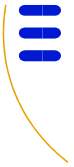
European Radiocommunications Committee (ERC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)



COMPATIBILITY BETWEEN DECT AND RADIO RELAY SYSTEMS IN THE 2 GHz BAND

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1. INTRODUCTION

The CEPT Recommendation T/R 22-02 E and the EC Council Directive 91/287 designate the frequency band 1880-1900 MHz for the DECT. In the same frequency band there are two radio relay channel arrangements in operation in accordance with the CCIR Recommendation 298-4 in a number of countries in Europe. Also other radio relay channel arrangements are widely used in Europe in this band.

As the DECT is a mobile and licence-exempted system it is not possible to control even the location of so-called fixed part. Therefore DECT equipment will occur everywhere, co-ordination of sharing on a geographical basis is not feasible. This also means that the possibility of DECT equipment being in the mainlobe of a radio relay is not feasible. This also means that the possibility of DECT equipment being in the mainlobe of a radio relay antenna cannot be excluded in compatibility studies.

The aim of this Report is to show to what extent these two different radio systems, DECT and radio relays can operate in the same and adjacent frequency bands in a given situation and to give then for the Administrations a reference to a general methodology to study the compatibility.

Between the DECT and the current 2 GHz radio relay systems operating in accordance with the CCIR Recommendation 298-4 detailed compatibility analysis has been made to indicate the number of radio relay channels which have to be cleared to allow interference-free operation of the DECT and to avoid harmful interference from the DECT to the radio relay in the same and adjacent bands.

Figure 1 shows the location of the DECT and the radio relay channels (16 Mbit/s) in relation to each other in the 2 GHz band.

2. TECHNICAL CHARACTERISTICS OF THE DECT AND RADIO RELAY SYSTEMS (IN ACCORDANCE TO THE CCIR RECOMMENDATION 283-4) AND THE PROPAGATIONS CONDITIONS USED IN THE CALCULATIONS

2.1 Characteristics of the DECT

The transmission characteristics are in accordance with the relevant draft standard prepared by ETSI (pr ETS 300 175-1 August 1991). The radiated peak poster is 27 dBm e.i.r.p. Optional values such as 20 dB additional antenna gain are not used in this study. It is assumed that the total emitted power is within 1 MHz band i.e. Pdect = 27 dBm/1' MHz.

In the receiver the maximum allowed interference power I = – 104 dBm (=– 83 dBm – 21 dB (= protection ratio)). Receiver antenna gain is assumed to be 0 dBi.

In the DECT system all 10 channels are in use. This means that it is not possible to close down a channel or channels to protect a radio link receiver.

2.2 Characteristics of the radio relay systems in the 2 GHz band

The radio relay systems under study use two 16 Mbit/s radio link channel arrangements in accordance with the CCIR Recommendation 283-4.

The transmitter power is typically 24 dBm and the antenna gain within the main beam (± 3 degrees from the mainlobe centre) is 31 dBi (D = 2.4 m). A conventional radio relay antenna pattern is assumed. The spectral power density of a transmitter and the selectivity of the radio link receiver (both the RF and the IF filters) used in the calculations are in accordance with the characteristics of existing equipment.

The maximum permissible interference power to the receiver is calculated using the assumption that 1 dB degradation is acceptable in the total fading margin of a radio link.

2.3 **Propagation characteristics**

Radio relay systems in the 2 GHz band are also used in urban areas and are typically mounted on a roof of a high building. Consequently the free-space propagation model is applied up to a distance of 5 km. Beyond 5 km a factor of 40 log d is applied instead of 20 log d.

3. INTERFERENCE FROM A RADIO LINK TRANSMITTER TO A DECT RECEIVER

The results from the calculations are shown in Figure 2. The necessary frequency separations are indicated by the vertical axis. The necessary frequency separation in the worst case situation when a DECT receiver is located in the main beam of a radio link transmitter at a distance of 100 m is 28 MHz.

4. INTERFERENCE FROM A DECT TRANSMITTER TO A RADIO RELAY RECEIVER

It is assumed that only one DECT carrier is within the 8 MHz pass-band of a radio relay receiver.

