RECOMMENDATION ITU-R F.637-2

RADIO-FREQUENCY CHANNEL ARRANGEMENTS FOR RADIO-RELAY SYSTEMS OPERATING IN THE 23 GHz BAND

(Question ITU-R 108/9)

(1986-1992-1994)

The ITU Radiocommunication Assembly,

considering

a) that the band 21.2-23.6 GHz is allocated to the fixed and other services;

b) Resolution No. 525 of the World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (Malaga-Torremolinos, 1992);

c) that both analogue and digital systems are in use in this band;

d) that the band is used for differing applications by various administrations and that these applications may require different radio-frequency channel arrangements;

e) that several types of service with various capacities may be in simultaneous use in this frequency band;

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

g) that the applications in this frequency band may require differing channel bandwidth;

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

recommends

1. that radio-frequency channel arrangements for the band 21.2-23.6 GHz should be based on a homogeneous pattern;

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

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

where:

$1 \le p \le 685$

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:

$$f_p = f_r + 4 + 2.5\,p$$

where:

$1 \le p \le 959$

f_r : reference frequency of the homogeneous pattern;

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

$$f_r = 21\,196 \quad \text{MHz}$$

other reference frequencies may be agreed by the administrations concerned;

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

Note 1 – Examples of channel arrangements based on this Recommendation are described in Annexes 1, 2, 3, 4 and 5.

Note 2 – 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 § 2, is used in conjunction with the main pattern.

ANNEX 1

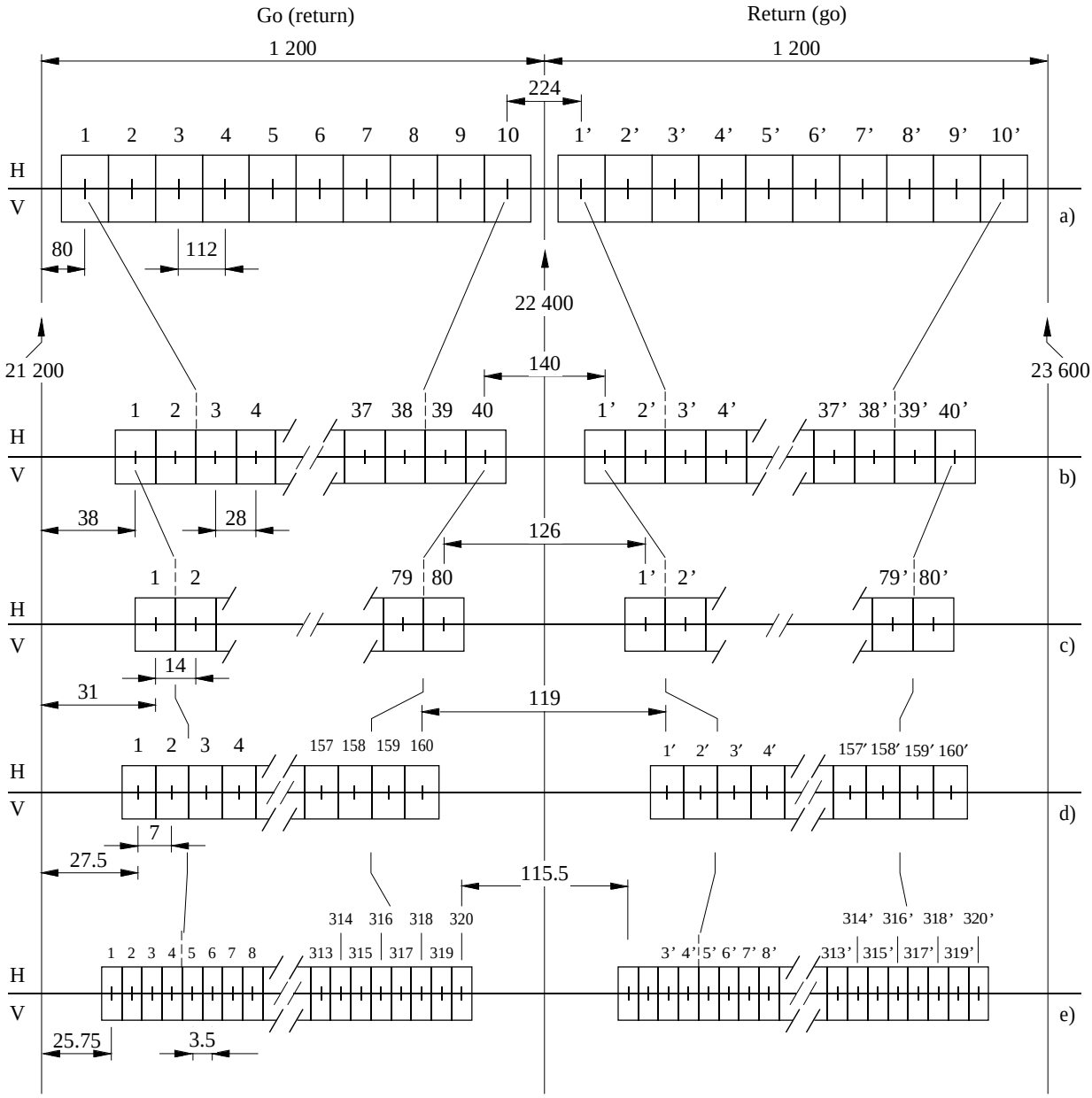
Radio-frequency channel arrangements in the band 21.2-23.6 GHz in accordance with § 2 (United Kingdom)

