Recommendation T/R 13-02 E (Montreux 1993)

PREFERRED CHANNEL ARRANGEMENTS FOR
FIXED SERVICES IN THE RANGE 22.0 - 29.5 GHz

Recommendation proposed by the Working Group "Frequency Management" (FM)

Text of the Recommendation adopted by the "European Radiocommunications Committee" (ERC):

The European Conference of Postal and Telecommunications Administrations,

considering:

1) that following decisions taken at WARC-92, new fixed service channelling arrangements are required in the range 22.0 - 29.5 GHz;

2) that a wide range of fixed service applications requiring various channel bandwidths need to be accommodated;

3) that there are technical and economic advantages in adopting harmonised channel plans.

noting:

a) that in the context of this recommendation the guard band is defined as the frequency difference between the edge of the band and the channel edge;

b) that the separation band is defined as the band between the go and return halves, from edge of the bands used by other services;

c) that the centre gap is defined as the frequency difference between the upper and lower channel edges of the go and return halves of the band;

d) that TX/RX separation is defined as the frequency separation between the centre frequency of the transmitter and the centre frequency of the associated receiver.
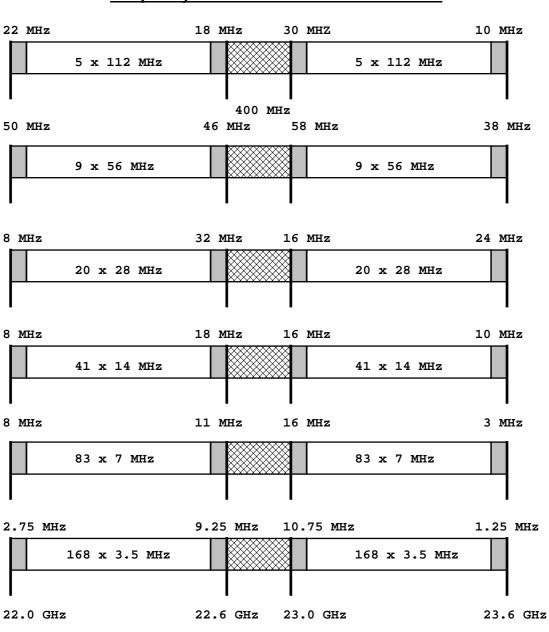

further noting:

that the bands 22.6 - 23.0 GHz and 24.25 - 24.5 GHz may be used for unidirectional links such as ENG/OB.

Edition of February 1, 1994

recommends:

1) that the fixed service in the band 22.0 - 22.6 GHz paired with 23.0 - 23.6 GHz should be operated in accordance with the channel plan given in <u>Annex A;</u>

2) that the fixed service in the band 24.5 - 26.5 GHz should be operated in accordance with the channel plan given in <u>Annex B</u>;

3) that the fixed service in the band 27.5 - 29.5 GHz should be operated in accordance with the channel plan given in <u>Annex C.</u>

