

*NRSC  
REPORT*

# NATIONAL RADIO SYSTEMS COMMITTEE

**NRSC-R14  
AM Radio Interference Study  
("B. Angell Study")  
June 1988**



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## NRSC-R14

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**FOREWORD**

NRSC-R14, AM Radio Interference Study (“B. Angell Study”), was prepared for the National Association of Broadcasters, documents the results of a study of listener acceptance of different types and levels of AM interference.

The NRSC is jointly sponsored by the Consumer Electronics Association and the National Association of Broadcasters. It serves as an industry-wide standards-setting body for technical aspects of terrestrial over-the-air radio broadcasting systems in the United States.

# **AM RADIO INTERFERENCE STUDY**

## **Final Study**



National Association of Broadcasters • 1771 N Street, N.W. • Washington, D.C. 20036-2898

**AM Radio Interference Study  
Final Report  
June 1988**

**B. Angell & Associates, Chicago, IL**

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**Overview**

The technical assignment criteria for the AM radio service are based on engineering, and other policy inputs. The last time the FCC considered the results of a consumer acceptance study of interference in the AM band was over 40 years ago. To update and expand upon these historical data, the NAB commissioned B. Angell & Associates to conduct a new study of listener acceptance of different types and levels of AM interference. In this study, co-channel and first adjacent channel interference at varying dB levels (bracketing current FCC standards) for a series of music and talk programming selections were studied. Overall, it was found that 1988 listener acceptability of AM interference is lower than was found in earlier studies. To satisfy at least 50% of AM listeners, current AM technical assignment criteria need to be adjusted.

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AM RADIO INTERFERENCE STUDY

Final Report

MM Docket No. 87-267

Prepared for: NATIONAL ASSOCIATION OF BROADCASTERS  
Washington, D.C.  
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## I. EXECUTIVE SUMMARY

### BACKGROUND AND OBJECTIVES

The National Association of Broadcasters commissioned a study to determine the level of transmitter interference at which AM reception is unacceptable to the listening public. This is in response to the Federal Communications Commission's Notice of Inquiry (MM Docket No. 87-267), "Review of Technical Assignment Criteria for the AM Broadcast Industry."

The Technical Assignment Criteria for the four classes of AM stations are based on a system of "protected contours" for which specific field strength values have been determined. The reference data, on which these technical guideline values for new or modified AM service are based, were reported in 1946. Since then 1940s, the number and quality of audio sources available to the public have changed dramatically.

Both co-channel and first adjacent channel interference were tested. Each type of interference was heard in three formats:

- Music over music
- Music over news/talk, and
- Talk over news/talk





The music tapes used also had three formats, based on the usual music format listened to by each respondent:

- AOR/Black-Urban/CHR (Contemporary Hit Radio)
- Easy Listening/Beautiful Music
- Country/AC (Adult Contemporary)

A complete description of the methodology of the study and qualification of the respondents can be found in the background, objectives and methodology sections of this report.

#### SUMMARY OF FINDINGS

The primary results of the study are as follows:

- The minimum acceptable D/U (desirable/undesirable) ratio (i.e., mean greater than 3.5 on a 6-point acceptance scale) for co-channel interference with musical program material was 26dB. For talk programming with either music or talk interference, 40dB was the minimum acceptable co-channel D/U ratio. For adjacent channel interference, the corresponding ratios were 16dB for music, 16dB for talk with talk interference and 20dB for talk with music interference.
- For both co-channel and adjacent channel interference, respondents accepted much less interference on talk segments than they did on music segments.
- For musical formats, co-channel interference yielded high acceptance ratings at 26dB Wide and



above. Some variation of acceptability occurred in various musical formats.

- Adjacent channel interference for musical formats yielded high acceptance ratings at 16dB Wide and above. Again, there were variations of acceptability among different musical formats.

RADIO INTERFERENCE TOLERANCE LEVELS  
(Desired/Undesired dB levels)

	<u>ADJACENT</u>		<u>CO CHANNEL</u>	
	<u>DESIRED</u>	<u>UNDESIRE</u>	<u>DESIRED</u>	<u>UNDESIRE</u>
All Music	16dB Wide +*	12dB Wide - 6dB Narrow -	26dB Wide +	22dB Wide - 28dB Narrow -
AOR/Black	16dB Wide +	12dB Wide - 6dB Narrow -	22dB Wide +	28dB Narrow -
Beautiful Music	6dB Narrow + 12dB Wide +	0dB Narrow - 6dB Wide -	30dB Wide +	28dB Wide - 28dB Narrow -
Country/AC	16dB Wide +	12dB Wide - 6dB Narrow -	26dB Wide + 26dB Narrow +	22dB Wide - 22dB Narrow -
News/Talk (Music Interference)	20dB Wide +	16dB Wide - 6dB Narrow -	40dB Wide +	34dB Wide - 28dB Narrow -
News/Talk (Voice Interference)	16dB Wide +	12dB Wide - 6dB Narrow -	40dB Wide +	34dB Wide - 28dB Narrow -

\* In linear terms, the 26dB Wide acceptable co-channel figure can be stated as the interfering signal level being 5 percent of the desired signal level (in mathematical terms, the inverse logarithm of -1.3, which is -26dB first divided by 20, which is .05). For the acceptable adjacent channel figure of 16dB Wide, the interfering signal level is 16 percent of the desired signal. Using the same terms, the 12dB Wide unacceptable adjacent channel level represents an interfering signal level 25 percent of the desired signal level.



- Almost all of the respondents reported some experience with radio interference in their everyday listening situation. The problems mentioned most frequently included: station fading in and out; static/crackling; station over station; and blocked signal. Interference problems occur more often in cars than in buildings.
  
- When they hear it, respondents indicated that they deal with radio interference problems in a variety of ways, ranging from waiting to see if it improves, attempting to adjust the set, changing stations, or turning the radio off.
  
- Most of those studied felt the tapes that they had listened to were similar to "normal" radio interference they have experienced in the past. A few thought it was different, but they were divided about whether the interference on the tapes was worse or not as bad as usual interference.
  
- AM sound quality was reported to fall short of FM sound quality for the following reasons:
  - interference, especially weather related interference, increased hiss and background noise, and increased static
  
  - Sound quality, which appears to be both an image problem and an actual problem, including lack of stereo sound; less clarity of sound; and lack of clear/crisp musical sound



- Reception, especially weaker signal and inconsistent signal (producing fading in and out)

In summary, the study findings suggest that the acceptance standards for AM broadcast quality, as perceived by these respondents, are quite high. Although the 1946 study used a different methodology, it found that listeners in 1946, as compared to our 1988 data, would accept greater amounts of interference. For example, in 1946, 50% of the respondents accepted a D/U ratio of 28.6dB for talk with talk co-channel interference. In this study, the figure was 40dB. The overall co-channel interference ratio that satisfied 50% of the 1946 listeners was 23.5dB. Although no overall ratio is offered here, the music ratio was 26dB and both talk ratios were 40dB. Since adjacent channel interference was not tested with listeners in the 1946 study, no direct comparisons are made against the current findings.



## II. BACKGROUND AND OBJECTIVES

The National Association of Broadcasters (NAB) is interested in contributing to the Federal Communications Commission's Notice of Inquiry in MM Docket No. 87-267, "Review of Technical Assignment Criteria for the AM Broadcast Industry."

