



# ERC Recommendation

## 14-01

Radio-frequency channel arrangements for high capacity  
analogue and digital radio-relay systems operating in the  
band 5925 to 6425 MHz

**Approved Bonn 1995**

**Amended May 2015**

**ERC RECOMMENDATION 14-01 OF 19 SEPTEMBER 2014 ON RADIO-FREQUENCY CHANNEL ARRANGEMENTS FOR HIGH CAPACITY ANALOGUE AND DIGITAL RADIO-RELAY SYSTEMS OPERATING IN THE BAND 5925-6425 MHz AMENDED 8 MAY 2015**

“The European Conference of Postal and Telecommunications Administrations,

*considering*

- a) that it is sometimes desirable to be able to interconnect radio-relay systems on international circuits in the 6 GHz band at radio frequencies;
- b) that, in a frequency band 500 MHz wide, it may be desirable to interconnect up to eight go and eight return channels;
- c) that economy may be achieved if at least four go and four return channels can be interconnected between systems, each of which uses common transmit-receive antennas;
- d) that many interfering effects can be substantially reduced by a carefully planned arrangement of the radio frequencies in radio-relay systems employing several radio-frequency channels;
- e) that the use of certain types of modulation permits the use of the radio-frequency channel arrangements defined for 1800 telephone channel systems for the transmission of digital channels with a bit rate of the order of 140 Mbit/s or synchronous digital hierarchy bit rates;
- f) that for these digital radio systems, further economies are possible by accommodating up to eight go and eight return channels on a single antenna;
- g) that it may sometimes be desirable to interleave additional radio-frequency channels between those of the main pattern;
- h) that there may be a desire to interconnect more than eight go and eight return radio-frequency channels, each with a capacity significantly lower than 1800 telephone channels;
- i) that it is also highly desirable to be able to operate systems using a mix of analogue and digital radio channels on the same route;
- j) there are technical and economical advantages in adopting harmonised channel plans;
- k) that frequency reuse techniques, supported also by modern techniques such as Cross-polar Interference Cancellers (XPIC) may significantly improve the spectrum usage in dense networks;
- l) that, when very high capacity links are required, further economy may be achieved using wider channel bandwidth associated to high efficient modulation formats;
- m) that this recommendation is based on the Recommendation ITU-R F.383;
- n) that Recommendation ECC/REC/(14)06 contains arrangements for smaller channels spacing in the guard bands and center gap of the 5925-6425 MHz band;

*recommends*

1. that the preferred radio-frequency channel arrangement for up to eight go and return channels with each channel being either an analogue channel accommodating 1800 telephone channels, or the equivalent, or a digital channel with a capacity of the order of 140 Mbit/s, or synchronous digital hierarchy bit rates and operating at frequencies in the lower 6 GHz band <sup>1</sup>, should be as shown at Annex 1;
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;

---

<sup>1</sup> Actual bit rates including overhead may be as much as 5% or more higher than net transmission rates.

3. that the go and return channels on a given section should preferably use polarisations as shown below:

	Go	Return
H(V)	1 3 5 7	2' 4' 6' 8'
V(H)	2 4 6 8	1' 3' 5' 7'

The following alternative arrangement of polarisation may be used by agreement between the administrations concerned:

	Go	Return
H(V)	1 3 5 7	1' 3' 5' 7'
V(H)	2 4 6 8	2' 4' 6' 8'

4. that, when common transmit-receive antennas for double polarisation are used and not more than four channels are accommodated on a single antenna, it is preferred that the channel frequencies be selected by either making  $n = 1, 3, 5$  and  $7$  in both halves of the band or making  $n = 2, 4, 6$  and  $8$  in both halves of the band <sup>2</sup>;
5. that, when additional radio-frequency channels, interleaved between those of the main pattern, are required, the values of the centre frequencies of these radio-frequency channels should be  $14.825$  MHz below those of the corresponding main channel frequencies in systems for  $1800$  channels, or the equivalent, and digital high capacity digital systems, it may not be practical, because of the bandwidth of the modulated carrier, to use interleaved frequencies;
6. that up to  $16$  go and return radio-frequency channels, each with a capacity of up to  $600$  telephone channels, may be obtained on the same route if the additional radio-frequency channels are used simultaneously, with those of the main pattern. Different polarisations should be used alternately for adjacent radio-frequency channels in the same half of the band <sup>3</sup>;
7. that the preferred centre frequency is  $6175.0$  MHz; other centre frequencies may be used by agreement between the administrations concerned;
8. that administrations may consider merging any of two adjacent  $29.65$  MHz channels specified in Annex 1 to create one  $59.3$  MHz channel, with centre frequency lying in the central point of the distance between the merged channels. This decision may be subject to minimum bit rate obligations. To assist international co-ordination, administrations may refer to the channel identifiers described in Annex 2."

*Note:*

*Please check the Office documentation database <http://www.ecodocdb.dk> for the up to date position on the implementation of this and other ECC Recommendations.*

<sup>2</sup> When common transmit-receive antennas are used and not more than four channels are accommodated on a single antenna, channel frequencies may be selected, by agreement between administrations, by making  $n = 1, 3, 5$  and  $7$  in the lower half of the band, and  $n = 2, 4, 6$  and  $8$  in the upper half of the band. If a second similar antenna is used for four further channels, the channel frequencies may be selected by making  $n = 2, 4, 6$  and  $8$  in the lower half of the band and  $n = 1, 3, 5$  and  $7$  in the upper half of the band, but if only three further channels are required, the channel frequencies may be selected by making  $n = 2, 4,$  and  $6$  in the lower half of the band and  $n = 3, 5$  and  $7$  in the upper half of the band to avoid the difficulty of separating frequencies  $8$  and  $1$ .

