

## CEPT/ERC/RECOMMENDATION 12-06 E (Rome 1996)

**HARMONISED RADIO FREQUENCY CHANNEL ARRANGEMENTS FOR DIGITAL TERRESTRIAL FIXED SYSTEMS OPERATING IN THE BAND 10.7 - 11.7 GHz**

*Text of the recommendation adopted by the Working Group "Spectrum Engineering" (WG SE):*

"The European Conference of Postal and Telecommunications Administrations,

*considering*

1. that CEPT has a long-term objective to harmonise the use of frequencies throughout Europe,
2. that CEPT should develop radio frequency channel arrangements in order to make the most effective use of the spectrum available,
3. that digital systems with a capacity of up to 4 x 140 Mbit/s or the equivalent synchronous digital hierarchy bit rates seem to be feasible,
4. that there exists within the ITU-R the Recommendation F.387 which gives channel arrangements for this band,
5. that the main channel plan in ITU-R Recommendation F.387-6 extends beyond the limits of this band,

*noting*

1. that ITU Radio Regulation 8 Footnote 833 states that all emissions in the band 10.68 - 10.7 GHz are prohibited except for those provided for by Radio Regulation 8 Footnote 834,

*recommends*

1. that for future allocations in the 10.7 - 11.7 GHz band, the preferred radio frequency channel arrangement for digital radio relay systems with a capacity of 140 Mbit/s, 155 Mbit/s or 622 Mbit/s, and operating in the 11 GHz band should be derived as follows:

let  $f_0$  be the frequency of the centre of the band of frequencies occupied (MHz); and  
 $f_n$  be the centre frequency of a radio frequency channel in the lower half of the band (MHz); and  
 $f'_n$  be the centre frequency of a radio frequency channel in the upper half of the band (MHz);

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

$$\begin{array}{ll} \text{Lower half of the band} & f_n = (f_0 - 505 + 40 n) \text{ MHz} \\ \text{Upper half of band} & f'_n = (f_0 + 25 + 40 n) \text{ MHz} \end{array}$$

where  $n = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, \text{ or } 11$   
and  $f_0 = 11\,200 \text{ MHz}$

as shown in Figure 1,

2. that if multi-carrier transmission (Note 1) is employed, a block of  $n$  channels will be used together. Although there will be one carrier operating in each of these channels, the carrier frequencies will not necessarily align, for technical reasons, with the centre frequencies of the channel. Operation of multi-carrier systems is addressed in greater detail in Annex A,

3. that if greater spectral efficiency is required, the preferred radio frequency channel arrangement providing 12 go and return channels is based on § 1 above with two additional channels. The frequencies (MHz) of the individual channels are expressed by the following relationships:

Lower half of the band  $f_n = (f_0 - 505 + 40 n)$  MHz

Upper half of the band  $f'_n = (f_0 - 15 + 40 n)$  MHz

where  $n = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11$  or  $12$

and  $f_0 = 11\,200$  MHz

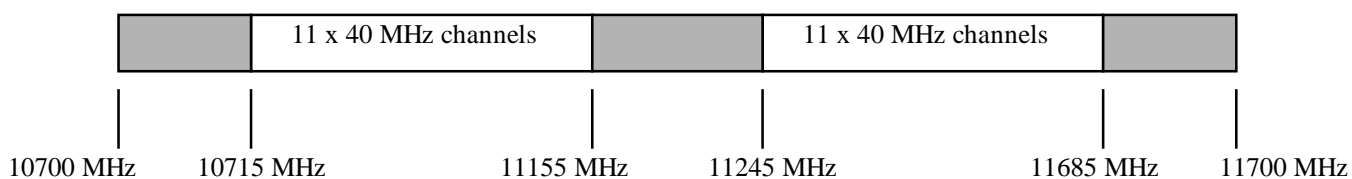
as shown in Figure 2.”

**NOTE 1:** A multi-carrier system is a system with  $n$  (where  $n > 1$ ) digitally modulated carrier signals simultaneously transmitted (or received) by the same radio frequency equipment. The centre frequency should be regarded as the arithmetic average of the  $n$  individual carrier frequencies of the multi-carrier system.