In the United Kingdom, the use of the band 21.2-23.6 GHz is based on a homogeneous 3.5 MHz frequency pattern. Various channel spacings are accommodated as shown in Fig. 1 and interleaved patterns are also used for the various spacings. In some applications, additional channels can be added in the edge and central guard bands using the homogeneous pattern.

FIGURE 1

Radio-frequency channel arrangements for digital and analogue radio-relay systems operating in the 21.2-23.6 GHz band (United Kingdom)

(All frequencies in MHz)



Note 1 – The radio-frequency channel arrangements of Fig. 1e) are derived by the use of carriers interleaved between those of the homogeneous pattern of § 2.

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ANNEX 2

Radio-frequency channel arrangements in the band 21.2-23.6 GHz in accordance with § 2 (France)

In France, the use of the band 21.2-23.6 GHz is based on the homogeneous 3.5 MHz frequency pattern as shown in Fig. 2.

The applications are as follows:

– 21.2-22 GHz band (Part A of Fig. 2)

  Television picture transmission

  In this sub-band, two frequency plans are used as shown in Part A of Fig. 2

– 22-22.5 GHz band (Part B of Fig. 2)

  Television picture transmission and telephony or television picture information transmission at 34 Mbit/s

– 22.5-23.065 GHz band (Part C of Fig. 2)

  Television picture transmission, telephony or television information transmission at 34 Mbit/s as well as narrow-band type applications such as:

  – data transmission below 144 kbit/s,
  – additional stereophonic sound channel,
  – additional 2 Mbit/s point-to-point system,
  – TDMA point-to-multipoint system.

For narrow-band systems, subdivision of each 28 MHz channel, on the basis of 7 MHz, is adopted.

– 23.065-23.5 GHz band (Part D of Fig. 2)

