

RECOMMENDATION ITU-R V.573-5*

Radiocommunication vocabulary

(1978-1982-1986-1990-2000-2007)

Scope

This Recommendation provides the main vocabulary reference, giving synonymous terms in three languages and the associated definitions. It includes terms given in Article 1 of the Radio Regulations (RR) and extends the list to technical terms defined in texts of the ITU-R.

The ITU Radiocommunication Assembly,

considering

- a) that Article 1 of the Radio Regulations (RR) contains the definitions of terms for regulatory purposes;
- b) that the Radiocommunication Study Groups have a need to establish new and amended definitions for technical terms that do not appear in RR Article 1 or that are so defined as to be unsuitable for Radiocommunication Study Group purposes;
- c) that it would be desirable for some of these terms and definitions established by the Radiocommunication Study Groups to be more widely used within the ITU-R,

recommends

that the terms listed in RR Article 1 and in Annex 1 below should be used as far as possible with the meaning ascribed to them in the corresponding definition.

NOTE 1 – Study Groups are invited, where there is a difficulty in using any of the terms with the meaning given in the corresponding definition, to forward to the Coordination Committee for Vocabulary (CCV) a proposal for revision or alternative application, accompanied by substantiating argument.

NOTE 2 – A number of terms in this Recommendation appear also in RR Article 1 with a different definition. These terms are identified by (RR . . . , MOD) or (RR . . . (MOD)) if the modifications consist only of editorial changes. Modifications are proposed for two reasons:

- some RR definitions only take into account regulatory aspects, while the CCV proposes definitions of a technical nature;
- some RR definitions give rise to difficulties of interpretation, in these cases, modifications or additions proposed by the CCV may be useful later for draft revisions of the RR definitions.

Only terms and definitions contained in the RR should be used when applying the Regulations.

NOTE 3 – A comprehensive list of terms and definitions is available at:

<http://www.itu.int/ITU-R/go/terminology-database>

* This Recommendation was updated in 2003 and 2005 for editorial reasons only.

Annex 1

The terms and definitions in this Annex are arranged according to subject as follows:

- A Stations and links
 - A1 – General terms and stations
 - A2 – Links
 - A3 – Space radiocommunications links
 - A4 – Terms concerning attenuation in a radio link
 - A5 – Coverage area and associated terms
- B Frequencies and bandwidths
 - B0 – Frequency bands
 - B1 – Arrangement of radio channels
- C Radiation and emission
- D Transmitters and classes of emission
- E Power and radiated power
- F Receivers, noise and interference
 - F0 – Noise
 - F1 – Interference
 - F2 – Signal to interference ratio, protection ratio
 - F3 – Field strength and power flux density
 - F4 – Diversity reception
- G Propagation
 - G0 – Terms related to radio waves
 - G1 – Tropospheric propagation
 - G2 – Ionospheric propagation
- H Space radiocommunications
 - H0 – General terms
 - H1 – Types of satellites
 - H2 – Geostationary satellite
 - H3 – Space research – Earth exploration
 - H4 – Broadcasting
- J Standard frequencies and time signals

In cases where the definition of a term is identical to that appearing in another text (International Telecommunication Convention Annex* (CV), RR Article 1 (RR), ITU-R Recommendation or Report (Rec. or Rep.)) the reference to the other text concerned is given in brackets after the definition. If the reference definition has been modified, the symbol MOD is added to the reference.

SECTION A – STATIONS AND LINKS

Sub-section A1 – General terms and stations

A01 **radiocommunication**; *radiocommunication*; *radiocomunicación*
 (CV 1005 (MOD))
 (RR 1.6 (MOD)) Telecommunication by means of radio waves.

Note – The definition of the term “telecommunication” is included in Appendix 2 of Recommendation ITU-R V.662 dealing with general terms.

* Constitution and Convention of the International Telecommunication Union, Annex (Geneva, 1992).

- A02
(RR 1.5, MOD) **radio waves, hertzian waves;** *ondes radioélectriques, ondes hertziennes; ondas radioeléctricas, ondas hertzianas*
- An electromagnetic wave propagated in space without artificial guide and having by convention a frequency lower than 3 000 GHz.
- Note* – The electromagnetic waves having frequencies around 3 000 GHz may be regarded either as radio waves or optical waves.
- A03
(RR 1.4, MOD) **radio;** *radio, radioélectrique; radio, radioeléctrico*
- Pertaining to the use of radio waves.
- Note* – In French and in Spanish “radio” is always a prefix.
- A04
(RR 1.61 (MOD)) (radio) **station;** *station (radioélectrique); estación (radioeléctrica)*
- One or more transmitters or receivers of a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radioastronomy service.
- Note 1* – In the RR, each station shall be classified by the service in which it operates permanently or temporarily.
- Note 2* – **Radiocommunication service;** *Service de radiocommunication; Servicio de radiocomunicación* (RR 1.19).
- A service as defined in the RR involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes.
- A05
(RR 1.64) **space station;** *station spatiale; estación espacial*
- A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth’s atmosphere.
- A06
(RR 1.63) **earth station;** *station terrienne; estación terrena*
- A station located either on the Earth’s surface or within the major portion of the Earth’s atmosphere and intended for communication:
- with one or more space stations; or
 - with one or more stations of the same kind by means of one or more reflecting satellites or other objects in space.
- A07
(RR 1.8) **space radiocommunication;** *radiocommunication spatiale; radiocomunicación espacial*
- Any radiocommunication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space.
- A08
(RR 1.7) **terrestrial radiocommunication;** *radiocommunication de terre; radiocomunicación terrenal*
- Any radiocommunication other than space radiocommunication or radio-astronomy.
- A09
(RR 1.62) **terrestrial station;** *station de terre; estación terrenal*
- A station effecting terrestrial radiocommunication.
- A09a
(Rec. F.1399) **high altitude platform station (HAPS);** *station placée sur une plate-forme à haute altitude (HAPS); estación en plataforma a gran altitud (HAPS)*
- A station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth.

- A10
(RR 1.67) **mobile station;** *station mobile; estación móvil*
- A station in the mobile service intended to be used while in motion or during halts at unspecified points.
- Note 1 – Mobile service;* *Service mobile; Servicio móvil* (CV 1003) (RR. 1.24). A radiocommunication service between mobile and land stations, or between mobile stations. (CV)
- Note 2 –* The definitions of those categories of stations in mobile services, which are most useful for Radiocommunication Study Group 8 work are given in Appendix A to this Recommendation.
- A11
(RR 1.69) **land station;** *station terrestre; estación terrestre*
- A station in the mobile service not intended to be used while in motion.

Sub-section A2 – Links

- A21 **radio link;** *liaison radioélectrique; radioenlace*
- A telecommunication facility of specified characteristics between two points provided by means of radio waves.
- A22
(Rec. F.592, MOD) **radio-relay system;** *faisceau hertzien; sistema de relevadores radioeléctricos*
- Radiocommunication system between specified fixed points operating at frequencies above about 30 MHz which uses tropospheric propagation and which normally includes one or more intermediate stations.
- A23
(Rec. F.592, MOD) **trans-horizon radio-relay system;** *faisceau hertzien transhorizon; sistema de relevadores radioeléctricos transhorizonte*
- Radio-relay system using trans-horizon tropospheric propagation, chiefly forward scatter.
- A24
(Rec. F.1399, MOD) **wireless access;** *accès hertzien, accès sans fil; acceso inalámbrico*
- Radio connection between a radio user and a core network.
- Note –* Examples of wireless access:
- fixed wireless access (FWA);
 - mobile wireless access (MWA);
 - nomadic wireless access (NWA).

Sub-section A3 – Space communication links (see also Sub-section H0)

- A31
(RR 1.113) **satellite link;** *liaison par satellite; enlace por satélite*
- A radio link between a transmitting earth station and a receiving earth station through one satellite.
- A satellite link comprises one up-link and one down-link.
- A31a **up-link;** *liaison montante; enlace ascendente*
- A radio link between a transmitting earth station and a receiving space station.
- Note 1 –* The term is also used in terrestrial communications for a link between a transmitting mobile station and a receiving base station.
- Note 2 –* The symbol \uparrow is used as a subscript for letter symbols representing quantities associated with an up-link.

- A31b **down-link**; *liaison descendante; enlace descendente*
- A radio link between a transmitting space station and a receiving earth station.
- Note 1* – The term is also used in terrestrial communications for a link between a transmitting base station and a receiving mobile station.
- Note 2* – The symbol ↓ is used as a subscript for letter symbols representing quantities associated with a down-link.
- A31c
(RR 1.115) **feeder link**; *liaison de connexion; enlace de conexión*
- A radio link from an earth station at a given location to a space station, or *vice versa*, conveying information for a space radiocommunication service other than for the fixed-satellite service. The given location may be at a specified point, or at any fixed point within specified areas.
- Note* – Examples of feeder links:
- an up-link for a broadcasting satellite;
 - a down-link for a data collection or Earth exploration satellite;
 - an up-link and down-link between a coast earth station and a satellite in the maritime mobile-satellite service.
- A32
(RR 1.114) **multi-satellite link**; *liaison multisatellite; enlace multisatélite*
- A radio link between a transmitting earth station and a receiving earth station through two or more satellites, without any intermediate earth station.
- A multi-satellite link comprises one up-link, one or more satellite-to-satellite links and one down-link.
- A33 **inter-satellite link**; *liaison intersatellite; enlace entre satélites*
- A radio link between a transmitting space station and a receiving space station without an intermediate earth station.
- A34
(RR 1.111, MOD) **satellite system**; *système à satellites; sistema de satélites*
- A space system using one or more artificial satellites.
- Note* – If the primary body of the satellite or satellites of a specific system is not the Earth, it should be identified.
- A35
(RR 1.110) **space system**; *système spatial; sistema espacial*
- Any group of cooperating earth stations and/or space stations employing space radiocommunication for specific purposes.
- A36
(RR 1.112) **satellite network**; *réseau à satellite; red de satélite*
- A satellite system or a part of a satellite system, consisting of only one satellite and the cooperating earth stations.