ANNEX A

Frequency bands 22.0-22.6 / 23.0 - 23.6 GHz

```
22 MHz              18 MHz   30 MHz                    10 MHz
┌─┬──────────────┬─┬▨▨▨▨┬─┬──────────────┬─┐
│ │  5 x 112 MHz │ │▨▨▨▨│ │  5 x 112 MHz │ │
└─┴──────────────┴─┴▨▨▨▨┴─┴──────────────┴─┘
                       400 MHz
50 MHz              46 MHz   58 MHz                    38 MHz
┌─┬──────────────┬─┬▨▨▨▨┬─┬──────────────┬─┐
│ │  9 x 56 MHz  │ │▨▨▨▨│ │  9 x 56 MHz  │ │
└─┴──────────────┴─┴▨▨▨▨┴─┴──────────────┴─┘

8 MHz               32 MHz   16 MHz                    24 MHz
┌─┬──────────────┬─┬▨▨▨▨┬─┬──────────────┬─┐
│ │  20 x 28 MHz │ │▨▨▨▨│ │  20 x 28 MHz │ │
└─┴──────────────┴─┴▨▨▨▨┴─┴──────────────┴─┘

8 MHz               18 MHz   16 MHz                    10 MHz
┌─┬──────────────┬─┬▨▨▨▨┬─┬──────────────┬─┐
│ │  41 x 14 MHz │ │▨▨▨▨│ │  41 x 14 MHz │ │
└─┴──────────────┴─┴▨▨▨▨┴─┴──────────────┴─┘

8 MHz               11 MHz   16 MHz                    3 MHz
┌─┬──────────────┬─┬▨▨▨▨┬─┬──────────────┬─┐
│ │  83 x 7 MHz  │ │▨▨▨▨│ │  83 x 7 MHz  │ │
└─┴──────────────┴─┴▨▨▨▨┴─┴──────────────┴─┘

2.75 MHz            9.25 MHz 10.75 MHz                 1.25 MHz
┌─┬──────────────┬─┬▨▨▨▨┬─┬──────────────┬─┐
│ │ 168 x 3.5 MHz│ │▨▨▨▨│ │ 168 x 3.5 MHz│ │
└─┴──────────────┴─┴▨▨▨▨┴─┴──────────────┴─┘
22.0 GHz            22.6 GHz 23.0 GHz                  23.6 GHz
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Let

    fo   be the centre frequency of **21196** MHz
    fn   be the centre frequency of the radio-frequency channel in the lower half of the band
    fn' be the centre frequency of the radio-frequency channel in the upper half of the band
TX/RX separation = **1008** MHz
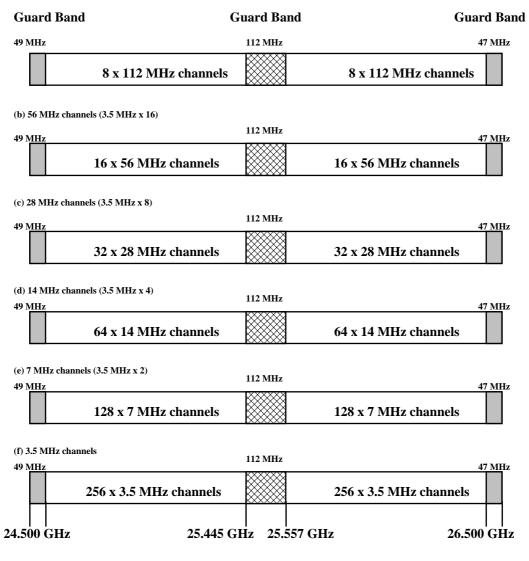Centre gap   = **400** MHz

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

a)   for systems with a carrier spacing of 112 MHz

   lower half of the band : $f_n = f_o + 770 + 112n$
   upper half of the band : $f_n' = f_o + 1778 + 112n$ where $n = 1, ... 5$

b)   for systems with a carrier spacing of 56 MHz

   lower half of the band : $f_n = f_o + 826 + 56n$
   upper half of the band : $f_n' = f_o + 1834 + 56n$ where $n = 1, ... 9$

c)   for systems with a carrier spacing of 28 MHz

   lower half of the band : $f_n = f_o + 798 + 28n$
   upper half of the band : $f_n' = f_o + 1806 + 28n$ where $n = 1, ... 20$

d)   for systems with a carrier spacing of 14 MHz

   lower half of the band : $f_n = f_o + 805 + 14n$
   upper half of the band : $f_n' = f_o + 1813 + 14n$ where $n = 1, ... 41$

e)   for systems with a carrier spacing of 7 MHz

   lower half of the band : $f_n = f_o + 808.5 + 7n$
   upper half of the band : $f_n' = f_o + 1816.5 + 7n$ where $n = 1, ... 83$

f)   for systems with a carrier spacing of 3.5 MHz

   lower half of the band : $f_n = f_o + 805 + 3.5n$
   upper half of the band : $f_n' = f_o + 1813 + 3.5n$ where $n = 1, ...168$

ANNEX B

Frequency band 24.5 - 26.5 GHz

(a) 112 MHz channels (3.5 MHz x 32)

| Guard Band | | Guard Band | | Guard Band |

| 49 MHz | | 112 MHz | | 47 MHz |

| | 8 x 112 MHz channels | | 8 x 112 MHz channels | |

(b) 56 MHz channels (3.5 MHz x 16)

		112 MHz		
49 MHz				47 MHz
	16 x 56 MHz channels		16 x 56 MHz channels	

(c) 28 MHz channels (3.5 MHz x 8)

		112 MHz		
49 MHz				47 MHz
	32 x 28 MHz channels		32 x 28 MHz channels	

(d) 14 MHz channels (3.5 MHz x 4)

		112 MHz		
49 MHz				47 MHz
	64 x 14 MHz channels		64 x 14 MHz channels	

(e) 7 MHz channels (3.5 MHz x 2)

		112 MHz		
49 MHz				47 MHz
	128 x 7 MHz channels		128 x 7 MHz channels	

(f) 3.5 MHz channels

		112 MHz		
49 MHz				47 MHz
	256 x 3.5 MHz channels		256 x 3.5 MHz channels	

| **24.500 GHz** | | **25.445 GHz** | **25.557 GHz** | | **26.500 GHz** |

Let

f_o be the centre frequency of **25501.0** MHz

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

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