  FM and AM tele-distribution applications

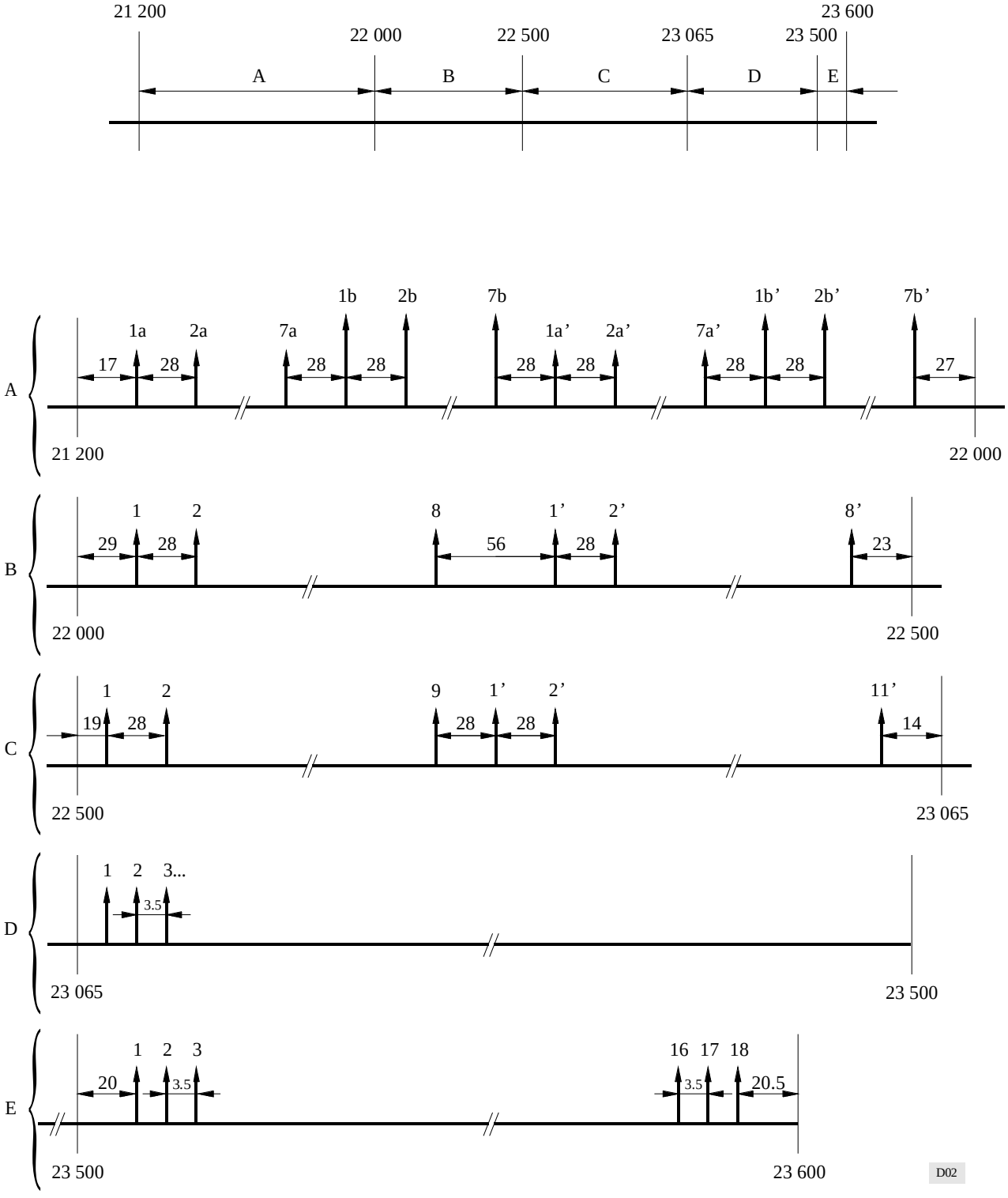
– 23.5-23.6 GHz band (Part E of Fig. 2)

  Application for non-telephony use.

FIGURE 2

Radio-frequency channel arrangements for digital and analogue radio-relay systems operating in the 21.2-23.6 GHz band (France)

(All frequencies in MHz)



ANNEX 3

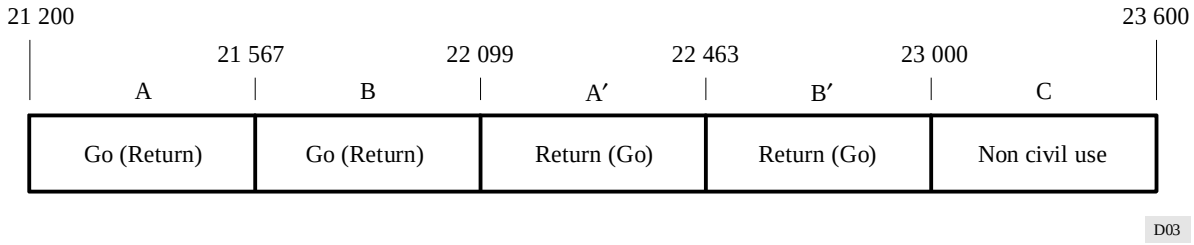
Radio-frequency channel arrangements in the band 21.2-23.6 GHz in accordance with § 2 (Italy)

In Italy the band 21.2-23.6 GHz is shared as shown in Fig. 3.

FIGURE 3

Radio-frequency channel arrangement for analogue and digital radio-relay systems operating in the 21.2-23.6 GHz band (Italy)

(All frequencies in MHz)



The radio-frequency channel arrangements are based on the homogeneous 3.5 MHz pattern as shown in Figs. 4a and 4b.

The applications are as follows:

a) 21 200-21 567 MHz and 22 099-22 463 MHz sub-bands (Fig. 4a):

- analogue TV transmission,
- reduced bandwidth analogue TV transmission.

These two sub-bands may be used for go/return transmission.

b) 21 567-22 099 MHz and 22 463-23 000 MHz sub-bands (Fig. 4b):

- 34 Mbit/s transmission,
- 8 Mbit/s transmission,
- 2 Mbit/s transmission.

These two sub-bands are used for go/return transmission.

c) 23 000-23 600 MHz sub-band:

- application for non civil use.