Sub-section A4 – Terms concerning attenuation in a radio link*

- A41
(Rec. P.341, MOD) **total loss** (of a radio link); *affaiblissement global (d'une liaison radioélectrique); pérdida total (de un enlace radioeléctrico)*

(Symbols: L_t or A_t)

The ratio, usually expressed in decibels, between the radio-frequency power supplied by the transmitter of a radio link and the radio-frequency power supplied to the corresponding receiver in real installation, propagation and operational conditions.

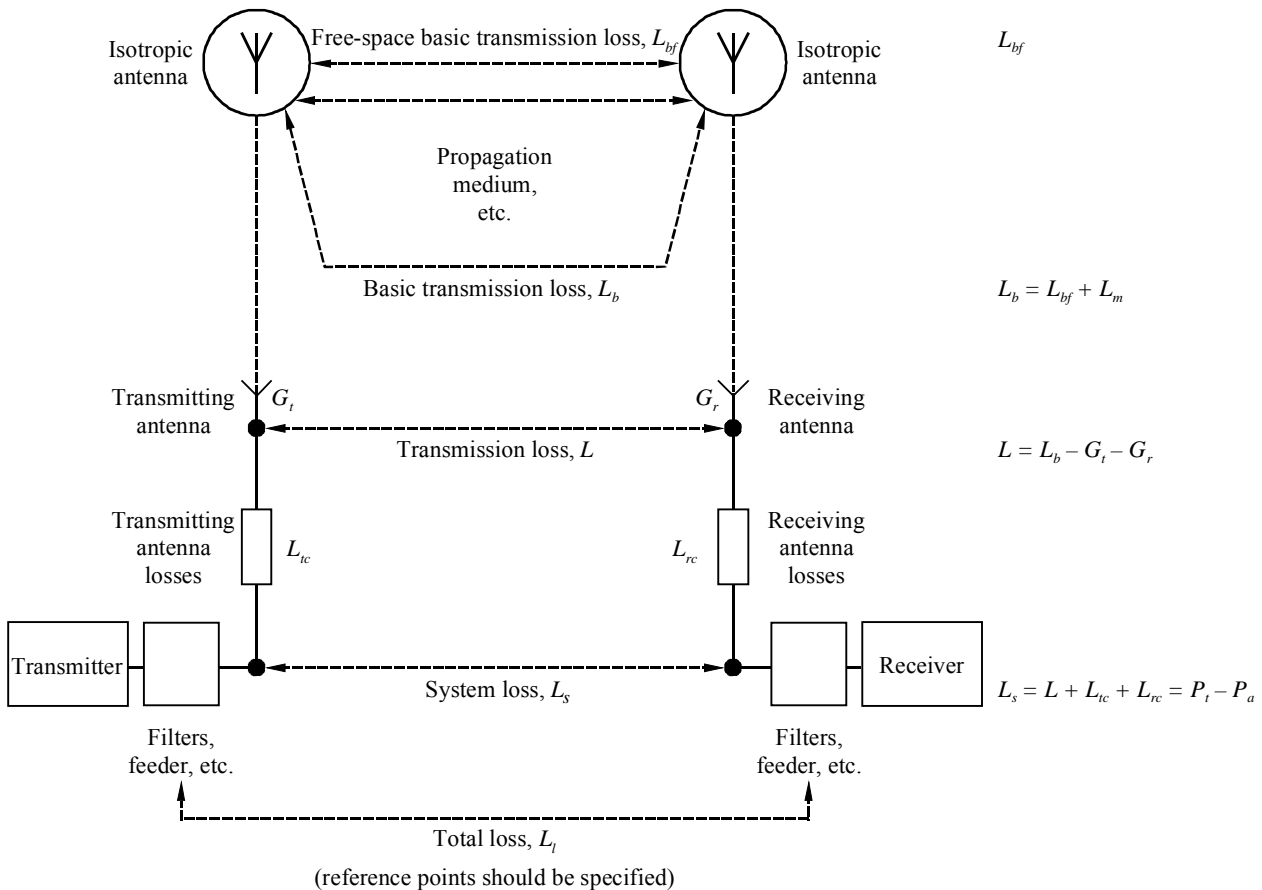
* A graphical depiction of these terms is given in Fig. 1.

Note – It is necessary to specify in each case the points at which the power supplied by the transmitter and the power supplied to the receiver are determined, for example:

- before or after the radio frequency filters or multiplexers that may be employed at the sending or the receiving end;
- at the input or at the output of the transmitting and receiving antenna feed lines.

FIGURE 1

Graphical depiction of terms used in the transmission loss concept



0573-01

A42
(Rec. P.341, MOD)

system loss; *affaiblissement du système, affaiblissement entre bornes d'antennes; pérdida del sistema*

(Symbols: L_s or A_s)

The ratio, usually expressed in decibels, for a radio link, of the radio frequency power input to the terminals of the transmitting antenna and the resultant radio frequency signal power available at the terminals of the receiving antenna.

Note 1 – The available power is the maximum active power which a source can deliver to a load i.e. the power which would be transferred if the impedances were conjugately matched.

Note 2 – The system loss may be expressed by:

$$L_s = 10 \lg (p_t/p_a) = P_t - P_a \quad \text{dB} \quad (1)$$

where:

p_t : radio frequency power input to the terminals of the transmitting antenna

p_a : resultant radio frequency signal power available at the terminals of the receiving antenna.

Note 3 – The system loss excludes losses in feeder lines but includes all losses in radio-frequency circuits associated with the antenna, such as ground losses, dielectric losses, antenna loading coil losses, and terminating resistor losses.

A43
(Rec. P.341, MOD)

transmission loss (of a radio link); *affaiblissement de transmission (d'une liaison radioélectrique)*; *pérdida de transmisión (de un enlace radioeléctrico)*

(Symbols: L or A)

The ratio, usually expressed in decibels, for a radio link, of the power radiated by the transmitting antenna to the power that would be available at the receiving antenna output if there were no loss in the radio-frequency circuits of the antennas, it being assumed that the antenna radiation characteristics are retained.

Note 1 – Transmission loss is equal to system loss minus the loss in the radio-frequency circuits which are integral parts of the antennas.

Note 2 – The transmission loss may be expressed by:

$$L = L_s - L_{tc} - L_{rc} \quad \text{dB} \quad (2)$$

where L_{tc} and L_{rc} are the losses, expressed in decibels, in the transmitting and receiving antenna circuits respectively, excluding the dissipation associated with the antennas radiation, i.e., the definitions of L_{tc} and L_{rc} are $10 \lg (r'/r)$, where r' is the resistive component of the antenna circuit and r is the radiation resistance.

A44
(Rec. P.341, MOD)

basic transmission loss (of a radio link); *affaiblissement de propagation (d'une liaison radioélectrique)*, *affaiblissement entre antennes isotropes (d'une liaison radioélectrique)*; *pérdida básica de transmisión (de un enlace radioeléctrico)*

(Symbols: L_b or A_i)

The transmission loss that would occur if the antennas were replaced by isotropic antennas with the same polarization as the real antennas, the propagation path being retained, but the effects of obstacles close to the antennas being disregarded.

Note 1 – The basic transmission loss is equal to the ratio of the equivalent isotropically radiated power of the transmitter system and the power, available from an isotropic receiving antenna.

Note 2 – The effect of the local ground close to the antenna is included in computing the antenna gain, but not in the basic transmission loss.

A45
(Rec. P.341, MOD)

free space basic transmission loss; *affaiblissement d'espace libre*; *pérdida básica de transmisión en el espacio libre*

(Symbols: L_{bf} or A_0)

The transmission loss that would occur if the antennas were replaced by isotropic antennas located in a perfectly dielectric, homogeneous, isotropic and unlimited environment, the distance between the antennas being retained.

Note – If the distance d between the antennas is much greater than the wavelength λ , the free space attenuation in decibels will be:

$$L_{bf} = 20 \lg \left(\frac{4\pi d}{\lambda} \right) \quad \text{dB} \quad (3)$$

A46
(Rec. P.341, MOD)

ray path transmission loss; *affaiblissement de transmission pour un trajet radioélectrique*; *pérdida de transmisión en el trayecto de un rayo*

(Symbols: L_r or A_r)

The transmission loss for a particular ray propagation path, equal to the basic transmission loss minus the transmitting and receiving antenna gains in the ray path directions.

