

Federal Communications Commission
Office of Engineering and Technology
Document Release Form
Project Number EEB-87-6
March 2, 1989

1. Author's Name: William H. Inglis
2. Document Title: A Study of UHF Television Receiver Interference Immunities
3. Document Category: Internal Technical Note
4. Signature of Author and Date:
William H. Inglis 3/10/89
5. Signature of Branch/Division Chief (indicating submission for review):
Mark Davis (for K.R. Nichols) March 10, 1989
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7. Signature of Release Authority and Date:

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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. Television receiver interference immunities and local oscillator radiation were the bases for the UHF taboos, which were formulated in the Sixth Report and Order, in Docket Number 9736 et.al., 41 FCC 148 (1952). From time to time additional UHF receiver data have been obtained to evaluate the continuing need for the UHF taboos.

This study incorporates electronic tuner technology, circa 1985 to 1987, in order to update the data base. Video cassette recorders (VCR's) are included, for the first time, to evaluate the impact of their characteristics upon the study. Eight television receivers and three VCR's were selected and obtained through our sampling program. A computer controlled test environment was designed and implemented to improve the test procedure. This computer controlled environment has improved the data collection process. The computer recorded data for three observers, eleven sets, and fourteen taboo combinations with seven levels and two data points for each set for each test, or over 6,000 net data coordinates.

We have compared the present sample to a 1983 sample of television receivers. Although preliminary, it would appear that the 1983 sample receivers were generally more immune to taboo interference than the present sample. Image and half-IF interference are apparently exceptions. The VCR's also appear to be more immune to taboo interference but the sample is too small to draw firm conclusions.

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. Such restrictions do not apply to VHF assignments except for adjacent channel mileage separations. 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. ^{1/} From time to time additional UHF receiver data have been obtained to evaluate the UHF taboos. ^{2/ 3/}

This paper adds to the data base of UHF receiver performance. The receiver data base for this study was chosen to represent the electronic tuner technology, circa 1985 to 1987. The test sample consisted of eight (8) color television receivers and three (3) VCR's. All eleven (11) had electronic tuners.

Compared to mechanical tuners, electronic tuners offer ease of tuning, better noise figures, and lower oscillator radiation. However, they are acknowledged to be generally poorer with respect to UHF interference immunities. The poorer immunity performance may be attributable to the RF amplifier circuitry and varactors used universally with electronic tuners but not with mechanical UHF tuners.

The emphasis on electronic tuners in the sample not only reflects a conservative approach but also recognizes the present substantial dominance of electronic tuners. In an industry-government meeting in 1985 ^{4/} it was reported that some 77% of color television receivers being marketed employed electronic tuners. The percentage of color television receivers with electronic tuners is increasing.

^{1/} Sixth Report and Order, Docket Numbers 8736, 8975, 8976, and 9175, Federal Communications Commission, April 11, 1952.

^{2/} 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.

^{3/} 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.

^{4/} Minutes of meeting, Land Mobile Radio/UHF Television Technical Advisory Committee, November 15, 1985.

DESCRIPTIONS OF THE UHF TABOOS
("n" is the number of the tuned channel)

IF Beat Taboos (n + or - 8 channels)
20 miles separation ⁵

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 which will be picked up by a receiver's IF amplifier. Where a 45.75 MHz IF is in use, such signals may exist in channels which are separated by seven or eight channels from the desired station's channel. (The seven channel separation is subsumed by the restriction based on local oscillator radiation, discussed below.)

Intermodulation Taboos (n + or - 2, 3, 4, 5 channels)
20 miles separation

Intermodulation results from a combination of input channel signals which produces a spurious signal or signals within the tuned channel. The spurious signals, f_x , can be computed from $f_x = 2f_a - f_b$ where f_a is the frequency of one station and f_b is the frequency of the other station.

Adjacent Channel (n + or - 1 channel), 55 miles separation

In contrast to the above mileage separations which apply only to UHF television, 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.

Sound Image Taboos (n + or - 14 channels), 60 miles separation and
Picture Image Taboos (n + or - 15 channels), 75 miles separation

Image interference arises from signals in a receiver's image channel band. This band is located as much above the 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 difference in mileage separations is partly due to this visual carrier frequency's being in a more vulnerable part of the receiver's image channel. The lower amplitude of an aural carrier compared to a visual carrier is also taken into consideration.

⁵ Statements in this section regarding existing mileage separations are the minimum mileage separations between full power UHF television transmitters.

Oscillator Taboo ($n +$ or $- 7$ channels), 60 miles separation

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 cochannel interference to another nearby receiver tuned to channel $n+7$. Protection against such interference is based on the principle of preventing overlapping Grade A service areas of 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 which would not be as good in quality.

TEST PROCEDURE

For tests of this sample, two technically trained individuals and the Branch Secretary made subjective observations of "just perceptible" interference. Interfering signal levels were adjusted to the nearest decibel in dBm, decibels referred to one milliwatt. If the data from any two or more observers was not within four decibels, the appropriate observations would be repeated. The second reading was retained even if it gave a larger difference than the first.

In making an interference level judgement, an observer was seated at a distance of four to six times the picture height from the face of the television receiver's picture tube. For tests of a VCR, the video output was observed from a television receiver with a video input. No light source was directed at the screen and specular reflections were avoided on the face of the picture tube. The room was illuminated with somewhat less light than may be typical in ordinary home viewing.

With the television channel combinations established for a particular test, the level of the desired signal was set by computer, in sequence, to the specified values. The values used were -5, -15, -25, -35, -45, or -65 dBm. The levels of the interfering signal(s) were controllable by the observer using the computer programmable function keys. Observations of the interfering signal level for the criterion of "just perceptible" interference were obtained by adjusting the attenuators to the point at which an increase caused a visible increase in the interference while an equal decrease caused the interference to disappear; i.e., become imperceptible.

In a previous test of this kind, notably the tests reported in 1974, three observers were used, and the desired signal and undesired signal(s) were translated off-the-air television signals. With three observers there was always a middle value (the median), and while the data for FCC/OET TM87-3 ⁶ was obtained with two viewers, this current project returned to the use of three viewers. The use of three observers was a desirable improvement for purposes of the statistical analysis. The stability of the desired signal, together with the stability of the undesired signal(s) made possible the

⁶ See "A Study of UHF Television Receiver Interference Immunities", Project EEB-87-2, FCC/OET TM87-3

testing of the same interference situation on different days. 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.

As in the previous tests, the undesired television signal(s) were translated off-the-air television signals. This maintained interference characteristics such as lack of frame synchronization and saturation changes in the undesired programming.

We are presently engaged in viewer testing. The test procedure for viewer testing is essentially the same as noted above but for only two desired levels, -35 and -45 dBm. We are still evaluating techniques for elimination of variability of the equipment.

COMMENTS ABOUT THE DATA

Tabulations of the receiver data are given in Appendix A. "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 represent viewable interference. Only a few UHF channels were used as the desired channel. This could lead to an uncertainty of several decibels, according to A.G. Day. ^{7/} The receiver sample size and structure has limitations. The sample consisted of eight (8) color receivers, and three (3) VCR's, none of which employed a mechanical UHF tuner.

CONCLUSION

This paper presents data regarding the UHF taboo performance of a sample of television receivers. The data supplements similar information given previously.

The median data from the 1983 sample is plotted with a "3" marker on the attached graphs. The median data from the total present sample is plotted with an "8" marker and the same data "without" the VCR data is plotted with a "W" marker. The 1974 data was not available in the proper format for plotting but has been compared with the other data. Except for sound image (i.e. n, n+14), the 1974 sample receivers are more immune to taboo interference than subsequent sample (electronic tuner) receivers.

A review of the attached tables and graphs reveals that the 1983 sample receivers were generally more immune to taboo interference (better) than the present sample of receivers. Image interference immunity (both sound and picture) is, however, better in the present sample. Half-IF interference

^{7/} loc. cit.

immunity is also better in the present sample.

The VCR's tested are generally more immune to UHF taboo interference (better) than the other receivers in the present sample, except for lower adjacent channel interference. It is premature, however, to draw conclusions regarding VCR's because of the small sample. The next sample of receivers will include more VCR's and will give a clearer indication of the characteristics of VCR's.

APPENDIX A

Receiver Data Tables
and Graphs

Notes: 1. Test numbers 1 and 2 are reserved for VHF intermodulation.

2. Receivers 9, 10, and 11 are VCR's.

3. For the graphs:

"3": 1983 sample median

"8": Present sample median

"W": Present sample median without VCR's.

