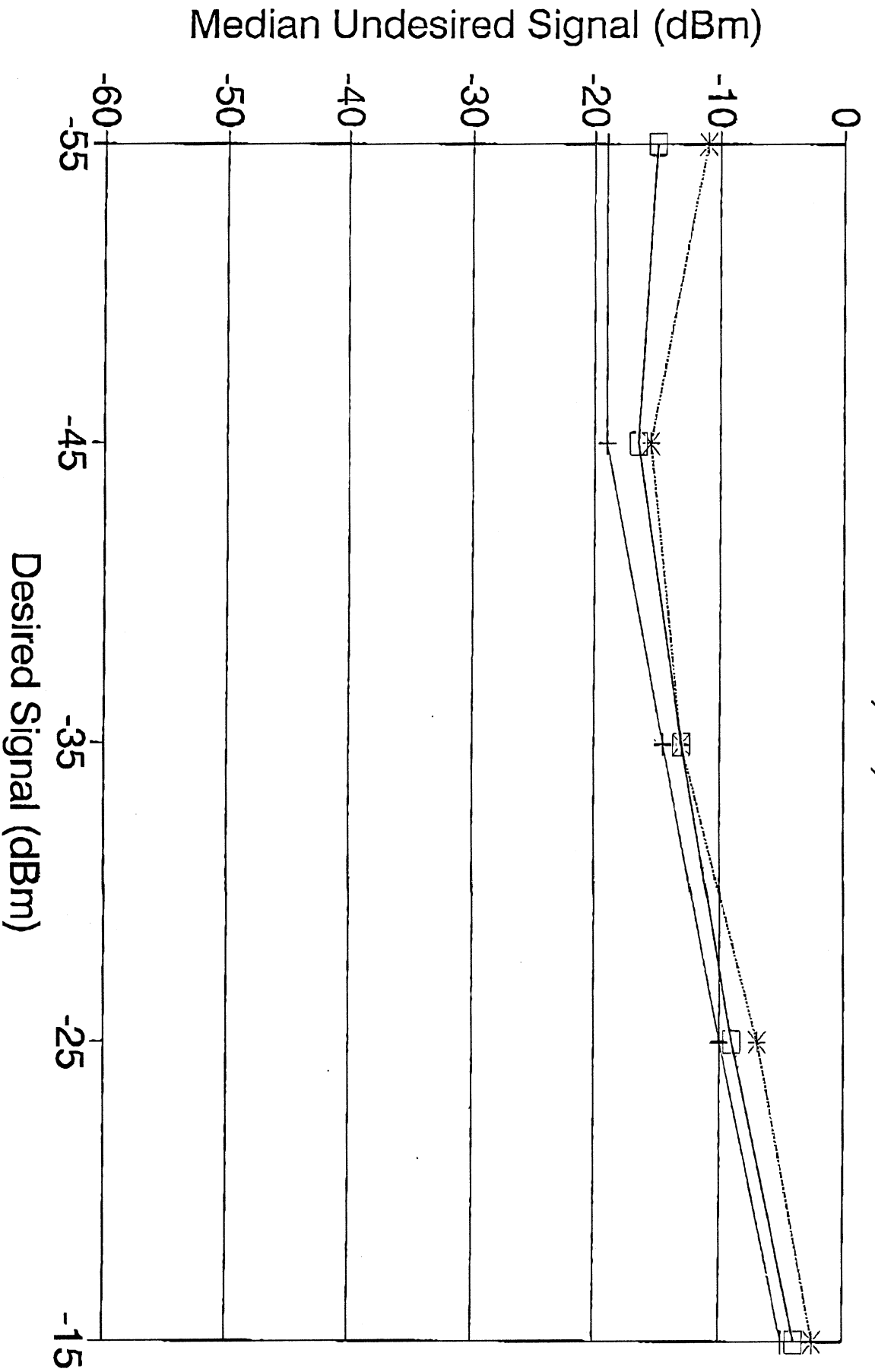
Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-1	-9	-9	-11	-8
2	-4	-10	-21	-33	-28
3	-5	-3	-9	-17	-12
4	-4	M	M	-3	-4
5	-3	-11	-21	-26	-25
6	-3	-3	-11	-9	-12
7	-7	-10	-19	-27	-30
8	M	M	M	-2	M
9	-4	-7	-18	-25	-26
10	M	M	M	-7	-10
11	M	M	M	-4	-3
12	-2	-11	-18	-20	-20
13	-13	-18	-30	-36	-30
14	-2	-5	-13	-17	-17
15	-1	-7	-13	-20	-19
16	-1	-6	-13	-21	-21
17	M	-7	-11	-16	-10
18	-12	-11	-13	-13	-13
19	-2	-4	-7	-9	-4
20	M	M	M	-5	-6
21	-4	-12	-10	-15	-9
22	-3	-8	-13	-12	-4
23	M	-7	-13	-16	-12
24	M	M	-3	-5	-1
25	-6	-12	-19	-23	-15
26	-10	-12	-15	-25	-29
27	-16	-18	-24	-33	-29
28	-2	-10	-13	-15	-15
29	-1	M	-5	-10	-14
30	M	M	-4	-11	-19

Rcvr. Desired Signal Levels (dBm) for Channel N  
 No. -15 -25 -35 -45 -55

31	-3	-4	-14	-20	-18
32	M	M	-2	-4	0
33	M	M	-4	-5	-3
34	M	M	-3	-4	-3
35	M	M	-3	-3	M
36	-1	-9	-13	-19	-24
37	-6	-14	-22	-32	-34
38	M	M	-5	-6	0
39	-11	-19	-25	-24	-14
40	-13	-7	-14	-19	-22
41	-13	-7	-15	-23	-22
42	-13	-25	-31	-40	-35
43	-5	-14	-21	-25	-19
44	-1	-4	-9	-10	-8
45	-5	-9	-19	-26	-22
46	M	-6	-11	-14	-9
47	-11	-14	-14	-11	-9
48	M	-5	-17	-23	-32
49	-10	-16	-17	-23	-20
50	-3	-10	-16	-22	-21

DESIRED	-15	-25	-35	-45	-55
SIG (dBm)	-15	-25	-35	-45	-55
CASES	35	37	45	50	48
MEAN	-5.743	-9.838	-13.78	-16.78	-15.83
S.D.	4.507	4.947	6.990	9.603	9.753
MEDIAN	-4.000	-9.000	-13.00	-16.50	-15.00
MINIMUM	-16.00	-25.00	-31.00	-40.00	-35.00
MAXIMUM	-1.000	-3.000	-2.000	-2.000	0.000

# UHF IF, N, N+8





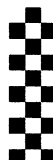
Television Interference Type: IF

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N-8

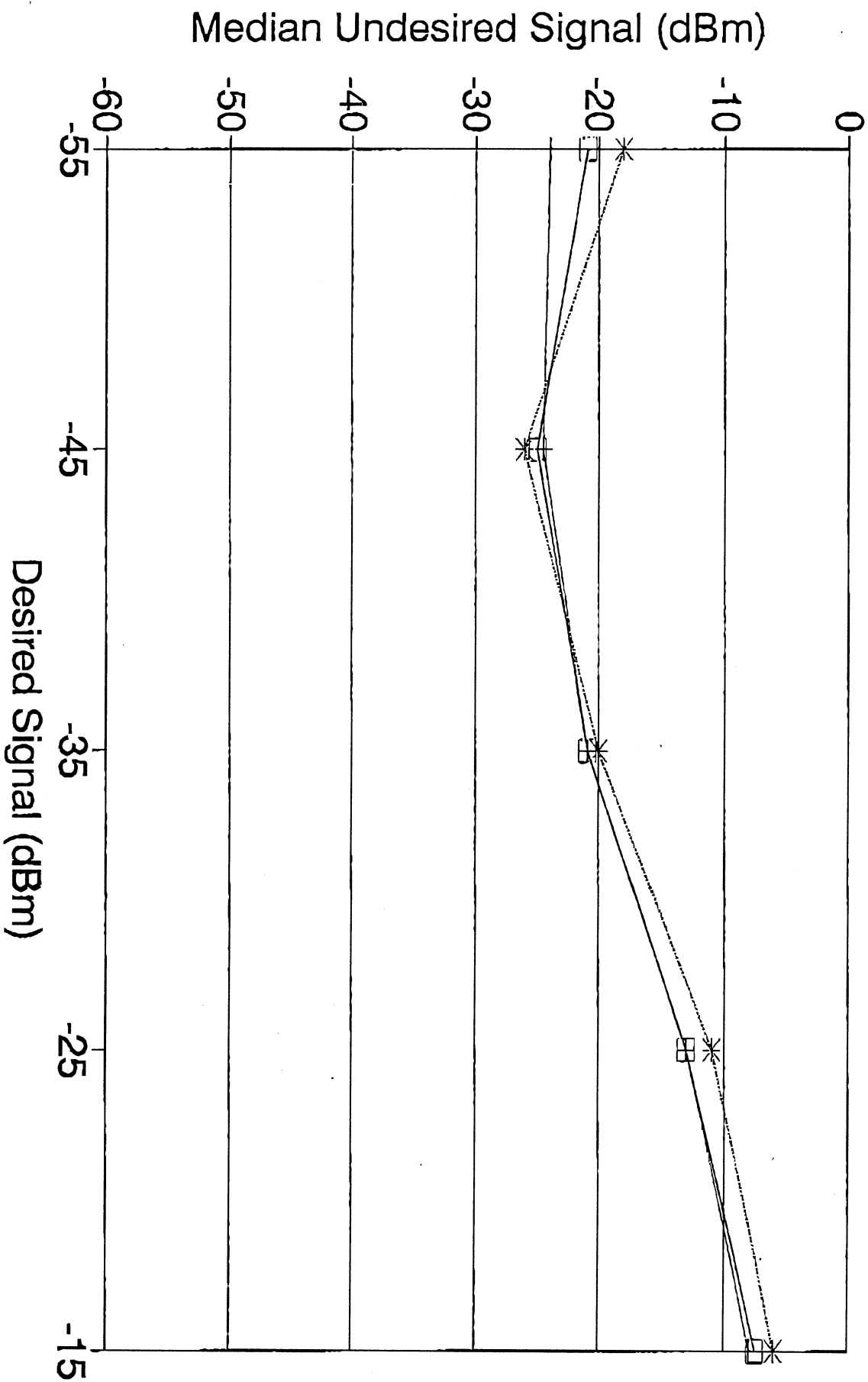
Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-2	-11	-21	-26	-25
2	-2	-6	-11	-20	-17
3	-5	-12	-23	-31	-26
4	-5	-11	-22	-25	-19
5	-2	-10	-21	-30	-29
6	-11	-18	-16	-14	-5
7	M	-5	-13	-20	-19
8	-9	-7	-7	-6	-4
9	-6	-4	-15	-18	-15
10	M	M	-6	-16	-25
11	M	M	-3	-14	-15
12	-7	-16	-28	-33	-30
13	-10	-19	-26	-32	-27
14	-1	-7	-14	-15	-12
15	M	-11	-20	-26	-21
16	M	-7	-16	-24	-22
17	-8	-17	-26	-29	-20
18	-11	-19	-27	-27	-16
19	-5	-5	-12	-10	-4
20	0	M	-8	-9	-5
21	-6	-16	-26	-30	-25
22	-9	-18	-29	-28	-18
23	M	-10	-18	-26	-18
24	-1	-9	-20	-19	-11
25	-12	-22	-31	-30	-23
26	-14	-17	-26	-35	-34
27	-11	-16	-24	-34	-33
28	-5	-15	-25	-33	-28
29	0	M	-6	-15	-19
30	M	M	-7	-18	-25

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-9	-17	-28	-36	-27
32	M	-1	-4	-4	-2
33	M	M	-3	-9	-9
34	M	-3	-6	-10	-9
35	M	-2	-1	-7	M
36	-11	-13	-22	-30	-33
37	-14	-23	-31	-41	-39
38	-1	M	-5	-4	-6
39	-19	-26	-34	-35	-30
40	-8	-7	-21	-30	-29
41	-6	-13	-23	-35	-34
42	-11	-22	-28	-36	-35
43	-15	-25	-33	-41	-33
44	M	-6	-10	-20	-24
45	-9	-18	-24	-21	-20
46	-11	-16	-22	-24	-21
47	-12	-16	-17	-14	-11
48	-1	0	-3	-10	-21
49	-7	-14	-24	-27	-23
50	-4	-11	-25	-25	-22

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	38	43	50	50	49
MEAN	-7.368	-12.58	-18.22	-23.04	-20.78
S.D.	4.704	6.634	9.285	10.04	9.350
MEDIAN	-7.500	-13.00	-21.00	-25.00	-21.00
MINIMUM	-19.00	-26.00	-34.00	-41.00	-39.00
MAXIMUM	0.000	0.000	-1.000	-4.000	-2.000