Note – The ray path transmission loss may be expressed by:

$$L_t = L_b - G_t - G_r \quad \text{dB} \quad (4)$$

where G_t and G_r are the plane-wave directive gains of the transmitting and receiving antennas for the directions of propagation and polarization considered.

A47
Rec. P.341, MOD)

loss relative to free space; *affaiblissement par rapport à l'espace libre; pérdida relativa al espacio libre*

(Symbols: L_m or A_m)

The difference, between the basic transmission loss and the free-space basic transmission loss, expressed in decibels.

Note 1 – The loss relative to free space may be expressed by:

$$L_m = L_b - L_{bf} \quad \text{dB} \quad (5)$$

Note 2 – Loss relative to free space may be divided into losses of different types, such as:

- *absorption loss* for example by ionospheric, atmospheric gases or hydrometeors;
- *diffraction loss* as for ground waves;
- *effective reflection or scattering loss*, as in the ionospheric case including the results of any focusing or defocusing due to curvature of a reflecting layer;
- *polarization coupling loss*, which can arise from any polarization mismatch between the antennas for the particular ray path considered;
- *aperture to medium coupling loss or antenna gain degradation*, which may be due to substantial scattering phenomena on the path;
- *losses due to phase interference between the direct ray and rays reflected from the ground, other obstacles or atmospheric layers.*

A48

spreading loss; *affaiblissement géométrique, atténuation géométrique; pérdida por dispersión (geométrica)*

The attenuation of an electromagnetic wave due uniquely to the fact that with increasing distance the energy is distributed over a wider area.

Note – In a homogeneous and isotropic medium, the spreading loss is characterized by a decrease of the power flux-density in proportion to the reciprocal of the square of the distance to the source.

Sub-section A5 – Coverage area and associated terms

A51a

coverage area (of a space station); *zone de couverture (d'une station spatiale); zona de cobertura (de una estación espacial)*

Area associated with a space station for a given service and a specified frequency within which, under specified technical conditions, it is feasible for radiocommunications to be established with one or several earth stations, either for reception or transmission or both.

Note 1 – Several coverage areas may be associated with one and the same station, for example, a satellite with several antenna beams.

Note 2 – The technical conditions include the following: characteristics of the equipment used both at the transmitting and receiving stations, how it is installed, quality of transmission desired, e.g., protection ratios and operating conditions.

Note 3 – The following may be distinguishable:

- interference free coverage area, i.e., that limited solely by natural or artificial noise;
- the nominal coverage area: it is defined, when establishing a frequency plan, by taking into account the foreseen transmitters;
- the actual coverage area, i.e., with allowance made for the noise and interference which exist in practice.

Note 4 – The concept of “coverage area” cannot be simply applied to a space station on board a non-geostationary satellite for which further study is necessary.

Note 5 – Furthermore, the term “service area” should have the same technical basis as for “coverage area”, but also include administrative aspects.

The following text has been suggested as an example:

service area (of a space station); *zone de service (d'une station spatiale)*; *zona de servicio (de una estación espacial)*

Area associated with a station for a given service and a specified frequency under specified technical conditions where radiocommunications may be established with existing or projected stations and within which the protection afforded by a frequency assignment or allotment plan or by any other agreement must be respected.

Note 1 – Several separate service areas involving both reception and/or transmission, may be associated with the same station.

Note 2 – The technical conditions include the following: characteristics of the equipment used both at the transmitting and receiving stations, how it is installed, quality of transmission desired and operating conditions.

A51b

coverage area (of a terrestrial transmitting station); *zone de couverture (d'une station d'émission de Terre)*; *zona de cobertura (de una estación transmisora terrenal)*

Area associated with a transmitting station for a given service and a specified frequency within which, under specified technical conditions, radiocommunications may be established with one or several receiving stations.

Note 1 – Several coverage areas may be associated with one and the same station.

Note 2 – The technical conditions include the following: characteristics of the equipment used both at the transmitting and receiving stations, how it is installed, quality of transmission desired, e.g., protection ratios and operating conditions.

Note 3 – The following may be distinguishable:

- interference-free coverage area, i.e., that limited solely by natural or artificial noise;
- the nominal coverage area: it is defined, when establishing a frequency plan by taking into account the foreseen transmitters;
- the actual coverage area, i.e., with allowance made for the noise and interference which exists in practice.

Note 4 – Furthermore, the term “service area” should have the same technical basis as for “coverage area”, but also include administrative aspects.

A52

capture area (of a terrestrial receiving station); *zone de captage (d'une station de réception de Terre)*; *zona de captación (de una estación receptora terrenal)*

Area associated with a receiving station for a given service and a specified frequency within which, under specified technical conditions, radiocommunications may be established with one or several transmitting stations.

Note – The notes concerning the coverage area (of a transmitting station) are valuable also, *mutatis mutandis*, for the capture area.

SECTION B – FREQUENCIES AND BANDWIDTHS

Sub-section B0 – Frequency bands

B01 (radio frequency) **channel, RF channel**; *canal radioélectrique, radiocanal, canal RF; radiocanal, canal radioeléctrico, canal RF*

Part of the radio spectrum intended to be used for an emission and which may be defined by two specified limits, or by its centre frequency and the associated bandwidth, or by any equivalent indication.

Note 1 – Usually the specified part of the radio spectrum is that which corresponds to the assigned frequency band.

Note 2 – A radio frequency channel may be time-shared in order to allow radiocommunication in both directions by simplex operation.

Note 3 – In some countries and certain texts of the existing RR, the term “channel” (F and S: canal) is also used to denote a radio frequency circuit or, in other words, two associated radio frequency channels within the meaning of the proposed definition, each of which is used for one of the two directions of transmission.

Note 4 – Recommendation ITU-R V.662 defines the general term “frequency channel” (Term 2.05).

B02 (RR 1.152) **necessary bandwidth**; *largeur de bande nécessaire; anchura de banda necesaria*

For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

B03 (RR 1.147, MOD) **assigned frequency band**; *bande de fréquences assignée; banda de frecuencias asignada*

The frequency band within which the emission of a station is authorized; the width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance. Where space stations are concerned, the assigned frequency band includes twice the maximum Doppler shift that may occur in relation to any point of the Earth’s surface.

Note 1 – For certain services, the term “Assigned channel” is equivalent.

Note 2 – For the definition of “Frequency tolerance” see § D. (Term D02)

B04 (RR 1.153) **occupied bandwidth**; *largeur de bande occupée; anchura de banda ocupada*

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage $\beta/2$ of the total mean power of a given emission.

Unless otherwise specified by the ITU-R for the appropriate class of emission, the value of $\beta/2$ should be taken as 0.5%.

B05 **occupied band**; *bande occupée; banda ocupada*

The frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage $\beta/2$ of the total mean power of a given emission. Unless otherwise specified by the ITU-R, for the appropriate class of emission, the value of $\beta/2$ should be taken as 0.5%.

Sub-section B1 – Arrangement of radio channels

In the definitions which follow, the expression “given set of radio channels” may be considered to refer to similar phrases used by several Radiocommunication Study Groups, for example:

- Study Group 9: Arrangement of radio channels;

- Study Groups 4, 8, 10, 11: Frequency plan;
- Study Group 7: Channel plan.

The term “characteristic frequency” refers to RR No. 1.149 “A frequency which can be easily identified and measured in a given emission”. In some Radiocommunication Study Groups, the term “characteristic frequency” may, for example, also refer to “centre frequency” or “carrier frequency”.

- B09
(RR 1.148, MOD) **assigned frequency**; *fréquence assignée; frecuencia asignada*
- The centre of the assigned frequency band.
- B10
(RR 1.150, MOD) **reference frequency**; *fréquence de référence; frecuencia de referencia*
- A frequency having a fixed and specified position in respect to the assigned frequency.
- B11 **adjacent channel**; *canal adjacent; canal adyacente*
- In a given set of radio channels, the RF channel whose characteristic frequency is situated next above or next below that of a given channel.
- Note 1* – The adjacent channel situated above the given channel is known as the “upper adjacent channel” and the one below it as the “lower adjacent channel”.
- Note 2* – Two adjacent channels may have part of the frequency spectrum in common and this may be referred to as frequency overlap.
- B12 **second adjacent channel**; *deuxième canal adjacent; segundo canal adyacente*
- In a given set of radio channels, the RF channel whose characteristic frequency is situated next above that of the upper adjacent channel or next below that of the lower adjacent channel.
- B13 **co-channel**; *cocanal, cofréquence; cocanal*
- Refers to the use of the same RF channel by two or more emissions.
- B14 **orthogonal co-channel**; *cocanal (orthogonal); cocanal (ortogonal)*
- Refers to the use of the same RF channel by two emissions with orthogonal polarizations, for the transmission of two independent signals.
- B15 **channel spacing**; *espacement entre canaux; separación de canales*
- In a given set of radio channels, the difference in frequency between the characteristic frequencies of two adjacent channels.
- B16 **offset**; *décalé; separado*
- In a given set of radio channels, this term refers to a change of the characteristic frequency of a radio-frequency channel in relation to its nominal frequency, by a specified value which is generally small compared to the channel spacing.
- B17 **interleaved**; *intercalé; intercalado*
- In a given set of radio channels, this term refers to the insertion of additional channels between the main channels (or each RF channel and its adjacent channels), the characteristic frequencies of the additional channels being different from those of the main channels by a specified value, generally a significant portion (e.g. one half) of the nominal channel spacing.
- B18 **alternated** (polarization); *(à polarisation) alternée; (con polarización) alternada*
- In a given set of radio channels, this term refers to an arrangement of channels in which two adjacent channels have orthogonal polarizations.