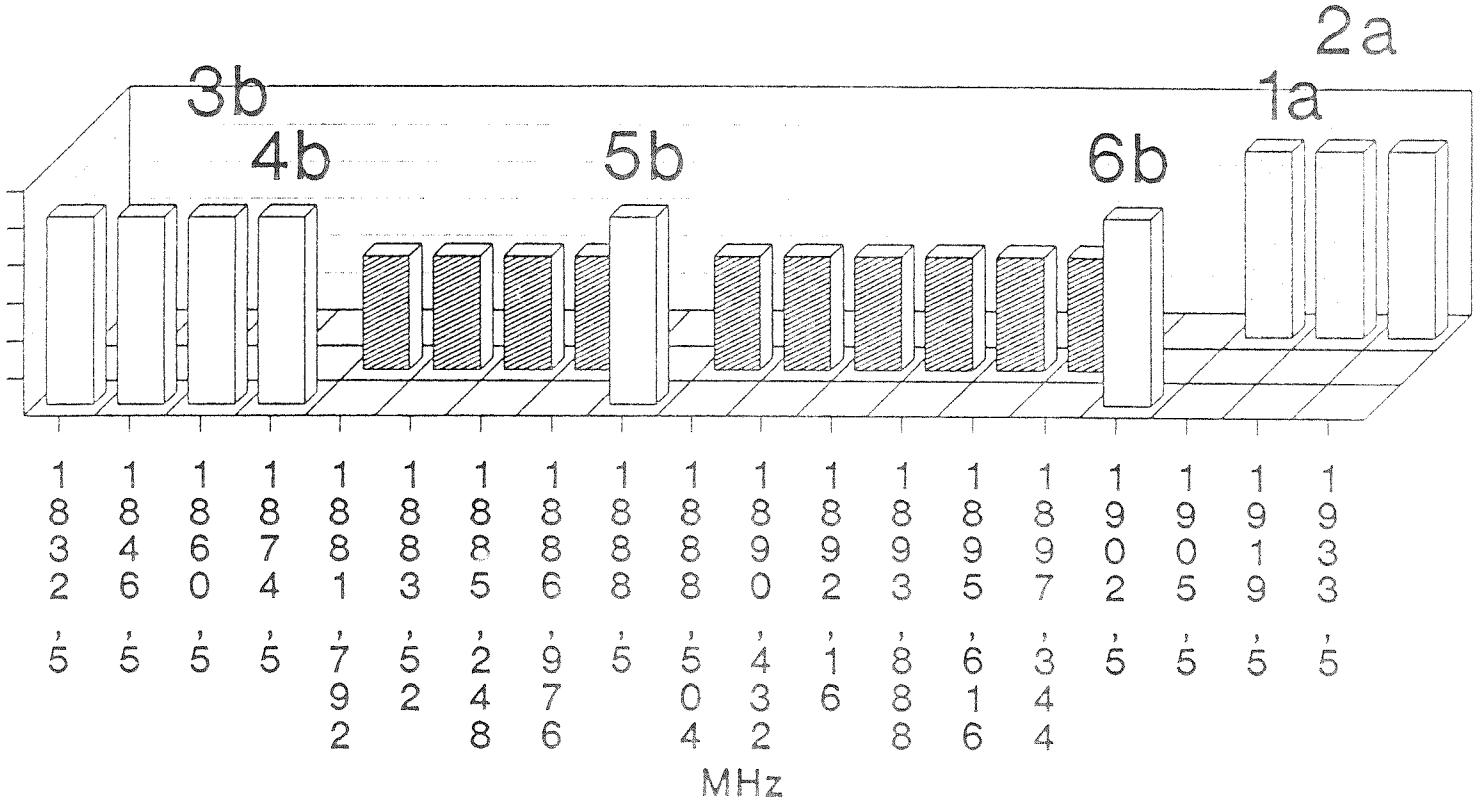
The calculations are similar to the previous case except that the effect of selectivity of a radio link receiver is included. The calculations result in the necessary frequency separations to protect the radio link receivers on channel 4b, see Figure 3.

For more detailed compatibility analysis, see results in reference documents.

5. CONCLUSION

Sharing within the designated DECT band is not feasible and a guard band is required outside the 20 MHz DECT band. This general conclusion is not dependent on the applied propagation model or the channelling plan of a radio relay system.

Depending on the characteristics of the radio relay system and the location of the radio relay antennas a frequency separation of up to 30 MHz between the carrier frequency of a radio relay link and the DECT band may be necessary. Administrations should therefore decide on a case-by-case basis which radio relay channels are to be taken out of operation in the adjacent bands to the DECT.