# UHF IF, N, N-8



Television Interference Type: IF

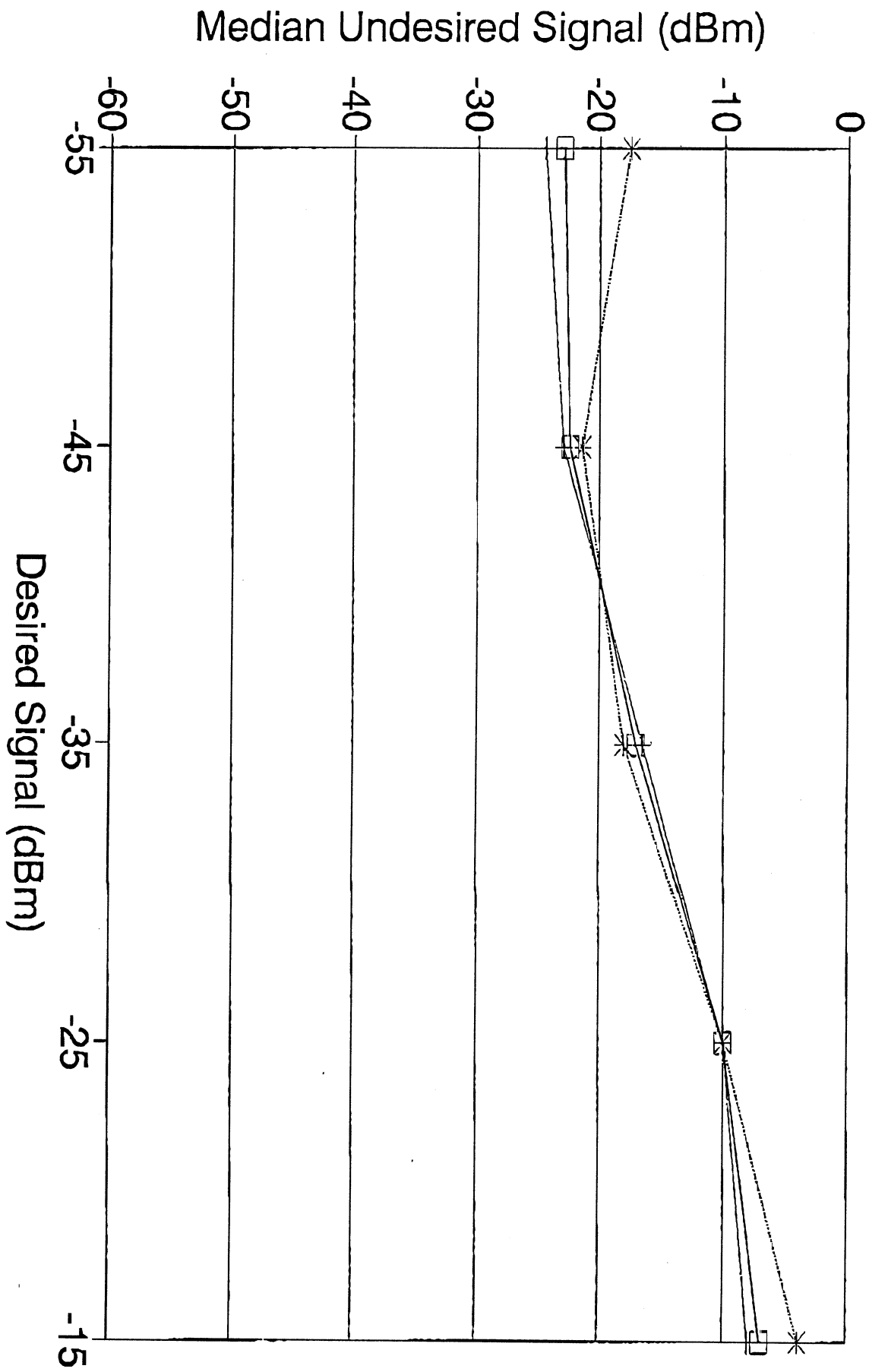
Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N-7

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-6	-15	-24	-29	-29
2	-2	-3	-12	-22	-19
3	-5	-8	-19	-27	-25
4	M	-6	-13	-14	-9
5	M	-5	-15	-23	-24
6	-8	-9	-10	-9	-4
7	M	-7	-16	-24	-22
8	M	-3	-4	-5	-3
9	-7	-6	-17	-17	-20
10	M	M	-5	-16	-25
11	M	M	-8	-19	-22
12	-7	-16	-26	-30	-29
13	-8	-16	-20	-24	-25
14	-2	-9	-15	-20	-15
15	M	-9	-13	-21	-17
16	M	-5	-13	-22	-20
17	-2	-11	-23	-25	-20
18	-10	-22	-32	-32	-23
19	-4	-3	-7	-6	-6
20	-2	M	-8	-10	-11
21	-7	-17	-27	-28	-28
22	-4	-9	-19	-23	-16
23	M	-10	-17	-21	-18
24	0	-10	-20	-17	-10
25	-11	-22	-30	-30	-30
26	-15	-18	-25	-33	-40
27	-15	-17	-25	-34	-36
28	-8	-17	-26	-36	-39
29	M	-1	-10	-22	-29
30	M	M	-8	-17	-24

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-13	-21	-29	-39	-40
32	M	-4	-10	-8	-7
33	M	M	-4	-6	-7
34	-1	-3	-10	-11	-10
35	M	-3	-7	-8	-5
36	0	-2	-14	-23	-27
37	-7	-12	-24	-32	-35
38	-2	M	-7	-12	-11
39	-17	-28	-35	-29	-28
40	-11	-10	-19	-29	-32
41	-11	-17	-26	-36	-40
42	-13	-12	-22	-31	-31
43	-11	-22	-31	-39	-40
44	-4	-7	-14	-25	-31
45	-6	-15	-21	-27	-23
46	-10	-19	-20	-17	-21
47	-10	-9	-10	-13	-15
48	-3	0	-6	-14	-22
49	-8	-16	-26	-36	-34
50	0	-10	-18	-21	-23

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	36	44	50	50	50
MEAN	-6.944	-11.00	-17.20	-22.24	-22.40
S.D.	4.635	6.779	8.224	9.244	10.37
MEDIAN	-7.000	-10.00	-17.00	-22.50	-23.00
MINIMUM	-17.00	-28.00	-35.00	-39.00	-40.00
MAXIMUM	0.000	0.000	-4.000	-5.000	-3.000

# UHF IF, N, N-7



Television Interference Type: IF

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+7

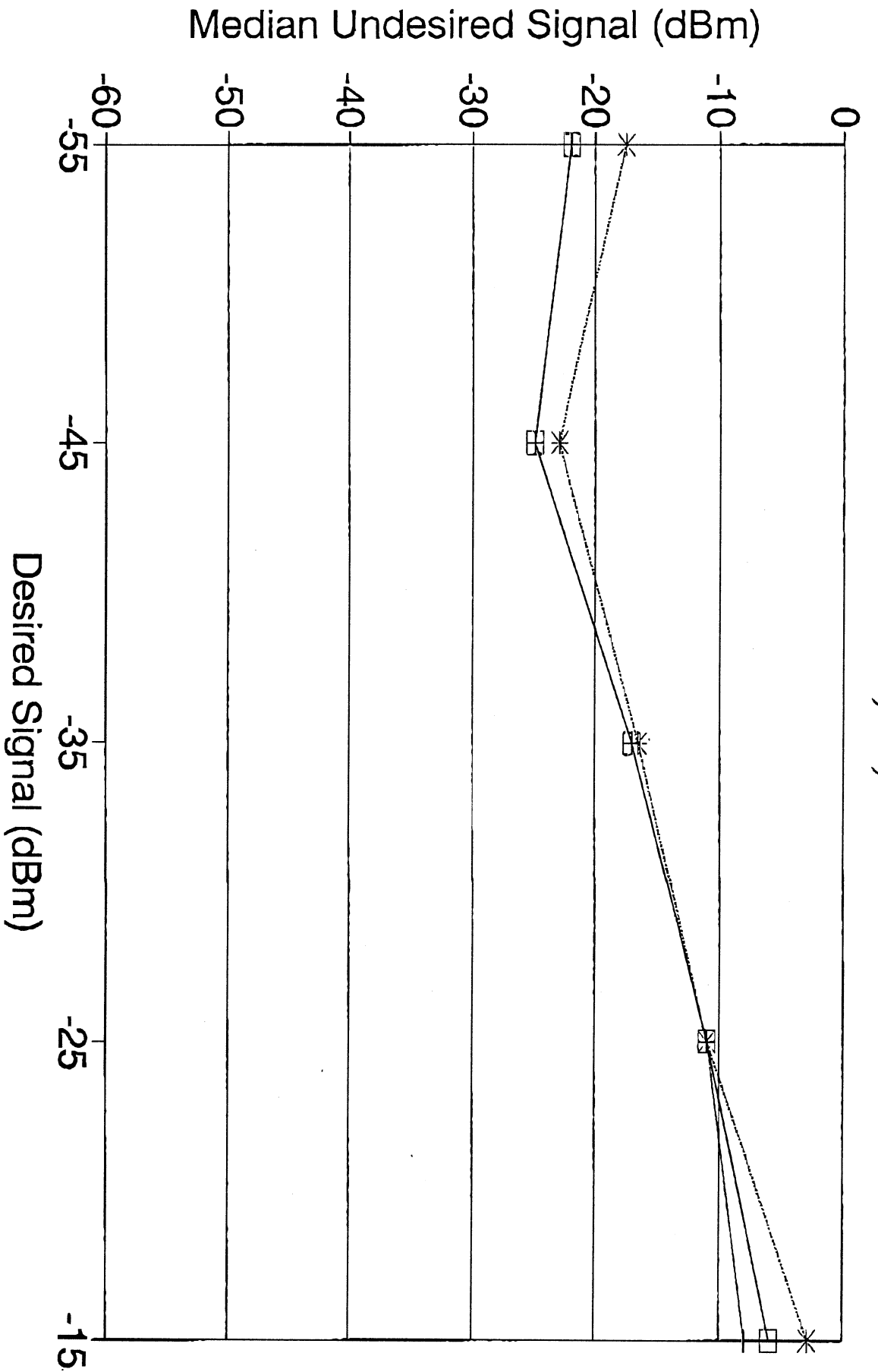
Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-4	-11	-15	-20	-19
2	M	-11	-23	-35	-33
3	-8	-8	-14	-24	-18
4	-3	-9	-14	-20	-14
5	-4	-9	-12	-17	-17
6	-13	-8	-11	-17	-20
7	-8	-10	-21	-29	-28
8	M	-3	-1	0	0
9	-4	-6	-15	-23	-22
10	M	M	-3	-10	-20
11	M	M	M	-8	-14
12	-6	-15	-23	-26	-26
13	-10	-16	-27	-34	-33
14	-3	-10	-18	-25	-24
15	-6	-14	-24	-32	-30
16	-3	-11	-16	-25	-26
17	-2	-11	-20	-21	-16
18	-11	-15	-19	-25	-23
19	-2	-4	-13	-13	-7
20	M	M	-1	-7	-8
21	-3	-11	-7	-13	-10
22	-2	-8	-10	-16	-6
23	-2	-11	-17	-27	-24
24	M	-3	-10	-12	-3
25	-5	-13	-22	-25	-19
26	-13	-14	-21	-31	-37
27	-17	-23	-29	-41	-38
28	-5	-13	-16	-22	-22
29	-6	-8	-17	-26	-33
30	-75	-7	-14	-25	-35

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-8	-12	-17	-26	-24
32	M	-2	-5	-9	-8
33	M	-2	-8	-14	-15
34	M	-3	-9	-13	-14
35	M	0	-8	-10	-8
36	-6	-12	-22	-30	-32
37	-6	-11	-20	-27	-31
38	M	M	-6	-9	-5
39	-14	-20	-25	-26	-21
40	-18	-16	-23	-31	-34
41	-12	-14	-19	-25	-29
42	-10	-20	-29	-36	-32
43	-7	-16	-23	-28	-22
44	-4	-10	-13	-14	-19
45	-14	-21	-29	-35	-31
46	-3	-9	-18	-25	-22
47	-12	-14	-13	-13	-9
48	-6	-11	-21	-30	-34
49	-15	-24	-30	-37	-35
50	-8	-15	-23	-29	-33

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	39	46	49	50	50
MEAN	-9.179	-11.17	-16.61	-22.32	-21.66
S.D.	11.71	5.495	7.438	9.195	10.11
MEDIAN	-6.000	-11.00	-17.00	-25.00	-22.00
MINIMUM	-75.00	-24.00	-30.00	-41.00	-38.00
MAXIMUM	-2.000	0.000	-1.000	0.000	0.000



# UHF IF, N, N+7



Television Interference Type: Sound Image

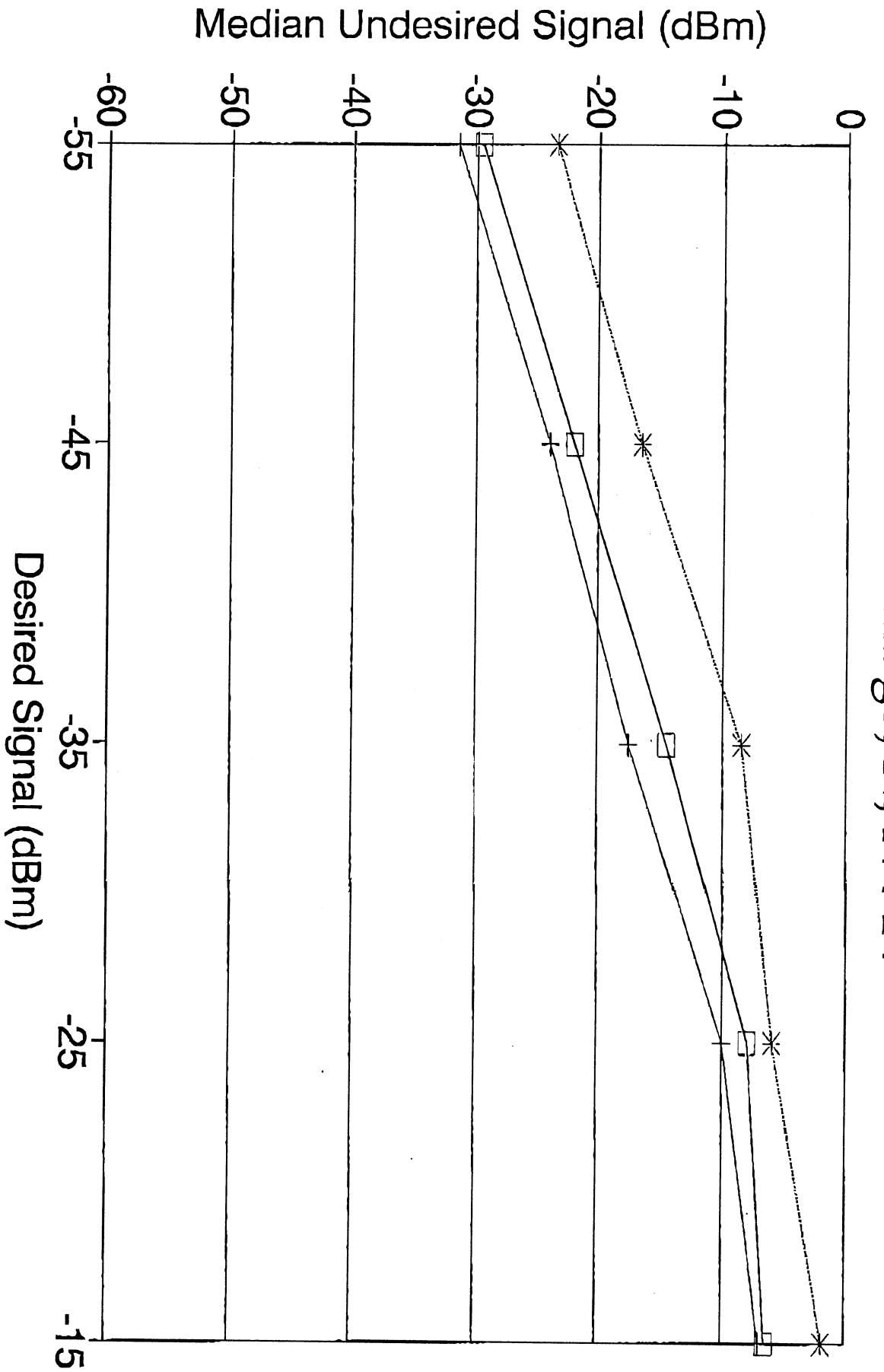
Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+14