FIGURE 4a

A, A′, sub-bands: analogue TV systems/reduced bandwidth analogue TV systems
(All frequencies in MHz)

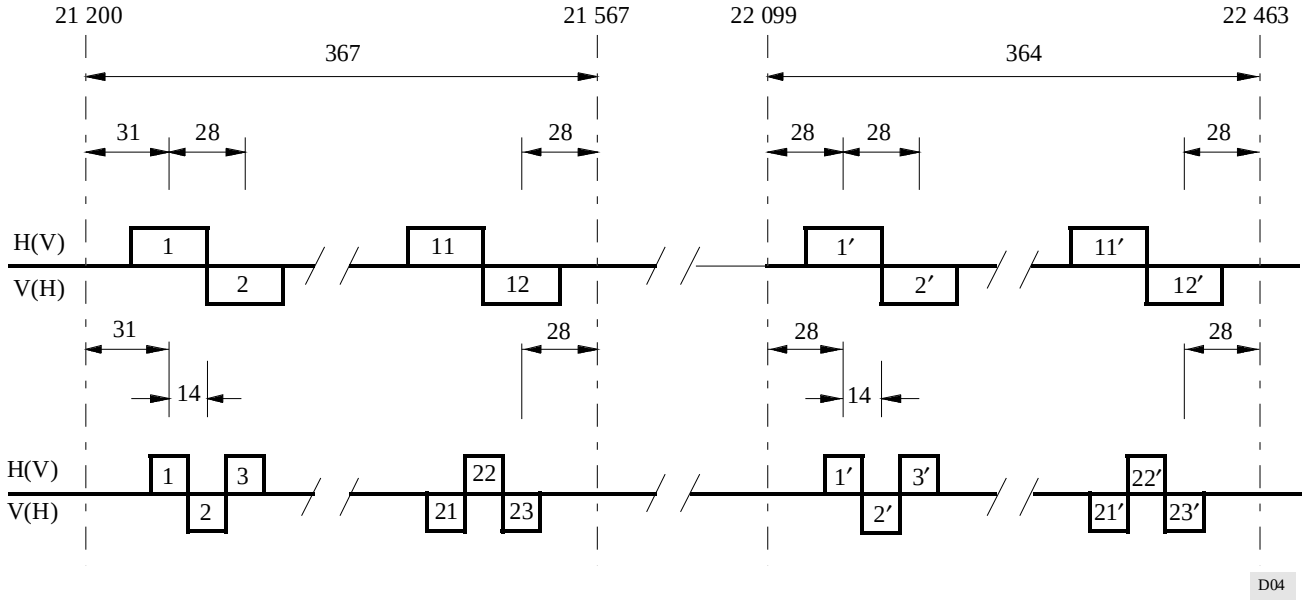
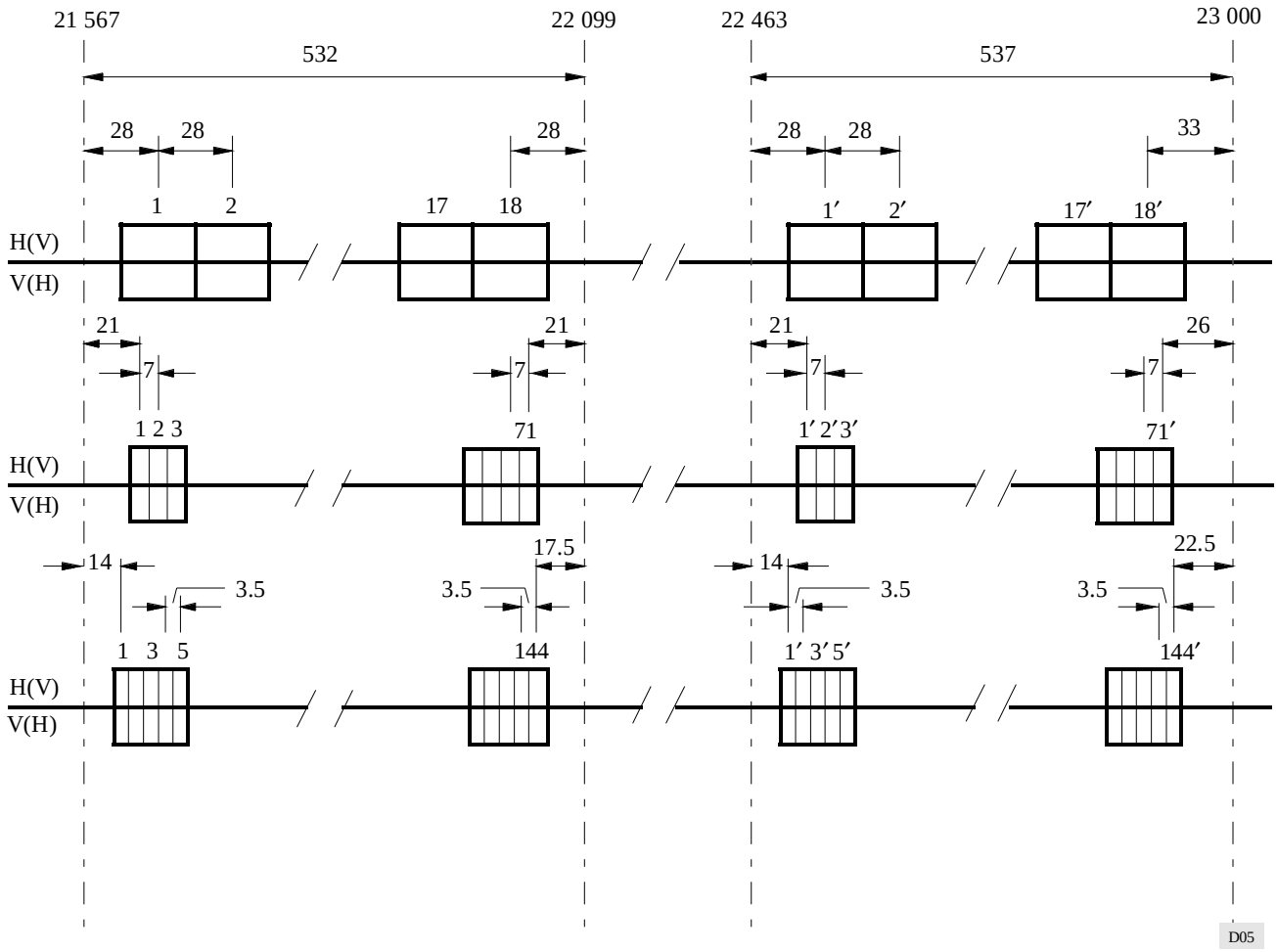