<sup>3</sup> The use of a single antenna working allows for seven go and seven return channels based on the preferred arrangement of polarisation and eight go and eight return channels based on the alternative arrangement of polarisation.

**ANNEX 1: DERIVATION OF RADIO FREQUENCY CHANNELS**

The radio frequency channel arrangement for carrier spacings of 29.65 MHz shall be derived as follows:

Let

$f_0$  be the frequency (MHz) of the centre of the band of frequencies occupied;

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

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

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

lower half of the band:  $f_n = f_0 - 259.45 + 29.65 n$

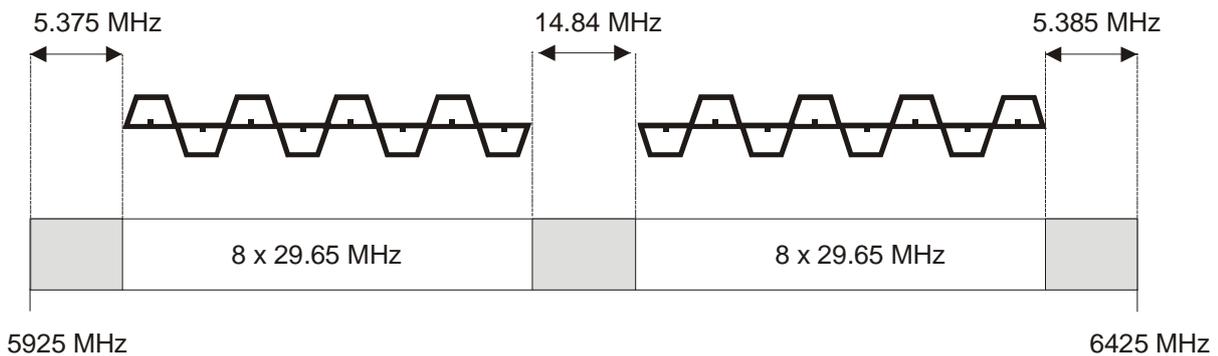
upper half of the band :  $f'_n = f_0 - 7.41 + 29.65 n$  where  $n = 1, 2, 3, 4, 5, 6, 7$  or  $8$ .

**Table 1: Calculated parameters according to Recommendation ITU-R F.746**

XS MHz	n	f1 MHz	f8 MHz	f'1 MHz	f'8 MHz	Z1S MHz	Z2S MHz	YS MHz	DS MHz
29.65	1...8	5945.2	6152.75	6197.24	6404.79	20.2	20.21	44.49	252.04

Z1S: lower guard band

Z2S: upper guard band



**Figure 1: Occupied spectrum 5925-6425 MHz**

## ANNEX 2: CHANNEL IDENTIFIERS FOR DERIVATIVE 59.3 MHz CHANNELS

The derivative 59.3 MHz channels (ref. Recommends 8) can be identified by using the following numbering:

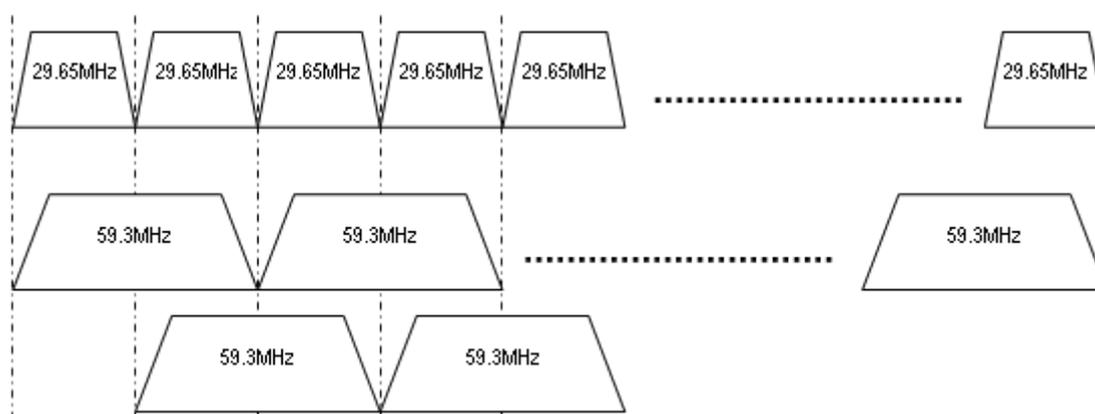
$$f_n = (f_0 - 244.625 + 29.65n) \text{ MHz}$$

$$f_n' = (f_0 + 7.415 + 29.65n) \text{ MHz}$$

$$n = 1, 2, \dots, 7$$

$$f_0 = 6175.0 \text{ MHz}$$

Note: The numbering is just for identification of the channelling. It should be noted, that adjacent channel numbers cannot be used on the same physical link due to channel overlap. See diagram below for channel arrangement example.



**Figure 2: Channel arrangement example**