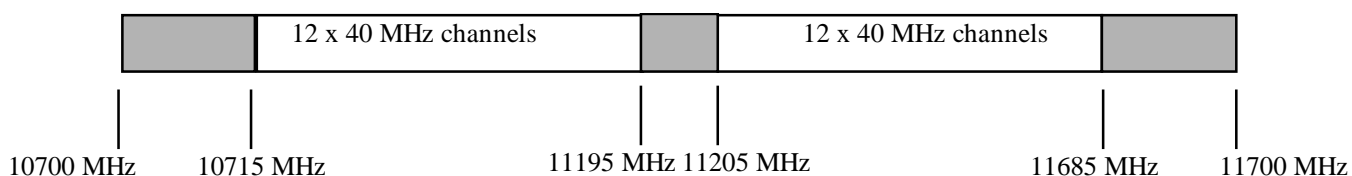
**TABLE 1:** Calculated parameters according to ITU-R Rec. F.746

XS / MHz	40	40
n	11	12
$f_1$ / MHz	10735	10735
$f_{11}$ / MHz	11135	11135
$f_{12}$ / MHz		11175
$f'_1$ / MHz	11265	11225
$f'_{11}$ / MHz	11665	11625
$f'_{12}$ / MHz		11665
$Z_1S$ / MHz	35	35
$Z_2S$ / MHz	35	35
YS / MHz	130	50
DS / MHz	530	490

**FIGURE 1**



**FIGURE 2**



**Annex A**

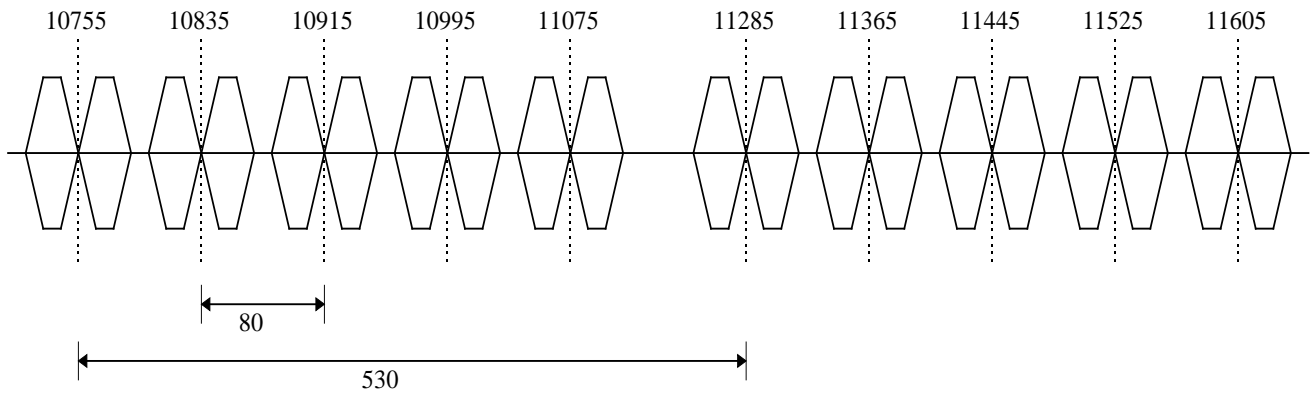
**DESCRIPTION OF A MULTI-CARRIER SYSTEM**

A multi-carrier system is a system with  $n$  (where  $n > 1$ ) digitally modulated carrier signals simultaneously transmitted (or received) by the same radio frequency equipment.

An example of a co-polar channel arrangement using a two-carrier system with 64 QAM is shown below.

The channel arrangement depicted in Figure 3 is based upon the use of a two-carrier system transmitting  $2 \times 2 \times 155$  Mbit/s (STM-1) or  $1 \times 622$  Mbit/s (STM-4) via two-carrier pairs using both polarisations in the co-channel arrangement.

**FIGURE 3**



An example of a radio frequency arrangement for a  $2 \times 2 \times 155$  Mbit/s (STM-1) or  $1 \times 622$  Mbit/s (STM-4) radio relay system operating with 80 MHz channel spacing in the 10.7 - 11.7 GHz band, as used in Switzerland.