The Technical Assignment Criteria for the four classes of AM stations are based on a system of "protected contours" for which specific field strength values have been determined. Those values are calculated for both "nominal usable field strength" ( $E_{nom}$ ), and the "minimum usable field strength" ( $E_{min}$ ) needed to satisfy  $E_{nom}$ .

The FCC has developed technical guidelines as parameters regarding new or modified AM service. The reference data on which these values are based were reported in 1946, when the AM band was the primary broadcast medium. Since the 1940s, the number and quality of audio sources available to the public have changed dramatically. The primary concern at this time is interference. The three main sources of interference are:

- Station Transmitter Interference
  - Co-channel
  - Adjacent channel
- Man-made Interference
- Atmospheric Interference

Transmitter interference data will be used to investigate frequency allocation and frequency protection policies with the intent of initiating an AM spectrum



reevaluation. Transmitter interference, particularly co-channel interference, is the priority for this investigation. Therefore, man-made, atmospheric and skywave-groundwave interference conditions were not addressed in this study.

The objective of the study is to evaluate the degree to which different types and levels of transmitter interference affect the acceptability of various types of AM signals by the listening public.



### 111. METHODOLOGY

#### Limitations

As with any study, certain limitations must be kept in mind. In this study, a non-random sample was used, thus limiting the projectibility to a population. Additionally, respondents self-selected the formats they listened to based on their reported favorite stations. The choice of musical formats was reduced to three for reasons of logistics. While potential respondents were screened for "normal" hearing ability, this was based on self-report and a potential for bias exists.

#### Procedures

A total of 500 interviews were conducted with individuals 18 years and older in five geographically dispersed markets. The cities used for interviewing were Burlington, VT; Jacksonville, FL; Chicago, IL; Wichita, KS; and Los Angeles, CA. While not meant to suggest statistical projectability, these markets were selected as representative of a national cross section of radio listeners. One hundred interviews were completed in each market.

Respondents were screened to meet the following qualifications:

- Own at least one radio
- Report TSL (time spent listening) of:
  - At least 1 hour/day (5 hours/week)
  - and - No more than 10 hours/day (60 hours/week)



- At least 25% of sample AM listeners
- Fall within one of ten representative format preferences
- (Within the above) Age, sex and race distributions

In each of the markets, potential respondents were intercepted randomly at shopping centers/malls. Those who qualified were asked to participate in the study. In two of the markets (Burlington, VT and Wichita, KS.), respondents were paid a cooperation incentive of \$15 to \$25. In the remaining locations, such incentives were not necessary.

Such interviewing procedures are commonly used in a wide variety of consumer studies to ascertain prevailing attitudes, opinions, preferences and for the determination of acceptance thresholds. In our professional opinion as consumer researchers, we are confident that this methodological choice is appropriate and reliable, given the study objectives.

#### Interference Tested

Two types of station transmitter interference were tested: first adjacent channel and co-channel. Half of the respondents listened to tapes containing adjacent channel interference, while half listened to co-channel interference. Each respondent listened to ten musical selections on tape. The type of music was determined by their favorite or usual choice of music, i.e., respondents





were assigned to formats based on their self reported listening preferences. Adjacent and co-channel interference were tested in all three music formats:

- AOR/Black-Urban/CHR (Contemporary Hit Radio)
- Easy Listening/Beautiful Music
- Country/AC (Adult Contemporary)

Each respondent also heard tapes with talk. One set of these tapes had music interference over the talking, while the other set had voice interference.

Both desired and undesired interfering transmissions originated off either CD versions of music selections or professional reel to reel recordings of news/talk programming. The audio selections were:

<u>Desired Signal</u>	<u>Format</u>
Smokin' Gun - Robert Cray Band	AOR/Black-Urban/CHR
Margaritaville - Jimmy Buffett	Country/AC
Ebb Tide - 101 Strings	Easy Listening/Beautiful
Live talk segment - WGN radio	News/Talk

<u>Undesired Signal</u>	<u>Type of Interference</u>
Everlasting - Natalie Cole	Music
Live newscast - WGN radio	Voice

The "Desired Signal" selections were chosen for the broadest appeal across designated formats. The "Undesired music Signal" selection was used since, as a Pop production, the audio level was quite consistent due to processing in the original recording. The "Undesired voice Signal" was typical of current newscast formats.



The interference tested, listed from no interference (the FM benchmark) to the most interference, is as follows:

<u>Adjacent Channel</u>	<u>Co-Channel</u>
FM	FM
20dB Wide*	40dB Wide
16dB Wide	34dB Wide
6dB Narrow	30dB Wide
12dB Wide	28dB Narrow
0dB Narrow	28dB Wide
6dB Wide	26dB Narrow
-4dB Narrow	26dB Wide
0dB Wide	22dB Narrow
-4dB Wide	22dB Wide

\* For example, "20dB Wide" for adjacent channel interference indicates the interfering station transmitted signal was set at a level 20dB below the level of on-channel signal, and the recording was made with the test receiver set to its "wide" bandwidth mode (respondents listened to an audio bandwidth of approximately 9 kHz in the "wide" mode and 6 kHz in the "narrow" mode). "FM" refers to a strong signal, with "wide" bandwidth and without an interfering signal.



## Technical Notes Regarding Preparation of Tapes

The tapes used in the study were prepared by NAB. The details of how these tapes were produced have been provided by NAB, and this technical information follows.

As noted, the audio tapes used in this study contain recordings of AM transmissions with varying amounts of added interference. To create these recordings, an AM transmission and reception system was constructed in the electronics laboratory of the National Association of Broadcasters.

Those interference cuts were recorded by the NAB onto a digital audio tape (DAT).

A DAT player was used to reproduce first generation cuts onto a professional cassette machine. Back-up tapes were produced simultaneously on a second machine and were also, therefore, first generation. The cassette tape used was Maxell UDXL11.

All recordings were monophonic with the same information to both channels of the cassettes using a "Y" connector. Signal levels were set for 0dB peaks. No equalization or noise reduction was used. The NAB felt that the most accurate cassette reproduction of the original audio signal would be achieved without any noise reduction. After some experimenting with and without noise reduction, the project director was in agreement with the NAB.



### Equipment Used for Listening Tests

The audio playback equipment that was used for the consumer listening tests was identical in each market. The audio equipment consisted of:

- A Tascam 122 Mk 11 cassette deck
- An Electro-Voice 1/3 Octave EQ
- 2 Electro-Voice Sentry 100 Self-Powered Speakers

In order to ensure identical audio information on both speakers, the audio output was fed from the left channel only of the cassette deck into the EQ. From the EQ, a splitter was used to send identical signals to each speaker.

### Technical Preparation for Listening Rooms

Each room was equalized for flat response up to 10KHZ using a pink noise source and spectrum analyzer with calibrated microphone. Pre-recorded pink noise cassette tapes were used so that the room could be EQed for the specific head alignment of the individual cassette deck.

The microphone was placed in various orientations and at different elevations so as to test response within the range of movement for a seated listener. All frequencies were set to compensate for seating positions.

In some locations, the room required hanging sound dispersion material on the wall in order to obtain a flat acoustic response. All other rooms were equalized without the need for additional sound absorption/dispersion.