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
-4	-10	-20	-30	-36	
2	M	-10	-22	-34	-42
3	-19	-9	-12	M	-9
4	-17	-2	-9	-22	-32
5	M	-1	-8	-15	-23
6	-15	-20	-32	-41	-48
7	-3	M	8	5	13
8	M	-2	-11	-21	-29
9	-12	-19	-25	-35	-44
10	M	-7	-17	-25	-32
11	-4	-6	-18	-30	-37
12	-5	-13	-19	-31	-38
13	M	0	-12	-20	-29
14	-1	-5	-8	-13	-20
15	M	M	-6	-13	-23
16	-3	-7	-12	-20	-26
17	M	M	M	-5	-13
18	-5	-3	-7	-15	-21
19	M	M	-9	-18	-24
20	M	M	-8	-20	-25
21	0	-7	-16	-25	-32
22	M	-7	-15	-24	-29
23	-2	-4	-8	-11	-16
24	M	M	M	-5	-16
25	M	M	-9	-20	-29
26	-7	-14	-14	-14	-19
27	-7	-11	-12	-19	-26
28	-8	-13	-21	-30	-38
29	M	-5	-18	-27	-38
30	M	-4	-16	-27	-35

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	M	-3	-11	-17	-25
32	-3	-13	-21	-30	-38
33	-3	0	M	-9	-17
34	M	M	M	-6	-13
35	M	-6	-10	-18	-25
36	-3	-8	-13	-19	-25
37	-6	-13	-21	-30	-36
38	-16	-18	-19	-19	-24
39	-2	-8	-15	-24	-31
40	-12	-15	-18	-22	-30
41	-10	-10	-13	-22	-31
42	-10	-19	-28	-34	-41
43	-12	-18	-25	-32	-39
44	M	-6	-14	-22	-33
45	-7	-17	-29	-36	-42
46	-1	-6	-11	-23	-31
47	-16	-27	-36	-47	-52
48	-30	-32	-27	-35	-44
49	-3	-9	-11	-19	-25
50	-11	-16	-22	-26	-30

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	32	42	46	49	50
MEAN	-8.031	-10.07	-15.65	-22.35	-28.96
S.D.	6.645	7.097	7.928	9.877	11.18
MEDIAN	-6.500	-8.500	-14.50	-22.00	-29.50
MINIMUM	-30.00	-32.00	-36.00	-47.00	-52.00
MAXIMUM	0.000	0.000	8.000	5.000	13.00

# UHF Image, N, N+14



□ Total Sample    + TV Only Sample    \* VCR Only Sample

Television Interference Type: Picture Image

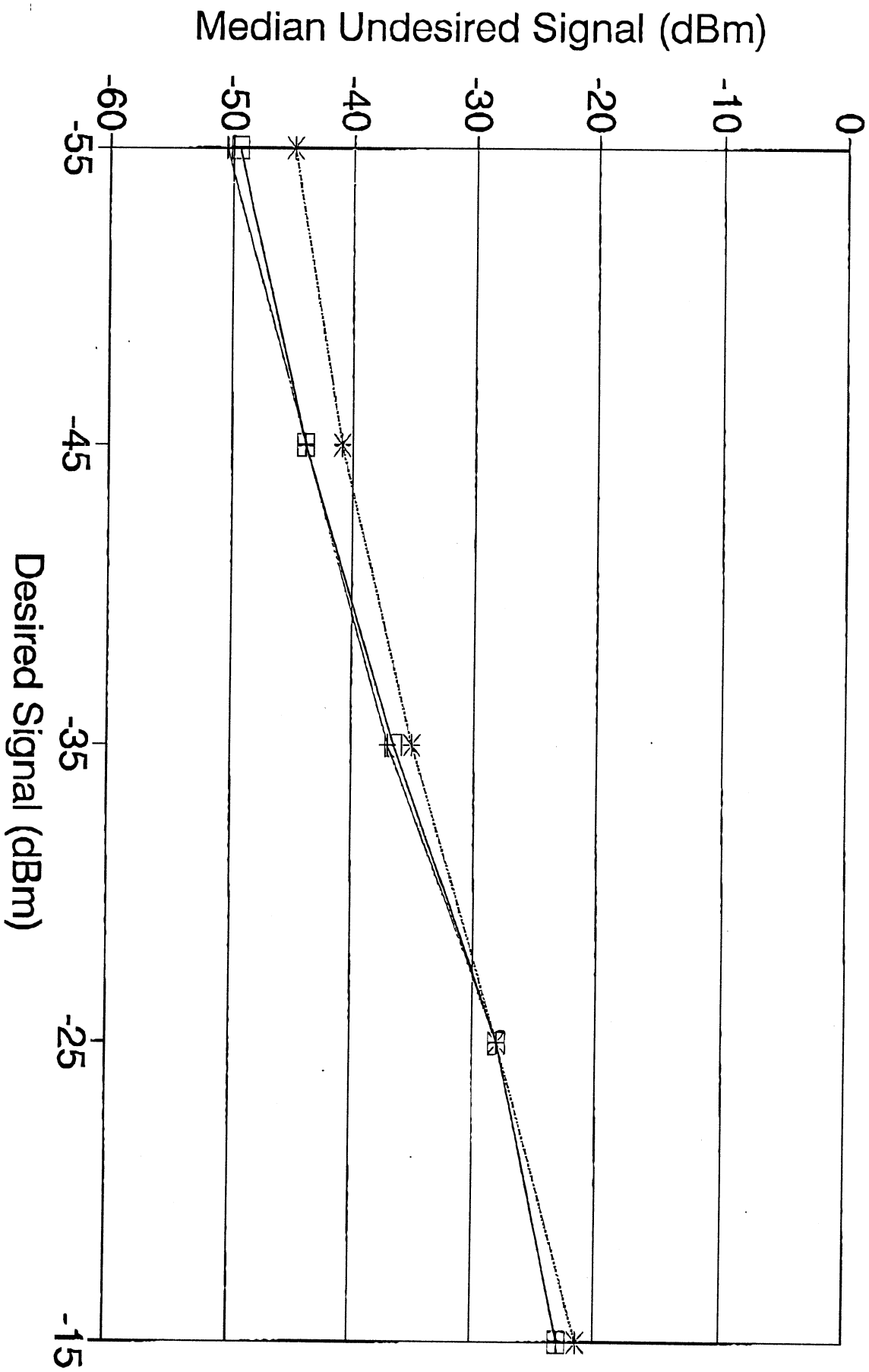
Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+15

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-21	-30	-38	-49	-55
2	-13	-24	-35	-46	-55
3	-50	-38	-39	-35	-39
4	-46	-34	-39	-51	-56
5	-13	-19	-28	-36	-40
6	-13	-22	-37	-44	-57
7	-12	-8	-15	-27	-36
8	-17	-28	-37	-47	-55
9	-30	-38	-46	-55	-61
10	M	-23	-33	-42	-51
11	-19	-21	-33	-44	-52
12	-19	-25	-35	-43	-49
13	-13	-26	-39	-47	-49
14	-31	-33	-37	-42	-44
15	-24	-25	-32	-40	-45
16	-26	-28	-34	-40	-45
17	-16	-21	-27	-36	-39
18	-19	-24	-33	-38	-37
19	-17	-29	-38	-47	-51
20	-18	-27	-36	-47	-51
21	-23	-32	-41	-50	-57
22	-30	-37	-46	-53	-54
23	-30	-28	-31	-36	-41
24	-5	-14	-22	-28	-32
25	-20	-29	-40	-49	-52
26	-26	-35	-34	-30	-32
27	-27	-30	-34	-42	-45
28	-31	-34	-45	-53	-58
29	-22	-24	-37	-49	-57
30	M	-21	-34	-46	-54

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-18	-28	-34	-44	-46
32	-19	-29	-39	-49	-53
33	-23	-27	-26	-33	-42
34	-11	-13	-22	-28	-35
35	-22	-23	-31	-41	-44
36	-26	-27	-34	-40	-50
37	-37	-44	-45	-52	-59
38	-36	-37	-41	-39	-41
39	-27	-33	-42	-49	-51
40	-27	-29	-32	-36	-46
41	-27	-25	-30	-40	-46
42	-22	-32	-41	-48	-54
43	-29	-39	-46	-51	-53
44	-24	-30	-39	-46	-52
45	-15	-26	-38	-46	-49
46	M	-21	-27	-37	-42
47	-31	-39	-53	-62	-66
48	-50	-52	-47	-51	-62
49	-22	-27	-33	-39	-44
50	-35	-40	-43	-43	-43

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	47	50	50	50	50
MEAN	-24.09	-28.56	-35.96	-43.32	-48.54
S.D.	9.571	7.895	7.068	7.424	7.893
MEDIAN	-23.00	-28.00	-36.50	-44.00	-49.50
MINIMUM	-50.00	-52.00	-53.00	-62.00	-66.00
MAXIMUM	-5.000	-8.000	-15.00	-27.00	-32.00

# UHF Image, N, N+15



Legend:  
—■— Total Sample  
---+--- TV Only Sample  
---\*--- VCR Only Sample

Television Interference Type: Adjacent Channel

Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N+1

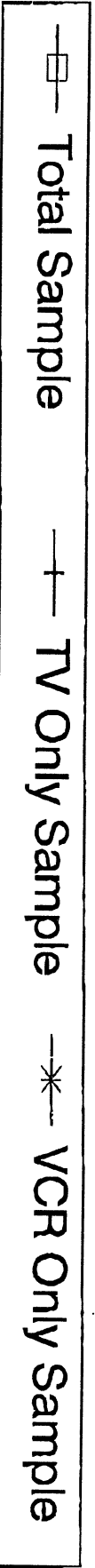
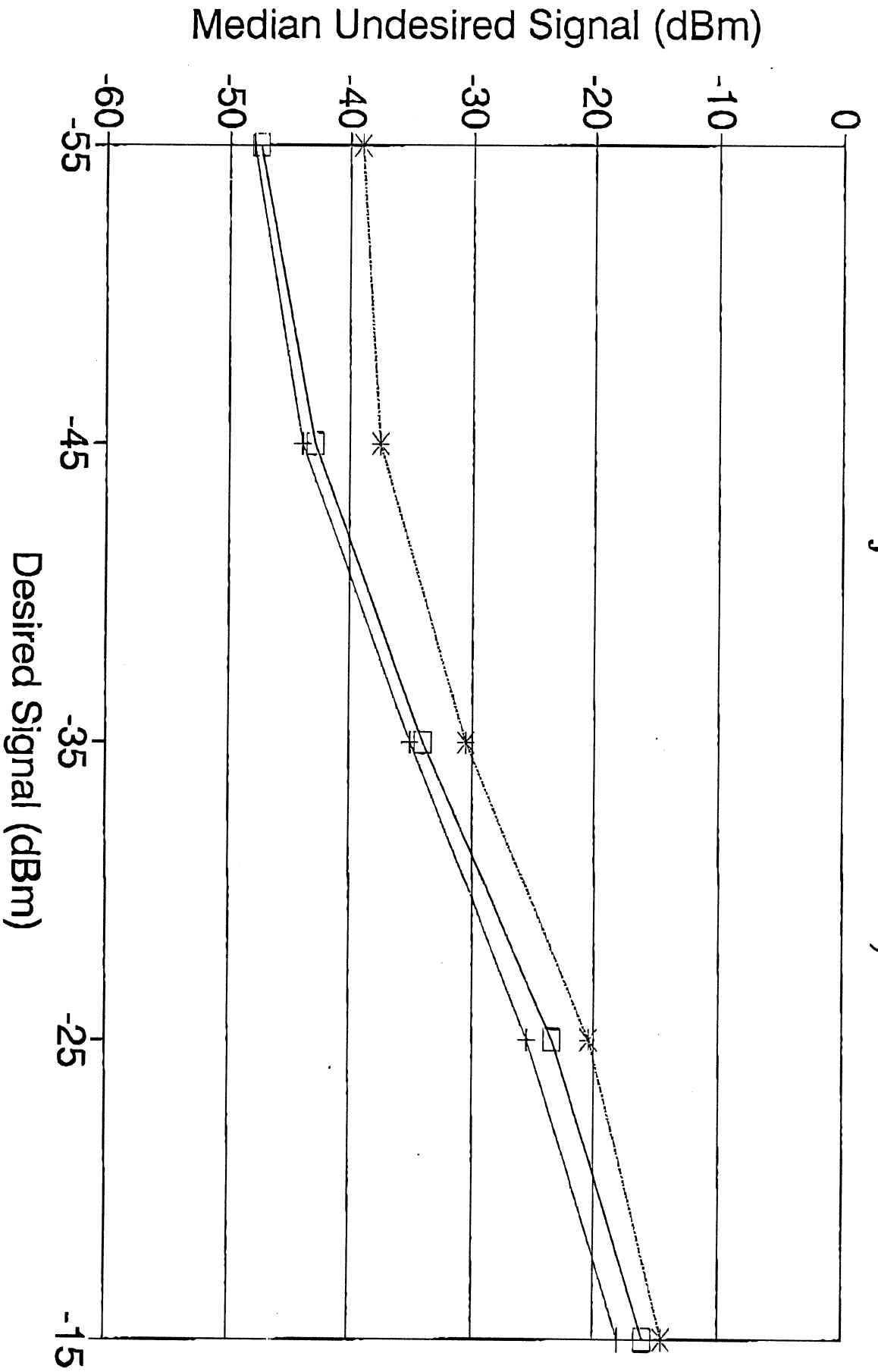
Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-27	-35	-44	-53	-63
2	-13	-22	-34	-44	-48
3	-20	-23	-33	-43	-49
4	-14	-21	-31	-42	-44
5	-15	-22	-31	-41	-46
6	-30	-24	-35	-45	-53
7	-19	-21	-29	-39	-41
8	-16	-21	-29	-39	-44
9	-13	-17	-27	-37	-41
10	M	-13	-23	-33	-43
11	-1	-12	-20	-29	-38
12	-13	-22	-29	-33	-36
13	-13	-23	-33	-42	-46
14	-12	-20	-30	-40	-40
15	-17	-25	-35	-44	-43
16	-16	-22	-32	-41	-50
17	-14	-21	-33	-37	-38
18	-17	-18	-30	-35	-35
19	-15	-16	-27	-29	-30
20	-13	-18	-26	-35	-40
21	-13	-22	-31	-36	-33
22	-20	-32	-42	-38	-35
23	-16	-23	-33	-43	-47
24	-12	-20	-29	-38	-42
25	-12	-18	-21	-23	-28
26	-18	-26	-37	-46	-52
27	-21	-31	-43	-50	-56
28	-14	-26	-36	-44	-48
29	-19	-29	-37	-47	-56
30	-13	-23	-36	-43	-48



Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-17	-27	-38	-46	-51
32	-16	-28	-36	-44	-51
33	-21	-26	-36	-45	-51
34	-16	-24	-34	-43	-46
35	-13	-23	-35	-45	-50
36	-15	-26	-37	-47	-48
37	-20	-30	-41	-47	-53
38	-13	-25	-35	-44	-47
39	-20	-31	-39	-48	-48
40	-19	-28	-37	-44	-50
41	-20	-22	-30	-43	-46
42	-19	-29	-39	-47	-51
43	-18	-29	-38	-44	-48
44	-11	-21	-32	-43	-51
45	-19	-27	-35	-43	-44
46	-20	-28	-39	-45	-48
47	-24	-28	-37	-48	-54
48	-15	-25	-33	-41	-46
49	-20	-30	-38	-47	-50
50	-21	-29	-34	-43	-50

DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	49	50	50	50	50
MEAN	-16.59	-24.04	-33.58	-41.72	-45.92
S.D.	4.569	4.840	5.171	5.686	6.877
MEDIAN	-16.00	-23.50	-34.00	-43.00	-47.50
MINIMUM	-30.00	-35.00	-44.00	-53.00	-63.00
MAXIMUM	-1.000	-12.00	-20.00	-23.00	-28.00

# UHF Adjacent Channel N, N+1



Television Interference Type: Adjacent Channel

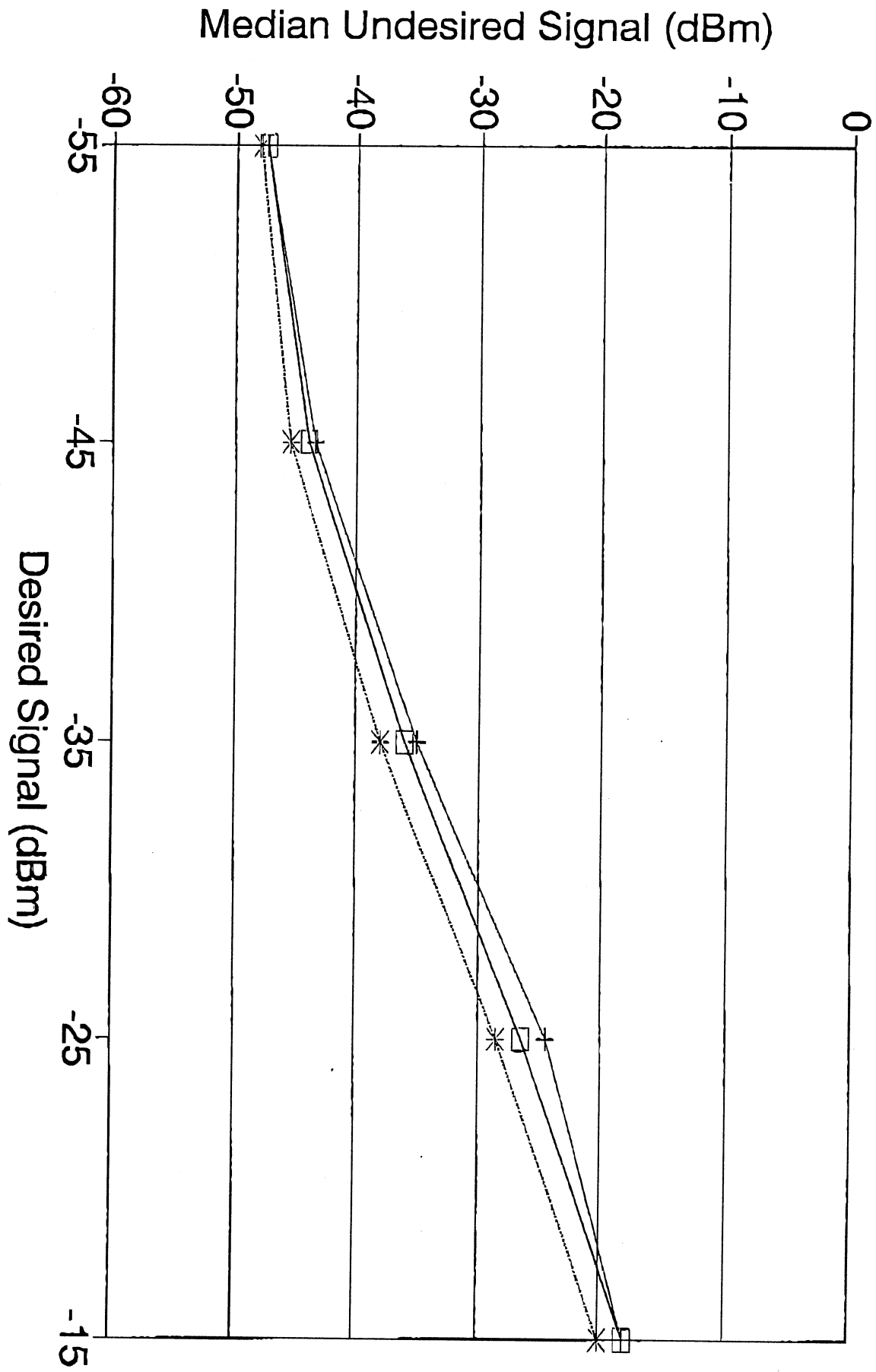
Undesired Signal Levels (dBm) for "Just Perceptible" Interference from Channels: N-1

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
1	-11	-19	-32	-38	-43
2	-20	-29	-39	-49	-55
3	-18	-25	-33	-42	-48
4	-19	-28	-37	-45	-47
5	-14	-24	-35	-43	-50
6	-18	-27	-36	-45	-51
7	-12	-21	-31	-38	-45
8	-23	-33	-41	-51	-58
9	-11	-18	-28	-36	-44
10	M	-25	-36	-45	-50
11	-10	-19	-30	-39	-45
12	-23	-32	-41	-49	-55
13	-23	-33	-42	-51	-54
14	-20	-30	-41	-51	-54
15	-20	-29	-38	-48	-54
16	-21	-31	-40	-49	-52
17	-20	-28	-38	-46	-50
18	-19	-28	-38	-45	-47
19	-25	-34	-41	-35	-39
20	-7	-14	-23	-33	-38
21	-20	-29	-38	-44	-47
22	-10	-20	-30	-42	-46
23	-19	-28	-37	-46	-49
24	-21	-31	-40	-48	-52
25	-14	-26	-35	-42	-45
26	-23	-31	-41	-49	-57
27	-23	-34	-42	-53	-55
28	-13	-22	-31	-41	-47
29	-11	-21	-31	-39	-42
30	-12	-22	-28	-36	-46

Rcvr. No.	Desired Signal Levels (dBm) for Channel N				
	-15	-25	-35	-45	-55
31	-21	-29	-39	-48	-50
32	-15	-24	-33	-42	-44
33	-12	-24	-30	-38	-42
34	-13	-24	-35	-40	-45
35	-9	-17	-30	-37	-43
36	-19	-30	-38	-49	-54
37	-16	-24	-36	-46	-56
38	-6	-17	-29	-38	-46
39	-18	-29	-38	-41	-43
40	-16	-23	-32	-39	-48
41	-18	-22	-32	-42	-47
42	-21	-26	-34	-44	-47
43	-11	-21	-32	-41	-43
44	-10	-19	-28	-37	-41
45	-19	-30	-44	-49	-55
46	-23	-32	-43	-48	-52
47	-15	-23	-33	-44	-46
48	-23	-31	-42	-50	-53
49	-19	-30	-37	-47	-52
50	-24	-35	-46	-53	-54

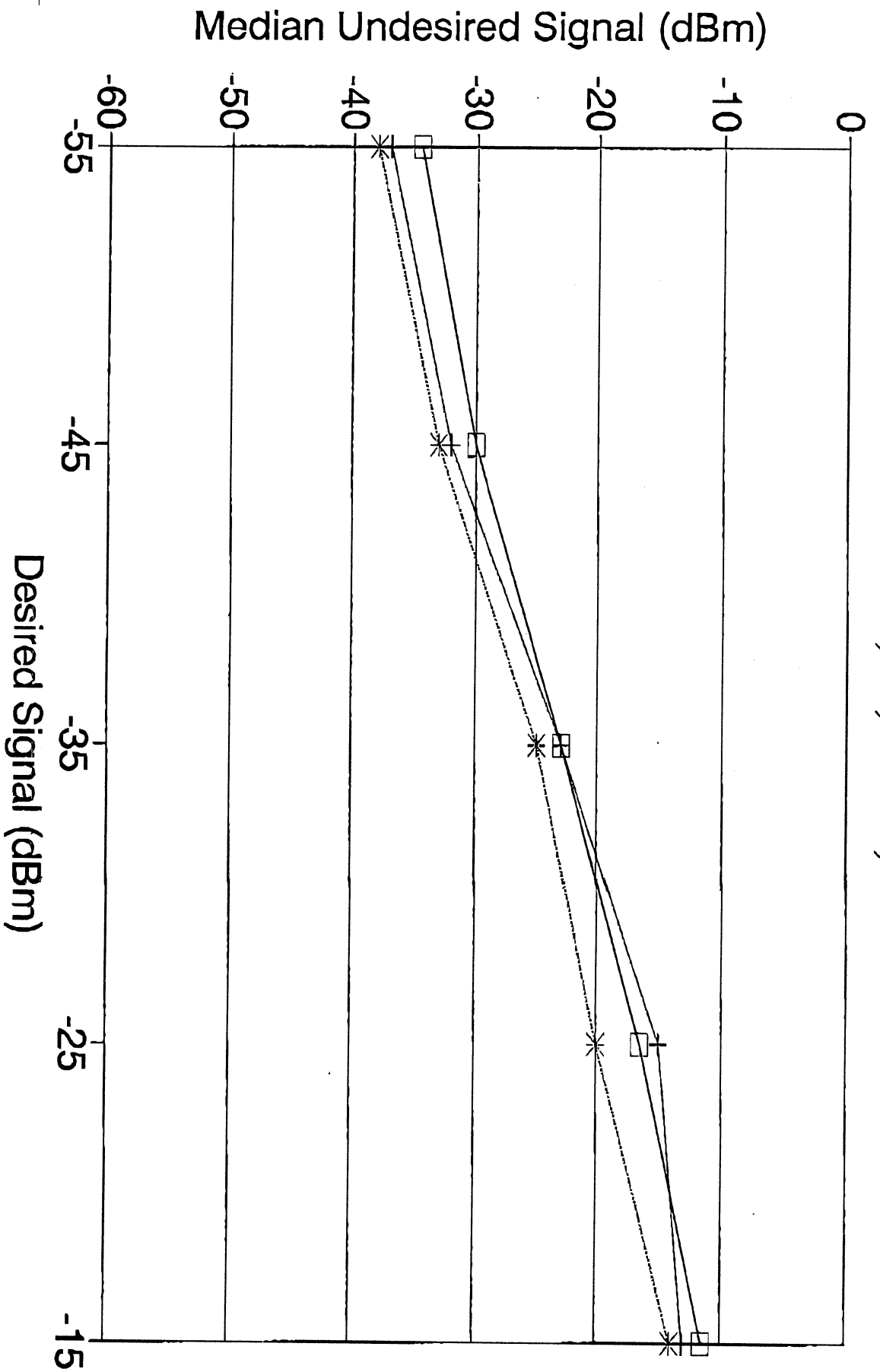
DESIRED SIG (dBm)	-15	-25	-35	-45	-55
CASES	49	50	50	50	50
MEAN	-16.90	-26.02	-35.68	-43.82	-48.52
S.D.	5.026	5.192	5.040	5.138	4.978
MEDIAN	-18.00	-26.50	-36.00	-44.00	-47.50
MINIMUM	-25.00	-35.00	-46.00	-53.00	-58.00
MAXIMUM	-6.000	-14.00	-23.00	-33.00	-38.00

