RECOMMENDATION ITU-R F.748-3

RADIO-FREQUENCY CHANNEL ARRANGEMENTS FOR RADIO-RELAY SYSTEMS OPERATING IN THE 25, 26 AND 28 GHz BANDS

(Question ITU-R 108/9)

(1992-1994-1995-1999)

The ITU Radiocommunication Assembly,

considering

a) that the bands 24.25-25.25 GHz, 25.25-27.5 GHz and 27.5-29.5 GHz are allocated to fixed and other services;

b) that some administrations use digital systems for point-to-point (P-P) and/or point-to-multipoint (P-MP) applications;

c) that the bands are used for differing applications by various administrations and that these applications require different frequency plans;

d) that several types of service with various capacities may be in simultaneous use in these frequency bands;

e) that the band allocated to each service or even to each administration may vary from one country to another;

f) that the applications in these frequency bands may require differing channel bandwidths;

g) that a high degree of compatibility between different systems and between radio-frequency channels of different arrangements can be achieved by selecting all channel centre frequencies from a homogeneous basic pattern,

recommends

1 that the preferred radio-frequency channel arrangement for the 24.25-25.25 GHz, 25.25-27.5 GHz and 27.5-29.5 GHz bands should be based on homogeneous patterns;

2 that the homogeneous pattern with a preferred 3.5 MHz interval be defined by the relation:

$$f_p = f_r + 3.5\,p$$

where:

$1 \leq p \leq 285$ for the band 24.25-25.25 GHz

$287 \leq p \leq 928$ for the band 25.25-27.5 GHz

$930 \leq p \leq 1\,500$ for the band 27.5-29.5 GHz

f_r : reference frequency of the homogeneous pattern;

3 that the homogeneous pattern with a preferred 2.5 MHz interval be defined by the relation:

$$f_p = f_r + 2 + 2.5\,p$$

where:

$1 \leq p \leq 399$ for the band 24.25-25.25 GHz

$401 \leq p \leq 1\,299$ for the band 25.25-27.5 GHz

$1\,301 \leq p \leq 2\,099$ for the band 27.5-29.5 GHz

f_r : reference frequency of the homogeneous pattern;

4 that the reference frequency of the homogeneous pattern for international connections should be:

$$f_r = 24\,248 \qquad \text{MHz}$$

5   that all go channels should be in one half of any bi-directional band, and all return channels in the other;

6   that the channel spacings, *XS*, centre gap, *YS*, and the lower and upper band limits, Z_1S, Z_2S, should be agreed by the administrations concerned, dependent on the application and the channel capacity envisaged (see Recommendation ITU-R F.746 for definitions of *XS*, *YS* and *ZS*).

NOTE 1 – Due regard has to be taken that, in certain countries, a 3.5 MHz homogeneous pattern, interleaved by 1.75 MHz from that referred in *recommends* 2, is used in conjunction with the main pattern.

NOTE 2 – Examples of channel arrangements based on this Recommendation are described in Annexes 1 and 2.

ANNEX 1

Radio-frequency channel arrangements for some CEPT administrations in the band 24.5-26.5 GHz in accordance with *recommends* 2

An example of the radio-frequency channel arrangement based on this Recommendation for carrier spacings of 112 MHz, 56 MHz, 28 MHz, 14 MHz, 7 MHz and 3.5 MHz is derived as follows (see Fig. 1):

Let f_0 be the reference frequency of 25 501 MHz $= f_r + (358 \times 3.5)$ MHz,

             f_n be the centre frequency of a radio-frequency channel in the lower half of the band,

             f'_n be the centre frequency of a radio-frequency channel in the upper half of the band,

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

a)   for systems with a carrier spacing of 112 MHz:

          lower half of band: $f_n = f_0 - 1\,008 + 112\,n$ MHz

          upper half of band: $f'_n = f_0 + 112\,n$ MHz

where:

          $n = 1, 2, 3, \ldots 8$

b)   for systems with a carrier spacing of 56 MHz:

          lower half of band: $f_n = f_0 - 980 + 56\,n$ MHz

          upper half of band: $f'_n = f_0 + 28 + 56\,n$ MHz

where:

          $n = 1, 2, 3, \ldots 16$

c)   for systems with a carrier spacing of 28 MHz:

          lower half of band: $f_n = f_0 - 966 + 28\,n$ MHz

          upper half of band: $f'_n = f_0 + 42 + 28\,n$ MHz

where:

          $n = 1, 2, 3, \ldots 32$

d)   for systems with a carrier spacing of 14 MHz:

          lower half of band: $f_n = f_0 - 959 + 14\,n$ MHz

          upper half of band: $f'_n = f_0 + 49 + 14\,n$ MHz

where:

          $n = 1, 2, 3, \ldots 64$

(See Note 1)

e) for systems with a carrier spacing of 7 MHz:

 lower half of band: $f_n = f_0 - 955.5 + 7\,n$ MHz

 upper half of band: $f'_n = f_0 + 52.5 + 7\,n$ MHz

where:

 $n = 1, 2, 3, \dots 128$

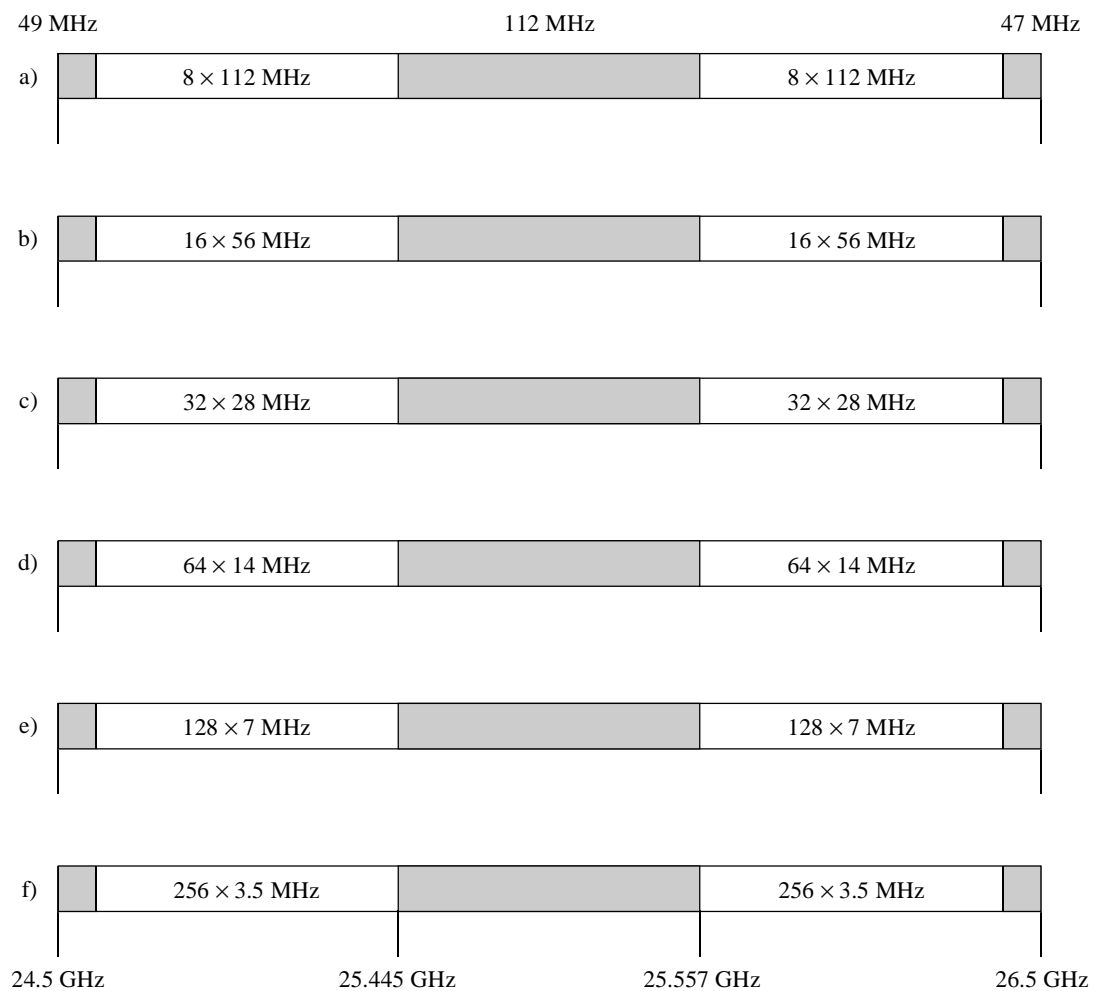f) for systems with a carrier spacing of 3.5 MHz:

 lower half of band: $f_n = f_0 - 953.75 + 3.5\,n$ MHz

 upper half of band: $f'_n = f_0 + 54.25 + 3.5\,n$ MHz

where:

 $n = 1, 2, 3, \dots 256.$

FIGURE 1

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NOTE 1 – The radio-frequency channel arrangements of § a) to e) of this Annex use channel centre frequencies f_n and f'_n selected from the homogeneous pattern of *recommends* 2. The arrangement of § f) above uses frequencies spaced by 3.5 MHz but interleaved between the homogeneous pattern of *recommends* 2 with an offset of 1.75 MHz.

NOTE 2 – Figure 1 gives occupied spectrum in the 24.5-26.5 GHz band. The centre and edge guard bands may be reduced, by agreement between administrations, to allow the use of an increased number of lower capacity systems, by the addition of extra channels using frequencies derived from the homogeneous pattern of *recommends* 2.

NOTE 3 – The radio-frequency channel arrangements of § a) to f) of this Annex may be used in digital systems for P-P and/or P-MP applications.

ANNEX 2

**Radio-frequency channel arrangements for some CEPT administrations
in the band 27.5-29.5 GHz in accordance with *recommends* 2**

An example of the radio-frequency channel arrangement based on this Recommendation for carrier spacings of 112 MHz, 56 MHz, 28 MHz, 14 MHz, 7 MHz and 3.5 MHz is derived as follows:

Let f_0 be the centre frequency of 28 500.5 MHz $= f_r + (1\,215 \times 3.5)$ MHz,

         f_n be the centre frequency of a radio-frequency channel in the lower half of the band,

         f_n' be the centre frequency of a radio-frequency channel in the upper half of the band,

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

a)   for systems with a carrier spacing of 112 MHz:

      lower half of band: $f_n = f_0 - 1\,008 + 112\,n$ MHz

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      lower half of band: $f_n = f_0 - 980 + 56\,n$ MHz

      upper half of band: $f_n' = f_0 + 28 + 56\,n$ MHz

where:

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c)   for systems with a carrier spacing of 28 MHz:

      lower half of band: $f_n = f_0 - 966 + 28\,n$ MHz

      upper half of band: $f_n' = f_0 + 42 + 28\,n$ MHz

where:

      $n = 1, 2, 3, \ldots 32$

d)   for systems with a carrier spacing of 14 MHz:

      lower half of band: $f_n = f_0 - 959 + 14\,n$ MHz

      upper half of band: $f_n' = f_0 + 49 + 14\,n$ MHz

where:

      $n = 1, 2, 3, \ldots 64$

e)   for systems with a carrier spacing of 7 MHz:

      lower half of band: $f_n = f_0 - 955.5 + 7\,n$ MHz

      upper half of band: $f_n' = f_0 + 52.5 + 7\,n$ MHz

where:

      $n = 1, 2, 3, \ldots 128$

(See Note 1)

f)   for systems with a carrier spacing of 3.5 MHz:

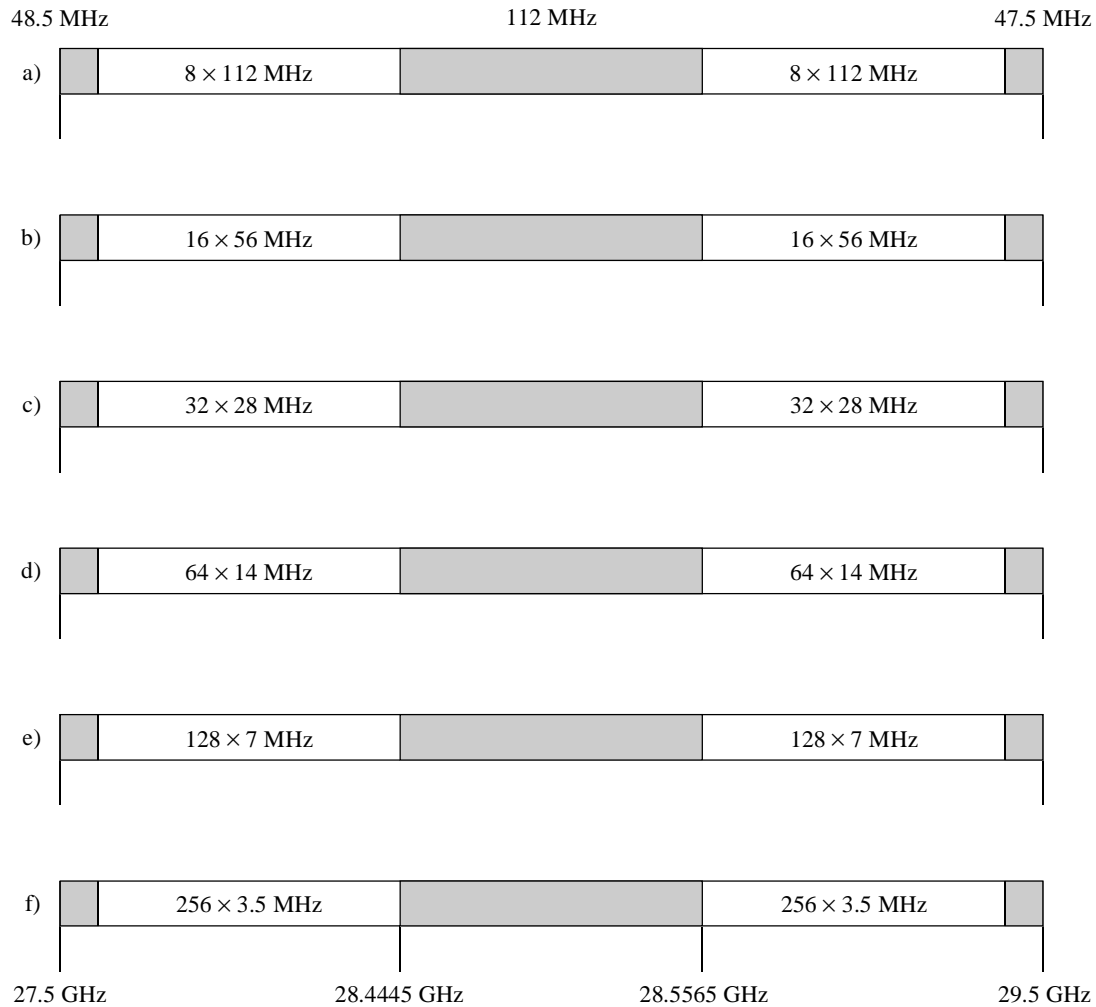lower half of band: $f_n = f_0 - 953.75 + 3.5\,n$ MHz

upper half of band: $f'_n = f_0 + 54.25 + 3.5\,n$ MHz

where:

$n = 1, 2, 3, \ldots 256.$

FIGURE 2

NOTE 1 – The radio-frequency channel arrangements of § a) to e) of this Annex use channel centre frequencies f_n and f'_n selected from the homogeneous pattern of *recommends* 2. The arrangement of § f) above uses frequencies spaced by 3.5 MHz but interleaved between the homogeneous pattern of *recommends* 2 with an offset of 1.75 MHz.

NOTE 2 – Figure 2 gives occupied spectrum in the 27.5-29.5 GHz band. The centre and edge guard bands may be reduced, by agreement between administrations, to allow the use of an increased number of lower capacity systems, by the addition of extra channels using frequencies derived from the homogeneous pattern of *recommends* 2.

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