### Transmission System

Two program chains were developed, one for the desired signal and one for the undesired, interfering signal. The program source material originated on two consumer-type compact disc players, a Magnavox CDB-560 and a Magnavox FD1051. The "talk" material, however, originated on a high-quality reel to reel professional tape machine, an Otari MX55. The output of each compact disc player then passed through state-of-the-art audio processing equipment, adjusted for typical and average station operation. Audio processing conformed to the NRSC-1 audio standard. The output of each audio processor then fed a laboratory-quality signal generator (HP 3314A and Boonton 103D) in order to produce an AM modulated RF carrier. The modulation of each generator was carefully adjusted to produce high average modulation without carrier-clipping. Modulation characteristics were observed on a Tektronix 7A18 Oscilloscope. The magnitude of the RF carriers and the occupied bandwidth of the AM transmissions were observed using a Tektronix 7L14 Spectrum Analyzer. The output of each signal generator was combined and fed to the receiving and recording system.

### Receiving System

The RF output of the transmission system was coupled to an automobile-type AM receiver. A matching network was used to avoid an impedance mismatch between the coaxial cable from the transmission system and the antenna inputs of the receiver. The receiver and one signal generator were tuned to 1000 kHz. This receiver was specially designed for the National Association of Broadcasters. It included NRSC deemphasis and as a wide a bandwidth as deemed



technically feasible for the receiver manufacturer. The receiver was equipped with both "wide" and "narrow" bandwidth positions. Tone controls were kept neutral. The other signal generator, representing the undesired signal, was tuned to either 1000 kHz or 1010 kHz, depending on whether co-channel or adjacent channel interference was being recorded. Since all transmissions were in monophonic, then each audio output of the AM receiver were combined and fed the right channel of a digital audio tape (DAT) recorder. Cue instructions, via microphone and preamp, were fed to the DAT left channel.

#### Recording and Test Procedure

A variety of desired-to-undesired (D/U) RF ratios were tested using the above-described transmission/reception system. The desired RF signals were kept constant. The magnitude of the undesired signals were controlled at the Boonton 103D signal generator. In each instance of recording, the D/U ratios were verified on the Tektronix spectrum analyzer. Recording gain was constant throughout the test. Audio processing was kept constant throughout the test, except that, for the FM "benchmark," two changes were made to the audio processing: (1) a wider audio bandwidth was used (approximately 12.5 kHz instead of 10 kHz), and (2) the processor's asymmetry control was turned to minimum (i.e., equal positive and negative peaks).

Set up of all test equipment was performed by competent engineering personnel, with much experience in conducting tests of this kind. Block diagram, lists of equipment, etc. are available at the offices of NAB Science & Technology, (202) 429-5346.



#### IV. DETAILED FINDINGS

The results of the respondents' opinions about the levels of interference they listened to on the test tapes are expressed as average, or mean ratings. The respondents rated 10 interference segments on each tape utilizing a 6-point acceptance scale, where a rating of 6 denoted "completely acceptable," and a rating of 1 denoted "completely unacceptable" levels of interference. With a midpoint value of this range at 3.5, any rating below 3.5 is considered "unacceptable."

##### A. Co-Channel Interference

###### 1. Interference Over Music

The acceptability ratings for respondents who heard "Easy Listening/Beautiful Music" tapes and "Country/AC" tapes were more consistent than the ratings of those who listened to "AOR/Black-Urban/CHR." The mean ratings for the first two types of Music almost perfectly followed the levels of interference. That is, the acceptability of the sound decreased as the level of interference increased.

Furthermore, based on these ratings, it was evident that higher interference levels were more acceptable for "Country/AC" music and for "Easy Listening/Beautiful music" than for "AOR/Black-Urban/CHR" music. In particular, those who listened to "AOR/Black-Urban/CHR" rated the narrow bandwidths at 28dB and 26dB much lower than the wide bandwidths at 28dB and



26dB. For all three types of music, 22dB Wide was rated higher than 22dB Narrow, although all were below the 3.5 threshold of acceptability.

Overall, the most acceptable ratings for co-channel interference were above 30dB Wide, of 4.12 or higher. The 28dB and 26dB levels were marginally acceptable, at 3.61 and 3.52, respectively.

In the following table, the acceptable levels based on a 6-point acceptance scale (1=Completely Unacceptable and 6=Completely Acceptable) are highlighted.

CO-CHANNEL MUSIC INTERFERENCE

<u>6-point acceptance scale</u>		<u>EASY</u>	<u>COUNTRY/</u>	<u>AOR/</u>	<u>TOTAL</u>
1=Completely Unacceptable	6=Completely Acceptable				
FM		5.14*	5.29*	4.92*	5.06*
40dB Wide		5.11*	4.67*	4.25*	4.49*
34dB Wide		4.86*	4.32*	3.80*	4.10*
30dB Wide		4.43*	4.06*	4.08*	4.12*
28dB Narrow		3.97*	3.75*	2.84	3.26
28dB Wide		3.49	3.68*	3.61*	3.61*
26dB Narrow		3.49*	3.54*	2.70	3.05
26dB Wide		2.83	3.54	3.68*	3.52*
22dB Narrow		2.66	3.10	2.29	2.57
22dB Wide		2.66	2.81	3.43*	3.15
(Base)		(35)	(72)	(145)	(252)

\* Acceptable to 50% or more of the respondents.





2. Interference Over Talk

The respondents' tolerance for interference caused by music over talk, or talk over talk, was much lower overall than was the music over music interference. As seen in the following table, only at the FM standards level, or at the 40dB Wide, was the interference perceived to be acceptable to the participants.

INTERFERENCE OVER TALK--CO-CHANNEL

<u>6-point acceptance scale</u>		
	1=Completely Unacceptable	
	6=Completely Acceptable	
	<u>MUSIC/ TALK</u>	<u>TALK/ TALK</u>
FM	4.49*	4.15*
40dB Wide	3.85*	3.84*
34dB Wide	3.09	3.39
30dB Wide	2.46	2.65
28dB Narrow	2.20	2.26
28dB Wide	2.00	1.96
26dB Narrow	1.95	1.83
26dB Wide	1.76	1.61
22dB Narrow	1.56	1.47
22dB Wide	1.47	1.40
(Base)	(252)	(252)

\* Acceptable to 50% or more of the respondents.



3. Co-Channel Summary

In summary then, co-channel interference was acceptable to the participants at FM and 40dB Wide levels for interference over talk. In turn, interference over music was tolerable to a much broader range, down to as low as 26dB Wide.

4. Additional Statistical Procedures--Co-Channel

A special statistical test, called an analysis of variance (ANOVA), was performed on the ratings for total music over music, total music over news/talk and for talk over news/talk. The purpose of this analysis was to determine the strength of the levels of difference among the means.

This analytical procedure was done to assure that any differences observed among the means were real differences, and not due to chance. ANOVA does this by comparing the variation of observations within each mean to the variation across all means. When "within" variation is large, it is more likely that differences are due to chance. When the ANOVA was significant (at the 95% confidence level) further comparisons were carried out to determine which means were significantly different.



For co-channel interference, the significant differences among the means are as follows:

(1) Total Music over Music

- FM is significantly more acceptable than 40dB Wide and below
- 40dB Wide is significantly more acceptable than 34dB Wide and below
- 30dB Wide and 34dB Wide are statistically comparable, and more acceptable than 28dB Narrow and below
- 28dB Wide and 26dB Wide are statistically comparable, and more acceptable than 28dB Narrow, 26dB Narrow and below

(2) Total Music over News/Talk

- FM is significantly more acceptable than 40dB Wide and below
- 40dB Wide is significantly more acceptable than 34dB Wide and below

(3) Total Talk over News/Talk

- FM is significantly more acceptable than 40dB Wide and below
- 40dB Wide is significantly more acceptable than 34dB Wide and below

The remaining significant differences all involved levels where the interference was consistently unacceptable to the respondents--at 3.5 and below.