SECTION C – RADIATION AND EMISSION

- C01
(RR 1.137, MOD) **radio-frequency radiation;** *rayonnement (radioélectrique); radiación (radioeléctrica)*
1. The phenomenon by which energy in the form of electromagnetic waves, in the radio-frequency range, emanates from a source into space.
 2. Energy transferred through space in the form of electromagnetic waves in the radio-frequency range.
- Note* – By extension the term “radio-frequency radiation” sometimes also covers induction phenomena.
- C02
(RR 1.138, MOD) **emission;** *emission; emisión*
1. Radio-frequency radiation in the case where the source is a radio transmitter.
 2. Radio waves or signals produced by a radio transmitting station.
- Note 1* – For example, the energy from the local oscillator of a radio receiver if transferred to external space, is a radiation and not an emission.
- Note 2* – In radiocommunication, the French term “émission” applies only to intentional radiation.
- C03
(RR 1.144) **out-of-band emission;** *émission hors bande; emisión fuera de banda*
- Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.
- C04
(RR 1.145) **spurious emission;** *rayonnement non essentiel; emisión no esencial*
- Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.
- C05
(RR 1.146, MOD) **unwanted emissions;** *rayonnements non désirés; emisiones no deseadas*
- Emissions consisting of spurious emissions and out-of-band emissions.
- C06
(Rec. SM.329, MOD) **harmonic emission;** *rayonnement harmonique; emisión armónica*
- Spurious emissions at frequencies which are whole multiples of those contained in the band occupied by an emission.
- C07 **intermodulation products (of a transmitting station);** *produits d'intermodulation (d'une station émettrice); productos de intermodulación (de una estación transmisora)*
- Each spectral component produced by intermodulation at one of the combination frequencies:
- $$f = pf_1 + qf_2 + rf_3 \dots$$
- where p, q, r are positive, negative or nil integers and where f_1, f_2, \dots are the frequencies of the various oscillations existing in a transmitting station, such as the carrier frequencies of the different transmitters, the sub-carrier or local oscillation frequencies, the frequencies of sidebands due to modulation, etc., where the sum $|p| + |q| + |r| + \dots$ is the order of an individual intermodulation product.

SECTION D – TRANSMITTERS AND CLASSES OF EMISSION

- D01 **(radio) transmitter;** *émetteur (radioélectrique); transmisor (radioeléctrico)*
- Apparatus producing radio-frequency energy for the purpose of radiocommunication.

- D02
(RR 1.151, (MOD)) **frequency tolerance**; *tolérance de fréquence*; *tolerancia de frecuencia*
- The maximum permissible departure by the centre frequency of the frequency band occupied by an emission from the assigned frequency or, by the characteristic frequency of an emission from the reference frequency.
- Note* – The frequency tolerance is expressed in parts in 10^6 or in hertz.
- D03
(RR 1.139) **class of emission**; *classe d'émission*; *clase de emisión*
- The set of characteristics of an emission, designated by standard symbols, e.g. type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also if appropriate, any additional signal characteristics.
- D03a **sideband**; *bande latérale*; *banda lateral*
- A frequency band lying above or below a sinusoidal carrier frequency and containing spectral components of significance produced by modulation.
- D03b **double sideband . . . (DSB)**; *... à double bande latérale (DBL)*; *... de doble banda lateral (DBL)*
- Pertaining to a transmission or emissions where both the lower and upper sidebands resulting from amplitude modulation are preserved.
- D04
(RR 1.140, MOD) **single sideband . . . (SSB)**; *. . . à bande latérale unique (BLU)*; *. . . de banda lateral única (BLU)*
- Pertaining to a transmission or emission where only either the lower sideband or the upper sideband resulting from amplitude modulation is preserved.
- D05 **full carrier . . .**; *. . . à porteuse complète*; *. . . de onda portadora completa*
- Pertaining to a transmission or emission with amplitude modulation where, by convention, the power of the sinusoidal carrier component is no more than 6 dB below the peak envelope power.
- Note 1* – Double-sideband amplitude-modulated emissions normally comprise a full carrier with a power level exactly 6 dB below the peak envelope power at 100% modulation.
- Note 2* – In single-sideband full-carrier emissions, a carrier at a power level of 6 dB below the peak envelope power is emitted, to enable the use of a receiver designed for double-sideband full-carrier operation.
- D06 **reduced carrier . . .**; *. . . à porteuse réduite*; *. . . de onda portadora reducida*
- Pertaining to a transmission or emission with amplitude modulation where the power of the sinusoidal carrier component is, by convention, reduced by more than 6 dB below the peak envelope power but remains at such a level that it can be reconstituted and used for demodulation.
- Note 1* – The level of the reduced carrier is normally between 6 dB and 32 dB and preferably between 16 dB and 26 dB below the peak envelope power of the emission.
- Note 2* – The reduced carrier may also be used to achieve automatic frequency control and/or gain control at the receiver.
- D07 **suppressed carrier . . .**; *. . . à porteuse supprimée*; *. . . de onda portadora suprimida*
- Pertaining to a transmission or emission with amplitude modulation where the power of the sinusoidal carrier component is reduced to a level such that it generally cannot be reconstituted and used for demodulation.
- Note* – A carrier is regarded as being suppressed when its level is at least 32 dB and preferably 40 dB or more below the peak envelope power of the emission.

- D08 **vestigial-sideband . . .**; . . . *à bande latérale résiduelle*; . . . *de banda lateral residual*
- Pertaining to a transmission or emission in which one complete sideband and its complementary vestigial sideband are utilized.
- D08a **vestigial sideband (VSB)**; *bande latérale résiduelle (BLR)*; *banda lateral residual (BLR)*
- A sideband in which only the spectral components corresponding to the lower frequencies of the modulating signals, are preserved, the other components being strongly attenuated.

SECTION E – POWER AND RADIATED POWER

- E01 (RR 1.157) **peak envelope power** (of a radio transmitter); *puissance en crête (d'un émetteur radioélectrique)*; *potencia en la cresta de la envolvente (de un transmisor radioeléctrico)*
- The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions.
- E02 (RR 1.158) **mean power** (of a radio transmitter); *puissance moyenne (d'un émetteur radioélectrique)*; *potencia media (de un transmisor radioeléctrico)*
- The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.
- E03 (RR 1.159) **carrier power** (of a radio transmitter); *puissance (de la) porteuse (d'un émetteur radioélectrique)*; *potencia de la portadora (de un transmisor radioeléctrico)*
- The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle taken under the condition of no modulation.
- Note* – With some types of modulating signals the concept of carrier power is meaningless.
- E04 (RR 1.160) **antenna gain**; *gain d'une antenne*; *ganancia de una antena*
- The ratio, usually expressed in decibels, of the power required at the input of a loss free reference antenna to the power supplied to the input of a given antenna to produce, in a given direction, the same field strength of the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization.
- Depending on the choice of the reference antenna, a distinction is made between:
- absolute or isotropic gain (G_i), when the reference antenna is an isotropic antenna isolated in space;
 - gain relative to a half-wave dipole (G_d), when the reference antenna is a half-wave dipole isolated in space whose equatorial plane contains the given direction;
 - gain relative to a short vertical antenna (G_v), when the reference antenna is a linear conductor, much shorter than one quarter of the wavelength, normal to the surface of a perfectly conducting plane which contains the given direction.
- E05 (Rec. BS.561, MOD) **cymomotive force (c.m.f.)** (in a given direction); *force cymomotrice (f.c.m.) (dans une direction donnée)*; *fuerza cimomotriz (f.c.m.) (en una dirección dada)*
- The product formed by multiplying the electric field strength at a given point in space, due to a transmitting station, by the distance of the point from the antenna. This distance must be sufficient for the reactive components of the field to be negligible; moreover, the finite conductivity of the ground is supposed to have no effect on propagation.

Note 1 – The cymomotive force (c.m.f.) is a vector; when necessary it may be expressed in terms of components along axes perpendicular to the direction of propagation.

Note 2 – The c.m.f. is expressed in volts; it corresponds numerically to the field strength in mV/m at a distance of 1 km.