Television Interference Study

Test No. 3

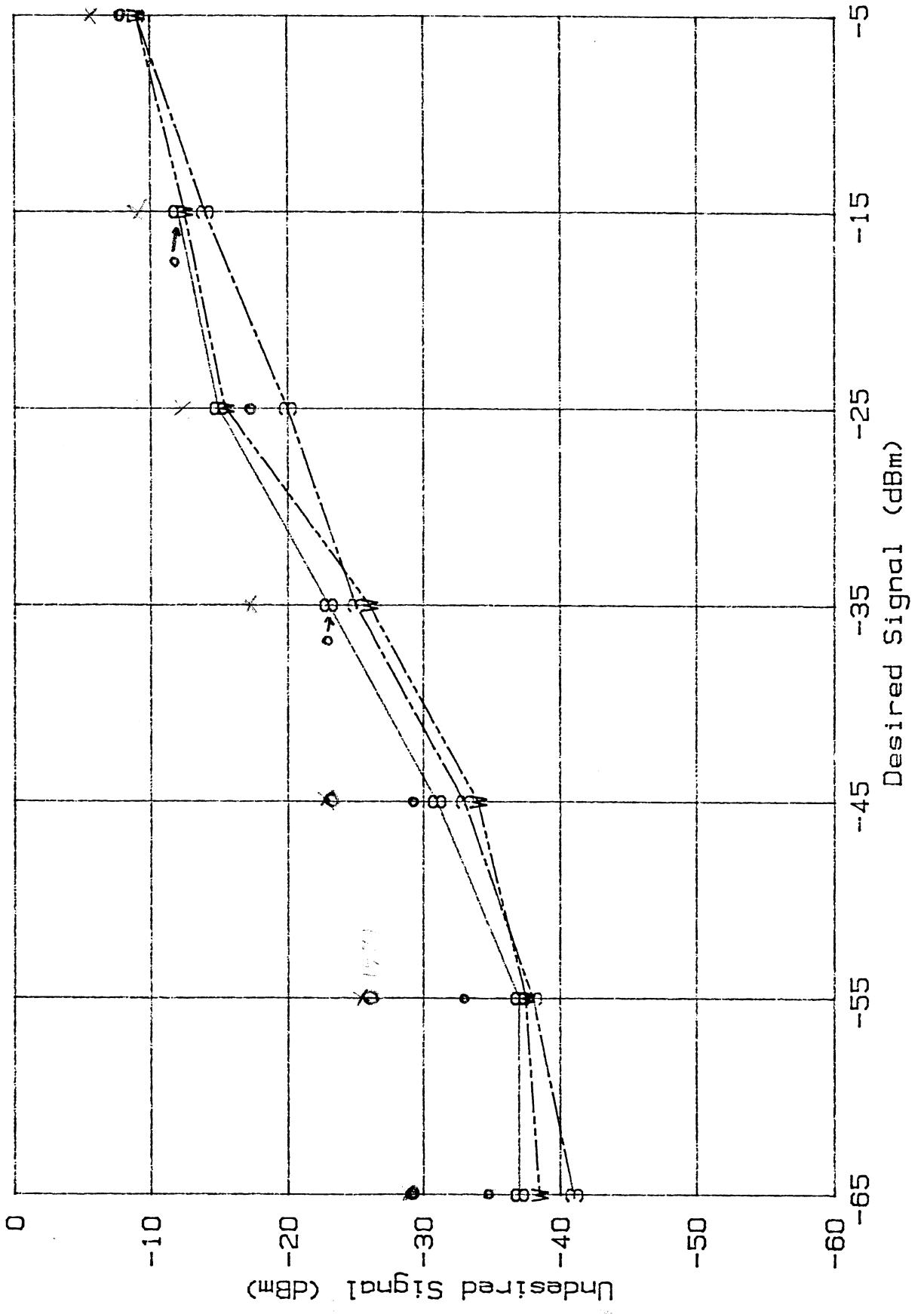
Desired Channel: N Undesired Channels: N+2, N+4 Interference Type: UHF IM

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-9	-12	-15	-25	-35	-37	-37
2	-16	-13	-21	-28	-39	-41	-42
3	M	-12	-15	-21	-32	-38	-41
4	M	-13	-22	-30	-38	-38	-40
5	M	M	-11	-20	-31	-31	-32
6	-11	-13	-16	-27	-33	-37	-37
7	M	M	-11	-19	-27	-31	-32
8	-13	-16	-24	-31	-42	-47	-47
9	M	M	-11	-13	-15	-18	-21
10	M	M	-11	-19	-25	-25	-27
11	M	-9	-16	-23	-24	-24	-23
MEAN	-12	-13	-16	-23	-31	-33	-35
S.D.	3	2	5	5	8	8	8
N	4	7	11	11	11	11	11
MEDIAN	-12	-13	-15	-23	-32	-37	-37
MINIMUM	-16	-16	-24	-31	-42	-47	-47
MAXIMUM	-9	-9	-11	-13	-15	-18	-21

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 3, UHF IM, N, N+2, N+4



Television Interference Study

Test No. 4

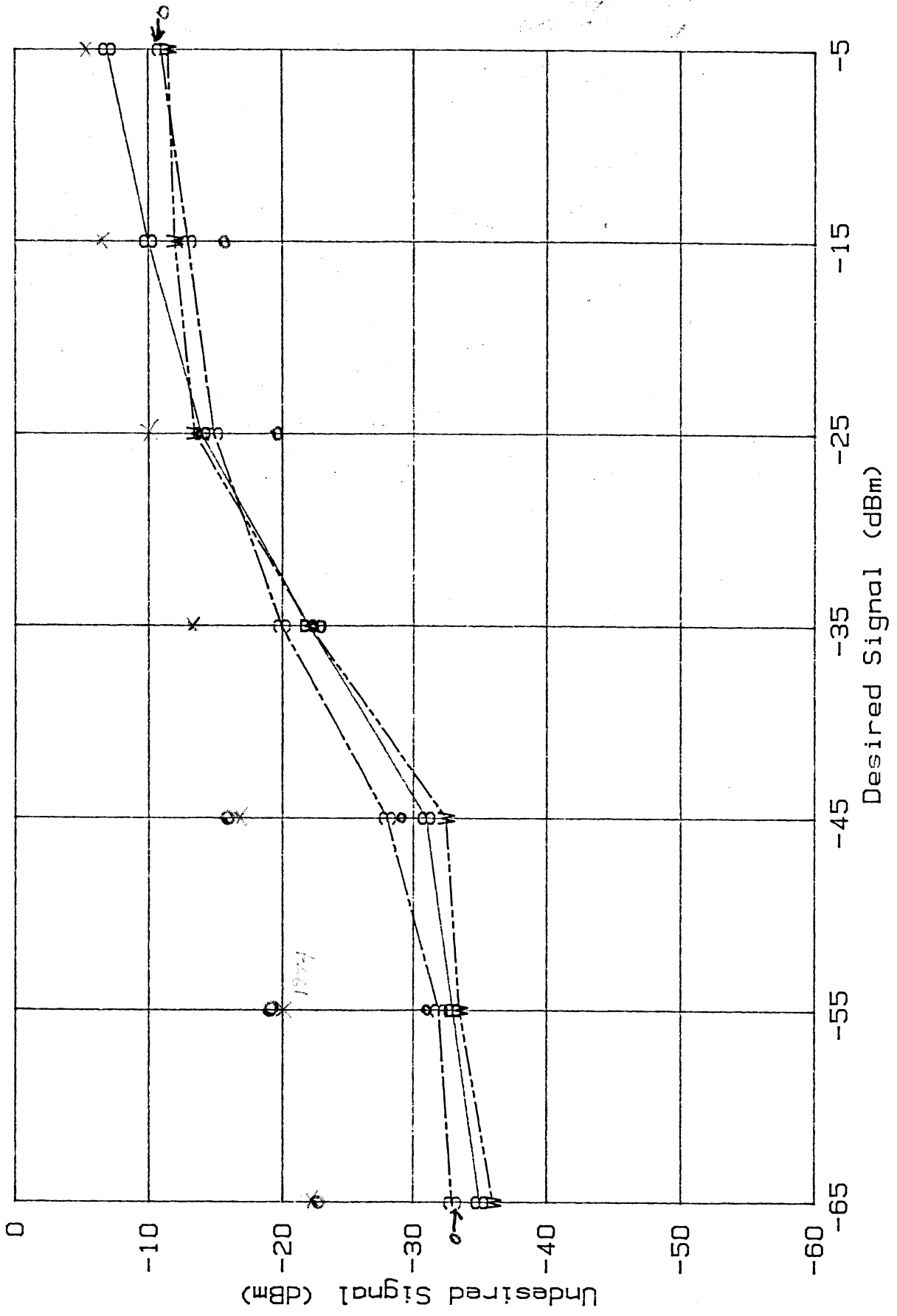
Desired Channel: N Undesired Channels: N-2, N-4 Interference Type: UHF IM

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-12	-14	-12	-21	-31	-33	-35
2	-17	-14	-17	-28	-34	-36	-38
3	M	-9	-13	-22	-33	-40	-41
4	-11	-11	-21	-22	-28	-28	-29
5	M	-10	-11	-22	-33	-34	-37
6	-7	-10	-14	-24	-32	-33	-35
7	-13	-14	-20	-31	-37	-38	-39
8	-13	-13	-9	-21	-27	-31	-32
9	M	M	-14	-18	-22	-25	-26
10	M	M	-11	-18	-21	-24	-24
11	M	M	-15	-22	-26	-29	-28
MEAN	-12	-12	-14	-23	-29	-32	-33
S.D.	3	2	4	4	5	5	6
N	6	8	11	11	11	11	11
MEDIAN	-13	-12	-14	-22	-31	-33	-35
MINIMUM	-17	-14	-21	-31	-37	-40	-41
MAXIMUM	-7	-9	-9	-18	-21	-24	-24

