Electronic Communications Committee (ECC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)

ADJACENT BAND COMPATIBILITY BETWEEN TETRA TAPS MOBILE SERVICES AT 870 MHz

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ADJACENT BAND COMPATIBILITY BETWEEN SRD AND TETRA TAPS MOBILE SERVICES AT 870 MHz

1 INTRODUCTION

This report is concerned with adjacent band compatibility issues relating to the use of TETRA above 870 MHz.

The primary focus is on the use of so-called "TETRA 2" High Speed Data in the band, and in particular the TETRA Advanced Packet Service (TAPS) that has recently been standardised by ETSI. The compatibility between TETRA (V+D) and Short Range Devices (SRD) was studied at the time of the DSI Phase II and found not to be a problem.

The report covers the issue of adjacent band compatibility of TAPS to SRD at 870 MHz that has been the subject of recent study within SE7. The TAPS up-link band 870 – 876 MHz band is adjacent to the SRD band below 870 MHz. This is shown in Figure 1.

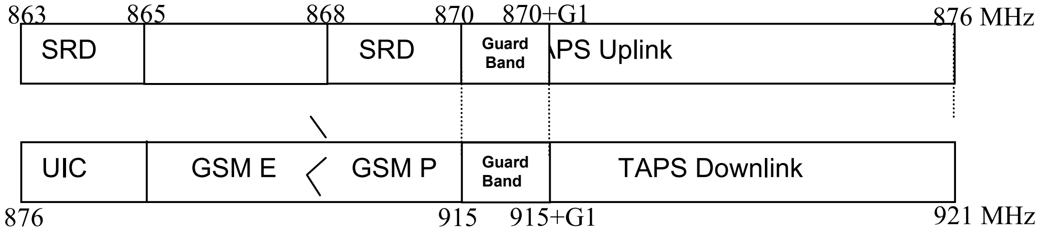

Figure 1: SRD and TAPS systems around 870 MHz

2 METHODOLOGY

The methodology used for the TAPS to SRD interference study is to establish the amount of wide band noise that may enter the SRD band below 870 MHz. This methodology is used because of the many different types of equipment and applications SRD represents which would make it an endless task to study. Also the absence of receiver protection parameters of SRD and the statistical nature of the location and time of usage of both SRD and TAPS mobile stations make it impossible to calculate any meaningful interference scenario.

The result of the wide band noise of TAPS MS entering the SRD band is depicted together with that of TETRA MS using the same bandwidth. This provides the basis of comparison which taking the conclusions of ERC Report 98 will determine the necessary guard band. (Extract of ERC Report 98 included in Annex 1).

3 INTERFERENCE SCENARIO

The following will determine the amount of wide band noise that may spill over from a TAPS mobile station transmitter into the SRD band. This will be compared to the already studied TETRA (V+D) for reference, see ERC Report 98.

Blocking has not been taken into account in the assessment of interference. This is because blocking occurs as a result of the power being present and is not related to the type of system producing the power. Blocking by TAPS, because of the power control, is expected to be less of a problem than blocking by TETRA, which has already been considered. Also because SRDs operate on a non protected basis it is reasonable to expect the manufacturer of the SRD to be aware of the TETRA allocation adjacent and to take this into account in their design.

4 TETRA & TAPS SPECTRUM MASKS

In the figure 2 below the spectrum masks of TETRA and TAPS are depicted in dBm in a TETRA bandwidth. The blue line depicts TAPS mask as specified in GSM 05.05. The pink line depicts the normalised mask, which takes account of the reduction in the TAPS power spectral density relative to TETRA (200 kHz vs. 18 kHz). The masks of TETRA are depicted for 1, 3, 10 and 30 Watt directly calculated from the specified dBc values. The mask of TAPS is slightly more complex because of the way TAPS (GSM) is specified and measured.