TX/RX separation = **1008** MHz

Centre gap   = **112** MHz

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

a)   for systems with a carrier spacing of 112 MHz

      lower half of the band: $f_n = f_o - 1008 + 112n$
      upper half of the band: $f_n' = f_o - + 112n$ where n = 1, ... 8

b)   for systems with a carrier spacing of 56 MHz

      lower half of the band: $f_n = f_o - 980 + 56n$
      upper half of the band: $f_n' = f_o + 28 + 56n$ where n = 1, ... 16

c)   for systems with a carrier spacing of 28 MHz

      lower half of the band: $f_n = f_o - 966 + 28n$
      upper half of the band: $f_n' = f_o + 42 + 28n$ where n = 1, ... 32

d)   for systems with a carrier spacing of 14 MHz

      lower half of the band: $f_n = f_o - 959 + 14n$
      upper half of the band: $f_n' = f_o + 49 + 14n$ where n = 1 , ... 64

e)   for systems with a carrier spacing of 7 MHz

      lower half of the band: $f_n = f_o - 955.5 + 7n$
      upper half of the band: $f_n' = f_o + 52.5 + 7n$ where n = 1 , ... 128

f)   for systems with a carrier spacing of 3.5 MHz

      lower half of the band: $f_n = f_o - 953.75 + 3.5n$
      upper half of the band: $f_n' = f_o + 54.25 + 3.5n$ where n = 1 , ... 256

The arrangement f) above uses frequencies spaced by 3.5 MHz but interleaved between the homogenous pattern with an offset of 1.75 MHz.

ANNEX C

Frequency band 27.5 - 29.5 GHz

48.5 MHz	112 MHz	47.5 MHz

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┌─┬──────────────┬─────┬──────────────┬─┐
│ │  8 x 112 MHz │▨▨▨▨▨│  8 x 112 MHz │ │
└─┴──────────────┴─────┴──────────────┴─┘

┌─┬──────────────┬─────┬──────────────┬─┐
│ │  16 x 56 MHz │▨▨▨▨▨│  16 x 56 MHz │ │
└─┴──────────────┴─────┴──────────────┴─┘

┌─┬──────────────┬─────┬──────────────┬─┐
│ │  32 x 28 MHz │▨▨▨▨▨│  32 x 28 MHz │ │
└─┴──────────────┴─────┴──────────────┴─┘

┌─┬──────────────┬─────┬──────────────┬─┐
│ │  64 x 14 MHz │▨▨▨▨▨│  64 x 14 MHz │ │
└─┴──────────────┴─────┴──────────────┴─┘

┌─┬──────────────┬─────┬──────────────┬─┐
│ │  128 x 7 MHz │▨▨▨▨▨│  128 x 7 MHz │ │
└─┴──────────────┴─────┴──────────────┴─┘

┌─┬──────────────┬─────┬──────────────┬─┐
│ │ 256 x 3.5 MHz│▨▨▨▨▨│ 256 x 3.5 MHz│ │
└─┴──────────────┴─────┴──────────────┴─┘
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27.5 GHz	28.4445 GHz	28.5565 GHz	29.5 GHz

Let

fo   be the centre frequency of **28500.5** MHz

fn   be the centre frequency of the radio-frequency channel in the lower half of the band

fn' be the centre frequency of the radio-frequency channel in the upper half of the band

TX/RX separation =   **1008** MHz

Centre cap   =   **112** MHz

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

a) for systems with a carrier spacing of 112 MHz

   lower half of the band: $f_n = f_o - 1008 + 112n$
   upper half of the band: $f_n' = f_o + 112n$ where n = 1, ... 8

b) for systems with a carrier spacing of 56 MHz

   lower half of the band: $f_n = f_o - 980 + 56n$
   upper half of the band: $f_n' = f_o + 28 + 56n$ where n = 1 , ... 16

c) for systems with a carrier spacing of 28 MHz

   lower half of the band: $f_n = f_o - 966 + 28n$
   upper half of the band: $f_n' = f_o + 42 + 28n$ where n = 1 , ... 32

d) for systems with a carrier spacing of 14 MHz

   lower half of the band: $f_n = f_o - 959 + 14n$
   upper half of the band: $f_n' = f_o + 49 + 14n$ where n = 1 , ... 64

e) for systems with a carrier spacing of 7 MHz

   lower half of the band: $f_n = f_o - 955.5 + 7n$
   upper half of the band: $f_n' = f_o + 52.5 + 7n$ where n = 1 , ... 128

f) for systems with a carrier spacing of 3.5 MHz

   lower half of the band: $f_n = f_o - 953.75 + 3.5n$
   upper half of the band: $f_n' = f_o + 54.25 + 3.5n$ where n = 1 , ... 256

The arrangement f) above uses frequencies spaced by 3.5 MHz but interleaved between the homogenous pattern with an offset of 1.75 MHz.