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 4, UHF IM, N, N-2, N-4



Television Interference Study

Test No. 5

Desired Channel: N Undesired Channels: N-2

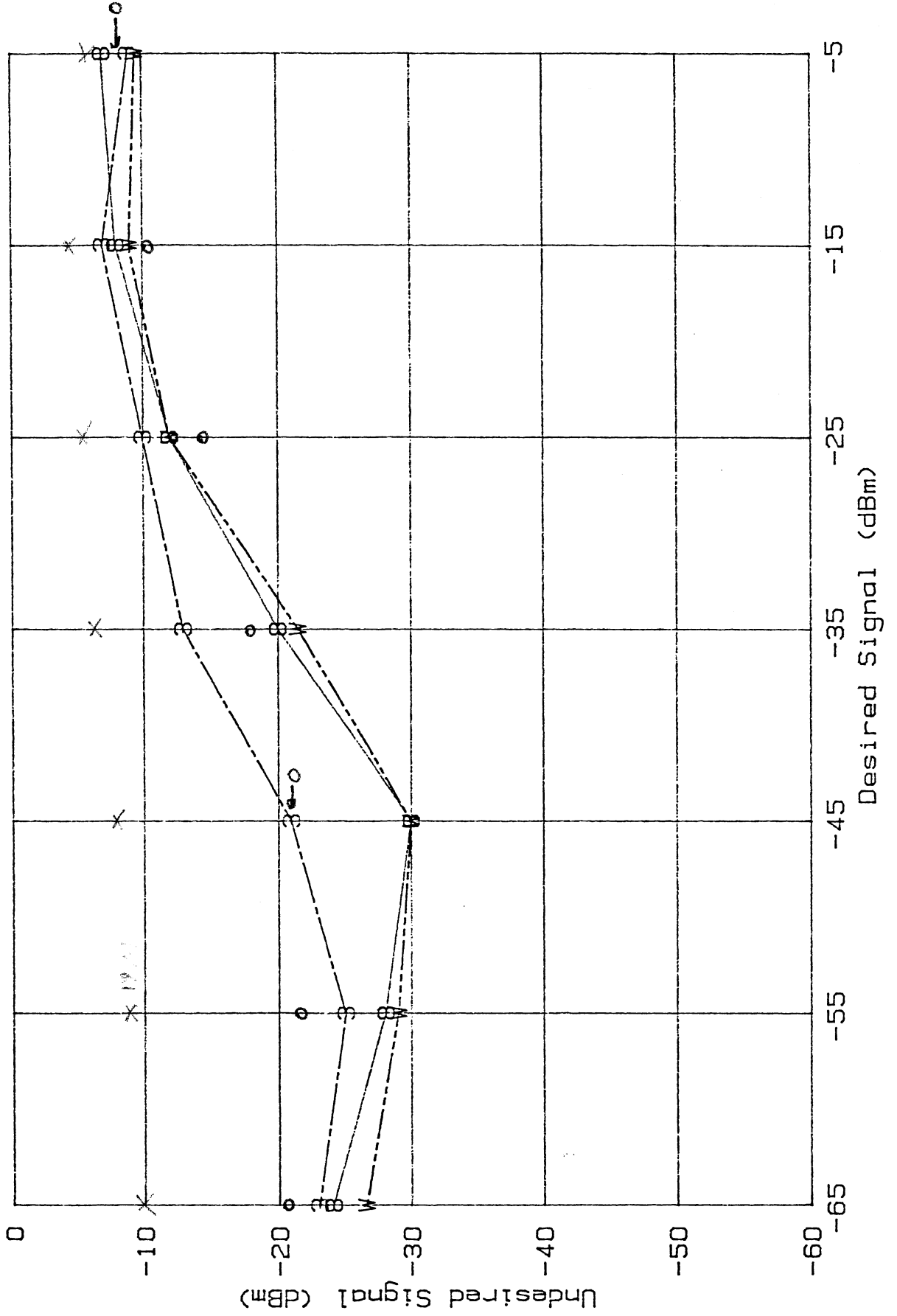
Interference Type: UHF CM

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-12	-12	-11	-20	-30	-29	-25
2	-15	-11	-13	-23	-30	-28	-24
3	M	-8	-12	-20	-31	-37	-34
4	-7	-8	-19	-23	-27	-25	-23
5	M	M	-12	-22	-31	-30	-28
6	-8	-7	-12	-21	-30	-29	-28
7	-11	-10	-16	-28	-33	-35	-32
8	-11	-10	-5	-14	-23	-22	-19
9	-6	M	-12	-12	-17	-16	-13
10	M	M	-9	-12	-12	-13	-16
11	M	M	-15	-20	-16	-14	-13
MEAN	-10	-9	-12	-20	-25	-25	-23
S.D.	3	2	4	5	7	8	7
N	7	7	11	11	11	11	11
MEDIAN	-11	-10	-12	-20	-30	-28	-24
MINIMUM	-15	-12	-19	-28	-33	-37	-34
MAXIMUM	-6	-7	-5	-12	-12	-13	-13

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 5, UHF CM, N, N-2



Television Interference Study

Test No. 6

Desired Channel: N Undesired Channels: N-4

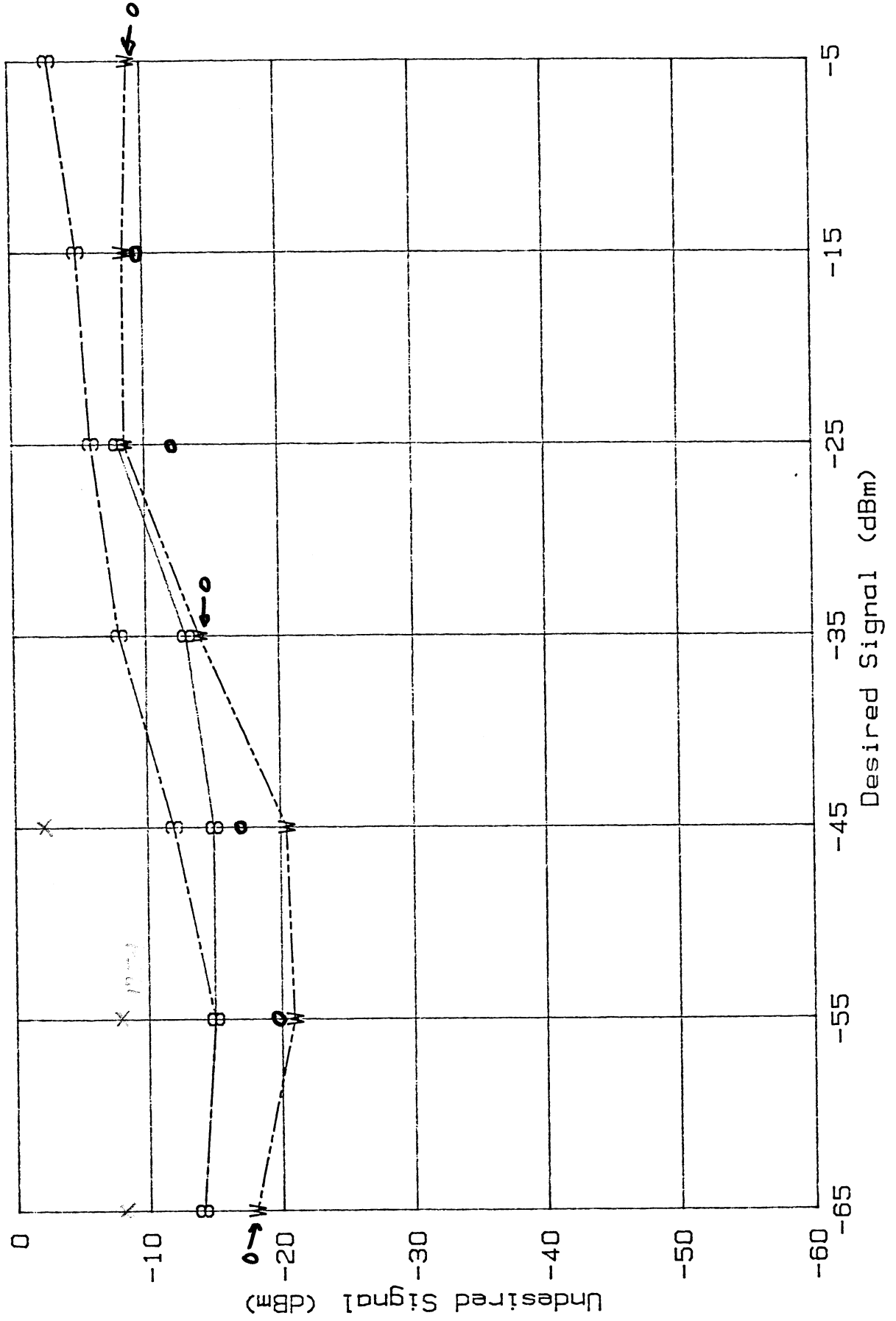
Interference Type: UHF CM

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-10	-10	M	-13	-18	-20	-17
2	-13	-11	-11	-21	-24	-24	-22
3	M	M	-8	-15	-27	-34	-31
4	M	-7	-19	-13	-12	-13	-10
5	M	M	-9	-12	-23	-22	-19
6	M	M	M	-10	-15	-15	-13
7	-10	-10	-13	-20	-25	-25	-23
8	-9	-10	M	-16	-18	-17	-14
9	M	M	-11	-10	-11	-12	M
10	M	M	M	-9	-10	-11	-6
11	M	M	-7	-14	-15	-11	-10
MEAN	-11	-10	-11	-14	-18	-19	-17
S.D.	2	2	4	4	6	7	7
N	4	5	7	11	11	11	10
MEDIAN	-10	-10	-11	-13	-18	-17	-16
MINIMUM	-13	-11	-19	-21	-27	-34	-31
MAXIMUM	-9	-7	-7	-9	-10	-11	-6