# UHF Adjacent Channel N, N-1



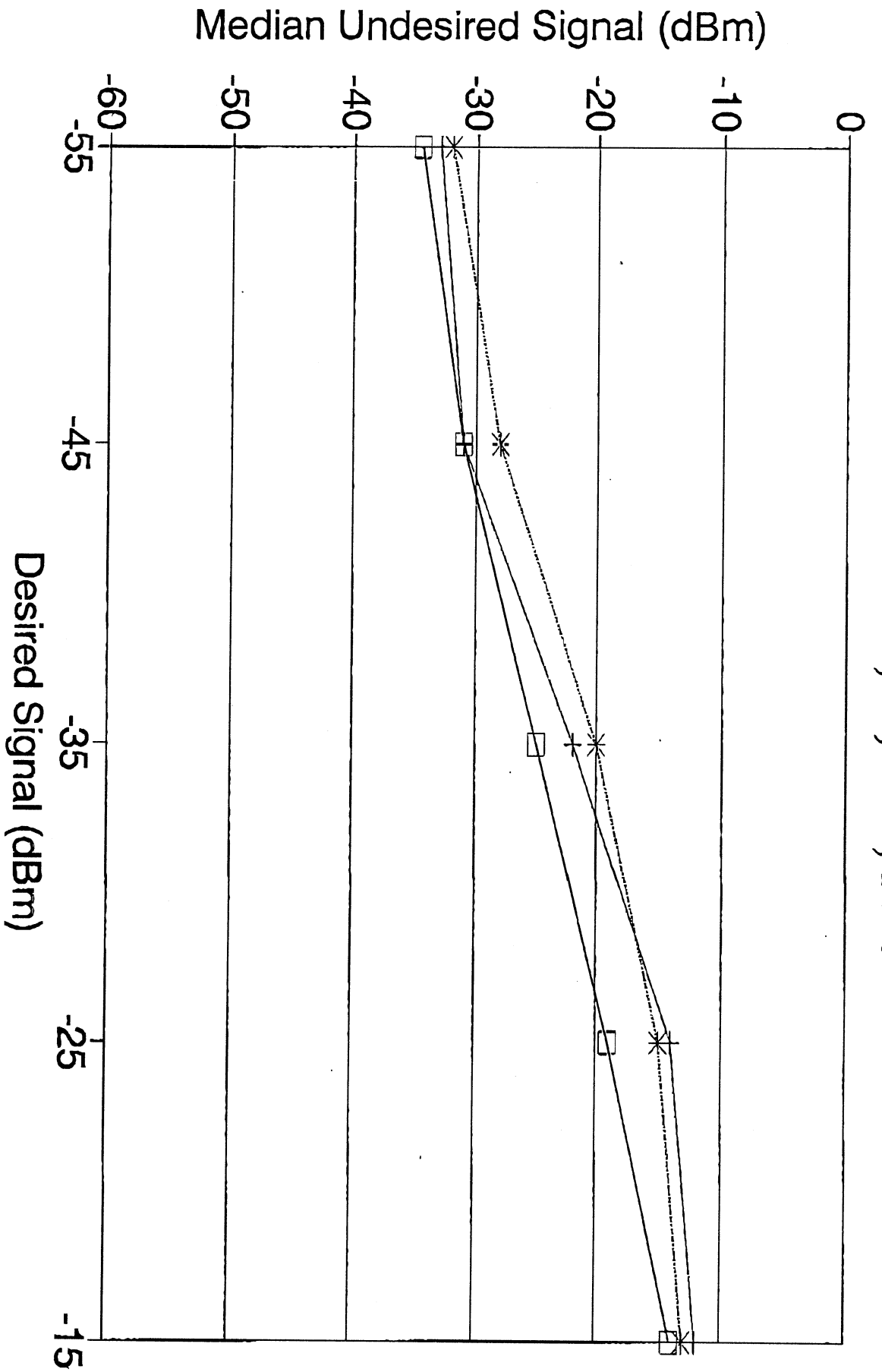
## APPENDIX C

# UHF IM, N, N+2, N+4



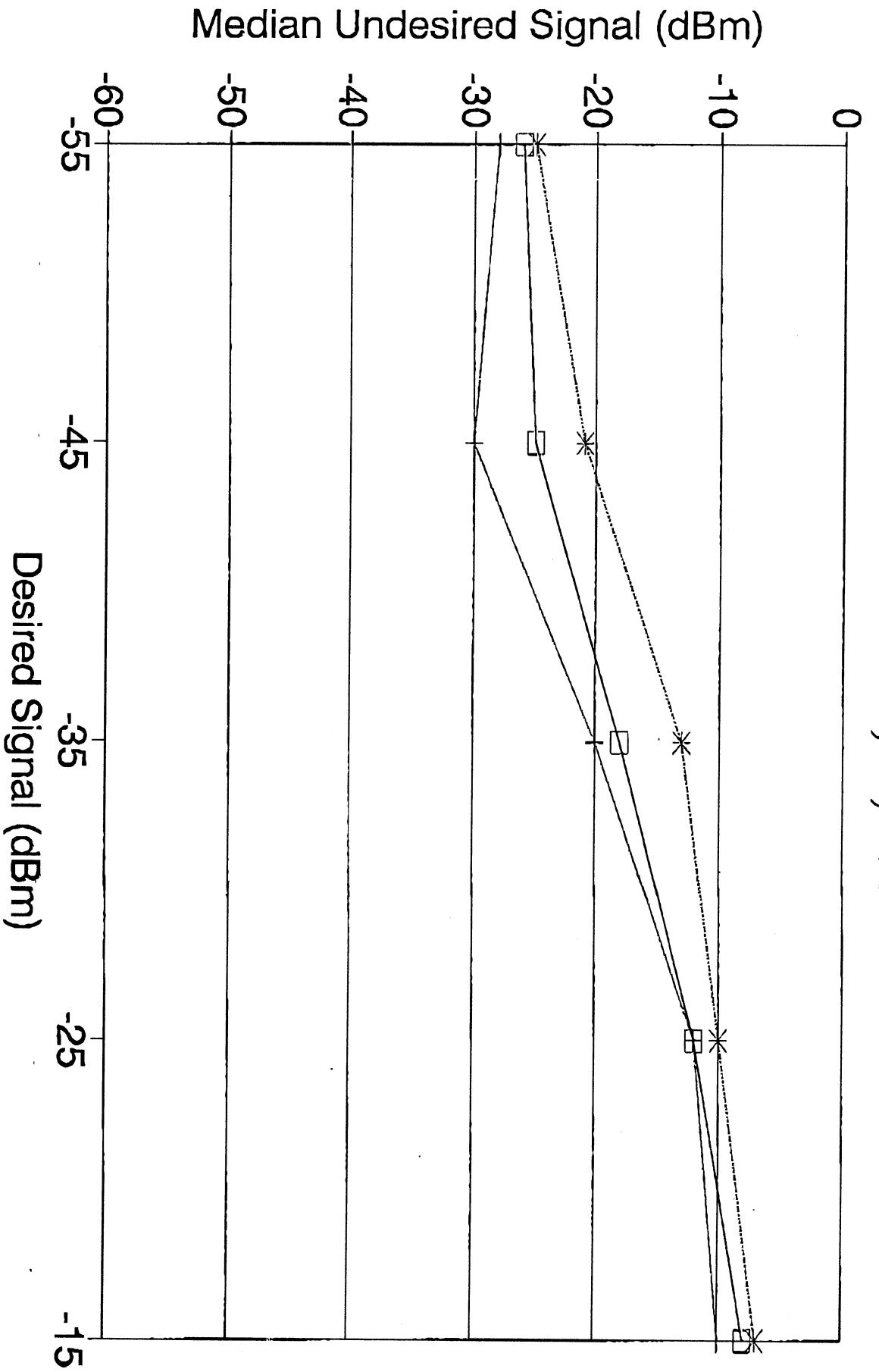
□ '91 50 Receivers    + '88 11 Receivers    \* '83 16 Receivers