FIGURE 4b

B, B′, sub-bands; 34, 8 and 2 Mbit/s systems (co-polar channel spacings)
(All frequencies in MHz)



ANNEX 4

Description of the radio-frequency channel arrangements in the band 21.2-23.6 GHz in accordance with § 3 (North America)

In the United States of America and Canada, the most widespread use of the 21.2-23.6 GHz band is in the 21.8-22.4 GHz and 23.0-23.6 GHz portions for which a frequency pattern with 50 MHz channels has been adopted. The same pattern is being used in the remainder of the 21.2-23.6 GHz band as usage is spreading. Accordingly, a homogeneous pattern is in use, based on § 3 and given by:

$$f_n = f_r - 21 + 50\,n$$

where:

$n = 1, 2, 3, \ldots 48$

f_r (reference frequency) = 21 196 MHz.

For two-way operation, the go-return separation is about 1 200 MHz. Typical systems in use include digital transmission at data rates between about 1.5 and 8 Mbit/s, and a variety of analogue video systems.

ANNEX 5

Radio-frequency channel arrangements in the band 21.2-23.6 GHz in accordance with § 2 (Germany)

Taking into account the fact, that:

– WARC-92 has allocated the band 21.4-22.0 GHz to the broadcasting-satellite service (BSS) on a primary basis in Regions 1 and 3;

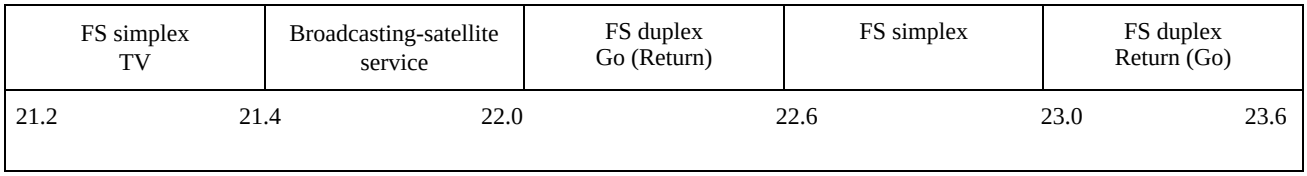
– many individual reception units for the BSS are expected to be used and interference from the fixed service should be minimized;

the operational use of radio-relay systems in the sub-band 21.40-22.00 GHz should be avoided.

The band plan based on WARC-92 decisions is shown in Fig. 5a.

FIGURE 5a

Band plan for the band 21.2-23.6 GHz based on WARC-92 decisions



An application of the band plan (Fig. 5a) for analogue and digital radio-relay systems (2 Mbit/s to 155 Mbit/s) is described in detail in Fig. 5b.

FIGURE 5b

Radio-frequency channel arrangements for digital and analogue radio-relay systems operating in the band 21.2-23.6 GHz based on WARC-92 decisions (Germany)

(All frequencies in MHz)