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 6, UHF CM, N, N-4



1974
 W. J. ...
 ...

Television Interference Study

Test No. 7

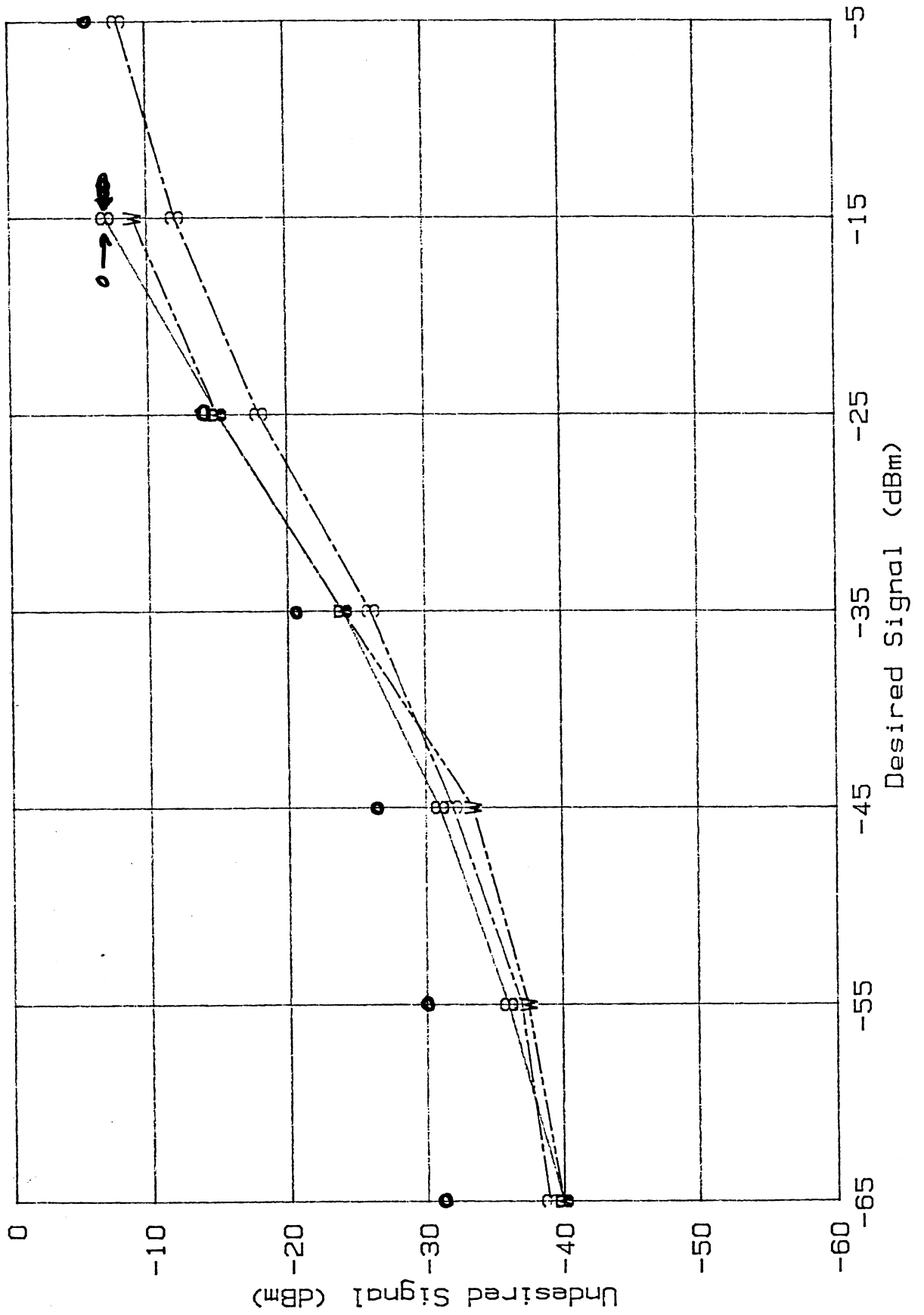
Desired Channel: N Undesired Channels: N+4 Interference Type: UHF Half-IF

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	M	-7	-18	-27	-36	-38	-40
2	-15	-16	-26	-34	-44	-47	-48
3	M	-12	-15	-24	-31	-40	-42
4	M	M	-14	-24	-34	-37	-40
5	M	M	-8	-16	-27	-31	-31
6	M	-11	-15	-23	-33	-36	-40
7	M	M	-13	-20	-27	-34	-34
8	-14	-16	-25	-36	-43	-47	-50
9	M	M	-8	-14	-14	-16	-18
10	M	M	-12	-23	-29	-29	-29
11	M	-10	-17	-26	-28	-28	-26
MEAN	-15	-12	-16	-24	-31	-35	-36
S.D.	1	4	6	7	8	9	10
N	2	6	11	11	11	11	11
MEDIAN	-15	-12	-15	-24	-31	-36	-40
MINIMUM	-15	-16	-26	-36	-44	-47	-50
MAXIMUM	-14	-7	-8	-14	-14	-16	-18

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 7, UHF Half IF, N, N+4



• 1978
 0.001
 4/20/78

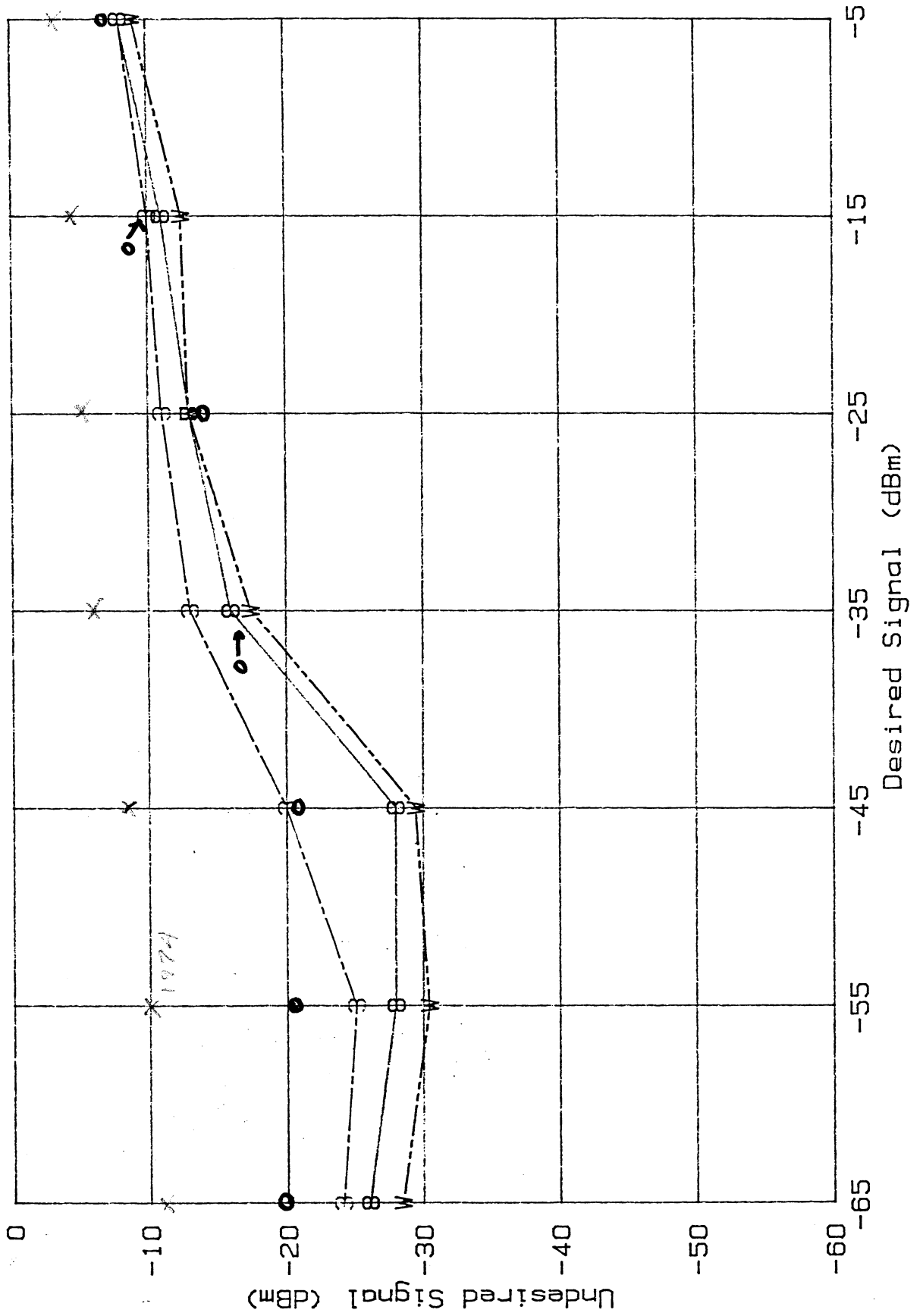
Desired Channel: N Undesired Channels: N+2 Interference Type: UHF CM