B. Adjacent Channel Interference

1. Interference Over Music

Respondents who listened to "Easy Listening/ Beautiful Music" appeared to be more tolerant of interference than those who were exposed to "Country/AC" or the "AOR/Black-Urban/CHR" music. The pattern of ratings as interference increased held for "Easy Listening/Beautiful Music" and "Country/AC." As for the co-channel test, the acceptability ratings were again less consistent for "AOR/Black-Urban/CHR." As with co-channel ratings, the wide bandwidths were rated higher than the narrow bands.

ADJACENT CHANNEL MUSIC INTERFERENCE

<u>6-point acceptance scale</u> 1=Completely Unacceptable 6=Completely Acceptable	<u>EASY LISTEN</u>	<u>COUNTRY/ AC</u>	<u>AOR/ BLACK</u>	<u>TOTAL MUSIC</u>
FM	5.46*	5.24*	5.19*	5.24*
20dB Wide	5.36*	4.47*	4.53*	4.60*
16dB Wide	4.93*	4.15*	4.33*	4.34*
6dB Narrow	3.54*	2.71	2.87	2.89
12dB Wide	3.64*	2.84	3.33	3.19
0dB Narrow	2.46	1.98	1.80	1.94
6dB Wide	2.54	1.90	2.19	2.13
-4dB Narrow	1.82	1.45	1.45	1.49
0dB Wide	1.82	1.43	1.49	1.51
-4dB Narrow	1.46	1.35	1.39	1.38
(Base)	(28)	(86)	(134)	(248)

\* Acceptable to 50% or more of the respondents.



2. Interference Over Talk

For adjacent channel interference, the respondents again demonstrated a lower level of tolerance for interference caused by either music or talk over talk than by music over music. For voice interference, acceptability was once again at the highest two levels: FM or at 20dB Wide. Interference related by talk over talk was slightly more acceptable than for music over talk. It was acceptable at the 16dB Wide level or above, with a mean of 3.58.

INTERFERENCE OVER TALK--ADJACENT CHANNEL

6-point acceptable scale

1=Completely Unacceptable

6=Completely Acceptable

	<u>MUSIC/ TALK</u>	<u>TALK/ TALK</u>
FM	4.92*	4.42*
20dB Wide	3.66*	4.12*
16dB Wide	2.95	3.58*
6dB Narrow	2.17	2.90
12dB Wide	2.06	2.67
0dB Narrow	1.65	2.03
6dB Wide	1.53	1.80
-4dB Narrow	1.36	1.56
0dB Wide	1.34	1.49
-4dB Narrow	1.29	1.39
(Base)	(248)	(248)

\* Acceptable to 50% or more of the respondents.



3. Additional Statistical Procedures--Adjacent Channel

Analysis of variance was also performed for the adjacent channel interference on the ratings for total music over music, total music over news/talk and for talk over news/talk. For adjacent interference, the significant differences between the means are as follows:

- (1) Total Music over Music
  - FM is significantly more acceptable than 20dB Wide and below
  - 20dB Wide is significantly more acceptable than 16dB Wide and below
  - 16dB Wide is significantly more acceptable than 12dB Wide and below
  
- (2) Total Music over News/Talk
  - FM is significantly more acceptable than 20dB Wide and below
  - 20dB Wide is significantly more acceptable than 16dB Wide and below
  
- (3) Total Talk over News/Talk
  - FM is significantly more acceptable than 20dB Wide and below
  - 20dB Wide is significantly more acceptable than 16dB Wide and below
  - 16dB Wide is significantly more acceptable than 6dB Narrow and below

As before, the remaining significant differences involved levels where the interference was unacceptable to the respondents -- at 3.5 and below.



C. Comparative Co-Channel Versus Adjacent Channel Interference Acceptance Ratings

As a further indication of the degree of acceptability of interference, between those respondents who are exposed to the co-channel tapes versus their adjacent channel counterparts, the findings within each of the two were combined, bringing together the acceptance resulting from all of the evaluations within each of the two segments.

For the accumulated co-channel segment, the ratings of 3.5 and above were restricted to interference at 34dB Wide or higher. All other interferences, from 30dB Wide on down, were judged unacceptable.

The combined adjacent channel ratings indicated that at 16dB Wide or above, the interference was judged acceptable. From 6dB Narrow and from 12dB Wide on down, the interference was judged unacceptable.



D. Experience with Radio Interference

At the beginning of the interview, the respondents were asked a series of questions about the extent of their experience with radio interference: what kinds of interference they had experienced; frequency of experiencing radio interference; where they heard radio interference (home, car, at work); how much radio interference bothered them; and what they usually did about interference. This section of the report provides a brief synopsis of their responses to this series of questions.

1. Type of Interference Experienced

Virtually all the respondents reported some experience with radio interference. In fact, only 4% said they had not experienced interference. The types of interference reported most frequently were:

Fading in and out	69%
Static/crackling	67
Station cutting in over station	45
Blocked Signal (building/hill)	37
Whistle/whine	20
Splashy/splattering sound	20

2. Frequency of Interference Experience

A very small proportion reported any of the above interference problems occurring "frequently." The incidence of reporting specific problems all or most of the time were: "static," 13%; "fading," 8%; "station over station," 7%; and "blocked signal," 6%.





3. Interference By Location

The most common location related reception problem was reported to be in the car. Regardless of location, "fading" and "static" remain the most frequently mentioned problems. "Blocking of the signal" reportedly occurs most often in the car. A summary of problem by location appears below.

	<u>CAR</u>	<u>HOME</u>	<u>WORK</u>
Fading in and out	40%	29%	6%
Static/crackling	41	26	8
Station cutting in over station	24	19	4
Blocked Signal (building/hill)	26	7	3
Whistle/whine	11	5	1
Splashy/splattering sound	10	6	2
None reported	32	50	84

4. Reaction to Interference

Half (50%) of those respondents who reported reception related problems said that "fading" and "static" bothered them "very much" or "somewhat." One-third (31%) said that "station over station" interference bothered them "very much" or "somewhat," while one-fourth (26%) felt that way about "blocked signals."

When interference problems are experienced, nearly two-thirds (63%) of these radio listeners reported that they "listen for a while" before



they decide it to be unacceptable enough to "do something about it." One in five (19%) decide to do something when they first turn the radio on, and 12% reported that they take action only when something else comes on the radio. The most common solution was said to be "change stations," reported by 57%. In addition, 30% turn the radio off, while 28% attempt to adjust the radio, and 12% wait to see if it will clear up. These answers total more than 100%, as listeners were allowed to give more than one response. For example, a person might have said they try to adjust the station and if that doesn't work, they turn off the radio.

5. Location of Interference

Respondents were asked if radio reception was generally worse when listening inside a building or in a car. Consistent with their previous answers, about two-thirds (64%) said interference was worse in a car, while 33% said interference was worse in a building. Those who believe interference is worse in a car feel it is worse for the following ways and reasons:

Interference in Car

Inconsistent signal (includes fading)	18%
Bad reception/interference in car	17
Static/noise	14
Interference from structures/buildings	12
Changes in distance from station	11
Electrical interference	10
Quality of car radio/sound in car	7



Those who believe interference is worse in a building feel it is worse for the following reasons:

Interference in Building

General interference (includes static)	12%
Weaker signal/bad reception	10
Inconsistent signal (includes fading)	7
Buildings interrupt signal	7
Electrical interference	5

6. Impact of Interference on Listener Behavior

Some respondents (14%) reported that they stopped listening to any radio stations because of too much interference. For those who have stopped listening to a station, 3% stopped listening to an AM station, 8% stopped listening to an FM station and 3% did not specify the kind of station to which they had stopped listening.