- E06 **antenna directivity diagram**; *diagramme de directivité d'antenne*; *diagrama de directividad de una antena*
- A curve representing, in polar or cartesian coordinates, a quantity proportional to the gain of antenna in the various directions in a particular plane or cone.
- E06a **horizontal directivity pattern**; *diagramme de directivité horizontal*; *diagrama de directividad horizontal*
- An antenna directivity diagram in the horizontal plane.
- E06b **vertical directivity pattern**; *diagramme de directivité vertical*; *diagrama de directividad vertical*
- An antenna directivity diagram in a specified vertical plane.
- E07
(RR 1.161, MOD) **equivalent isotropically radiated power (e.i.r.p.)**; *puissance isotrope rayonnée équivalente (p.i.r.e.)*; *potencia isotrópica radiada equivalente (p.i.r.e.)*
- The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain).
- Note* – The isotropic antenna, when fed with a power of 1 kW, is considered to provide an e.i.r.p. of 1 kW in all directions and to produce a field strength of 173 mV/m at 1 km distance.
- E08
(RR 1.162, MOD) **effective radiated power (e.r.p.)** (in a given direction); *puissance apparente rayonnée (p.a.r.)* (*dans une direction donnée*); *potencia radiada aparente (p.r.a.)* (*en una dirección dada*)
- The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.
- Note* – The reference antenna, when fed with a power of 1 kW, is considered to radiate an e.r.p. of 1 kW in any direction in the equatorial plane and produces a field strength of 222 mV/m at 1 km distance.
- E09
(RR 163, MOD) **effective monopole radiated power (e.m.r.p.)** (in a given direction); *puissance apparente rayonnée sur une antenne verticale courte (p.a.r.v.)* (*dans une direction donnée*); *potencia radiada aparente referida a una antena vertical corta (p.r.a.v.)* (*en una dirección dada*)
- The product of the power supplied to the antenna and its gain relative to a short vertical antenna in a given direction.
- Note* – The reference antenna, when fed with a power of 1 kW, is considered to radiate an e.m.r.p. of 1 kW in any direction in the perfectly conducting plane and produces a field strength of 300 mV/m at 1 km distance (equivalent to a c.m.f. of 300 V).

SECTION F – RECEIVERS, NOISE AND INTERFERENCE

Sub-section F0 – Noise

- F00
(Rec. V.662) **noise** (in telecommunication); *bruit (en télécommunication)*; *ruido (en telecomunicación)*
- Any variable physical phenomenon apparently not conveying information and which may be superimposed on, or combined with, a wanted signal.
- Note* – The term “radio-frequency noise” is defined in this Recommendation.
- F01 **spot noise temperature** (of a one-port network); *température de bruit (d'un monoporte)*; *temperatura de ruido puntual (de una red con una sola puerta)*
- The exchangeable noise power spectral density at a given frequency of a one-port electrical network, divided by Boltzmann's constant.

Note 1 – This definition assumes that quantum effects are negligible.

Note 2 – The spot noise temperature has the sign of the real part of the network impedance.

Note 3 – If the network has an impedance with a positive real part, its noise temperature at a given frequency equals the thermodynamic temperature to which a resistor equal in value to the real part of the impedance should be brought in order to obtain an available power of thermal noise equal to the available power of the noise of the network at the same frequency.

Note 4 – A receiving antenna can be regarded as a one-port electrical network when viewed from its output port.

F02

equivalent (spot) noise temperature (of a linear two-port network); *température équivalente de bruit (d'un biporte linéaire)*; *temperatura de ruido equivalente (puntual) (de una red lineal con dos puertas)*

(Symbol: $T(f)$)

The amount by which at a given frequency the noise temperature of a one-port electrical network connected to the input of a given linear two-port electrical network would have to be increased, if the noise due to this two-port network was temporarily suppressed, in order to cause the noise power spectral density at the output frequency corresponding to input frequency, to be the same as that of the total noise of the one-port and two-port networks.

Note 1 – This definition assumes that quantum phenomena are negligible.

Note 2 – The equivalent spot noise temperature of a two-port network is dependent on the impedance of the one-port network connected to input.

F03

spot noise factor, spot noise figure (of a linear two-port network); *facteur de bruit (d'un biporte linéaire)*; *factor de ruido puntual (de una red lineal con dos puertas)*

(Symbol: $F(f)$)

The ratio of the exchangeable power spectral density of the noise appearing at a given frequency at the output of a given linear two-port electrical network, to the spectral density which would be present at the output if the only source of noise were the thermal noise due to a one-port electrical network connected to the input and which is assumed to have at all frequencies a noise temperature equal to the reference thermodynamic temperature fixed, by convention, around 290 K.

Note 1 – The spot noise factor $F(f)$ is related to the equivalent spot noise temperature $T(f)$ as follows:

$$F(f) = 1 + \frac{T(f)}{T_0}$$

where T_0 is the thermodynamic reference temperature.

Note 2 – The value of the ratio $F(f)$ may be expressed in decibels. In English, the term “noise factor” is generally employed when the ratio is expressed arithmetically, and “noise figure” is employed when the ratio is expressed in decibels.

Sub-section F1 – Interference

F11a

radio (frequency) noise; *bruit radioélectrique*; *ruido radioeléctrico*

A time-varying electromagnetic phenomenon having components in the radio-frequency range, apparently not conveying information and which may be superimposed on, or combined with, a wanted signal.

Note 1 – In certain cases a radio-frequency noise may convey information on some characteristics of its source, for example its nature and location.

Note 2 – An aggregate of signals may appear as radio-frequency noise, when they are not separately identifiable.

F11b **radio-frequency disturbance**; *perturbation radioélectrique, parasite (radioélectrique); perturbación radioeléctrica, parásito (radioeléctrico)*

Any electromagnetic phenomenon having components in the radio-frequency range, which may degrade the performance of a device, equipment or system, or affect adversely living or inert matter.

Note – A radio-frequency disturbance may be a radio-frequency noise, an unwanted signal or a change in the propagation medium itself.

F11c **radio-frequency interference (RFI)**; *brouillage (radioélectrique); interferencia (radio-eléctrica)*
(RR 1.166, MOD)

Degradation of the reception of a wanted signal caused by a radio-frequency disturbance.

Note 1 – Often man-made noise is not included in interference.

Note 2 – Various levels of interference are defined for administrative purposes in the Radio Regulations viz. *permissible interference* (RR No. 1.167), *accepted interference* (RR No. 1.168) and *harmful interference* (RR No. 1.169). The first term describes a level of interference which in the given conditions involves degradation of reception quality to an extent considered insignificant, but which must be taken into account in the planning of systems. The level of permissible interference is usually laid down in ITU-R Recommendations and/or other international agreements. The second term describes a higher level of interference involving a moderate degradation of reception quality which in given conditions is deemed to be acceptable by the administrations concerned. The third term describes a level of interference which “seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service”.

Note 3 – The English words “interference” and “disturbance” are often used indiscriminately; the expression “radio-frequency interference” is also commonly applied to a radio-frequency disturbance or to an unwanted signal.

F12 **interfering source**; *source de brouillage; fuente interferente*

An emission, radiation, or induction which is determined to be a cause of interference in a radiocommunication system.

Sub-section F2 – Signal-to-interference ratio, protection ratio

F21 **signal-to-interference ratio; signal/interference ratio**; *rapport signal sur brouillage, rapport signal/brouillage; relación señal/interferencia*

The ratio, generally expressed in decibels, of the power of the wanted signal to the total power of interfering signals and noise, evaluated in specified conditions at a specified point of a transmission channel.

Note 1 – A distinction is made, for example, between:

- at the receiver input, the radio-frequency (RF) signal-to-interference ratio;
- at the receiver output, the audio-frequency (AF) signal-to-interference ratio and the video-frequency (VF) signal-to-interference ratio.

Note 2 – In each individual case, the noise and interfering signals taken into account should be specified.

Note 3 – The term “signal-to-disturbance ratio” or its abbreviated form “signal/disturbance ratio”, which is already used for electromagnetic compatibility, may be used as a synonym.

F22 **protection ratio**; *rapport de protection; relación de protección*

The minimum value of the signal-to-interference ratio required to obtain a specified reception quality under specified conditions and at a specified point.

Note 1 – Various ITU-R Recommendations contain definitions for specific applications. The minimum value is usually laid down in these Recommendations and in other international agreements.

Note 2 – The specified conditions comprise *inter alia*:

- the nature and characteristics of the wanted signal;
- the nature and characteristics of the radio-frequency disturbance or the noise and interfering signals;
- the receiver and antenna characteristics;
- the propagation conditions.

Note 3 – A distinction is made for example between:

- the radio-frequency (RF) protection ratio;
- the video frequency (VF) protection ratio;
- the audio-frequency (AF) protection ratio.

F23

protection margin; *marge de protection; margen de protección*

The difference between the signal-to-interference ratio and the protection ratio, these ratios being expressed in logarithmic form.

Note 1 – Generally, care is taken to ensure that the difference between the ratios is positive to ensure reliability of communication.

Note 2 – Various Recommendations contain definitions for specific applications (e.g. Recommendation ITU-R BO.566).

Sub-section F3 – Field strength and power flux-density

F31

minimum usable field-strength, [minimum usable power flux-density]; *champ minimal utilisable, [puissance surfacique minimale utilisable]; intensidad de campo mínima utilizable, [densidad de flujo de potencia mínima utilizable]*

(Symbols: E_{min} and P_{min})

Minimum value of the field-strength [minimum value of the power flux-density] necessary to permit a desired reception quality, under specified receiving conditions, in the presence of natural and man-made noise, but in the absence of interference from other transmitters.