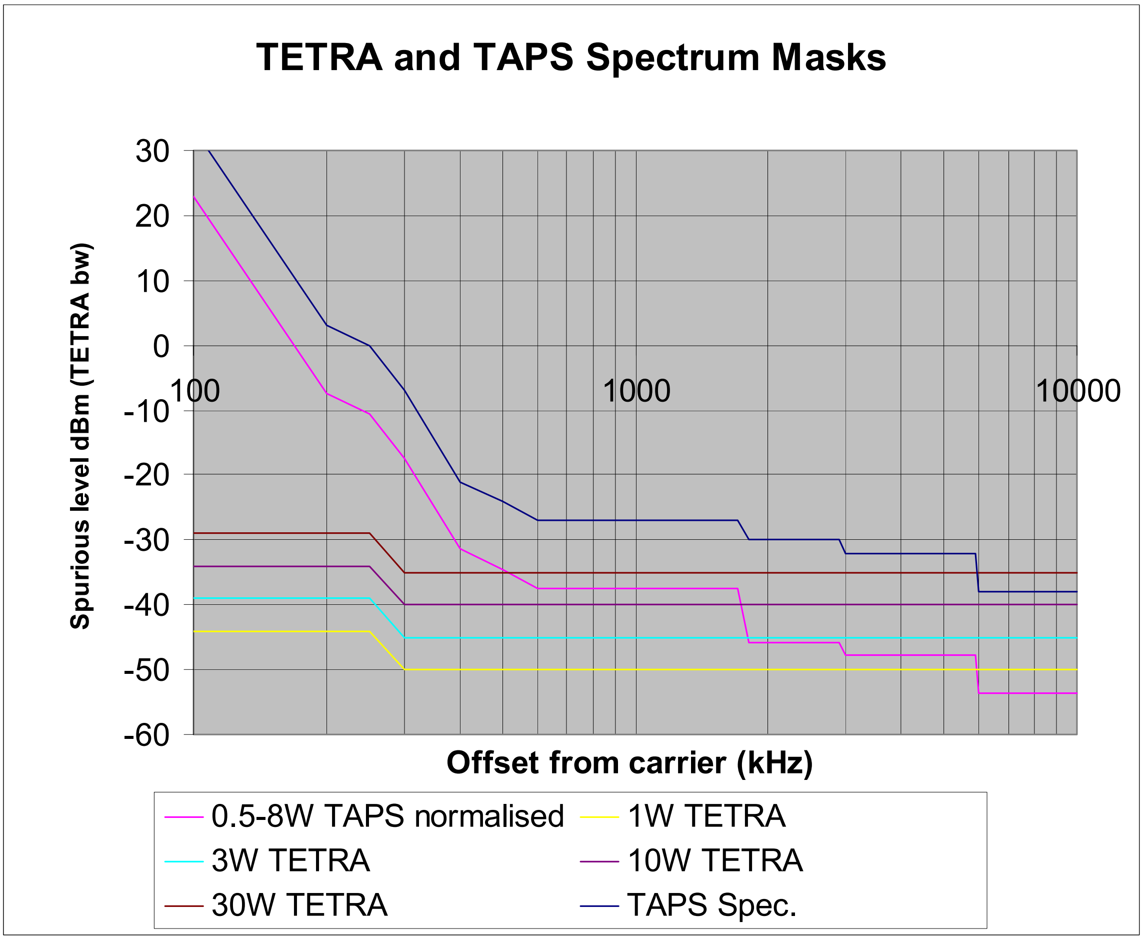

Figure. 2. Depiction of Wide Band Noise

The specified values for TAPS are measured in a 30 kHz bandwidth to distance from the carrier of 1.8 MHz. Above 1.8 MHz distance the measuring bandwidth is changed to 100 kHz without changing the reference measurement. The reference measurement is made in a 30 kHz bandwidth within the carrier itself. The result of this is that from the carrier to a distance of 1.8 MHz the actual measured value corresponds to a 200 kHz bandwidth. The bandwidth for measurements above 1.8 MHz distance from the carrier effectively corresponds to 666 kHz. This has been incorporated in the calculations in the following way. All the points for TAPS are corrected for the reference 200 kHz bandwidth to the 18 kHz bandwidth of TETRA by a 10.5 dB offset. Above 1.8 MHz an additional correction is made for the change in measuring bandwidth from 30 kHz to 100 kHz by another 5.2 dB offset.

5 INTERPRETATION

The spurious emissions limit that SRD receivers will be expected to operate with (-36 dBm in 120 kHz) corresponds to a level of –42 dBm in the figure below. Similarly, a spurious emissions level of –70 dBc applied to the TAPS transmitter corresponds to a level of –43 dBm.

In the figure 2 the TAPS spectral mask falls to these levels at 1.8 MHz separation. Beyond 1.8 MHz separation therefore, no effect on SRDs is expected.

At separations between 600 kHz and 1.8 MHz the TAPS wideband spectrum mask is higher than the spurious emissions limits. In this region the TAPS wideband noise limit is above that of a 3W TETRA MS closely spaced in frequency but below that of a 10W TETRA MS. When adding the statistical nature of a TAPS mobile stations position and transmit pattern it can be concluded that any interference risk to the SRDs below 870 MHz with separations of 600 kHz to 1.8 MHz is low.

At separations lower than 600 kHz, the TAPS noise mask rises rapidly and becomes large compared to the spurious emissions limits. In this region the probability of interference to SRDs below 870 MHz increases to an unacceptable level.

6 CONCLUSION

From the report it is clear that provided the guard band for TAPS transmissions above 870 MHz is 600 kHz or greater there is no significant risk of interference to SRDs below 870 MHz.

Coincidently, the required guard band for the SRDs is the same as the minimum guard band required to protect the GSM base station receivers at 915 MHz from blocking by TETRA or TAPS (see ECC Report No 5). This guard band is initially expected to be at around 1 MHz.