# UHF IM, N, N-2, N-4



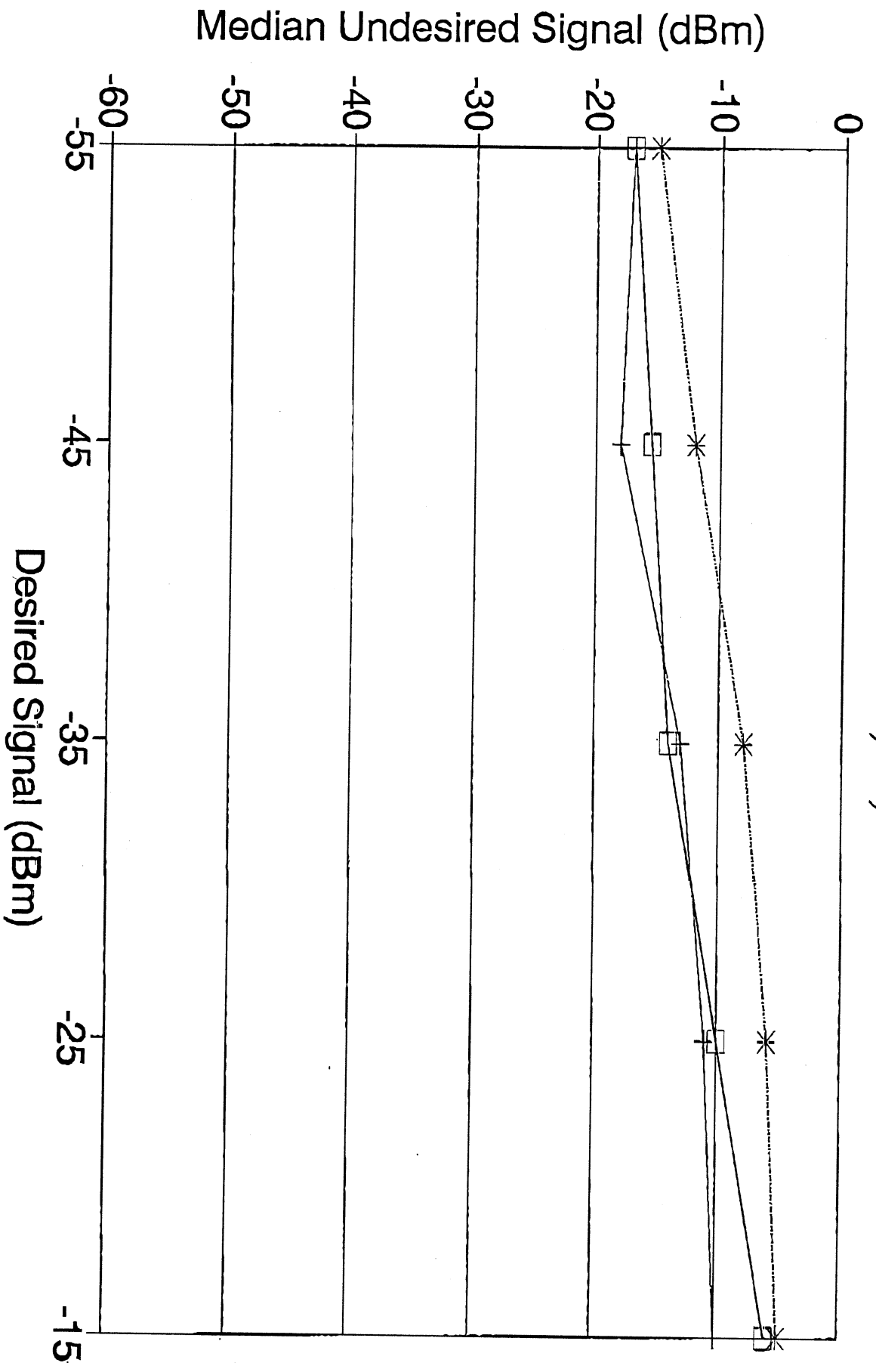


# UHF CM, N, N-2



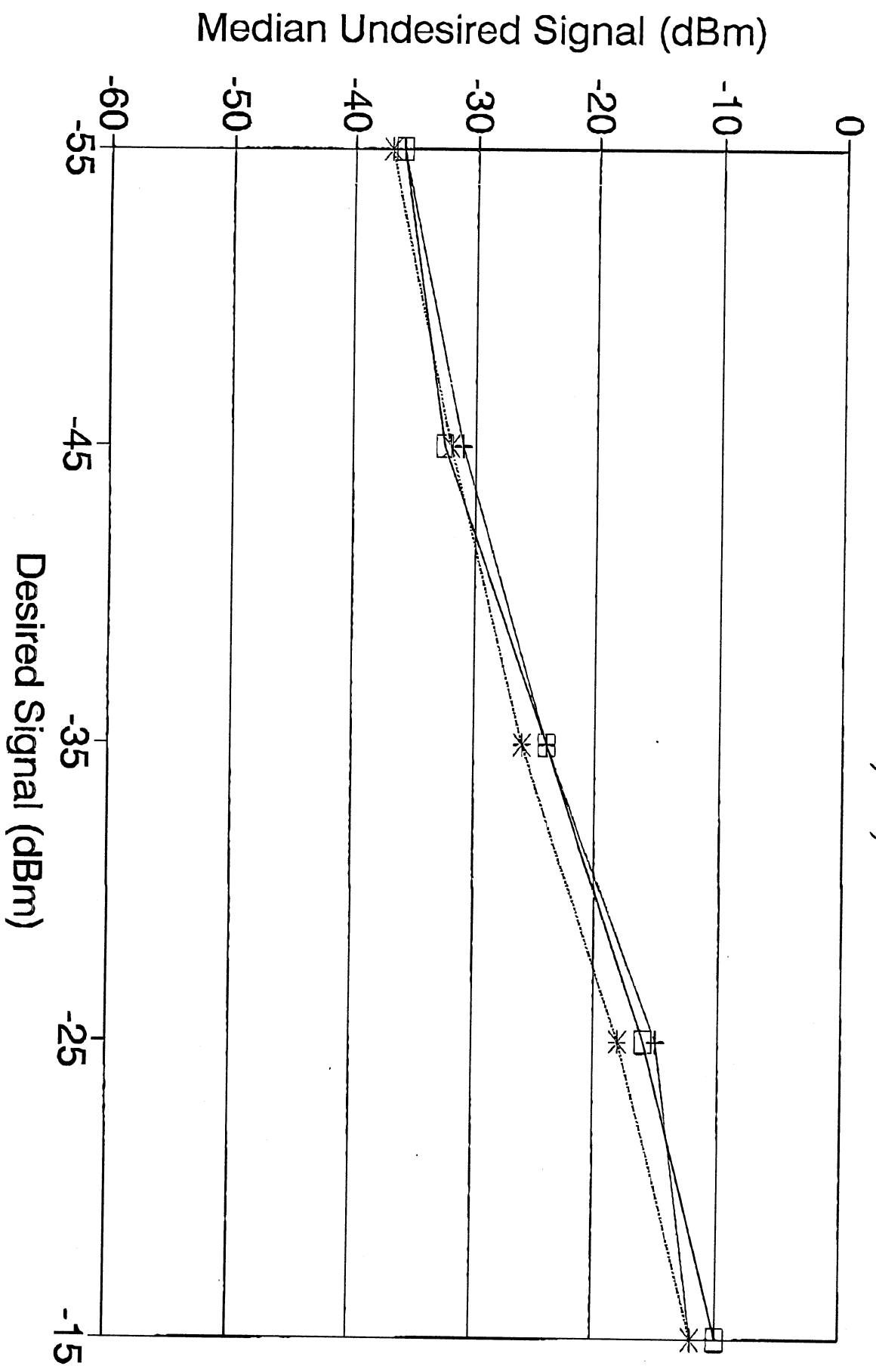
—□— '91 50 Receivers —+— '88 11 Receivers —\*— '83 16 Receivers

# UHF CM, N, N-4



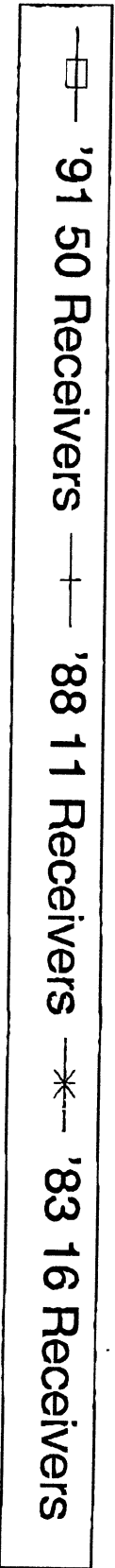
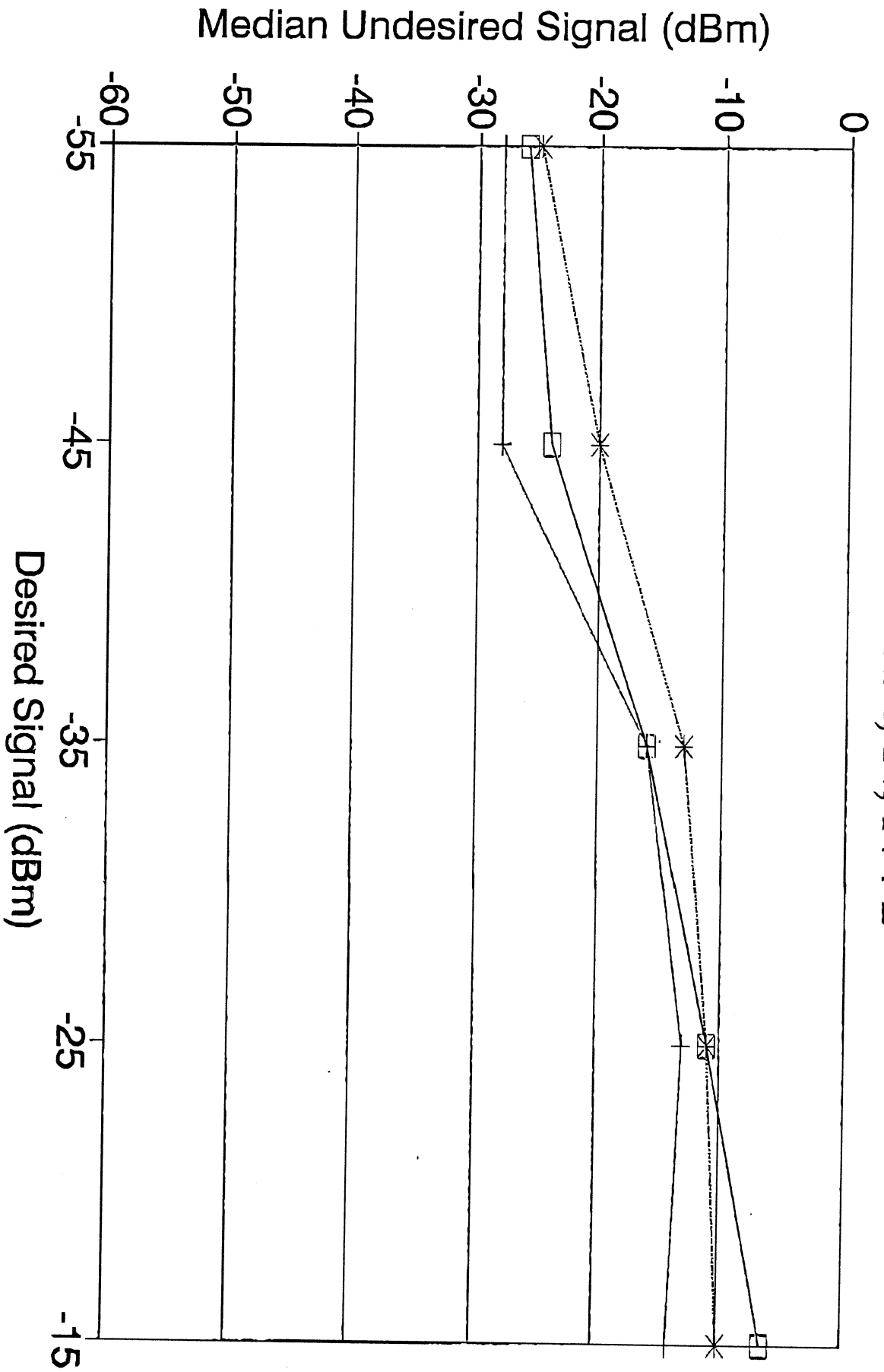
—□— '91 50 Receivers —+— '88 11 Receivers —\*— '83 16 Receivers