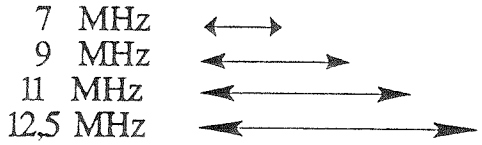
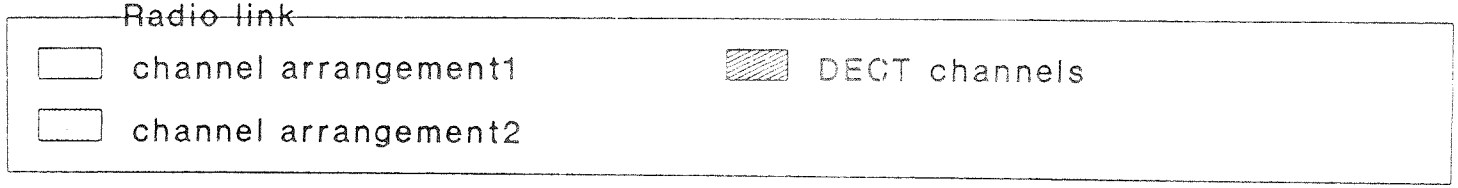
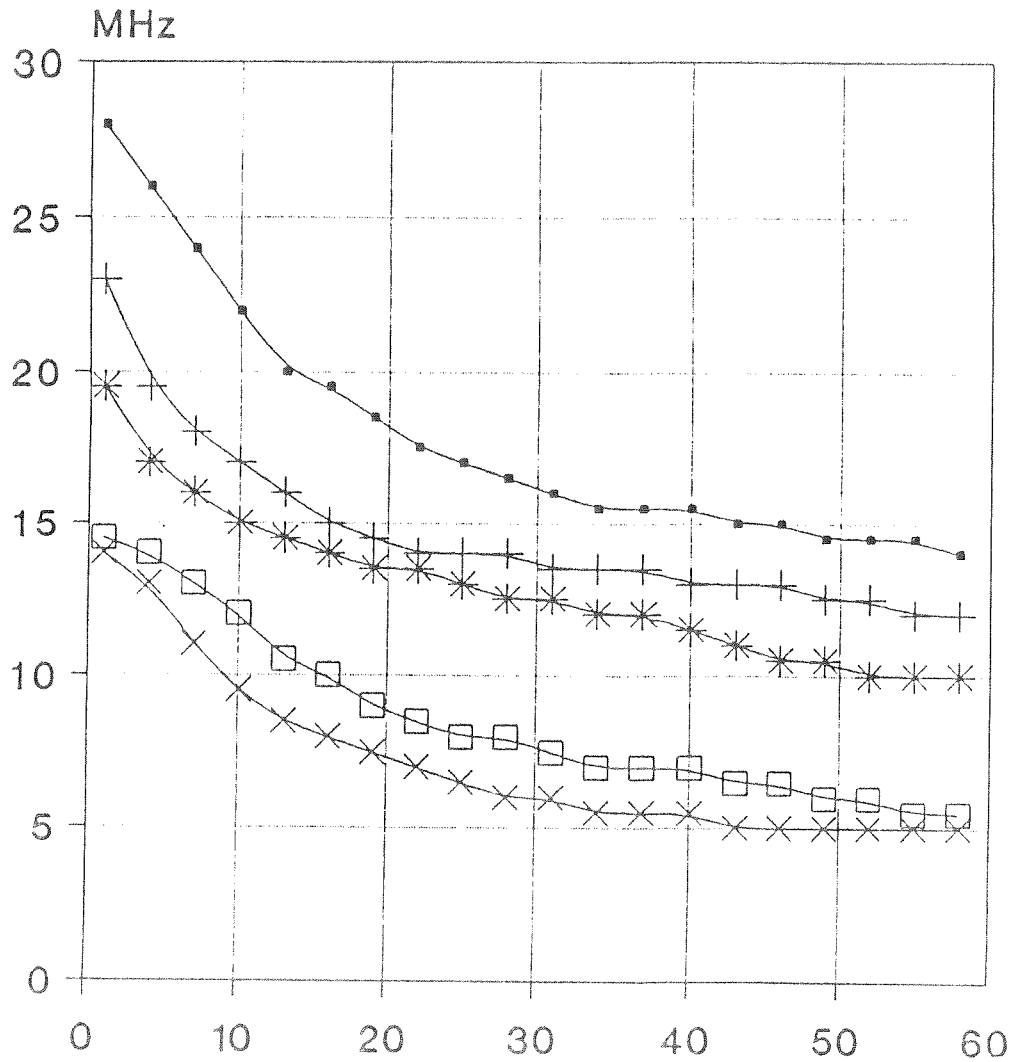


Figure 1. Location of radio link and DECT channels on a frequency scale.