Note 1 – The desired quality is determined in particular by the protection ratio against noise, and for fluctuating noise, by the percentage of time during which this protection ratio must be ensured.

Note 2 – The receiving conditions include, *inter alia*:

- the type of transmission, and frequency band used;
- the receiving equipment characteristics (antenna gain, receiver characteristics, siting, etc.);
- receiver operating conditions, particularly the geographical zone, the time and the season.

Note 3 – Where there is no ambiguity, the term “minimum field-strength” [“minimum power flux-density”] may be used.

Note 4 – The term “minimum usable field-strength” corresponds to the term “minimum field-strength to be protected” which appears in many ITU texts.

F32

usable field-strength, [usable power flux-density]; *champ utilisable, [puissance surfacique utilisable]; intensidad de campo utilizable, [densidad de flujo de potencia utilizable]*

(Symbols: E_u and P_u)

Minimum value of the field-strength [minimum value of the power flux-density] necessary to permit a desired reception quality, under specified receiving conditions, in the presence of natural and man-made noise and of interference, either in an existing situation or as determined by agreements or frequency plans.

Note 1 – The desired quality is determined in particular by the protection ratios against noise and interference and in the case of fluctuating noise or interference, by the percentage of time during which the required quality must be ensured.

Note 2 – The receiving conditions include, *inter alia*:

- the type of transmission and frequency band used;
- the receiving equipment characteristics (antenna gain, receiver characteristics, siting, etc.);
- receiver operating conditions, particularly the geographical zone, the time and the season, or the fact that, if the receiver is mobile, a median field strength for multipath propagation must be considered.

Note 3 – The term “usable field-strength” corresponds to the term “necessary field-strength” which appears in many ITU texts.

F33

reference usable field-strength, [reference usable power flux-density]; *champ utilisable de référence, [puissance surfacique utilisable de référence]; intensidad de campo de referencia utilizable, [densidad de flujo de potencia de referencia utilizable]*

(Symbols: E_{ref} and P_{ref})

The agreed value of the usable field-strength [the agreed value of the usable power flux-density] that can serve as a reference or basis for frequency planning.

Note 1 – Depending on the receiving conditions and the quality required, there may be several reference usable field-strength [reference usable power flux-density] values for the same service.

Note 2 – Where there is no ambiguity, the term “reference field-strength” [“reference power flux-density”] may be used.

F34
(RR 22.5C.1)

equivalent power flux-density; *puissance surfacique équivalente; densidad de flujo de potencia equivalente*

(Symbol: $epfd$)

Sum of the power flux-densities produced at a point on the Earth’s surface by all space stations within a non-geostationary-satellite system, taking into account the off-axis discrimination of a reference receiving antenna assumed to be pointing towards the geostationary-satellite orbit.

F35
(RR 22.5D.1)

aggregate power flux-density; *puissance surfacique cumulative; densidad de flujo de potencia combinada*

(Symbol: $apfd$)

Sum of the power flux-densities produced at a point in the geostationary-satellite orbit by all the earth stations of a non-geostationary-satellite system.

Sub-section F4 – Diversity reception

F41
(Rec. F.592)

diversity reception; *réception en diversité; recepción por diversidad*

A reception method in which one resultant signal is obtained from several received radio signals which convey the same information but for which the radio path or the transmission channel differs by at least one characteristic such as frequency, polarization, or the position or orientation of antennas.

Note 1 – The quality of the resultant signal can be higher than that of the individual signals, due to the partial decorrelation of propagation conditions over the different radio paths or transmission channels.

Note 2 – The term “time diversity” is sometimes used to refer to the repetition of a signal or part of a signal over a single radio path or transmission channel.

- F42
(Rec. F.592) **order of diversity;** *ordre de diversité; orden de diversidad*
- The number of different radio signals used for diversity reception. For two signals, reception is said to be “double diversity”, and so on.
- F43
(Rec. F.592) **space diversity reception;** *réception en diversité d'espace; recepción con diversidad de espacio*
- Diversity reception in which several antennas are used at appropriate distances from each other in a radio station.
- Note* – For line-of-sight radio-relay systems, separation is generally vertical, whereas for trans-horizon radio-relay systems, it is generally horizontal.
- F44
(Rec. F.592) **frequency diversity reception;** *réception en diversité de fréquence; recepción con diversidad de frecuencia*
- Diversity reception in which several radio channels are used with appropriate frequency separations.
- Note* – If the channels are situated in different frequency bands, the frequency diversity is said to be “cross-band diversity”.

SECTION G – PROPAGATION

Sub-section G0 – Terms related to radio waves

- G00 **polarization;** *polarisation; polarización*
- To be defined later.
- G01 **cross-polarization;** *transpolarisation; polarización cruzada, transpolarización*
- The appearance, in the course of propagation, of a polarization component which is orthogonal to the expected polarization.
- G02 **cross-polarization discrimination;** *discrimination de polarisation, découplage de polarisation; discriminación por polarización cruzada*
- For a radio wave transmitted with a given polarization, the ratio at the reception point of the power received with the expected polarization to the power received with the orthogonal polarization.
- Note* – The cross-polarization discrimination depends both on the characteristics of the antennas and on the propagation medium.
- G03
(Rec. P.310) **cross-polarization isolation;** *isolement de polarisation; aislamiento por polarización cruzada*
- For two radio waves transmitted at the same frequency with the same power and orthogonal polarization, the ratio of the co-polarized power in a given receiver to the cross-polarized power in that receiver.
- G04 **depolarization;** *dépolarisation; despolarización*
- A phenomenon by virtue of which all or part of the power of a radio wave transmitted with a defined polarization may no longer have a defined polarization after propagation.
- G04a **elliptical polarization;** *polarisation elliptique; polarización elíptica*
- To be defined later.

G05
(RR 1.154, MOD) **right-hand polarization, clockwise polarization;** *polarisation dextrorsum, polarisation dextrogyre* (deprecated in this sense); *polarización dextrógira, polarización en el sentido de las agujas del reloj*

An elliptical polarization for which the electric flux-density vector observed in any fixed plane not containing the direction of propagation, whilst looking in this direction, rotates with time in a right-hand or clockwise direction.

G06
(RR 1.155, MOD) **left-hand polarization, counter-clockwise polarization;** *polarisation senestrorsum, lévogyre* (deprecated in this sense); *polarización levógira, polarización en el sentido contrario de las agujas del reloj*

An elliptical polarization for which the electric flux-density vector observed in any fixed plane not containing the direction of propagation, whilst looking in this direction, rotates with time in a left-hand or counter-clockwise direction.

Sub-section G1 – Tropospheric propagation

G11
(Rec. P.310, MOD) **free-space propagation;** *propagation en espace libre; propagación en el espacio libre*

Propagation of an electromagnetic wave in a homogeneous ideal dielectric medium which may be considered of infinite extent in all directions.

Note – For propagation in free space, the magnitude of each vector of the electromagnetic field in any given direction from the source beyond a suitable distance determined by the size of the source and the wavelength is proportional to the reciprocal of the distance from the source.

G11a
(Rec. P.310) **ray path;** *trajet radioélectrique; trayecto radioeléctrico*

At each point, the path tangential to the direction of propagation of energy at this point.

Note 1 – The concept of ray is the basis of the geometrical optics which, when applicable, permits the substitution of simple relationships for Maxwell's equations.

Note 2 – In some cases, several paths may exist between two points.

Note 3 – In an isotropic medium, the ray path is a trajectory orthogonal to the wavefronts and the term "ray" is often defined as this trajectory. In an anisotropic medium, the trajectories orthogonal to the wave fronts do not always coincide with physical paths between a source and a receiving point and should not be called rays.

G12
(Rec. P.310, MOD) **line-of-sight propagation;** *propagation en visibilité directe; propagación con visibilidad directa*

Propagation between two points for which the direct ray is sufficiently clear of obstacles for diffraction to be of negligible effect.

G13
(Rec. P.310, MOD) **troposphere;** *troposphère; troposfera*

The lower part of the Earth's atmosphere extending upwards from the Earth's surface, in which temperature decreases with height except in local layers of temperature inversion. This part of the atmosphere extends to an altitude of about 9 km at the Earth's poles and 17 km at the equator.

G14 **tropospheric propagation;** *propagation troposphérique; propagación troposférica*

Propagation within the troposphere and by extension, propagation beneath the ionosphere, when not influenced by the ionosphere.

G15
(Rec. P.310) **radio horizon;** *horizon radioélectrique; horizonte radioeléctrico*

The locus of points at which the direct rays from a point source of radio waves are tangential to the surface of the Earth.

Note – As a general rule, the radio and geometric horizons are different because of atmospheric refraction.