# UHF Half IF, N, N+4

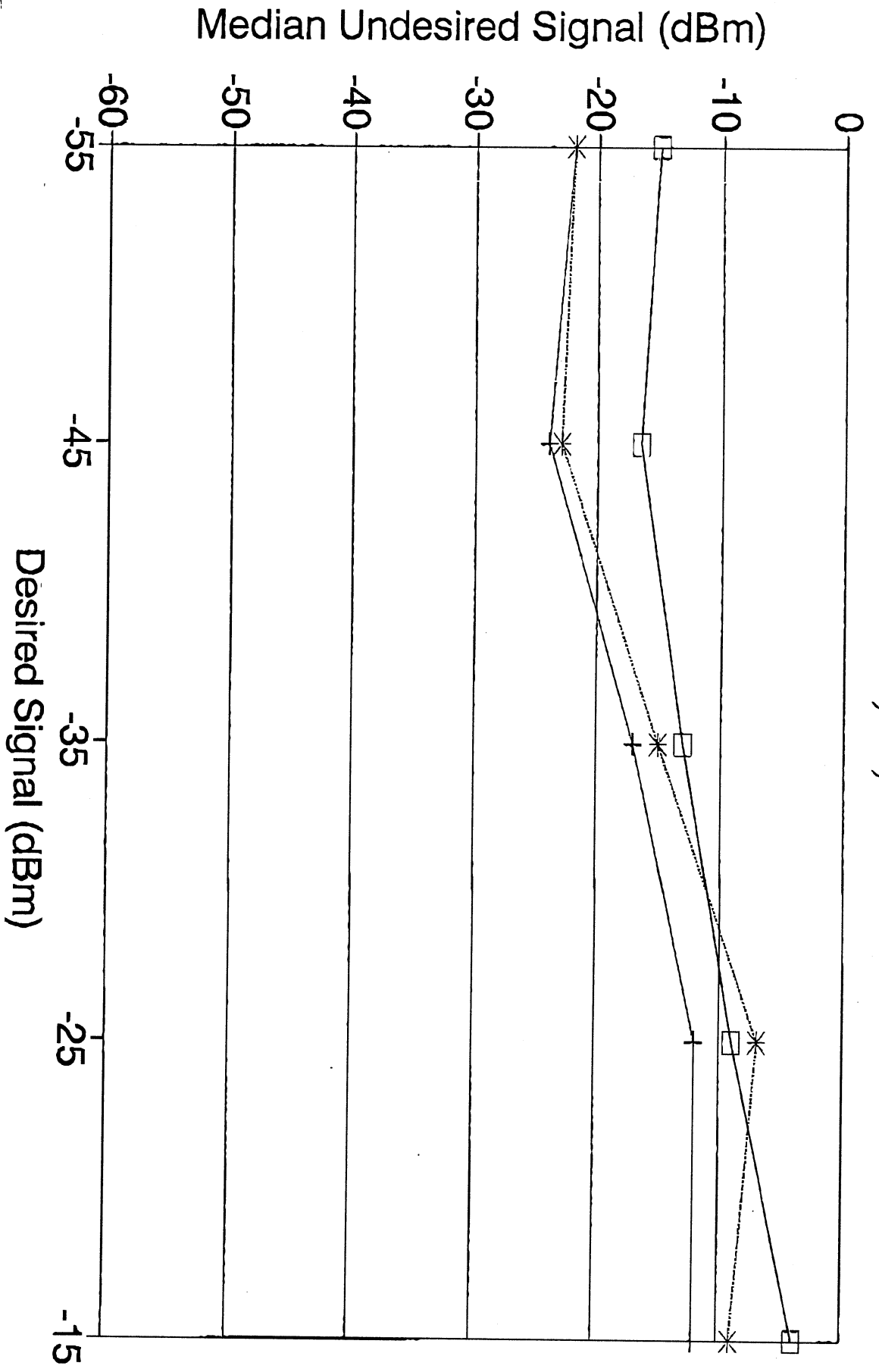


□ '91 50 Receivers    + '88 11 Receivers    \* '83 16 Receivers

# UHF CM, N, N+2

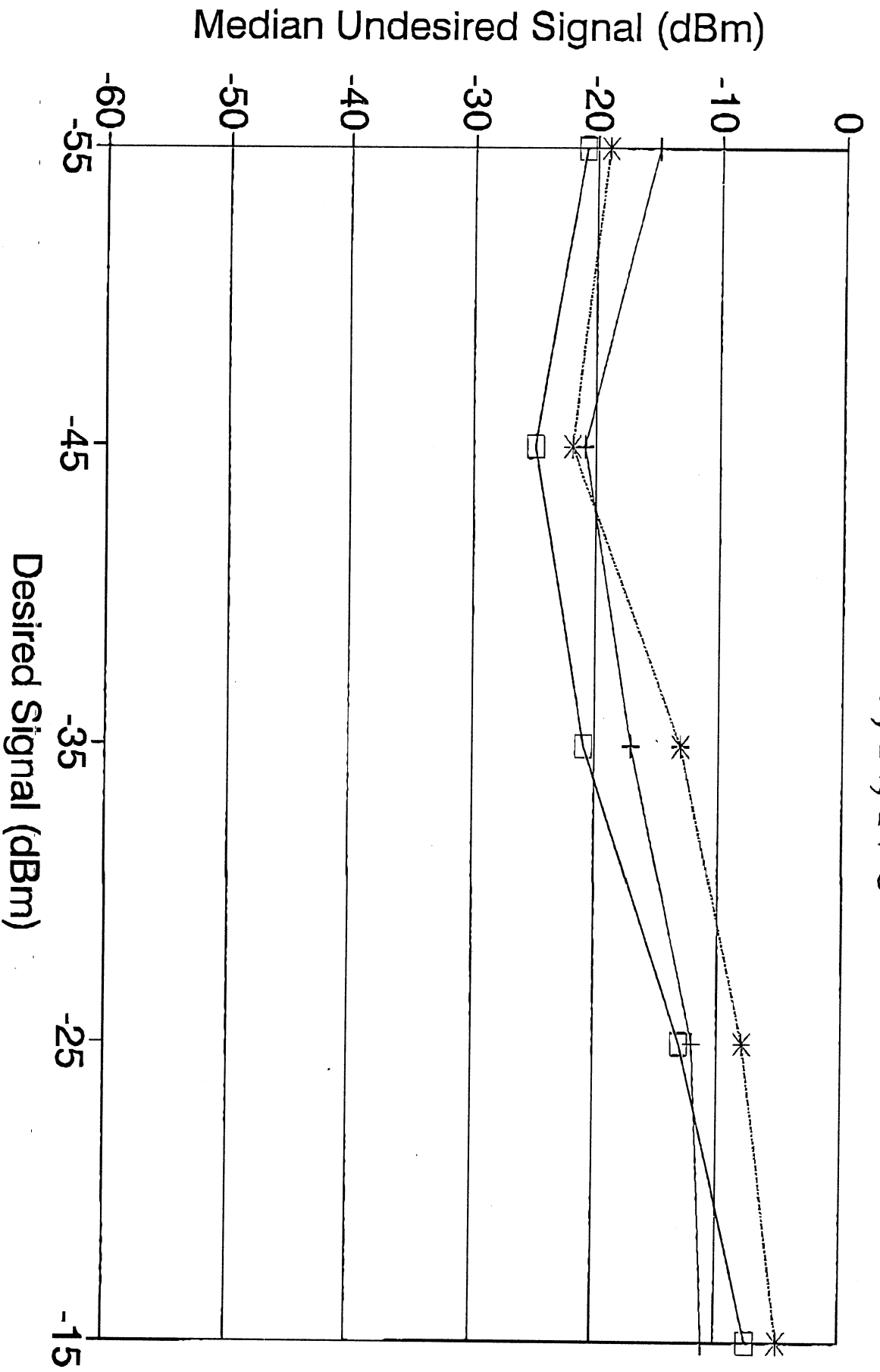


# UHF IE, N, N+8



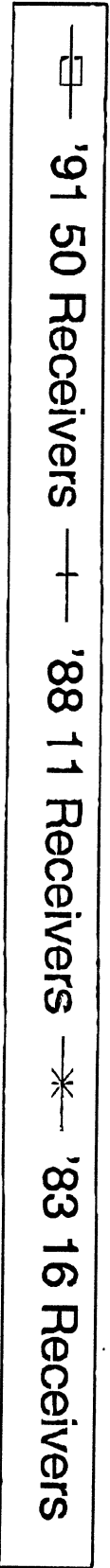
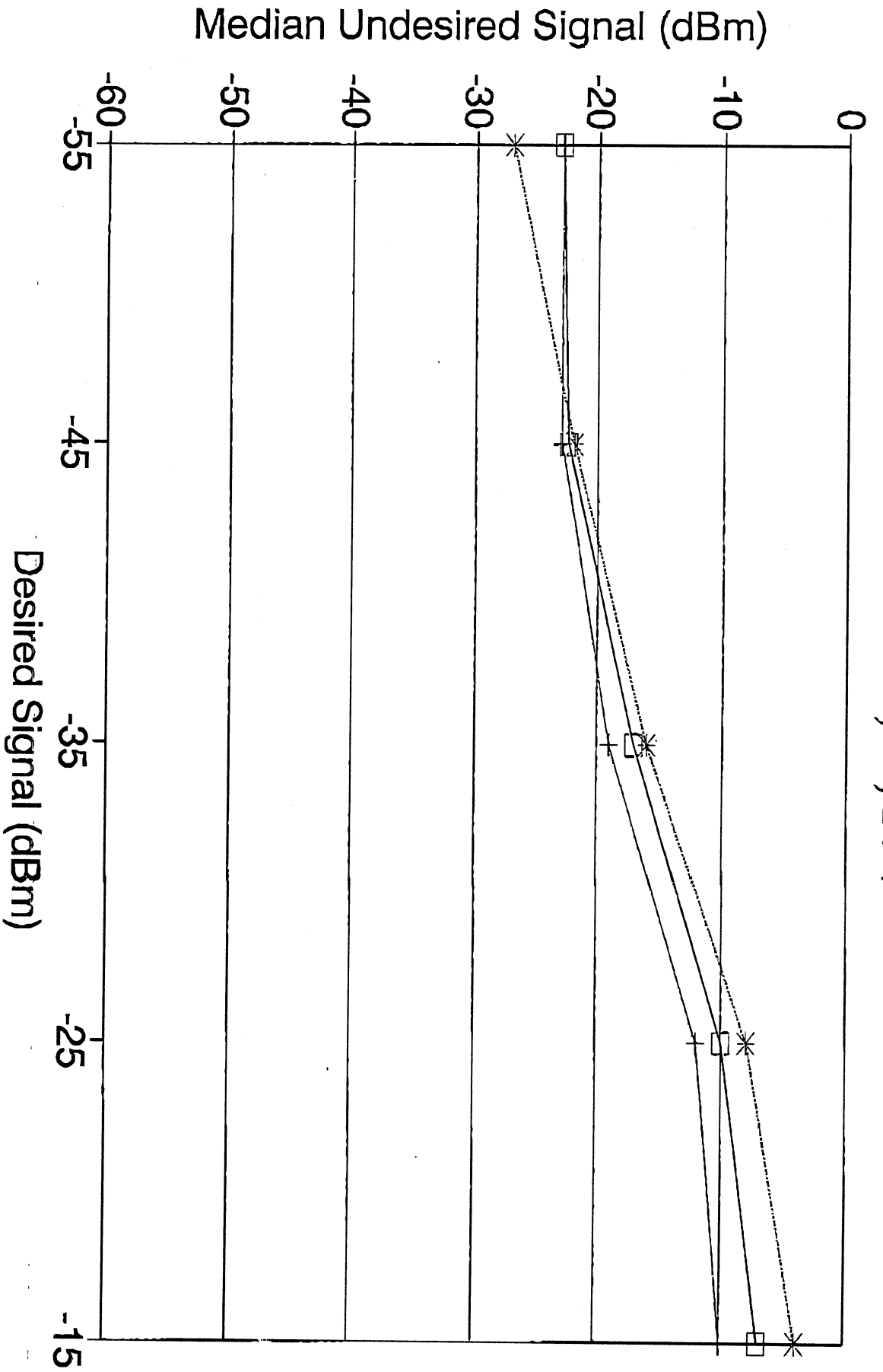
□ '91 50 Receivers    + '88 11 Receivers    \* '83 16 Receivers

# UHF IF, N, N-8

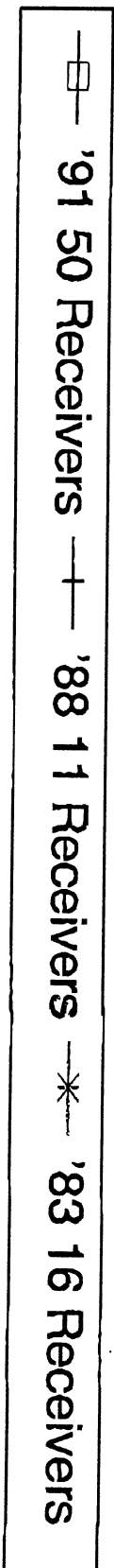
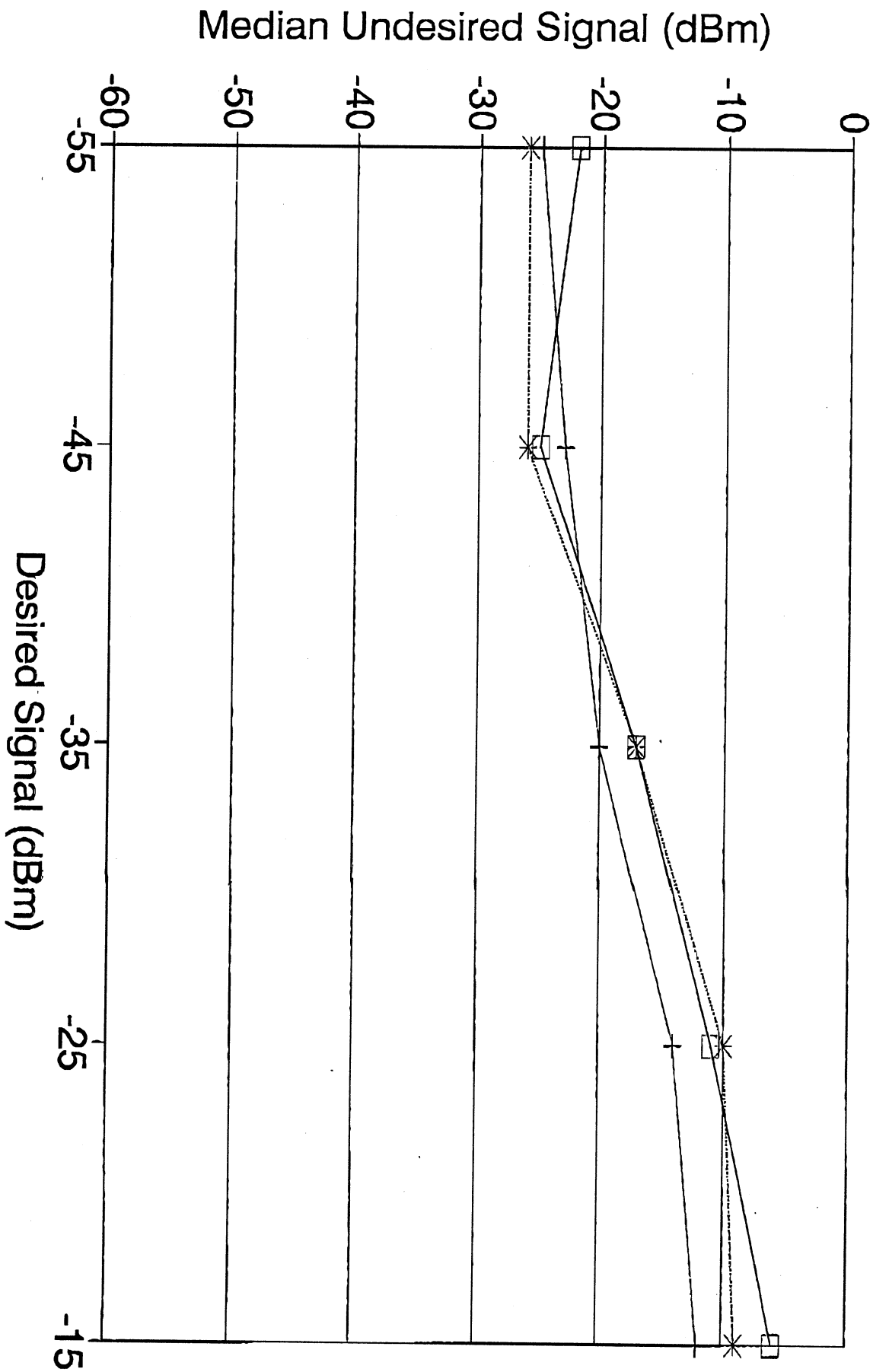