Location of a DECT receiver in relation to the main lobe of a radio link transmitter: angular separations given in degrees

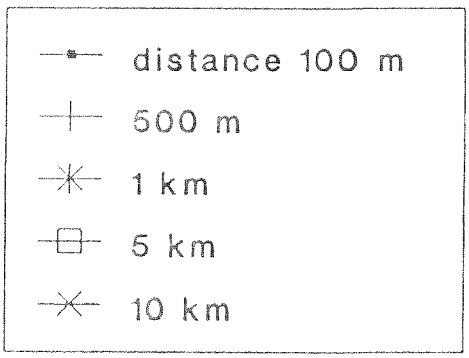
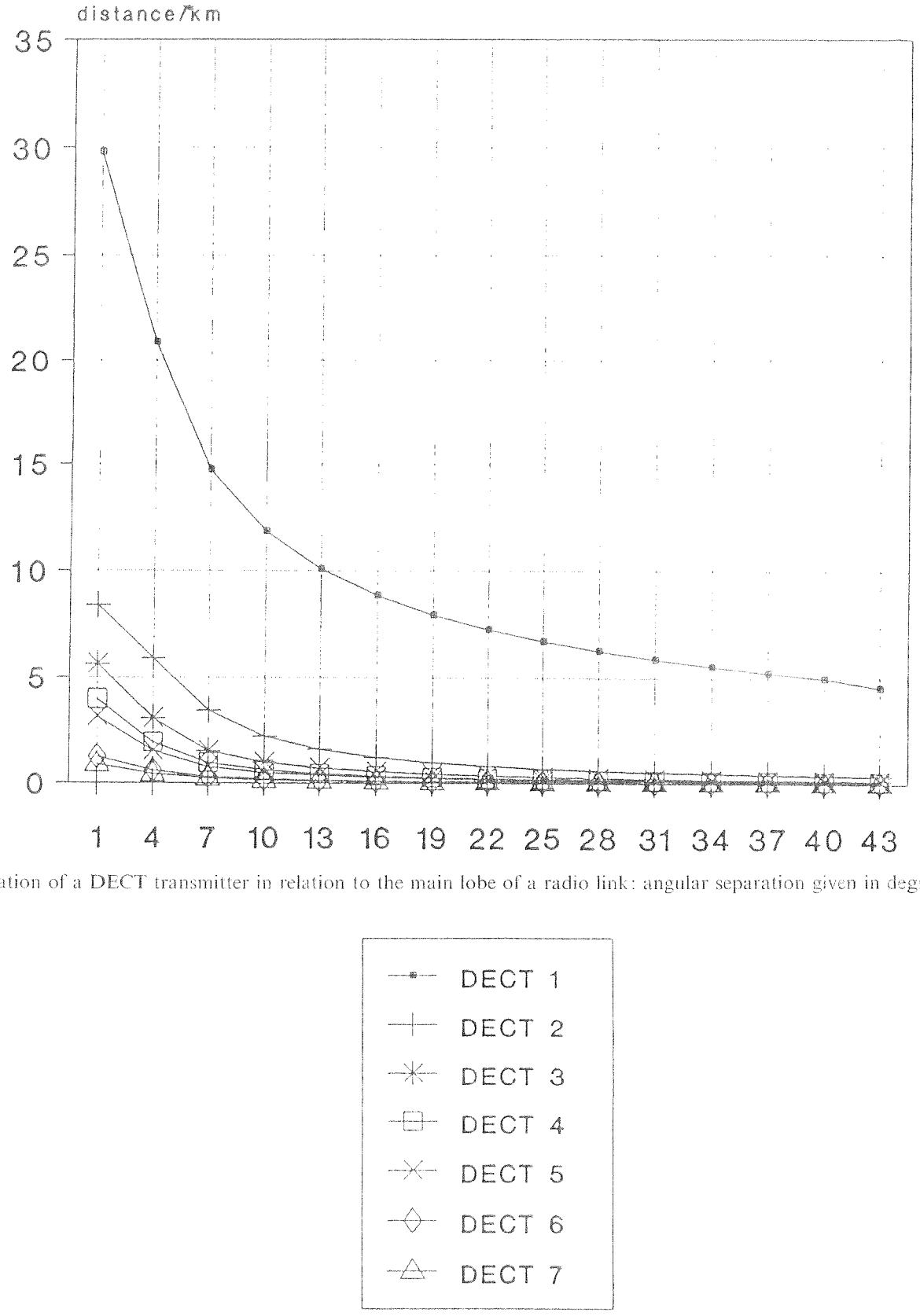


Figure 2. Interference from a radio link transmitter to a DECT receiver:
Necessary frequency separation (MHz) between DECT and radio link channels at certain geographical distances.



Location of a DECT transmitter in relation to the main lobe of a radio link: angular separation given in degrees

Figure 3. Interference from a DECT transmitter to a radio link receiver:
Necessary geographical distance from the lowest DECT channels to the radio link channel 4b.