- G16
(Rec. P.310, MOD) **trans-horizon propagation;** *propagation (troposphérique) transhorizon; propagación (troposférica) transhorizonte*
- Tropospheric propagation between points close to the ground, the reception point being beyond the radio horizon of the transmission point.
- Note* – Trans-horizon propagation may be due to a variety of tropospheric mechanisms such as diffraction, scattering, reflection from tropospheric layers. However ducting is not included because in a duct there is no radio horizon.
- G17
(Rec. P.310, MOD) **tropospheric radio-duct;** *conduit troposphérique, guide troposphérique; conducto radio-eléctrico troposférico*
- A quasi-horizontal stratification in the troposphere within which radio energy of a sufficiently high frequency is substantially confined and propagates with much lower attenuation, than would be obtained in a homogeneous atmosphere.
- G18
(Rec. P.310, MOD) **ducting;** *propagation (troposphérique) guidée; propagación guiada (troposférica) (por conducto)*
- Guided propagation of radio waves inside a tropospheric radio-duct.
- G19
(Rec. P.310, MOD) **tropospheric-scatter propagation;** *propagation par diffusion troposphérique; propagación por dispersión troposférica*
- Tropospheric propagation by scattering from many inhomogeneities and/or discontinuities in the refractive index of the atmosphere.
- G19a
(Rec. P.310, MOD) **precipitation-scatter propagation;** *propagation par diffusion par les précipitations; propagación por dispersión debida a las precipitaciones*
- Tropospheric propagation due to scattering caused by hydrometeors, mainly rain.
- G19b
(Rec. P.310, MOD) **multipath propagation;** *propagation par trajets multiples; propagación por trayectos múltiples*
- Propagation between a transmission point and a reception point over a number of separate propagation paths simultaneously.
- G19c **ground wave;** *onde de sol; onda de superficie*
- A radio wave basically determined by the properties of the ground which propagates in the troposphere and which is mainly due to diffraction around the Earth.

Sub-section G2 – Ionospheric propagation

- G21 **ionosphere;** *ionosphère; ionosfera*
- That part of the upper atmosphere characterized by the presence of ions and free electrons mainly arising from photo-ionization, the electron density being sufficient to produce significant modification of the propagation of radio waves in certain frequency bands.
- Note* – The Earth's ionosphere extends approximately from a height of 50 km to a height of 2 000 km.
- G22 **ionospheric propagation;** *propagation ionosphérique; propagación ionosférica*
- Radio propagation involving the ionosphere.
- G24 **trans-ionospheric propagation;** *propagation transionosphérique; propagación trans-ionosférica*
- Radio propagation between two points situated below and above the height of the maximum electron density of the ionosphere.

- G25 **ionospheric scatter propagation**; *propagation par diffusion ionosphérique; propagación por dispersión ionosférica*
- Ionospheric propagation involving scatter from irregularities in the electron density in the ionosphere.
- G26 **(propagation by) ionospheric reflection**; *(propagation par) réflexion ionosphérique; (propagación por) reflexión ionosférica*
- Ionospheric propagation at a sufficiently low frequency that, for given conditions, transionospheric propagation is not possible; the radio wave is then subject to progressive refraction which, when considered from a sufficiently large distance, may be considered as equivalent to reflection from a hypothetical surface.
- G27 **ionospheric wave**; *onde ionosphérique; onda ionosférica*
- A radio wave returned to the Earth by ionospheric reflection.
- G28 **hop** (ionospheric propagation); *bond, saut (en propagation ionosphérique); salto (en propagación ionosférica)*
- A propagation path between two points on the surface of the Earth, comprising one or more ionospheric reflections but without intermediate reflection by the ground.
- G29
(Rec. P.373, MOD) **basic MUF**; *MUF de référence; MUF básica*
- The highest frequency at which a radio wave can propagate between given terminals below the ionosphere on a specified occasion, by ionospheric refraction alone.
- Note* – The acronym MUF stands for “Maximum Usable Frequency”.
- G30
(Rec. P.373, MOD) **operational MUF**; *MUF d'exploitation, MUF; MUF de explotación, MUF*
- The highest frequency that would permit acceptable performance of a radio circuit by signal propagation via the ionosphere between given terminals below the ionosphere at a given time under specified working conditions.
- Note 1* – Acceptable performance may for example be quoted in terms of maximum error ratio or required signal/noise ratio.
- Note 2* – Specified working conditions may include such factors as antenna types, transmitter power, class of emission and required information rate.
- G31
(Rec. P.373, MOD) **lowest useful frequency (LUF)**; *fréquence minimale utilisable LUF; frecuencia mínima utilizable LUF*
- The lowest frequency that would permit acceptable performance of a radio circuit by signal propagation via the ionosphere between given terminals below the ionosphere at a given time under specified working conditions.
- Note* – See Notes 1 and 2 of term G30 “operational MUF”.

SECTION H – SPACE RADIOCOMMUNICATIONS

Sub-section H0 – General terms* (see also Sub-section A3)

- H01
(RR 1.178)
(Rec. S.673) **spacecraft**; *engin spatial; vehículo espacial*
- A man-made vehicle which is intended to go beyond the major part of the Earth’s atmosphere.

* The terms of celestial mechanics, relating to orbits, used in these definitions are defined in Recommendation ITU-R S.673.

- H02
(RR 1.177) **deep space**; *espace lointain*; *espacio lejano*
- Space at distances from the Earth equal to, or greater than, 2×10^6 km.
- H03
(Rec. S.673) **space probe**; *sonde spatiale*; *sonda espacial*
- A spacecraft designed for making observations or measurements in space.
- H04
(RR 1.179, MOD)
(Rec. S.673) **satellite**; *satellite*; *satélite*
- A body which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body.
- Note* – A body so defined which revolves around the Sun is called a planet or planetoid.
- H05
(Rec. S.673, MOD) **orbit**; *orbite*; *órbita*
1. The path, relative to a specified frame of reference, described by the centre mass of a satellite or other object in space, subjected solely to forces of natural origin, mainly the force of gravity.
 2. By extension, the path described by the centre of mass of a body in space subjected to forces of natural origin and occasional low-energy corrective forces exerted by a propulsive device in order to achieve and maintain a desired path.
- Note* – In the Radio Regulations, the above two definitions are combined in the following form (RR No. 1.184):
- “The path, relative to a specified frame of reference, described by the centre of mass of a satellite or other object in space subjected primarily to natural forces, mainly the force of gravity.”
- H06
(RR 1.185, MOD)
(Rec. S.673) **inclination** (of a satellite orbit); *inclinaison (d'une orbite de satellite)*; *inclinación (de una órbita de satélite)*
- The angle between the plane of the orbit of a satellite and the principal reference plane.
- Note* – By convention, the inclination of a direct orbit of a satellite is an acute angle and the inclination of a retrograde orbit is an obtuse angle.
- H07
(RR 1.186, MOD)
(Rec. S.673) **period** (of a satellite); *période (d'un satellite)*; *periodo (de un satélite)*
- The time elapsing between two consecutive passages of a satellite through a characteristic point on its orbit.
- H08
(RR 1.187, MOD)
(Rec. S.673) **altitude of the apogee [perigee]**; *altitude de l'apogée [du périégée]*; *altitud del apogeo [del perigeo]*
- The altitude of the apogee [perigee] above a specified hypothetical reference surface serving to represent the surface of the Earth.
- H09a
(Rec. S.673) **geocentric angle**; *angle géocentrique*; *ángulo geocéntrico*
- The angle formed by imaginary straight lines that join any two points with the centre of the Earth.
- H09b
(Rec. S.673) **topocentric angle**; *angle topocentrique*; *ángulo topocéntrico*
- The angle formed by imaginary straight lines that join any two points in space with a specific point on the surface of the Earth.
- H09c
(Rec. S.673) **exocentric angle**; *angle exocentrique*; *ángulo exocéntrico*
- The angle formed by imaginary straight lines that join any two points with a specific point in space.

Sub-section H1 – Types of satellites

- H11
(RR 1.180)
(Rec. S.673) **active satellite;** *satellite actif; satélite activo*
A satellite carrying a station intended to transmit or retransmit radiocommunication signals.
- H12
(RR 1.181 MOD)
(Rec. S.673,) **reflecting satellite;** *satellite réflecteur; satélite reflector*
A satellite intended to reflect radiocommunication signals.
- H13
(Rec. S.673) **station-keeping satellite;** *satellite maintenu en position; satélite de posición controlada*
A satellite, the position of the centre of mass of which is controlled to follow a specified law, either in relation to the positions of other satellites belonging to the same space system or in relation to a point on Earth which is fixed or moves in a specified way.
- H14
(Rec. S.673) **synchronized satellite, phased satellite** (deprecated); *satellite synchronisé, satellite en phase* (deprecated); *satélite sincronizado, satélite en fase* (deprecated)
A satellite controlled so as to have an anomalistic period or a nodal period equal to that of another satellite or planet, or to the period of a given phenomenon, and to pass a characteristic point in its orbit at specified instants.
- H15
(Rec. S.673) **attitude-stabilized satellite;** *satellite à commande d'orientation; satélite de actitud estabilizada*
A satellite with at least one axis maintained in a specified direction, e.g. toward the centre of the Earth, the Sun or a specified point in space.
- H16
(Rec. S.673) **synchronous satellite;** *satellite synchrone; satélite sincrónico*
A satellite for which the mean sidereal period is equal to the sidereal period of rotation of the primary body about its own axis; by extension, a satellite for which the mean sidereal period of revolution is approximately equal to the sidereal period of rotation of the primary body.
- H17
(Rec. S.673) **geosynchronous satellite;** *satellite géosynchrone; satélite geosincrónico*
A synchronous Earth satellite.
Note – The sidereal period of rotation of the Earth is about 23 hours 56 minutes.
- H18
(Rec. S.673) **sub-synchronous (super-synchronous) satellite;** *satellite sous-synchrone (super-synchrone); satélite subsincrónico (supersincrónico)*
A satellite for which the mean sidereal period of revolution about the primary body is a sub-multiple (an integral multiple) of the sidereal period of rotation of the primary body about its own axis.
- H19
(Rec. S.673) **stationary satellite;** *satellite stationnaire; satélite estacionario*
A satellite which remains fixed in relation to the surface of the primary body; by extension, a satellite which remains approximately fixed in relation to the surface of the primary body.
Note – A stationary satellite is a synchronous satellite with an orbit which is equatorial, circular and direct.

