



Government  
of Canada

Department of Communications

TRC - 48

## TELECOMMUNICATIONS REGULATION CIRCULAR

TELEVISION RECEPTION AND INTERFERENCE  
SERVICE AREA OF A TELEVISION STATION

MARCH 31, 1978

(REPLACES SII-13-44 OF JUNE 21, 1962)

TELECOMMUNICATION REGULATORY SERVICE

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TELEVISION RECEPTION AND INTERFERENCESERVICE AREA OF A TELEVISION STATION

1. The degree of annoyance from interference to television reception is dependent, among other things, on the relative intensities of the desired signal and the interfering signals, and on the type of interfering signal. This is somewhat similar to the effect of radio noise on the reception of speech and music. Unlike reception in the standard broadcast band, the intensity of a television signal usually falls off very rapidly beyond the primary service area, which is about 50 to 60 kilometres from the television broadcast station, and radio noise becomes correspondingly more objectionable. A limited area beyond this distance is referred to as the "fringe area", and although satisfactory reception may be obtained when conditions are favourable, continuous noise-free reception cannot be expected. Certain types of interference are generally found to be troublesome only beyond the primary service area while other types of interference are likely to be troublesome even within this area.
2. Most television receivers are made very sensitive in order that they may be usable with as low a signal as possible. There is, however, a practical limit to the minimum usable signal which will give satisfactory television reception, because there exists in all locations an unavoidable background noise. The noise level varies from place to place and, in general, determines for any particular locality the minimum satisfactory radio signal. Background radio noise offers no problem in the vicinity of transmitters; its effects are seen only where signals are weak. Weak signals mean that more gain has to be used, with the net result that noise is also amplified to such an extent that it becomes apparent on the television screen, and there is no practicable escape.
3. Some types of interference are attributable to limitations in the receiving system, as some receivers will respond not only to the signals to which they are tuned but also to signals at other frequencies. Some of these shortcomings are inherent in the design of certain receivers, and the difficulty can be overcome only by obtaining a receiver having greater selectivity. In other cases, however, the serviceman can do much to alleviate the trouble by improving the antenna system or installing a filter or "trap circuit" especially designed to reject the unwanted signal.
4. Other types of interference are due to radiation on the allotted frequency channel and these may be most effectively cured by suppression at the actual source.

VARIABLE RECEPTION CONDITIONS (FADING)

5. Reception conditions for television vary considerably with location and time. Outside the primary service area the intensity of the received signal is likely to vary considerably with time. This variation may be rapid, for instance at distances of 130 kilometres or more the received signal may fade and return to strength within a few minutes. There is likely to be random variation in the field strength from day to day and from season to season.
6. Furthermore, fading conditions for television signals are not the same as those for signals in the standard broadcast band, in so far as fading may be present in the former and not in the latter, and vice versa.

ANTENNAE

7. In order to obtain a satisfactory TV picture, adequate signal voltage at the receiver input terminals is necessary. Where the receiver is installed within a few kilometres of the TV broadcast station and the receiver is not shielded by a metal building, an indoor antenna may be satisfactory, but if the receiver is more than a few kilometres from the TV station, an outdoor antenna with a radio frequency transmission line is necessary.
8. Great care should be exercised in selecting a suitable type, location, direction, and height for this antenna to pick up the signal without undue noise.
9. As a general rule, increased height of the receiving antenna considerably improves the reception at distances greater than thirty kilometres from the TV broadcast station. However, there are sometimes exceptions to the rule, and whenever possible, tests should be made to determine the best height, location, and orientation of the antenna. Particularly in cities, the movement of the antenna a few metres will sometimes considerably affect the TV signal voltage delivered to the receiver.
10. Buildings and hills cause reflection of TV signals and sometimes the reflected signal causes "ghosts" on the TV screen, as the reflected signal in taking the longer path reaches the receiver at a later time, and a double image is produced. Occasionally a reflected signal is so much stronger than a direct one that the direct may be ignored and the antenna oriented to receive the reflected signal.
11. An aircraft flying overhead may cause reflections which temporarily ruin reception for short periods.
12. When more than thirty to sixty kilometres from the TV broadcasting station, a special antenna array is usually necessary in order to deliver adequate signal to the input terminals of the TV receiver.

