RECOMMENDATION ITU-R F.381-2[*,**]

Conditions relating to line regulating and other pilots and to limits for the residues of signals outside the baseband in the interconnection of radio-relay and line systems for telephony[***]

(1953-1959-1963-1966-1970)

The ITU Radiocommunication Assembly,

considering

a) that it may be necessary to interconnect radio-relay and line systems when establishing international circuits;

b) that a continuity pilot may be required to establish the continuity of the transmission path between the input and output terminals of a radio-relay system, independently of the frequency-division multiplex telephony being transmitted;

c) that in addition, a line-regulating pilot may be required to measure the level stability in the baseband of a frequency-division multiplex telephony radio-relay system;

d) that the variations of the level of the line-regulating pilot should correspond closely to the variations of the overall gain of the radio-relay system between its input and output terminals at the frequencies of the frequency-division multiplex telephony signals;

e) that pilots are also required on line systems for gain-regulating, monitoring and frequency-comparison purposes;

f) that the line pilots used for monitoring and frequency comparison may also be required to be transmitted over a radio-relay system;

g) that a pilot frequency of 308 kHz is already in use by line systems for gain-regulating and other purposes, and that there is a gap in the frequency-division multiplex signal spectrum within which the pilot is located;

h) that, in some radio-relay systems, it is permissible to place the service channels of a radio-relay system below the baseband (in certain cases, a service channel may be very near to a telephone channel in the general network);

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[*] This Recommendation applies to line-of-sight systems and near line-of-sight systems, and also where appropriate, to trans-horizon radio-relay systems.

[**] Radiocommunication Study Group 9 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44.

[***] Attention is drawn to the fact that, for direct through-connection between two radio-relay systems, frequencies outside the baseband may pass between the points R and R', with negligible attenuation relative to the baseband. The precautions called for to protect cable systems may, therefore, also be necessary to protect radio-relay systems. The points R and R' and the points T and T' are defined in Fig. 1 of Recommendation ITU-R F.380.

j) that it is essential to avoid undesirable effects, such as the interaction of the gain-regulating systems and interference or crosstalk from the pilots, when radio-relay and line systems are interconnected;

k) that all signals transmitted on a radio-relay system, even if they cannot cause interference to either the telephone channels or the pilots of a cable system interconnected with that radio-relay system, must have a limited power to avoid overloading the cable system;

l) that, if such interfering signals have to be eliminated by a filter incorporated in the radio equipment, that filter, the attenuation-versus-frequency characteristic of which has a finite slope, must not cause appreciable attenuation distortion on the telephone channel thus protected,

recommends

1 that the point of interconnection between a radio-relay system and a line system forming part of an international circuit shall be considered as a junction between line-regulating sections, except when the cable system constitutes a short extension of the radio system and is then a part of the same line-regulating section; if the radio-relay link constitutes a regulated line section, the station at one end of the system would be called "the radio-link control station" and the station at the other end would be called "the radio-link sub-control station". The duties of these stations are given in the maintenance instructions by the ITU-T;

2 that the continuity pilot of a multi-channel telephony radio-relay system should be located outside the band of frequencies occupied by the frequency-division multiplex signal and the preferred frequencies and levels will be as shown in Recommendation ITU-R F.401*;

3 that the level of the continuity pilot of a radio-relay system for telephony be suppressed below –50 dBm0 at the point of connection with a line system (point *R*);

4 that, for a line-regulating pilot on a frequency-division multiplex telephony radio-relay system with a capacity of 60 channels or more, 308 kHz ±3 Hz be the preferred frequency and the preferred pilot level be –10 dBm0. A second line-regulating pilot situated in the upper part of the baseband may also be used, the preferred value of frequency and level of which should be those recommended by the ITU-T for cable systems**;

5 that the level of the line-regulating pilot of a telephony radio-relay system be suppressed below –50 dBm0 at the point of connection with a line system, in all cases where this point is a junction between line-regulating sections (point *T* or before this point);

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* A continuity pilot within the baseband, possibly acting as the line-regulating pilot, may be used in systems of up to 120 channels for reasons of economy, after agreement between the administrations concerned.

** For systems up to 120 channels a line-regulating pilot of 60 kHz with a level of –10 dBm0 may be used; in this case the suppression level should conform with the provisions of ITU-T Recommendation G.243, § 3.1 (Vol. III, Fascicle III.2); thus the level of the line-regulating pilot, established by the ITU-T for lines, differs according to whether it concerns coaxial cables or symmetrical pairs (–10 dBm0 for coaxial cables and –15 dBm0 for symmetrical pair systems).

6 that the level of any line-regulating pilot of a line system to which a radio-relay system is connected be suppressed below −50 dBm0, before the input of the radio-relay system (point *R′*), in all cases where point *T′* is the junction between line-regulating sections, except by agreement between the administrations concerned;

7 that, when cable systems constitute short extensions of the radio system and are then part of the same line-regulating section, the same line-regulating pilots may be transmitted in the two systems;

8 that in the absence of any special agreement between administrations, the level of any pilot or supervisory signals, transmitted outside the baseband of a radio-relay system at a frequency not specified by the ITU-R, should, within the radio equipment, be reduced below −50 dBm0 at point *R*;

9 that similarly, in the absence of special agreements between the administrations concerned, the levels of all pilots or supervisory signals, transmitted over the cable system and having frequencies outside the baseband of the radio-relay link, should, within the equipment of the cable system, be reduced below −50 dBm0 at point *T* (and consequently at point *R′*);

10 that, if a radio-relay system service channel, adjacent to a telephone channel in the baseband, uses the levels, frequency allocation and signalling levels corresponding to those which would be recommended by the ITU-T for an ordinary telephone channel in the same position in the frequency spectrum, the channel filters are adequate to avoid the risk of cross-talk interference; if this condition is not met, an additional filter may be necessary and should be provided within the radio equipment;

11 that the frequencies mentioned in § 8 and 10 must be sufficiently distant from the baseband to ensure that the filters (or other appropriate devices) required to eliminate them do not cause attenuation distortion in the passband to exceed the recommended values;

12 that, to avoid overloading the cable system, the level of any other signal outside the baseband range be less than −20 dBm0 at the point *R*; similarly, to avoid overloading the radio-relay system, the level of any other signal outside the baseband should be less than −20 dBm0 at the point *R′*;

13 that, further, the level of the total power of all the signals outside the baseband range, including thermal and intermodulation noise, be less than -17 dBm0 at the points *R* and *R′*;

14 that all other line pilots *within* the band of frequencies occupied by the frequency-division multiplex telephony signal be freely transmitted by the radio-relay system to which the line system is connected.