Sub-section H2 – Geostationary satellite

- H21
(Rec. S.673) **geostationary satellite;** *satellite géostationnaire; satélite geoestacionario*
A stationary satellite having the Earth as its primary body.
Note – A geostationary satellite remains approximately fixed relative to the Earth (RR No. 1.189).

- H22
(Rec. S.673) **geostationary-satellite orbit;** *orbite des satellites géostationnaires; órbita de los satélites geoestacionarios*
- The unique orbit of all geostationary satellites.
- H23
(Rec. S.673) **visible arc;** *arc de visibilité; arco visible*
- The common part of the arc of the geostationary satellite over which the space station is visible above the local horizon from each associated earth station in the service area.
- H24
(Rec. S.673) **service arc;** *arc de service; arco de servicio*
- The arc of the geostationary satellite orbit within which the space station could provide the required service (the required service depends upon the system characteristics and user requirements) to all of its associated earth stations in the service area.
- H25
(Rec. S.673) **frequency re-use satellite network;** *réseau à satellite à réutilisation de fréquence; red de satélites con reutilización de frecuencias*
- A satellite network in which the satellite utilizes the same frequency band more than once, by means of antenna polarization discrimination, or by multiple antenna beams, or both.

Sub-section H3 – Space research – Earth exploration

- H31
(RR 1.182, MOD) **active sensor;** *détecteur actif, capteur actif; sensor activo*
- A measuring instrument in the Earth exploration-satellite service or in the space research service by means of which information is obtained by transmission and reception of electromagnetic waves.
- Note* – The definitions given in RR Nos. 1.182 and 1.183 are modified by changing the phrase “radio waves” to “electromagnetic waves”. From a technical point of view, the change is necessary because some remote sensors make measurements at wavelengths that correspond to frequencies above the upper limit of radio waves, conventionally fixed at 3 000 GHz.
- H32
(RR 1.183, MOD) **passive sensor;** *détecteur passif, capteur passif; sensor pasivo*
- A measuring instrument in the Earth exploration-satellite service or in the space research service by means of which information is obtained by reception of electromagnetic waves of natural origin.
- Note* – See Note for term H31.
- H33 **data relay satellite;** *satellite relais de données; satélite de retransmisión de datos*
- A satellite whose main purpose is the relay of data from one or more mission satellites or space probes to one or more earth stations. It may also provide for communication in the other direction. Additionally, it may be used as a relay for the space operation service.
- Note* – Data relay satellites are generally geostationary.
- H34 **data collection satellite;** *satellite de collecte de données; satélite de adquisición de datos*
- A satellite whose main purpose is the collection of data from stations on the Earth or in the atmosphere of the Earth, and subsequent forwarding of those data to one or more earth stations. It may also provide for communication in the other direction.

H35 **remote sensing satellite;** *satellite de télédétection; satélite de teledetección*

A satellite whose purpose is remote observation by reception of electromagnetic waves using active or passive sensors (these two types of sensors are defined in this Recommendation, numbers H31 and H32).

Sub-section H4 – Broadcasting

H41
(RR 1.129) **individual reception** (in the broadcasting-satellite service); *réception individuelle (dans le service de radiodiffusion par satellite); recepción individual (en el servicio de radiodifusión por satélite)*

The reception of emissions from a space station in the broadcasting-satellite service by simple domestic installations and in particular those possessing small antenna.

H42
(RR 1.130) **community reception** (in the broadcasting-satellite service); *reception communautaire (dans le service de radiodiffusion par satellite); recepción comunal (en el servicio de radiodifusión por satélite)*

The reception of emissions from a space station in the broadcasting-satellite service by receiving equipment, which in some cases may be complex and have antennae larger than those used for individual reception, and intended for use:

- by a group of the general public at one location; or
- through a distribution system covering a limited area.

H43
(Rec. BO.566, MOD) **direct distribution;** *distribution directe; distribución directa*

Use of a satellite link of the fixed-satellite service to relay broadcasting programmes from one or more points of origin, directly to terrestrial broadcasting stations without any intermediate distribution stages (possibly including other signals necessary for their operation).

H44
(Rec. BO.566, MOD) **indirect distribution;** *distribution indirecte; distribución indirecta*

Use of a satellite link of the fixed-satellite service to relay broadcasting programmes from one or more points of origin to various earth stations for further distribution to the terrestrial broadcasting stations (possibly including other signals necessary for their operation).

SECTION J – STANDARD FREQUENCIES AND TIME SIGNALS

J01
(Rec. TF.686) **frequency standard;** *étalon de fréquence; patrón de frecuencia*

A generator, the output of which is used as a frequency reference.

J02
(Rec. TF.686) **standard frequency;** *fréquence étalon; frecuencia patrón*

A frequency with a known relationship to a frequency standard.

Note – The term standard frequency is often used for the signal whose frequency is a standard frequency.

J03
(Rec. TF.686) **standard-time-signal emission;** *émission des signaux horaires; emisión de señales horarias*

An emission which disseminates a sequence of time signals at regular intervals with a specified accuracy.

- J04
(Rec. TF.686) **International Atomic Time (TAI);** *temps atomique international (TAI); Tiempo Atómico Internacional (TAI)*
- The time scale established by the Bureau international des poids et mesures (BIPM) on the basis of data from atomic clocks operating in several establishments conforming to the definition of the second, the unit of time of the International System of Units (SI).
- J05
(Rec. TF.686, MOD) **Universal Time (UT);** *temps universel (UT); Tiempo Universal (UT)*
- Universal Time (UT) is the general designation of time scales based on the rotation of the Earth. In applications in which precision of a few tenths of a second cannot be tolerated, it is necessary to specify the form of UT which should be used:
- UT0 is the mean solar time of the prime meridian obtained from direct astronomical observation;
 - UT1 is UT0 corrected for the effects of small movements of the Earth relative to the axis of rotation (polar variation) (see Recommendation ITU-R TF.460);
 - UT2 is UT1 corrected for the effects of a small seasonal fluctuation in the rate of rotation of the Earth.
- J06
(Rec. TF.686, MOD) **Coordinated Universal Time (UTC);** *temps universel coordonné (UTC); Tiempo Universal Coordinado (UTC)*
- The time scale, maintained by the BIPM and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals. UTC corresponds exactly in rate with TAI, but differs from it by an integral number of seconds.
- The UTC scale is adjusted by the insertion or deletion of seconds (positive or negative leap seconds) to ensure approximate agreement with UT1.

Appendix

to Recommendation ITU-R V.573-4

Stations in mobile services

- A10
(RR 1.67) **mobile station;** *station mobile; estación móvil*
- See Section A of Recommendation ITU-R V.573-4.
- A10a
(RR 1.73) **land mobile station;** *station mobile terrestre; estación móvil terrestre*
- A mobile station in the land mobile service capable of surface movement within the geographical limits of a country or continent.
- A10b
(RR 1.77) **ship station;** *station de navire; estación de barco*
- A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station.
- A10c
(RR 1.83) **aircraft station;** *station d'aéronef; estación de aeronave*
- A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft.

- A10d
(RR 1.65) **survival craft station;** *station d'engin de sauvetage; estación de embarcación o dispositivo de salvamento*
- A mobile station in the maritime mobile service or the aeronautical mobile service intended solely for survival purposes and located on any lifeboat, life-raft or other survival equipment.
- A10e
(RR 1.103) **radar beacon (racon);** *balise radar (racon); baliza de radar (racon)*
- A transmitter-receiver associated with a fixed navigational mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information.
- A10f
(RR 1.93, MOD) **emergency position-indicating radiobeacon station;** *station de radiobalise de localisation des sinistres; estación de radiobaliza de localización de siniestros*
- A station in the mobile service the emissions of which are intended to facilitate search and rescue operations.
- Note* – The extension of this definition in the case of stations the emissions of which are intended to be relayed by satellite, needs further study.
- A11
(RR 1.69) **land station;** *station terrestre; estación terrestre*
- See Section A of Recommendation ITU-R V.573-4.
- A11a
(RR 1.71) **base station;** *station de base; estación de base*
- A land station in the land mobile service.
- A11b
(RR 1.75) **coast station;** *station côtière; estación costera*
- A land station in the maritime mobile service.
- A11c
(RR 1.81 (MOD)) **aeronautical station;** *station aéronautique; estación aeronáutica*
- A land station in the aeronautical mobile service.
- Note* – In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea.
-