

RECOMMENDATION ITU-R F.390-4*

**DEFINITIONS OF TERMS AND REFERENCES CONCERNING
HYPOTHETICAL REFERENCE CIRCUITS AND HYPOTHETICAL REFERENCE
DIGITAL PATHS FOR RADIO-RELAY SYSTEMS**

(1963-1970-1974-1978-1982)

The ITU Radiocommunication Assembly,

recommends

that the following definitions be used for defining the nature and properties of hypothetical reference circuits and hypothetical reference digital paths:

1. Analogue radio-relay systems

1.1 *Hypothetical reference circuit*; circuit fictif de référence; circuito ficticio de referencia

A hypothetical circuit of definite length, comprising a number of intermediate and terminal equipments, this number being fairly large, but not excessive.

Note 1. – The hypothetical reference circuit is a necessary element in the study of certain characteristics of long-distance circuits (e.g. noise).

Note 2. – The length of the hypothetical reference circuit does not imply that longer real circuits cannot be used.

1.2 *Hypothetical reference circuit for telephony*; circuit fictif de référence (pour la téléphonie); circuito de referencia para la telefonía

A complete telephone circuit (between an audio-frequency terminal at each end), established over a hypothetical international carrier-system of definite length. It comprises a definite number of modulations and demodulations of the groups, supergroups and mastergroups, the number of these processes being reasonably large, but not the greatest number possible.

Note 1. – Various “hypothetical reference circuits for telephony” have been determined to permit coordination between the various specifications for the constituent parts of multiplex carrier telephony systems, so that the complete telephone circuits established over these systems should satisfy the UIT-T standards (see § 3.2, 3.3, 3.4 and 3.7). These various hypothetical reference circuits are all conceived for the same total length (except of course hypothetical reference circuits for satellite systems) and type of operation. They are intended as a guide only in the planning of carrier systems.

Note 2. – As a result of the introduction of three pairs of channel modulations, these hypothetical reference circuits for telephony may be used to study, not only a 2500 km circuit established over a carrier system or systems, but also an international connection having the same total length, composed of three circuits, set up on different carrier systems and interconnected in two international transit centres.

1.3 *Homogeneous section (for telephony)*; section homogène (pour la téléphonie); sección homogénea (para la telefonía)

A section without either branching or modulation of any mastergroup, supergroup, group or channel, established over the system in question, with the exception of those which are defined at the end of the section.

Note 1. – All hypothetical reference circuits are built up from homogeneous sections of equal length (six or nine sections as the case may be; the number is not specified for trans-horizon systems).

Note 2. – It is assumed that, at the end of each homogeneous section, the channels, groups, supergroups and mastergroups are interconnected among themselves in a random manner.

* Radiocommunication Study Group 9 made editorial amendments to this Recommendation in 2000 in accordance with Resolution ITU-R 44.

1.4 *Hypothetical reference circuits for other types of signal*

Using the same principles, other hypothetical reference circuits and homogeneous sections have been determined for other types of signal; television, programme circuits, etc. (see § 3.5, 3.6 and 3.7).

2. **Digital radio-relay systems**

Hypothetical reference digital path; conduit numérique fictif de référence; trayecto digital ficticio de referencia

A hypothetical digital path of definite length, comprising a number of intermediate and terminal equipments, this number being fairly large, but not excessive.

Note 1. – The hypothetical reference digital path is a necessary element in the study of certain characteristics of long-distance digital paths (e.g. errors, jitter).

Note 2. – The design objectives recommended by the ITU-T for transmission equipments are commonly expressed in terms of a maximum tolerable level of impairment arising in a hypothetical reference digital path. As far as possible, a design objective so expressed takes into account all possible uses of the system, e.g. telephony, telegraphy, data, etc.

3. **References**

3.1 *General definition of a hypothetical reference circuit*

ITU-T Recommendation G.212.

3.2 *Hypothetical reference circuit for telephony on cable systems and on open-wire lines*

See the references in ITU-T Recommendation G.212, § 2.

3.3 *Hypothetical reference circuits for telephony on line-of-sight or near line-of-sight radio-relay systems*

– using frequency-division multiplex (for more than 60 telephone channels) – Recommendation ITU-R F.392.

3.4 *Hypothetical reference circuit for television*

ITU-T Recommendation J.61.

3.5 *Hypothetical reference circuit for fixed-satellite service systems for telephony and/or television*

Recommendation ITU-R S.352.

3.6 *General definition of a hypothetical reference digital path*

ITU-T Recommendation G.721.

3.7 *Definitions of a digital radio section and a digital radio path*

ITU-T Recommendation G.702, Nos. 9032 and 9034.
