

RECOMMENDATION 704*

CHARACTERISTICS OF FM SOUND BROADCASTING REFERENCE
RECEIVERS FOR PLANNING PURPOSES

(1990)

The CCIR,

CONSIDERING

- a) that frequency assignment plans must of necessity take into account the characteristics of receivers;
- b) that the range of performance of receivers used by the public is very large;
- c) that a reference receiver with characteristics based on currently available receivers may be useful in a planning context;
- d) that standards for reference receivers should therefore be defined, which can be taken as a basis for frequency planning purposes;
- e) that these standards need to be taken into account by receiver manufacturers,

UNANIMOUSLY RECOMMENDS

that the receiver characteristics contained in Annex I should be used for FM sound broadcasting planning purposes.

ANNEX I

MONOPHONIC AND STEREOPHONIC RECEPTION USING THE
PILOT-TONE SYSTEM (± 75 kHz FREQUENCY DEVIATION) OR THE
POLAR-MODULATION SYSTEM (± 50 kHz FREQUENCY DEVIATION)

In deriving the recommended characteristics, the parameters contained in Annex II and Annex III were also considered.

1. **Antenna**

Recommendation 599 gives the directivity of an external antenna which is applicable for fixed installations only. Portable or car receivers normally have rod antennas; however, for portable or mobile reception of sound broadcasts, no directivity of the reception antenna should be applied in planning.

2. **Sensitivity**

For planning purposes, "sensitivity" is understood to mean "noise-limited sensitivity", given in terms of field strength or power level, required to achieve a specified signal-to-noise ratio at the audio output. Sensitivity should be presented as a single mean figure. The following values are suggested for the sensitivity of an average receiver:

- with an external antenna input (car receivers included):
 - 5 dB(pW) for monophonic reception,
 - 15 dB(pW) for stereophonic reception;
- with a built-in antenna (oriented for optimum reception in the actual field in which the receiver is placed, for conditions of measurement see [CCIR, 1986-90a and b]):
 - 30 dB(μ V/m) for monophonic reception,
 - 50 dB(μ V/m) for stereophonic reception.

These values are based upon an AF signal-to-noise ratio of 40 dB. The AF signal-to-noise measurement is made according to IEC Publication 315-4 in conjunction with CCIR Recommendation 468; reference frequency deviation: ± 75 kHz for the pilot-tone system, and ± 50 kHz for the polar-modulation system. If higher AF signal-to-noise ratios are to be applied in a planning context, the corresponding sensitivity can be calculated by linear extrapolation up to at least 56 dB (see Annex II, § 5).

* This Recommendation should be brought to the attention of the IEC.

3. Selectivity

Selectivity of a receiver is a measure of its ability to discriminate between a wanted signal to which the receiver is tuned and unwanted signals entering through the antenna circuit.

The selectivity is understood as an effective selectivity comprising RF selectivity, IF selectivity, limiter, discriminator, stereophonic decoder characteristics and AF frequency response.

3.1 *Selectivity with carrier frequency separations ≤ 400 kHz*

The selectivity should be sufficient to meet the RF protection ratios given in Recommendation 412. Protection ratio measurements are made in accordance with Recommendation 641. It is assumed that test signals are fed via the built-in antenna for receivers without an external antenna input.

3.2 *Selectivity with carrier frequency separations > 400 kHz*

RF protection ratios substantially lower than -25 dB should be met. At the critical carrier frequency separation of 10.7 MHz (assumed nominal intermediate frequency), RF protection ratios lower than -20 dB should be met.

4. Performance in the presence of strong signals*

FM broadcasting receivers overloading by strong input signals may result in:

- desensitization or comparable effects,
- intermodulation.

Such overloading may e.g. occur in the following cases:

- (a) a (very) strong wanted signal;
- (b) the wanted signal and one strong unwanted signal;
- (c) the wanted signal and two strong unwanted signals;
- (d) the wanted signal and more than two strong unwanted signals.

With reference to (b), the RF protection ratios should not be seriously affected (≤ 3 dB) if the input power of the wanted signal is increased to 50 dB(pW). Further information may be found in [CCIR, 1986-90c].

5. Automatic frequency control (AFC)

The AFC should be switchable (see Annex II, § 4).

6. Stereo/mono operation

Stereo portable and car receivers should preferably be equipped with a manual stereo/mono switch that will make possible satisfactory monophonic reception in case of insufficient field strength or in the presence of strong interfering signals.

7. Intermediate frequency

10.7 MHz is assumed even though some receivers use higher frequencies for different reasons (e.g. frequency diversity reception).

7.1 *Image rejection ratio*

The single signal image rejection ratio, when measured according to IEC Publication 315-4, should be at least 50 dB.

For the assumed intermediate frequency of 10.7 MHz the image rejection ratio can be disregarded with respect to in-band interference. However, interference from other services has to be taken into account.

* Administrations are requested to contribute on this subject to the CCIR under Study Programme 46N/10.