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-10	-11	-12	-16	-29	-28	-25
2	-19	-16	-17	-25	-34	-32	-30
3	M	-13	-13	-16	-27	-31	-30
4	-8	-12	-23	-29	-38	-37	-34
5	M	M	M	-13	-30	-28	-26
6	-13	-14	-18	-29	-36	-36	-33
7	-6	M	-13	-19	-25	-24	-23
8	-15	-15	-11	-11	-28	-30	-27
9	-8	M	-13	-12	-12	-10	-8
10	M	M	-8	M	-14	-11	-10
11	M	M	-9	-13	-13	-11	-9
MEAN	-11	-14	-14	-18	-26	-25	-23
S.D.	4	2	4	7	9	10	10
N	7	6	10	10	11	11	11
MEDIAN	-10	-14	-13	-16	-28	-28	-26
MINIMUM	-19	-16	-23	-29	-38	-37	-34
MAXIMUM	-6	-11	-8	-11	-12	-10	-8

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 8, UHF CM, N, N+2



0 1974
1974
1974

Television Interference Study

Test No. 9

Desired Channel: N Undesired Channels: N+8

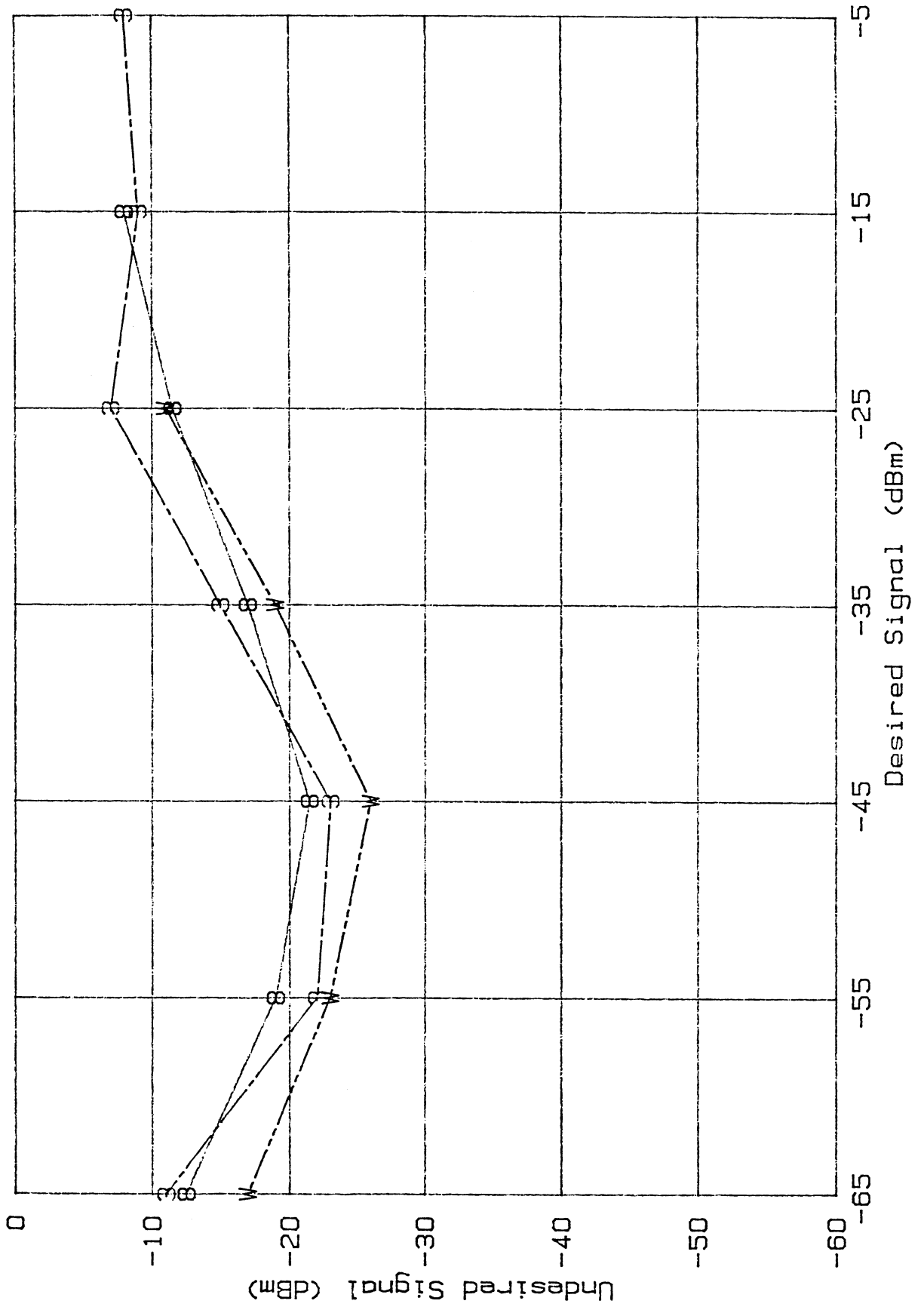
Interference Type: UHF IF

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	M	M	-11	-19	-28	-17	-9
2	-12	-16	-21	-30	-35	-26	-20
3	-8	-8	-7	-12	-19	-21	-16
4	M	M	M	-9	-16	-13	-8
6	M	M	-11	-16	-24	-23	-17
7	M	M	-12	-21	-26	-26	-20
8	-10	-13	-15	-23	-31	-31	-18
9	M	-8	-12	-17	-19	-9	M
10	M	M	M	-7	-8	M	M
11	M	-12	-16	-17	M	M	M
MEAN	-10	-11	-13	-17	-23	-21	-15
S.D.	2	3	4	7	8	7	5
N	3	5	8	10	9	8	7
MEDIAN	-10	-12	-12	-17	-24	-22	-17
MINIMUM	-12	-16	-21	-30	-35	-31	-20
MAXIMUM	-8	-8	-7	-7	-8	-9	-8