7. Perceptions of Test Interference

The study participants were asked if the interference they had listened to on the tapes was similar or different from the kinds of interference that they have heard on the radio. Three-fourths (78%) felt the tapes were similar to radio interference they have experienced in the past.



Those who felt it was the same noted these major similarities:

Station over station	57%
General interference (includes static/crackle/whine)	33
Inconsistent signal (includes fading)	16

Those who felt what they listened to was not the same noted these major differences:

This interference was worse	13%
This interference was not as bad	5
Station over station	9
General interference (includes static/crackle/whine)	5
Inconsistent signal (includes fading)	3
Hiss/background noise	3



8. Reactions to Overall Quality of Test Tape

Toward the end of the interview, the respondents listened to a full length NRSC wide band cut of their respective musical selection at the current FCC standards -- 26dB for co-channel or 0dB for adjacent channel. They were asked to rate the sound quality of the tape on a 4-point scale: excellent, good, fair or poor.

Those who had listened to the co-channel tape rated its sound quality at a mean of 2.66 out of 4.00 -- 65% rated it "excellent" or "good." The sound quality of the adjacent channel tape, in turn, was rated significantly lower at a mean of 1.94 -- 33% rated it "excellent" or "good."

	<u>CO-CHANNEL</u>	<u>ADJACENT CHANNEL</u>
FCC Standard	26dB	0dB
<u>Sound Quality Rating</u>		
Excellent	10%	4%
Good	55	29
Fair	26	26
Poor	9	42
<u>Mean</u>	<u>2.66</u>	<u>1.94</u>
(Base)	(252)	(248)



After the sound quality of the test tape had been rated, respondents were asked if they would expect to hear this kind of broadcast quality on an FM or AM station. They were nearly divided on this issue: 55% said it was AM, while 51% said it was FM. Since some of the participants stated that they would have expected this kind of broadcast quality for either AM or FM, these total over 100%.

The reasons given for these answers fell into four major categories, as follows:

	<u>AM</u>	<u>FM</u>
Sound quality (includes clarity/ frequency response/stereo/not stereo/overall quality)	31%	30%
Interference (includes more interference/static/hiss/noise/ station over station interference/ modulation)	23	14
Reception (includes strength of of signal/not as strong/ stronger/inconsistent/fading)	13	11
Image (includes view that FM is better/AM is worse/what I listen to/don't listen to, etc.)	9	7



9. Perception of AM Sound Quality

The study participants were next asked to describe the difference between the sound quality of the AM radio signal and the FM radio signal, thinking about other qualities, as well as interference. The differences they noted were similar to the answers given to the previous question. The sound quality of AM radio was described as follows:

<u>Sound Quality Image (Net)</u>	<u>58%</u>
No stereo sound	18
Less/no clarity of sound	14
Music not as clear/crisp	8
Poorer quality	6
<u>Interference (Net)</u>	<u>24%</u>
More interference/static	18
Hiss/background noise	4
<u>Reception (Net)</u>	<u>23%</u>
Weaker signal/distant	12
Fades out	4
<u>No Difference</u>	<u>2%</u>



10. Perceptions of AM Radio Sound Quality Problems

In closing, the respondents were asked to define the major problems with the sound quality of the AM radio signal. Again, these answers were quite similar to the earlier questions, although one new complaint with AM interference did emerge. This was the problem presented by weather interference, mentioned by 69% of those interviewed.

<u>Interference (Net)</u>	<u>85%</u>
Weather interference	69
Hiss/background noise	37
Static	19
More interference (not specified)	8
Station crowding	7
<u>Reception (Net)</u>	<u>33%</u>
Weak signal	20
Inconsistent/fading	9
<u>Sound Quality Image (Net)</u>	<u>32%</u>
Frequency response (includes music not crisp/flat/ tinny/shallow)	13
AM image	6
<u>Don't Know</u>	<u>15%</u>



B. Angell & Associates, Inc.



STUDY #88-123/1424Q  
FOR OFFICE USE ONLY:

RESPONDENT # \_\_\_\_\_ (1-4)

One East Superior Street • Chicago Illinois 60611 • 312/943-4400

ADJ-CHANNEL  
"A" CASSETTES (6)

NAB RADIO INTERFERENCE  
(Screening Questionnaire)

- 1 Burlington
- 2 Jacksonville
- (-3) Chicago
- 4 Wichita
- 5 Los Angeles (5)

Male -1  
Female - 2

FAVORITE STATION (Q.N):  
\_\_\_\_\_  
CASS. USED: ( ) (7)

AM LISTENER -1 Yes  
-2 No  
(8)

Hello, I'm \_\_\_\_\_ from B. Angell Research, an independent consumer research company. We are conducting a survey of public opinion in several cities throughout the country and would like to ask you a few questions.

A. In the past four months, have you participated in a marketing research study?

IF YES → TERMINATE AND TALLY → [ ] (9-10)

B. (SHOW CARD "A") Which one letter on this card best describes your age?

- A. -1 Under 18
  - B. -2 18-24
  - C. -3 25-34
  - D. -4 35-44
  - E. -5 45-54
  - F. -6 55+
- TERMINATE AND TALLY → [ ] (11-12)
- OBTAIN A GOOD SPREAD (13)

C. What is your occupation? \_\_\_\_\_

(PROBE FOR SPECIFIC FIELD) (14)

IF RADIO, MUSIC, BROADCAST-RELATED, TERMINATE AND TALLY → [ ] (15-16)

D. This survey specifically deals with listening to a variety of audio and sound sources. Since we will be talking about a wide range of sounds we would like to know: Do you have any hearing disorders?

Yes → TERMINATE AND TALLY → [ ]  
No → CONTINUE (17-18)

E. Do you live in the (INSERT MARKET) metro/suburban area?

-1 Yes → CONTINUE

-2 No → BURLINGTON ONLY:

(19) Are you a U. S. resident?

-1 Yes → CONTINUE

(20) -2 No → TERMINATE AND TALLY

F. How many radios, receivers, or tuners do you own that pick-up either FM and/or AM broadcast stations? (DO NOT READ)

-1 None → TERMINATE AND TALLY →  (21-22)

-2 One }  
-3 Two } → CONTINUE

-4 Three or more } (23)

(DO NOT MENTION) -- IF ASKED, DOES INCLUDE CAR RADIO

G. On a typical day, including all day long and all night, how much time do you spend listening to the radio -- would you say: (READ LIST) (CHECK ONE)

-1 Less than 1 hour per day TERMINATE AND TALLY →  (24-25)

-2 1-2 hours per day }  
-3 3-4 hours per day } → CONTINUE

-4 5-8 hours per day } (26)

-5 9-10 hours per day }  
-6 More than 10

hours per day ASK: How many days per week do you usually listen to the radio? (DO NOT READ)

-1 1-5 days per week → CONTINUE (27)

-2 6-7 days per week → TERMINATE AND TALLY  (28-29)

(SHOW CARD "B")

H. Which letter on this card best describes your radio listening:

A. -1 Only AM Stations

B. -2 Mostly AM but some FM Stations (at least 5 minutes per week)

C. -3 AM & FM Stations equally

D. -4 Mostly FM but some AM Stations (at least 5 minutes per week)

E. -5 Only FM Stations (CHECK QUOTA)

(30)