SOURCES OF INTERFERENCE TO TV RECEPTION

13. Undesired TV Signal on Adjacent Channels - This type of interference may be caused when a TV signal from an adjacent channel is strong compared to the desired signal, and the TV receiver is not sufficiently selective. Such interference may be eliminated by using a filter, in the antenna lead-in, tuned to prevent reception on the undesired frequency, or a quarter-wave stub. Where the direction of the undesired TV station is different from that of the desired station, improved reception may often be obtained by changing the orientation of the antenna.
14. Co-Channel TV Interference - Where the receiver is located within the range of two television transmitting stations on the same channel, there is likely to be considerable interference. If the desired signal is sufficiently strong, the interference may be overcome by the use of a directional array oriented so as to avoid reception from the undesired station.
15. Radio Signals on Frequencies Other Than the Desired TV Channels
  - (a) This type of interference includes the reception of radio signals from commercial and amateur radio stations, and medical diathermy and industrial-heating equipment. The interference is more pronounced on receivers which have not adequate selectivity, and on receivers capable of picking up radiation on the intermediate frequencies.
  - (b) This type of interference may, in some cases, be reduced by the use of a filter, in the antenna lead-in, designed to reject the undesired signals. In other cases, it may be necessary to shield the receiver to prevent pick-up on the intermediate frequency. Severe cases may require the application of both methods.
16. Other Radio Signals on the Desired TV Channel
  - (a) In licensing other radio communication stations, the Department of Communications endeavours to avoid making frequency assignments which might result in interference to TV reception. Occasionally, however, through faulty equipment or design, radio transmitters may radiate excessive harmonics, and if these harmonics fall on the TV channel they will cause interference. Such harmonics must be reduced to a reasonable level, at the transmitter, so that the effect on TV reception is not objectionable when receiving stations within normal range.
  - (b) Operators of medical diathermy and industrial heating apparatus are allotted certain frequency bands in which to operate, and are required to limit the radiation from their equipment on all communication frequencies. Some TV receivers located near such apparatus may be subject to interference because of this limited radiation.

17. Radiation from other TV Receivers - TV receivers radiate a certain amount of energy at several frequencies, particularly on the frequencies of the receiver oscillators, and may cause interference to other TV receivers near by. This receiver radiation is greater in the case of the earlier models as manufacturers are now improving the design to reduce this radiation.
18. Motor Vehicles
- (a) The ignition systems of some automobiles cause interference to TV reception.
  - (b) For some time, the Department of Communications has been working with the Canadian Standards Association, the Society of Automotive Engineers, and the manufacturers' representatives in the study of this problem. Great progress has been made, and most modern cars now cause very little TV interference. A considerable number of vehicles which cause excessive interference to television reception are still in operation however.
  - (c) There is no known means of adequately suppressing ignition interference at the TV receivers, and the only cure is the application of suppression to all motor vehicles which cause interference. The use of efficient antennas and receivers will, however, reduce the effect of such interference by improving the signal-to-interference ratio.
19. Electrical Appliances - Various types of electrical appliances may cause interference to television reception, but commonly the interference at the high frequencies used for television is not as objectionable as the interference from appliances in the standard broadcast band. The following household equipment may cause interference to TV reception:
- (a) Faults, such as loose connections in wiring, outlet receptacles, appliance cords, etc.;
  - (b) A type of incandescent lamp in which the filament is zigzagged between two spiders supported at top and bottom of a glass rod. This type of lamp causes radiation at high frequency, and when its frequency falls within the TV channel, it may cause interference up to a distance of 300 metres and appears as a horizontal bar across the screen;