□ '91 50 Receivers    + '88 11 Receivers    \* '83 16 Receivers

# UHF IF, N, N-7

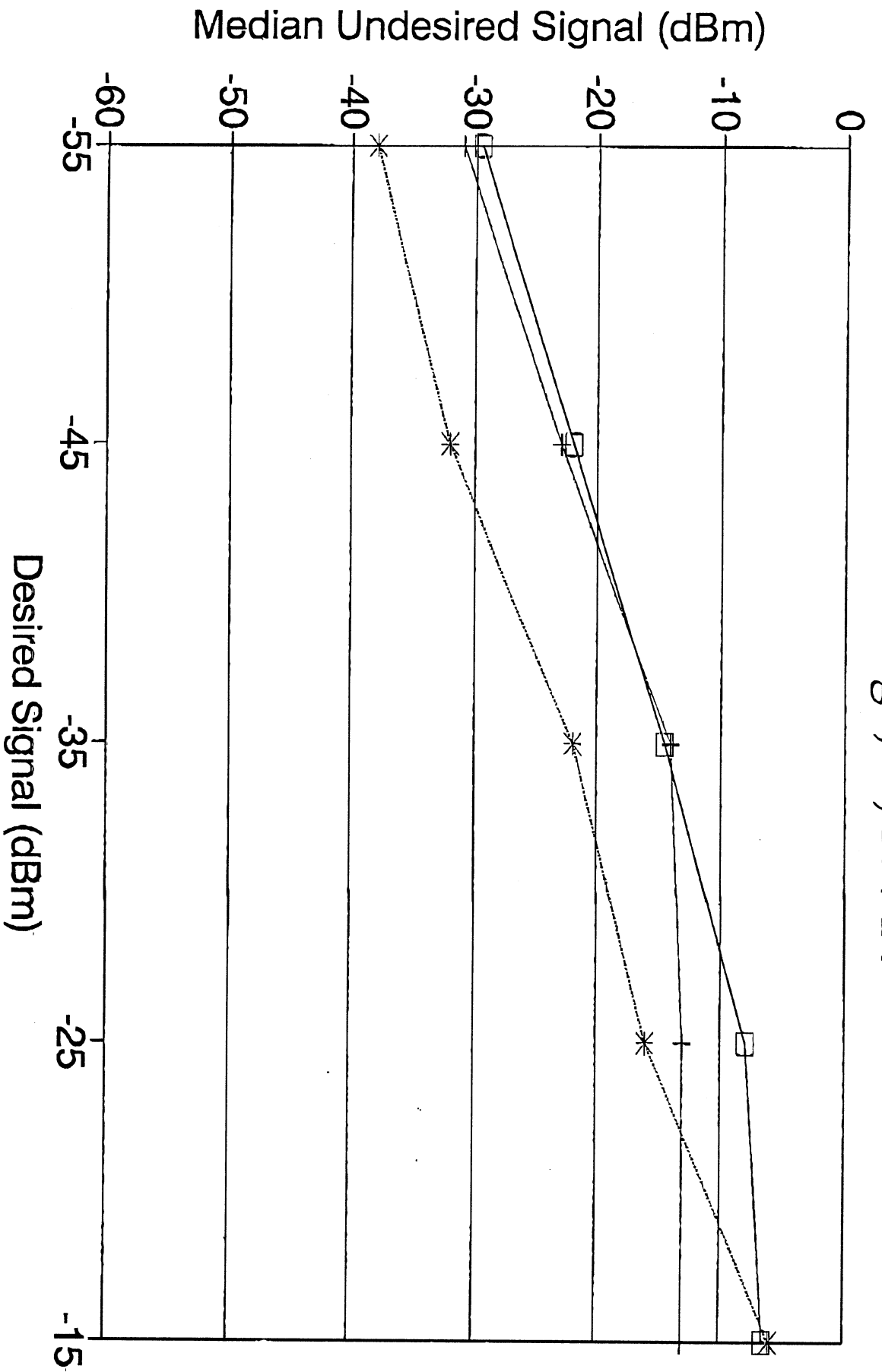


# UHF IF, N, N+7



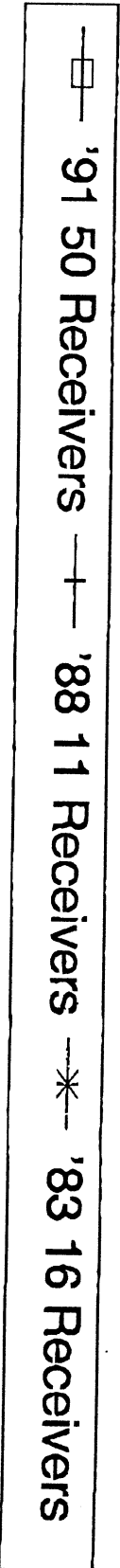
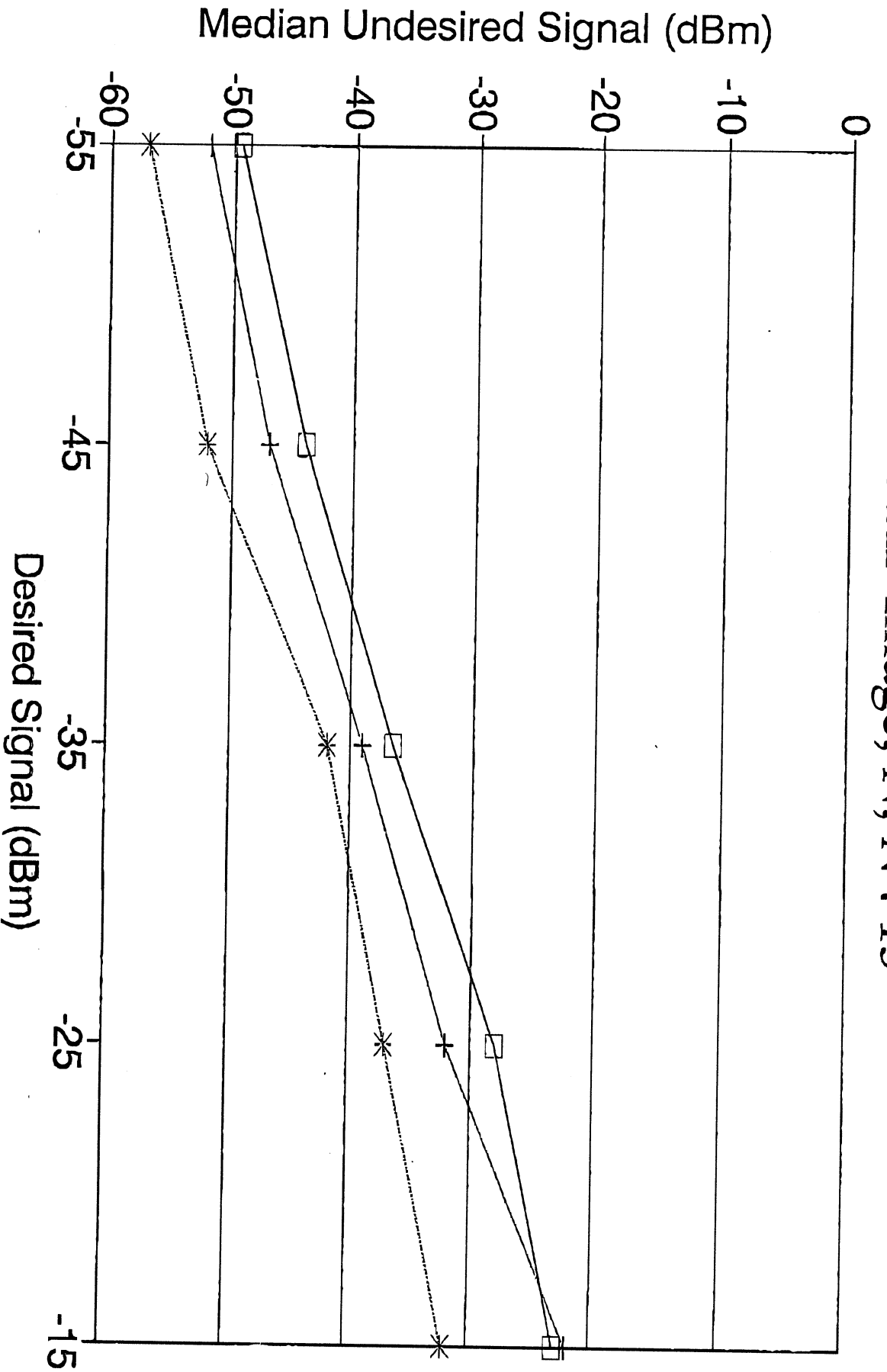


# UHF Image, N, N+14

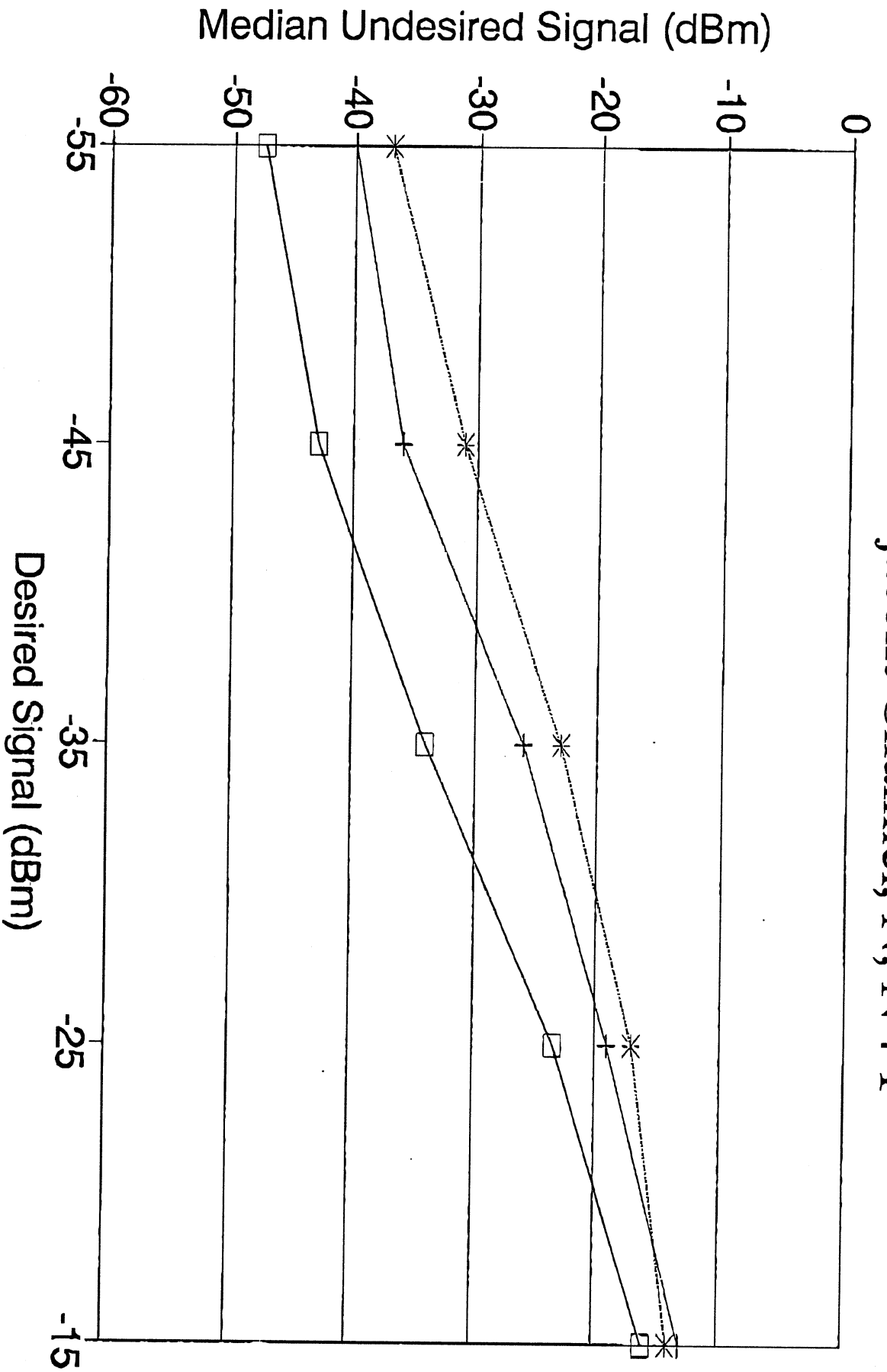


□ '91 50 Receivers    + '88 11 Receivers    \* '83 16 Receivers

# UHF Image, N, N+15

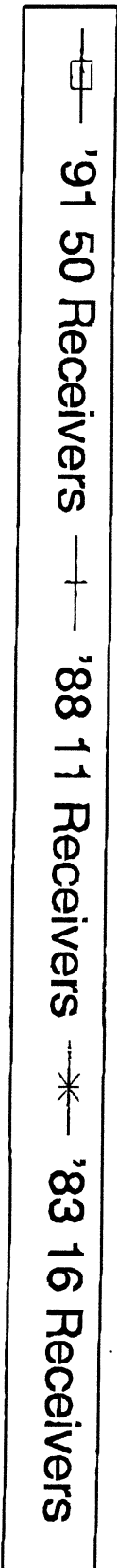
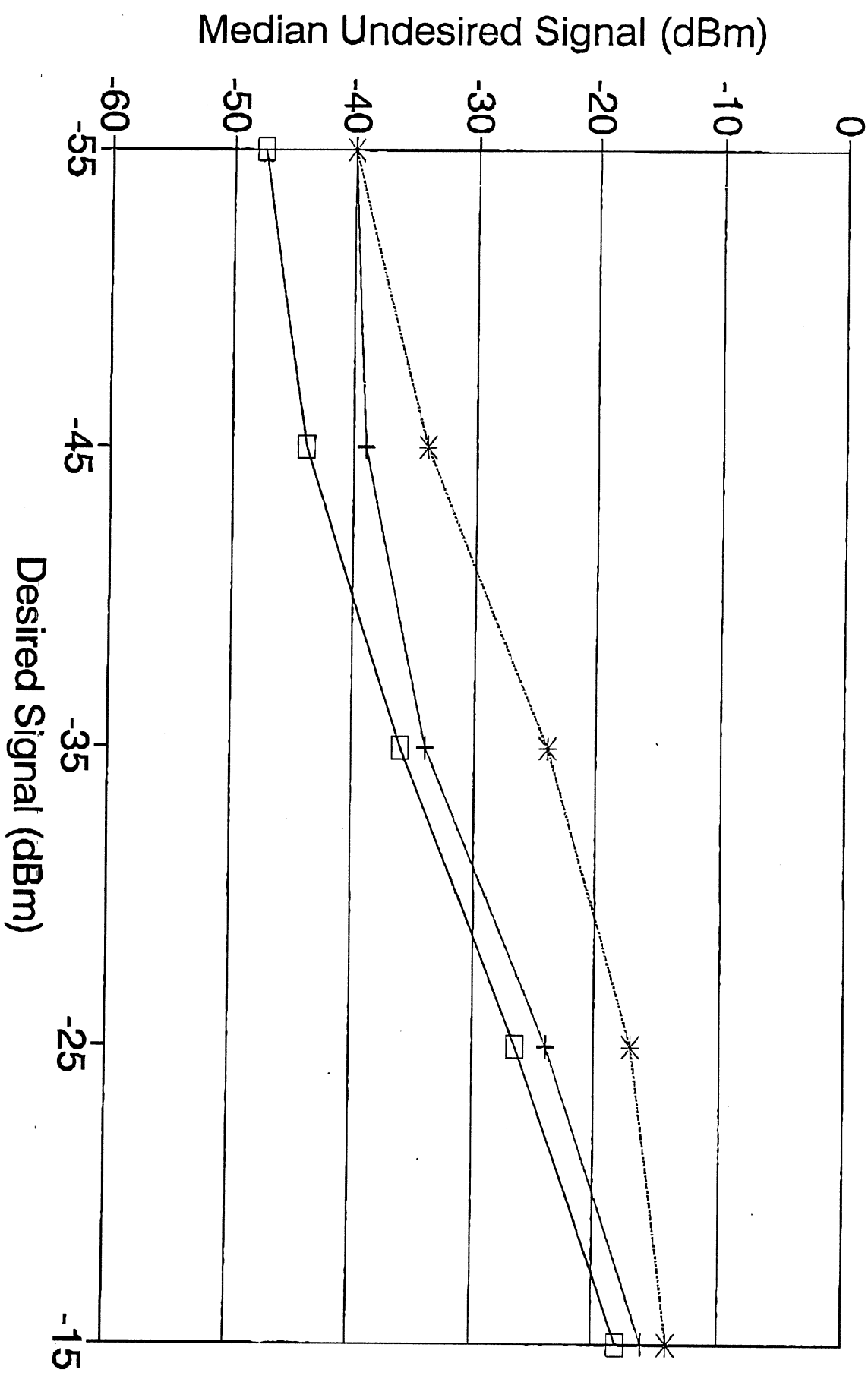


# UHF Adjacent Channel, N, N+1



□ '91 50 Receivers    + '88 11 Receivers    \* '83 16 Receivers

# UHF Adjacent Channel, N, N-1



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