RECORD ALL ANSWERS ON NEXT PAGE

- I. What radio stations do you listen to at least 5 minutes a week? (DO NOT READ) (CIRCLE ALL THAT APPLY)

(IF RESPONDENT DOES NOT KNOW CALL-LETTERS, HAVE THEM GIVE FREQUENCY/DIAL POSITION, SLOGAN, CITY/STATE, SPECIFIC PROGRAMS, OR ANY OTHER WAY OF IDENTIFYING STATION -- USE STATION PAGE FOR REFERENCE)

FOR ALL STATIONS CIRCLED IN Q.I  
ASK Qs. J - M AND RECORD ON NEXT PAGE:

- J. Is... (INSERT STATION FROM Q.I) which you listen to AM or FM?
- K. (SHOW CARD "C") Using this card, please tell me at what time of day do you usually listen to...  
(INSERT STATION FROM Q.I) (CIRCLE ALL THAT APPLY)
- L. In what location are you when you are usually listening to... (INSERT STATION FROM Q.I) -- would that be: (1) At Home; (2) Away-from-Home -- In the Car; or (3) Away-from-Home -- Not in the Car (CIRCLE ALL THAT APPLY)

(ASK ONLY FOR CIRCLED AS "OTHER" IN Q.I)

- M. What kind of programming or music do they have on (INSERT "OTHER" STATION FROM Q.I)? (BE AS SPECIFIC AS POSSIBLE) (CIRCLE ALL THAT APPLY) (RECORD ON NEXT PAGE)

(BM/E-Z = "Beautiful Music")

- N. Which is your favorite station? (ACCEPT ONLY ONE) (VERIFY IF STATION IS "AM" OR "FM" IF IT CAN BE EITHER)

- \* IF Q.N = ANY NEWS/TALK OR NON-MUSIC STATION -- ASK:  
And what is your favorite music station? (CIRCLE ONE MORE ON NEXT PAGE)

(31) STATION/FREQ	(BAND)		(WHEN LISTEN)					(WHERE LISTEN)			(KIND OF PROGRAM)					FAVRIT STATN
	AM	FM	6-10	10-3	3-7	7-Md	Md-6	HOME	CAR	OTHER	E-Z	CNTRY	BLACK	TALK	OTH	
-1 WAUR/107.9	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (36)						-1 (13)
-2 WBBMa/780	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-2*
-3 WBBMf/96.3	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-3
-4 WBEE/1570	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-4
-5 WBMXa/1490	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-5
-6 WBMXf/102.7	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (41)						-6
-7 WBEZ/91.5	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-7
-8 WCKG/105.9	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-8
-9 WCLR/101.9	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-9
-0 WCZE/820	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-0
-X WFMT/98.7	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (46)						-X
-R WFYR/103.5 (32)	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-R
-1 WGCia/1390	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-1 (14)
-2 WGCIf/107.5	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-2
-3 WGN/720	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-3*
-4 WIND/560	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (51)						-4
-5 WJJD/1160	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-5
-6 WJMK/104.3	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-6
-7 WJOB/1230	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-7*
-8 WJPC/950	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-8
-9 WJZQ/95.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (56)						-9
-0 WKQX/101.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-0
-X WLAK/93.9	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-X
-R WL00/100.3 (33)	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-R
-1 WLS/890	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-1 (15)
-2 WLUPa/1000	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (61)						-2
-3 WLUPf/97.9	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-3
-4 WMAQ/670	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-4*
-5 WMBia/1110	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-5
-6 WMBif/90.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-6
-7 WNIB/97.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (66)						-7
-8 WNUA/95.5	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-8
-9 WOJO/1320	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-9
-0 WRXR/105.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-0
-X WTAQ/106.7	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-X
-R WUSN/99.5 (34)	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0 (71)						-R
-1 WVON/1450	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-1 (16)
-2 WUCA/1270	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-2
-3 WXRT/93.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-3
-4 WYTZf/94.7 (35)	-1	-2	-3	-4	-5	-6	-7	-8	-9	-0						-4
<input type="checkbox"/> (OTHER)	-1	-2	-1	-2	-3	-4	-5	-1	-2	-3 (76)	-1	-2	-3	-4	-5 (9)	<input type="checkbox"/> (17)
<input type="checkbox"/> (OTHER)	-1	-2	-1	-2	-3	-4	-5	-1	-2	-3	-1	-2	-3	-4	-5 (10)	<input type="checkbox"/> (18)
<input type="checkbox"/> (OTHER)	-1	-2	-1	-2	-3	-4	-5	-1	-2	-3 (79-80)-1	-1	-2	-3	-4	-5 (11) (12)	<input type="checkbox"/> (19)

NOTE: IF WIND, WOJO, WTAQ, OR OTHER SPANISH LANGUAGE STATIONS ARE ONLY STATIONS LISTENED TO TERMINATE AND SAVE SCREENER

O. Which of these do you use regularly: (READ LIST) (CIRCLE ALL THAT APPLY)

- 1 Hi-Fi Stereo System (20)
- 2 Compact Disc Player (CD)
- 3 Record Turntable
- 4 Cassette Deck
- 5 Stereo TV
- 6 Hi-Fi/Stereo VCR
- 7 Graphic Equalizer

P. (SHOW CARD "D") Overall, which letter on this card best represents the value of the audio system you use most often?

- A. -1 Less than \$50 (21)
- B. -2 \$50-\$99
- C. -3 \$100-\$299
- D. -4 \$300-\$499
- E. -5 \$500-\$999
- F. -6 \$1,000-\$1,999
- G. -7 \$2,000-\$2,999
- H. -8 \$3,000 and over

Q. Generally speaking, how can you tell if you are hearing good audio quality? (PROBE) (BE SPECIFIC)

- \_\_\_\_\_ (22)
- \_\_\_\_\_ (23)
- \_\_\_\_\_ (24)
- \_\_\_\_\_ (25)
- \_\_\_\_\_ (26)
- \_\_\_\_\_ (27)
- \_\_\_\_\_ (28)
- \_\_\_\_\_ (29)
- \_\_\_\_\_ (30)

R. We would like to interview you as part of a survey on Audio and Radio listening. The rest of this interview will take about 15-20 minutes. If you will come with me, we would like to finish the rest of the questions at our offices (over here).

TAKE RESPONDENT TO INTERVIEWING LOCATION. ADMINISTER DETAILED QUESTIONNAIRE.

IF REFUSAL -- TERMINATE AND SAVE SCREENER

(31-32)

CHECK FOR APPROPRIATE MUSIC AND RECORD BELOW:  
(Chicago)

<u>FAVORITE STATION</u> <u>(FROM Q.N)</u>	<u>TAPE</u>	<u>FAVORITE STATION</u> <u>(FROM Q.N)</u>	<u>TAPE</u>	<u>FAVORITE STATION</u> <u>(FROM Q.N)</u>	<u>TAPE</u>
WAUR.....	2	*WGN.....	4	*WMAQ.....	4
*WBBMa.....	4	WJJD.....	2	WMBIa.....	2
WBBMf.....	1	WJMK.....	3	WMBif.....	2
WBEE.....	1	*WJOB.....	4	WNIB.....	2
WBMXa.....	1	WJPC.....	1	WNUA.....	1
WBMXf.....	1	WJZQ.....	2	WRXR.....	3
WBEZ.....	4	WKQX.....	3	WUSN.....	3
WCKG.....	1	WLAK.....	3	WVON.....	3
WCLR.....	3	WLOO.....	2	WWCA.....	2
WCZE.....	2	WLS.....	3	WXRT.....	1
WFMT.....	2	WLUPa.....	1	WYtz.....	1
WFYR.....	3	WLUPf.....	1		
WGCia.....	1				
WGCif.....	1				

(3)

Other (specify) ( )

MUST INCLUDE MUSIC STATION -- THERE WILL BE TWO FAVORITES  
CIRCLED ONLY WHEN 1st FAVORITE IS  
NEWS/TALK!