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 9, UHF IF, N, N+8



Television Interference Study

Test No. 10

Desired Channel: N Undesired Channels: N-8

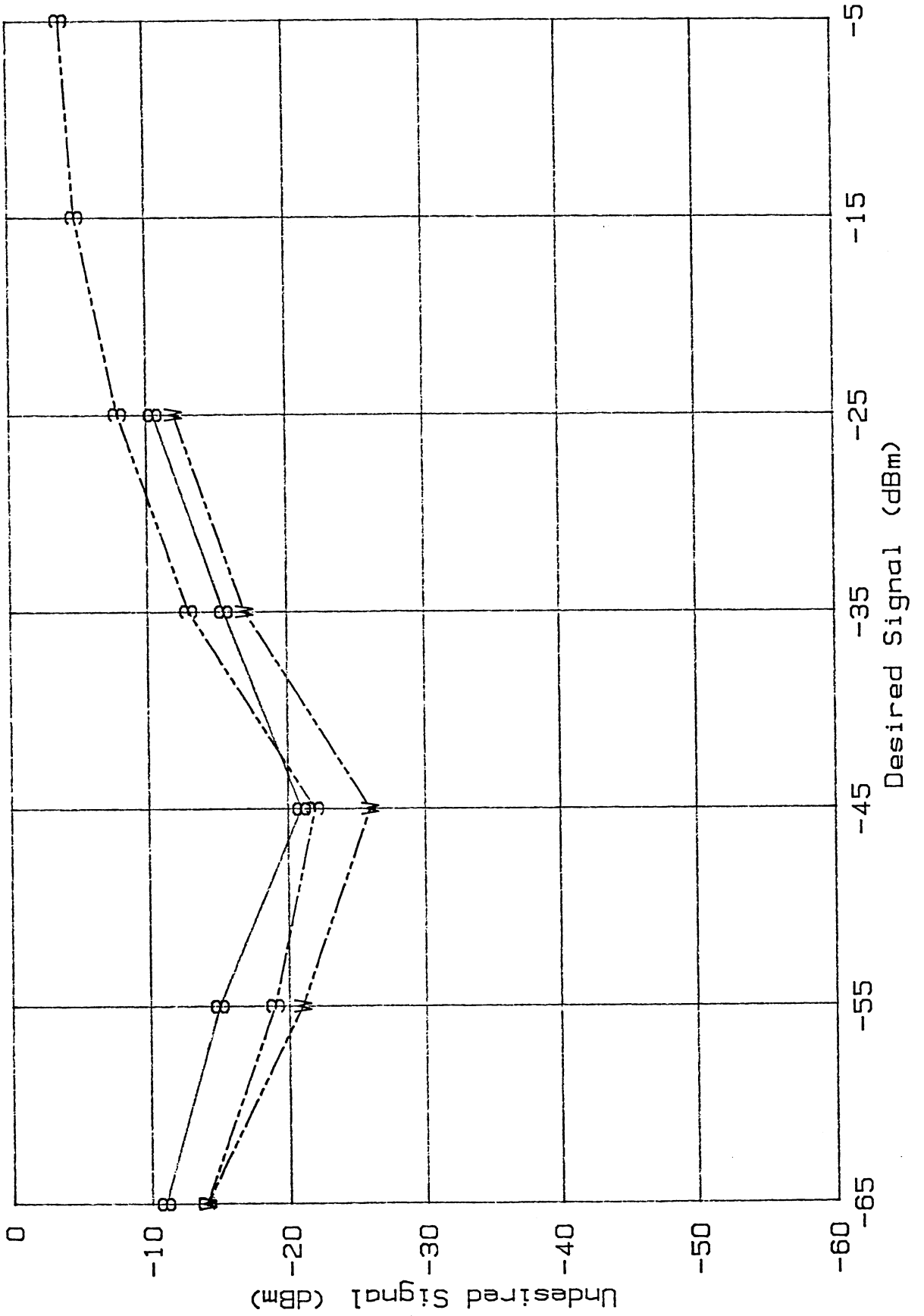
Interference Type: UHF IF

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	M	M	-12	-21	-29	-24	-14
2	-12	-11	-16	-26	-32	-27	-16
3	M	M	-8	-14	-26	-31	-25
4	M	M	-13	-12	-12	-13	-10
6	M	M	M	M	-11	-11	-9
7	-9	M	-9	-17	-18	-17	-15
8	M	M	-12	-19	-29	-21	-12
9	M	M	-8	-14	-22	-13	-9
10	M	M	-7	-8	-10	-7	M
11	M	-10	-21	-21	-20	-11	M
MEAN	-11	-11	-12	-17	-21	-18	-14
S.D.	2	1	5	5	8	8	5
N	2	2	9	9	10	10	8
MEDIAN	-11	-11	-12	-17	-21	-15	-13
MINIMUM	-12	-11	-21	-26	-32	-31	-25
MAXIMUM	-9	-10	-7	-8	-10	-7	-9

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 10, UHF IF, N, N-8



Television Interference Study

Test No. 11

Desired Channel: N Undesired Channels: N-7

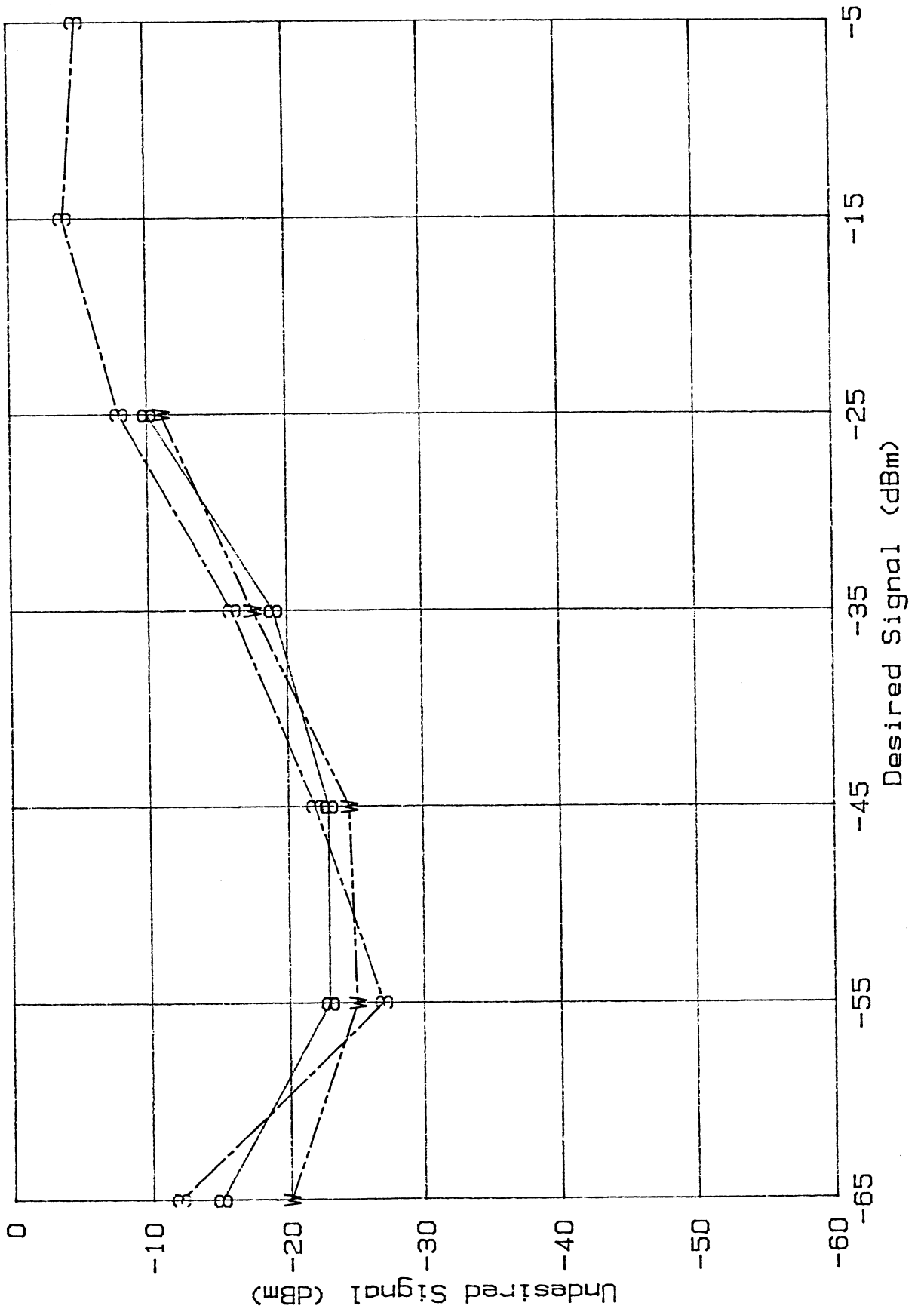
Interference Type: UHF IF

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	M	M	M	-11	-23	-18	-15
2	-11	-14	-22	-32	-40	-39	-36
3	M	M	-10	-19	-29	-35	-31
4	M	M	-13	-11	-10	-11	-5
5	M	M	-15	-25	-36	-34	-34
6	M	M	M	-11	-14	-14	-12
7	M	M	-10	-19	-23	-24	-20
8	M	-6	-12	-16	-26	-26	-20
9	M	M	-10	-19	-24	-23	-15
10	M	M	M	M	-10	-12	M
11	M	M	-11	-22	-17	-15	-8
MEAN	-11	-10	-13	-19	-23	-23	-20
S.D.		6	4	7	10	10	11
N	1	2	8	10	11	11	10
MEDIAN	-11	-10	-12	-19	-23	-23	-18
MINIMUM	-11	-14	-22	-32	-40	-39	-36
MAXIMUM	-11	-6	-10	-11	-10	-11	-5

