

RECOMMENDATION ITU-R F.283-5^{*,**}**Radio-frequency channel arrangements for low and medium capacity
analogue or digital fixed wireless systems
operating in the 2 GHz band**

(Question ITU-R 136/9)

(1959-1966-1970-1978-1982-1990)

The ITU Radiocommunication Assembly,

considering

- a) that it is sometimes desirable to be able to interconnect fixed wireless systems of 60, 120, 300 and up to 960^{***} telephone channel capacity, or low and medium capacity digital systems of equivalent bandwidth, on international circuits using radio frequencies in the 2 GHz band;
- b) that, in a frequency band 200 MHz wide, it may be desirable to interconnect up to six go and six return radio-frequency channels;
- c) that economy may be achieved, if at least three go and three return channels can be interconnected between systems each of which uses a common transmit-receive antenna;
- d) that for systems up to 300 telephony channels many interfering effects can be substantially reduced by a carefully planned arrangement of the radio frequencies in fixed wireless systems employing several radio-frequency channels;
- e) that for systems up to 300 telephony channels it may sometimes be desirable to interleave additional radio-frequency channels between those of the main pattern;
- f) that it is desirable for the values of the mid-frequencies of the radio-frequency channels to be the same for 60, 120, 300 and up to 960 channel telephony systems, as well as for digital systems;
- g) that the spacing between the mid-frequencies of the radio-frequency channels should be such that the systems can work with the maximum r.m.s. frequency deviation of 200 kHz per channel for systems up to 600 telephone channels, while for 960 telephone channel systems a lower frequency deviation should be used in order to improve the spectrum utilization,
- h) that the use of bit rates of the order of 70 Mbit/s is possible in the 2 GHz band,

* This Recommendation applies only to line-of-sight and near line-of-sight fixed wireless systems.

** Radiocommunication Study Group 9 made editorial amendments to this Recommendation in 2002 in accordance with Resolution ITU-R 44.

*** The provision of this Recommendation for 960 channels applies only in the frequency band 2 500 to 2 700 MHz.

recommends

1 that the preferred radio-frequency channel arrangement for up to six go and six return channels, each accommodating 60, 120, 300 or a maximum of 960^{***} telephone channels or digital systems up to about 70 Mbit/s, and operating within the frequency bands listed under § 6, should be as shown in Fig. 1, which is derived as follows:

Let f_0 be the frequency of the centre of a 200 MHz band of frequencies occupied (MHz);

f_n be the centre frequency of one radio-frequency channel in the lower half of this band (MHz);

f'_n be the centre frequency of one radio-frequency channel in the upper half of this band (MHz);

then the frequencies in MHz of individual channels are expressed by the following relationships:

$$\text{lower half of the band: } f_n = f_0 - 108.5 + 14 n,$$

$$\text{upper half of the band: } f'_n = f_0 + 10.5 + 14 n,$$

where

$$n = 1, 2, 3, 4, 5 \text{ or } 6;$$

2 that, in a section over which the international connection is arranged, all the go channels should be in one half of the band, and all the return channels should be in the other half of the band;

3 that for adjacent radio-frequency channels in the same half of the band, different polarizations should preferably be used alternately,*

4 that, when common transmit-receive antennas are used and three radio-frequency channels are accommodated on a single antenna, it is preferable that the channel frequencies be selected by either making $n = 1, 3$ and 5 in both halves of the band or making $n = 2, 4$ and 6 in both halves of the band;

5 that, when additional radio-frequency channels, interleaved between those of the main patterns, are required, the values of the centre frequencies of these radio-frequency channels should be 7 MHz above those of the corresponding main channel frequencies;**

6 that the centre frequencies should preferably be those shown below:

$$f_0 = 1\,808 \text{ MHz for the band } 1\,700 \text{ to } 1\,900 \text{ MHz};$$

$$f_0 = 2\,000 \text{ MHz for the band } 1\,900 \text{ to } 2\,100 \text{ MHz};$$

$$f_0 = 2\,203 \text{ MHz for the band } 2\,100 \text{ to } 2\,300 \text{ MHz (see Note 3)};$$

$$f_0 = 2\,586 \text{ MHz for the band } 2\,500 \text{ to } 2\,700 \text{ MHz}^{***}.$$

Other centre frequencies may be used by agreement between the administrations concerned.

* The same polarization for adjacent channels can also be used for low capacity digital systems.

** In systems for 960 telephone channels in the band 2 500 to 2 700 MHz, or digital systems of about 70 Mbit/s, it may not be practicable to use interleaved frequencies, because of the wide bandwidth occupied by the modulated carrier.

*** Attention is drawn to the fact that the lowest main channel frequency is below 2 500 MHz and that in accordance with Article S5 of the Radio Regulations, all emissions are prohibited in the band 2 690-2 700 MHz except in the countries mentioned in RR Nos. S5.421 and S5.422 and for equipment in operation by 1 January 1985.

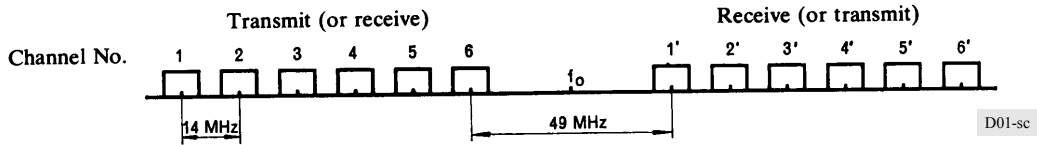


FIGURE 1 – Radio-frequency channel arrangement for international connection of radio-relay systems operating in the 2 GHz band

NOTE 1 – When the frequency band 1 900 to 2 300 MHz or 1 700 to 2 100 MHz is used for large capacity fixed wireless systems and a 60, a 120 or a 300 channel system is used on the same route, the possibility of introducing mutual interference is greatly reduced if separate antennas are used for the two systems (see Fig. 1).

NOTE 2 – In systems for up to 300 telephony channels, operational difficulties may be experienced along a route, due to over-reach and similar problems. In such cases, additional frequencies, spaced 3.5 MHz from the allocations given above, are available for use as stagger frequencies.

NOTE 3 – In certain countries, particularly in Region 2, it may be preferable to have the frequencies in MHz of individual channels as expressed by the following relationships:

lower half of the band: $f_n = f_0 - 94.5 + 14 n$,

upper half of the band: $f'_n = f_0 - 3.5 + 14 n$,

where

$n = 1, 2, 3, 4, 5$ or 6 .

Interleaved channels should be 7 MHz below those of the corresponding main channels.

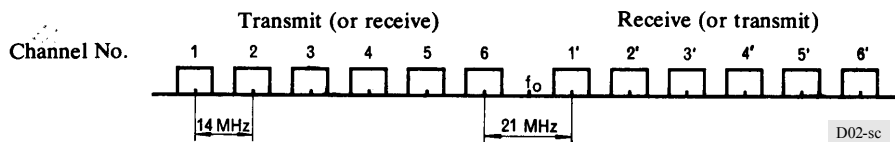


FIGURE 2 – Radio-frequency channel arrangement referred to in Note 3

NOTE 4 – When using a 960* telephone channel system, in accordance with this Recommendation, the following preferred values should be used:

- r.m.s. deviation per channel: 140 kHz,
- frequency of continuity pilot: 4 715 kHz,
- r.m.s. deviation for the continuity pilot: 100 kHz.

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