(TAPES "1 - 3")

NOTE: THIS DATA MUST BE VERIFIED WITH A SUPERVISOR AND LOGGED  
ON THE MAIN QUESTIONNAIRE AND FRONT OF SCREENER



ADJ-CHANNEL  
 "A" CASSETTES

One East Superior Street • Chicago, Illinois 60611 • 312/943-4400

B. Angell & Associates, Inc.

AM LISTENER -1 Yes  
 -2 No

NAB RADIO INTERFERENCE  
 (Main Questionnaire)

-1 Burlington  
 ② Jacksonville  
 -3 Chicago  
 -4 Wichita  
 -5 Los Angeles

FROM LAST PAGE OF SCREENER:  
 RECORD FAVORITE STATION  
 FROM Q.N. \_\_\_\_\_  
 CASSETTE USED: ( )

TIME STARTED:  
 \_\_\_\_\_ a.m.  
 \_\_\_\_\_ p.m.

NOTE: MAKE SURE ALL TAPES HAVE BEEN RE-WOUND AND THE CORRECT TAPE FOR THIS RESPONDENT HAS BEEN CHOSEN AND INSERTED IN CASSETTE MACHINE

MAKE SURE POWER BUTTON ON PLUG STRIP (ON FLOOR) IS ON

1. We would like to know how you feel toward interference on the radio. By interference, we mean any annoying or undesirable noise or other sounds that either partially or completely obscure the radio station you want to hear. Thinking about your normal radio listening, or if you try to tape off the radio, have you ever been bothered by interference on the radio?

-1 Yes  
 -2 No

(39)

**RECORD ALL ANSWERS ON NEXT PAGE**

2. (SHOW CARD "E") Which of the situations listed on this card have you ever experienced while listening to the radio?  
(CIRCLE ALL THAT APPLY)

- (1) The station you are listening to "fading in and out"
- (2) A building or hill blocking your signal
- (3) Another station cutting in over your station
- (4) "Splashy" or "splattering" sound over your station
- (5) Static/crackling
- (6) Whistles, whines/tones

Other \_\_\_\_\_

(Please describe in detail)

**FOR ALL SITUATIONS CIRCLED IN Q.2/"EXPERIENCED" --  
ASK Qs. 3 - 6 AND RECORD ON NEXT PAGE.**

(SHOW CARD "F")

3. How often do you experience... (INSERT ALL CIRCLED FROM Q.2):

IF Q.3 = -2 OR -1 SKIP TO Q.7a.

4. On which stations have you heard... (INSERT ALL CIRCLED FROM Q.2)?

(SHOW CARD "G")

5. When you hear ... (INSERT ALL CIRCLED FROM Q.2), in what location would you be listening to the radio?

(SHOW CARD "H")

6. How much does it bother you when you hear ... (INSERT ALL CIRCLED FROM Q.2) ?



RECORD ALL ANSWERS FOR Qs. 3-6 BELOW

Q.2 EXP.	Q.3					Q.4		Q.5				Q.6					
	ALL TIME	MOST TIME	SOME TIME	HDLY EVER	NEVR	STATIONS (WRITE IN)		AT HOME	IN CAR	AT WORK	OTHR AWAY	VERY MUCH	SOME WHAT	SLIG HTLY	NOT ALL		
-1 (40)	-5	-4	-3	-2	-1 (45)	_____	_____	(58)	-1	-2	-3	-4 (9)	-4	-3	-2	-1 (22)	
-2	-5	-4	-3	-2	-1	_____	_____		-1	-2	-3	-4	-4	-3	-2	-1	
-3	-5	-4	-3	-2	-1	_____	_____		-1	-2	-3	-4	-4	-3	-2	-1	
-4	-5	-4	-3	-2	-1	_____	_____		-1	-2	-3	-4	-4	-3	-2	-1	
-5	-5	-4	-3	-2	-1	_____	_____	(62)	-1	-2	-3	-4	-4	-3	-2	-1	
-6	-5	-4	-3	-2	-1 (50)	_____	_____		-1	-2	-3	-4	-4	-3	-2	-1	
_____	-5	-4	-3	-2	-1	_____	_____		-1	-2	-3	-4 (15)	-4	-3	-2	-1 (28)	
(Other)																	
_____	-5	-4	-3	-2	-1	_____	_____		-1	-2	-3	-4	-4	-3	-2	-1 (29)	
(Other)																	
_____	-5	-4	-3	-2	-1	_____	_____		-1	-2	-3	-4	-4	-3	-2	-1 (30)	
(Other)																	
(41)								(54)								(67)	(18)

(42)	(55)	(68)	(19)	(31)
(43)	(56)	(69)	(20)	(32)
(44)	(57)	(70)	(21)	(33)

(71-78)  
(79-80)-2  
CARD 3 (1-10 dup)

7a. When you experience interference problems, at what point do you decide that the interference is unacceptable for the purpose of listening to the station? (READ) (CIRCLE ONE) (34)

- 1 When you first turn it on (34)
- 2 After you have listened a while
- 3 Only after a different music selection and/or program comes on
- 4 Some other time (Specify) \_\_\_\_\_ (35)
- \_\_\_\_\_ (36)
- \_\_\_\_\_ (37)
- \_\_\_\_\_ (38)

7b. What do you do if the the interference is completely unacceptable? (DO NOT READ) (CIRCLE ALL THAT APPLY) (39)

- 1 Try to adjust radio
- 2 Wait to see if it clears up
- 3 Turn to another station
- 4 Turn off the radio
- 5 Turn down the volume
- [ ] Other (Specify) \_\_\_\_\_ (40)
- \_\_\_\_\_ (41)
- \_\_\_\_\_ (42)
- \_\_\_\_\_ (43)

8a. Do you generally find that radio interference is worse when listening inside a building or in the car?

- 1 Building (44)
- 2 Car

8b. In what ways is it worse? (PLEASE DESCRIBE)

- \_\_\_\_\_ (45)
- \_\_\_\_\_ (46)
- \_\_\_\_\_ (47)
- \_\_\_\_\_ (48)
- \_\_\_\_\_ (49)
- \_\_\_\_\_ (50)
- \_\_\_\_\_ (51)

9. Are there any stations you no longer listen to because of problems with too much interference?

-1 Yes  $\longrightarrow$  Which stations? \_\_\_\_\_ (53)

-2 No (52) \_\_\_\_\_ (54)

(55)

MAKE SURE TAPE (\_\_\_\_) IS IN THE CASSETTE MACHINE  
ALWAYS USE MUSIC TAPE FIRST

! START CASSETTE ! (ALL TAPES HAVE 20 SECONDS AT THE BEGINNING IN WHICH TO SET VOLUME)

TELL RESPONDENT: Please adjust the volume knob (HERE) for the level you like listening to the radio.