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 11, UHF IF, N, N-7



Television Interference Study

Test No. 12

Desired Channel: N Undesired Channels: N+7

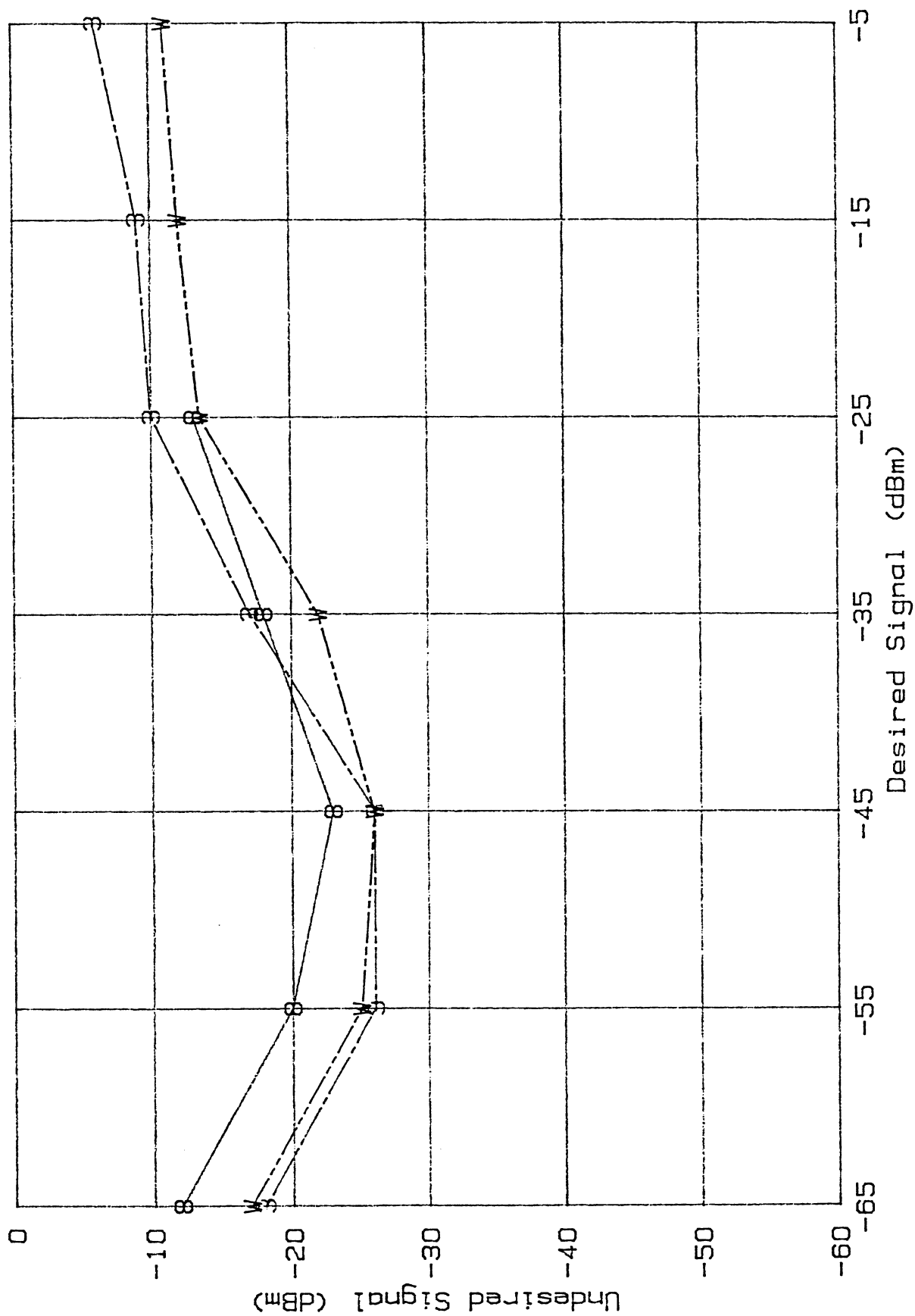
Interference Type: UHF IF

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	M	M	-9	-15	-23	-18	-11
2	-14	-23	-30	-35	-40	-34	-24
3	-14	-12	-11	-18	-23	-26	-19
4	M	-12	-21	-30	-32	-30	-21
5	M	M	M	-8	-12	-12	-12
6	-11	-12	-14	-22	-27	-24	-15
7	M	M	-14	-22	-25	-20	-12
8	-13	-12	-13	-23	-31	-32	-27
9	M	M	M	M	-9	M	M
10	M	M	M	-11	-12	M	M
11	M	M	-13	-14	-11	M	M
MEAN	-13	-14	-16	-20	-22	-25	-18
S.D.	1	5	7	8	10	8	6
N	4	5	8	10	11	8	8
MEDIAN	-14	-12	-14	-20	-23	-25	-17
MINIMUM	-14	-23	-30	-35	-40	-34	-27
MAXIMUM	-11	-12	-9	-8	-9	-12	-11

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 12, UHF IF, N, N+7



Television Interference Study

Test No. 13

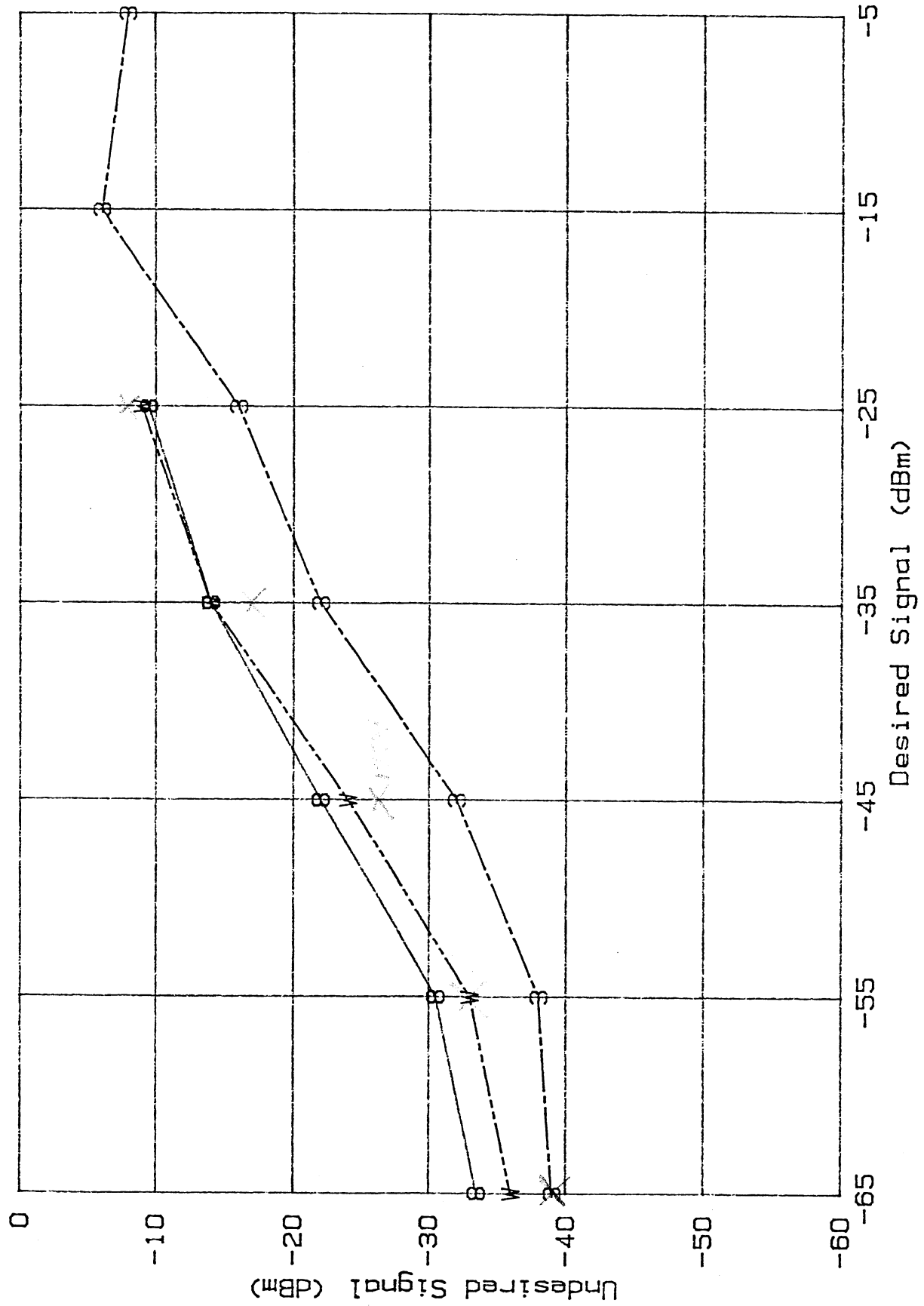
Desired Channel: N Undesired Channels: N+14 Interference Type: UHF Image

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	M	M	M	M	-8	-11	-14
2	M	M	-9	-14	-22	-28	-31
3	-14	-13	-15	-20	-25	-33	-36
4	M	M	M	-10	-19	-26	-29
6	M	M	-8	-14	-24	-33	-37
7	M	M	-13	-21	-30	-40	-43
8	-12	-14	-20	-26	-38	-41	-43
9	M	M	M	-12	-19	-25	-27
10	M	-7	-10	-14	-20	-22	-22
11	-8	-12	-24	-31	-34	-39	-37
MEAN	-11	-12	-14	-18	-24	-30	-32
S.D.	3	3	6	7	9	9	9
N	3	4	7	9	10	10	10
MEDIAN	-12	-13	-13	-14	-23	-31	-34
MINIMUM	-14	-14	-24	-31	-38	-41	-43
MAXIMUM	-8	-7	-8	-10	-8	-11	-14

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 13, UHF Image, N, N+14



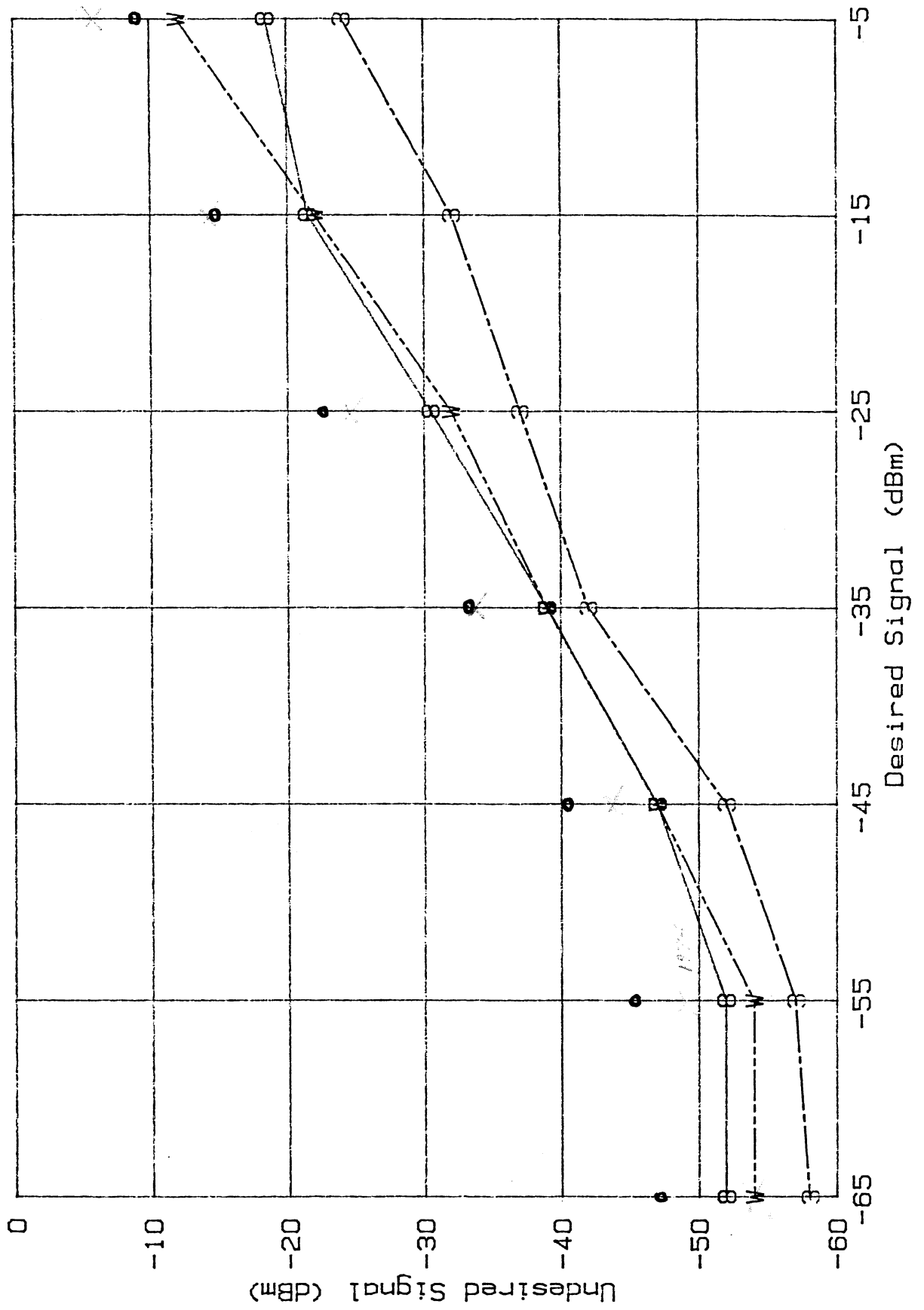
Desired Channel: N Undesired Channels: N+15 Interference Type: UHF Image