HAVE RESPONDENT SET VOLUME FOR GOOD LISTENING LEVEL.  
MAKE SURE LEVEL IS APPROPRIATE FOR ATTENTIVE,  
COMFORTABLE LISTENING (NOT TOO LOUD OR TOO SOFT) WHILE  
SETTING LEVEL ACCORDING TO PERSONAL PREFERENCE --  
UNTIL TONE IS HEARD.

! STOP CASSETTE !

10. LOOK AT AND RECORD VOLUME SETTING THAT THE RESPONDENT HAS CHOSEN. (DO NOT ALLOW RESPONDENT TO SET VOLUME CONTROL AT 1:2 OR 9:10)

	-3 3:4	-5 5:6	-7 7:8	
-2 2:3	-4 4:5	-6 6:7	-8 8:9	(56)

INTRODUCTION: (HAND RESPONDENT DATA CARD THAT MATCHES TAPE SELECTION) Please be seated comfortably. I am going to play for you some short segments from radio station broadcasts. We are interested in getting your opinion on interference you may hear in this programming. Please tell us is if what you hear is Completely Acceptable, Completely Unacceptable, or somewhere in-between.

Using the card in front of you, read the rating on the left side of the row; then read the rating on the right side.

If you feel the rating on the right completely describes what you hear, put a check mark in the box closest to that rating. If you feel that the rating on the left completely describes what you hear, put a check mark closest to that rating.

You may, of course, put a check mark in any one box between the ratings depending on how closely that rating describes what you feel. The closer you place a mark to a rating, the more strongly you feel that rating describes what you hear.

AUDIO TEST

SECTION 1

(Music Interference Over Music)

Here is selection #1:

! START CASSETTE !

(1ST MUSIC SEGMENT)

! STOP CASSETTE !

Now, please check the box you feel is most appropriate. (MAKE SURE RESPONDENT CHECKS ONE BOX). OK, from now on, I will let the tape run. Please rate each one during the pause.

Next is selection #2 -- and we will continue for a total of 10 selections:

! START CASSETTE !

NOTE: WATCH TO MAKE SURE RESPONDENTS KEEP THEIR PLACE IN THE ORDER AND THAT THERE IS NO CONFUSION. (IF THERE IS ANY MAJOR PROBLEM, ISSUE A BRAND NEW DATA CARD AND START ALL OVER FROM "TEST" AT TOP).

WHEN TONE SOUNDS AT END OF SEGMENTS --

! STOP CASSETTE ! -- REMOVE TAPE (DO NOT REWIND YET!)

---



11. Was the interference you just heard similar or different from the kinds of interference you have heard on the radio in the past? (CIRCLE ALL THAT APPLY)

-1 Similar → In what ways was it similar? \_\_\_\_\_ (58)

\_\_\_\_\_ (59)  
(57) \_\_\_\_\_ (60)

\_\_\_\_\_ (61)  
\_\_\_\_\_ (62)

-2 Different → In what ways was it different? \_\_\_\_\_ (63)

\_\_\_\_\_ (64)

\_\_\_\_\_ (65)

\_\_\_\_\_ (66)

\_\_\_\_\_ (67)

12. What do you feel about the sound quality of this tape we are listening to now, which is from a radio transmission -- (TURN-UP MUSIC IF NEEDED) would you say it is: (READ LIST) (ACCEPT ONE ONLY)

-4 Excellent \_\_\_\_\_ (68)

-3 Good

-2 Fair

-1 Poor

13. Would you expect to hear this kind of broadcast quality on an FM station or on an AM station? (CIRCLE ALL THAT APPLY)

-1 FM → Why is that? \_\_\_\_\_ (70)

(69) \_\_\_\_\_ (71)

\_\_\_\_\_ (72)

-2 AM → Why is that? \_\_\_\_\_ (73)

\_\_\_\_\_ (74)

\_\_\_\_\_ (75)

\_\_\_\_\_ (76)

\_\_\_\_\_ (77)

\_\_\_\_\_ (78)

(79-80)-3

14. Thinking about other qualities as well as interference, what is there about the sound quality of the AM radio signal that is different from the way the FM signal sounds?\_\_\_\_\_ (9)

\_\_\_\_\_ (10)

\_\_\_\_\_ (11)

(12)

(13)

(14)

15. What do you feel are the major problems with the sound quality of the AM radio signal? (PROBE) (BE SPECIFIC)

\_\_\_\_\_ (15)

\_\_\_\_\_ (16)

\_\_\_\_\_ (17)

\_\_\_\_\_ (18)

(19)

(20)



CLASSIFICATION SECTION

Now, I have a few questions that will allow us to combine your answers with others who take part in this nationwide survey.

S. In total, how many people, including yourself, are there living in your household? (ACTUAL NUMBER)

\_\_\_\_\_ People (21-22)

T. Of these, how many are... (READ) (RECORD NUMBER FOR EACH)

\_\_\_ Under 12 (23)

\_\_\_ 12-17 (24)

\_\_\_ 18 or older (25)

U. How would you best describe your background -- would it be:  
(READ)

-1 White

-2 Black

-3 Hispanic

-4 Asian

Other (Specify) \_\_\_\_\_ (26)

V. (HAND RESPONDENT CARD "I")  
Please tell me which letter on this card best represents your household's total annual income:

A. -1 Under \$20,000 (27)

B. -2 \$20,000 - 34,999

C. -3 \$35,000 - 49,999

D. -4 \$50,000 and over

W. (DO NOT ASK)

RECORD SEX: (28)

-1 Male

-2 Female

**NOTE -- NOTE: REWIND ALL TAPES AND ORGANIZE FOR NEXT INTERVIEW.**

My supervisor may be calling to verify my work. May I have your:

NAME: \_\_\_\_\_ PHONE: (    ) \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

INTERVIEWER: \_\_\_\_\_ DATE: \_\_\_\_\_

CONFIRMED BY: \_\_\_\_\_ CONFIRMED DATE: \_\_\_\_\_

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

TIME ENDED:
_____ a.m.
_____ p.m.

(29-30)  
(31-60) DATA CARDS  
(61-78)

(79-80)-4

CUT#

1. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
2. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
3. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
4. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
5. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
6. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
7. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
8. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
9. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
10. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
11. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
12. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
13. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
14. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
15. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
16. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
17. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
18. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
19. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE
20. COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE

CASSETTE 

RECORDING CARD

REPODENT NAME

CUT#

1.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	(31)
2.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
3.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
4.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
5.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
6.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
7.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
8.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
9.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	
10.	COMPLETELY ACCEPTABLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	COMPLETELY UNACCEPTABLE	(40)

**NRSC-R14**

**NRSC Document Improvement Proposal**

If in the review or use of this document a potential change appears needed for safety, health or technical reasons, please fill in the appropriate information below and email, mail or fax to:

National Radio Systems Committee  
 c/o Consumer Electronics Association  
 Technology & Standards Department  
 1919 S. Eads St.  
 Arlington, VA 22202  
 FAX: 703-907-4190  
 Email: [standards@ce.org](mailto:standards@ce.org)

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<input type="checkbox"/> Immediate <span style="margin-left: 200px;"><input type="checkbox"/> At next revision</span>		
PROBLEM AREA (ATTACH ADDITIONAL SHEETS IF NECESSARY):		
a. Clause Number and/or Drawing:		
b. Recommended Changes:		
c. Reason/Rationale for Recommendation:		
ADDITIONAL REMARKS:		
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