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-12	-10	M	-22	-31	-36	-34
2	-22	-27	-34	-39	-47	-51	-50
3	-37	-38	-40	-44	-48	-55	-57
4	-18	-20	-22	-28	-38	-45	-46
6	-11	-20	-27	-36	-46	-54	-54
7	-10	-22	-33	-43	-53	-60	-59
8	-23	-28	-32	-41	-48	-55	-57
9	-19	-21	-29	-39	-47	-46	-45
10	-15	-16	-23	-28	-31	-33	-33
11	-28	-38	-45	-53	-55	-53	-55
MEAN	-20	-24	-32	-37	-44	-49	-49
S.D.	8	9	8	9	8	9	9
N	10	10	9	10	10	10	10
MEDIAN	-19	-22	-32	-39	-47	-52	-52
MINIMUM	-37	-38	-45	-53	-55	-60	-59
MAXIMUM	-10	-10	-22	-22	-31	-33	-33

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 14, UHF Image, N, N+15



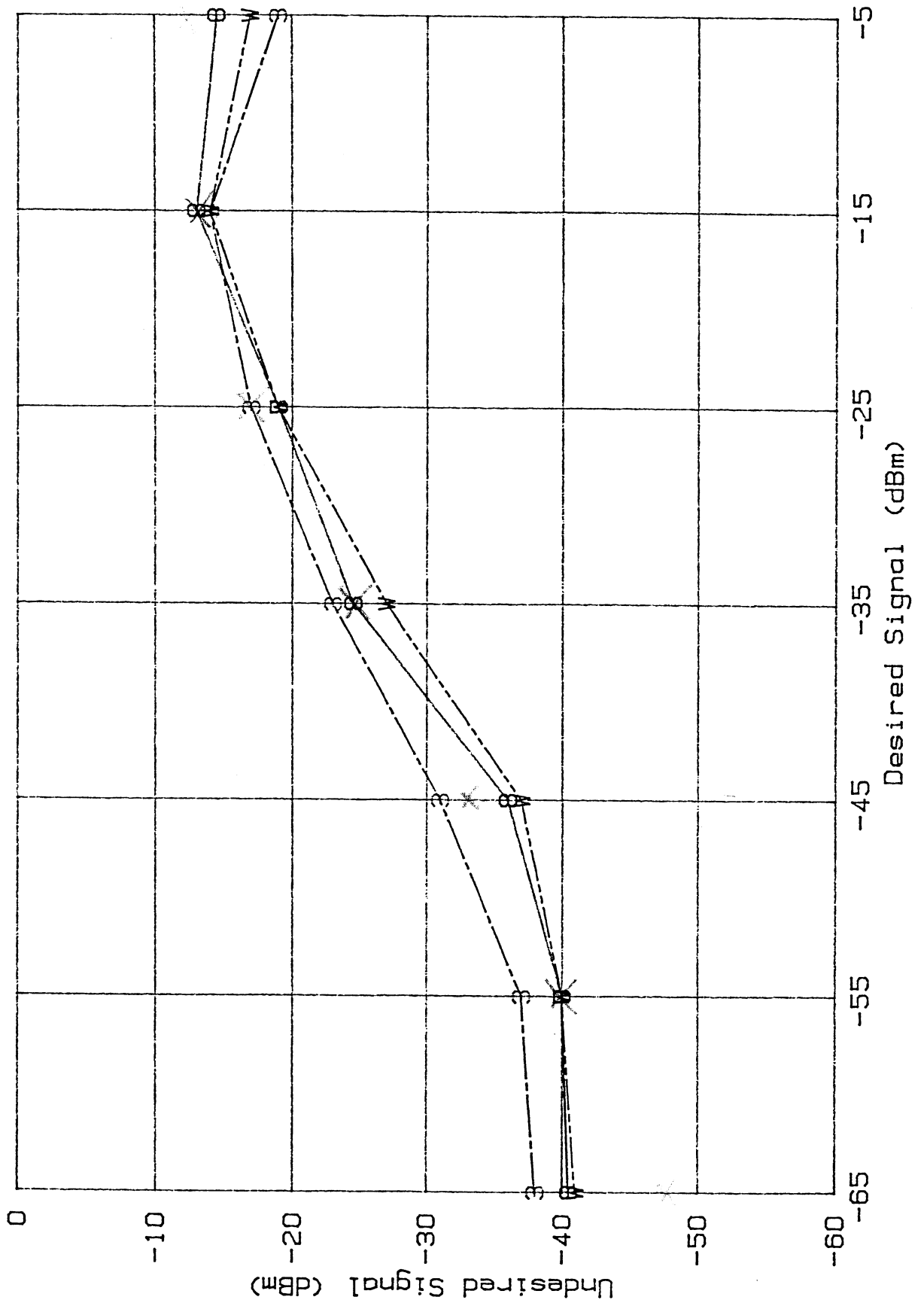
Desired Channel: N Undesired Channels: N+1 Interference Type: UHF Adj Ch

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-17	-14	-15	-24	-34	-36	-35
2	-34	-20	-26	-34	-40	-40	-41
3	-16	-13	-21	-25	-37	-41	-41
4	-10	-13	-19	-30	-42	-41	-43
6	-19	-14	-21	-31	-41	-43	-45
7	-13	-11	-19	-27	-37	-40	-40
8	-23	-17	-16	-24	-35	-40	-44
9	-12	-9	-19	-27	-35	-32	-30
10	M	M	-9	-21	-27	-28	-27
11	M	-9	-20	-22	-22	-24	-33
MEAN	-18	-13	-19	-27	-35	-37	-38
S.D.	8	4	4	4	6	6	6
N	8	9	10	10	10	10	10
MEDIAN	-17	-13	-19	-26	-36	-40	-41
MINIMUM	-34	-20	-26	-34	-42	-43	-45
MAXIMUM	-10	-9	-9	-21	-22	-24	-27

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 15, UHF Adj Ch, N, N+1



Television Interference Study

Test No. 16

Desired Channel: N Undesired Channels: N-1 Interference Type: UHF Adj Ch

Undesired Channel Levels (dBm) for
"Just Perceptible" Interference

Rcvr. No.	Desired Channel Levels (dBm)						
	-5	-15	-25	-35	-45	-55	-65
1	-19	-26	-34	-45	-54	-55	-53
2	-24	-17	-22	-33	-36	-39	-39
3	-16	-18	-28	-37	-44	-49	-44
4	-13	-15	-21	-31	-36	-36	-35
6	-9	-14	-17	-28	-38	-41	-41
7	-9	-13	-18	-28	-37	-39	-43
8	-14	-14	-16	-23	-33	-36	-36
9	-9	-21	-32	-41	-49	-52	-52
10	-9	-15	-25	-34	-40	-37	-41
11	-19	-29	-36	-45	-44	-43	-43
MEAN	-14	-18	-25	-35	-41	-43	-43
S.D.	5	5	7	7	7	7	6
N	10	10	10	10	10	10	10
MEDIAN	-14	-16	-24	-34	-39	-40	-42
MINIMUM	-24	-29	-36	-45	-54	-55	-53
MAXIMUM	-9	-13	-16	-23	-33	-36	-35

Note: Test numbers 1 and 2 are reserved for VHF intermodulation tests.
Receivers 9, 10, and 11 are VCR's.

TEST 16, UHF Adj Ch, N, N-1

