

Technical constraints associated with the 917-921MHz band

Publication date: [] February 2005

Contents

Section		Page
1	Introduction	3
2	Background	4
3	Technical Analysis	5
4	Conclusions	6
Annex A	Specification for the Base Transmit band 917-921 MHz	7

Section 1

Introduction

- 1.1 Ofcom has announced in the Spectrum Framework Review: Implementation Plan (“SFR:IP”) (published on 13 January 2005) proposals to make available for award the band 872-876MHz paired with 917-921MHz. This band was previously licensed to a company in the Inquam group for the provision of a Public Access Mobile Radio (PAMR) network but when the licence was revoked in July 2004 the network had not been rolled out.
- 1.2 This note provides a summary of recent work undertaken by Ofcom in relation to the potential technical characteristics of this band, and in particular the constraints that may be appropriate to avoid interference to existing GSM network(s) in adjacent bands.
- 1.3 This note is provided to assist potential respondents to the SFR:IP consultation. Ofcom considers that the technical analysis included in this note is relevant to the consultation, as any significant constraint on the technical use of the bands may impact on the potential use of the spectrum.
- 1.4 The note identifies, in Annex A, a proposed specification for use of 917-921 MHz. This proposal takes into account the desirability of avoiding interference to adjacent GSM networks.
- 1.5 This document has been prepared because Ofcom is required to consider the constraints that it would be appropriate to impose on use of the 917-921 MHz band if the band is to be released for use. Ofcom has a duty to secure optimal use of the electro-magnetic spectrum, and in considering the constraints that should be set for the 917-921 MHz band, Ofcom considers that it is appropriate to take into account any adverse effects that use of this band may have on the users of adjacent bands. This document does not, however, imply that the users of those adjacent bands enjoy a guarantee of freedom from any particular level of interference.

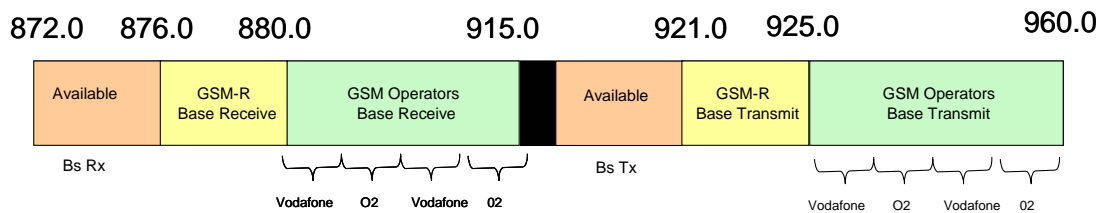
Section 2

Background

Frequency plan for 900 MHz band

- 2.1 The 900 MHz band is primarily assigned to the mobile cellular GSM operators Vodafone and O₂, using the 880-915 MHz and 925-960 MHz band. This band is used extensively throughout Europe and elsewhere for GSM. The 900 MHz band is also assigned to the GSM-R system used for the railway signalling and communications system licensed in the UK to Network Rail Ltd. The spectrum that is presently available for assignment is the block shown as **Available** in Figure 1 below. This is the spectrum that Ofcom identified for potential release in the SFR:IP.

Figure 1: Band Plan for the 872 - 960 MHz Band



The adjacent band issue

- 2.2 The user adjacencies are shown in Figure 1. Whilst there are adjacencies between GSM-R and Vodafone, and between GSM-R and the available spectrum, these are relatively benign adjacencies. This is because the respective operators would all be using their respective assignments in similar modes, i.e. they share common base transmit and base receive arrangements.
- 2.3 It is the adjacency between O₂ (910.1-914.9 MHz) and the available spectrum that is the prime adjacency for the purposes of interference analysis, with a base transmit band next to a base receive band.
- 2.4 Ofcom has analysed the scope for interference. Its starting point has been the series of adjacent band compatibility studies issued by CEPT associated with the use of 872 – 876/917 – 921 MHz band. These are in particular Report 5, Report 38 and Report 41 dealing respectively with compatibility between GSM and TETRA (TAPS), GSM and GSM-R and CDMA-PAMR. These studies are based on a set of GSM specifications and system parameter assumptions. These Reports have been reviewed by Ofcom and in the next section and in Annex A it sets out the results of its analysis.

Section 3

Technical Analysis

Emission Mask

- 3.1 Ofcom has assessed the potential for interference between use of the spectrum available at 917-921 MHz and the adjacent O₂ assignment and GSM-R. In this analysis, Ofcom assumes that whilst the award is expected to be on a technology neutral basis, the spectrum mask for the 917-921 MHz band shall be based on technologies compliant with the GSM standard. The 917-921MHz band was originally planned to be used for TETRA 2 TAPS, which is a GSM variant, and the adjacent networks are also using GSM technology.

Interference level

- 3.2 Ofcom has considered the characteristics of adjacent band services, GSM 900 and GSM-R. It has used the most recent studies on this subject, ECC Reports 05, 38 and 41, as a way of defining what might constitute interference to these systems from unwanted emissions, spurious emissions and intermodulation. This is, again, for illustrative purposes only, and does not imply that the users of these adjacent bands are guaranteed protection at levels that would be consistent with these ECC Reports. The ECC Reports are available from the ERO website at [http:// www.ero.dk](http://www.ero.dk)
- 3.3 In line with these Reports, interference levels at the GSM base station receive band (890-915MHz) have been assumed not to exceed -125 dBm. It has also been assumed for the purpose of the analysis that the GSM receiver antenna has a gain of 15 dB and the path loss has been calculated based on free space. The conclusion is that excessive interference could be avoided with an emission mask as specified in Annex A.

Transmit Power Constraint

- 3.4 On the basis of this analysis, to reduce blocking in O₂ base receiver stations, the transmitted power in the band 917-921MHz would need to be restricted to a level not exceeding 32 dBm. There may be scope for higher power use in the band but this is likely to be at the expense of an increased guard band within the new existing assignment.

Section 4

Conclusions

Out-of-Band Emissions

- 4.1 The out of band emission profiles contained in Annex A should provide adequate protection to adjacent GSM services.

Blocking

- 4.2 If the transmit power is restricted to 32 dBm, the potential for blocking to O₂ stations is reduced to those base stations with a separation distance of 20 metres or less. It is expected that these co-ordination issues would be handled by the application of good site engineering practice.

Protection of GSM-R

- 4.3 Should the spectrum be used for CDMA technologies with a channel raster of 1.25 MHz and power restricted to 32 dBm, then ECC Report 38 defines the protection for GSM-R. There is a requirement that there shall be a guard band of 200 KHz from the GSM-R spectrum and a geographic separation from any railway line of 250 metres.

Annex A

Specification for the Base Transmitt band 917-921MHz

A.1 The following specification is derived from the figures supplied in 3GPP 45.005¹ for GSM.

Transmit Powers

A.2 The following transmit powers are assumed:

900 MHz BS 24 dBm to yield 32 dBm ERP

Measurement Bandwidth

A.3 The measurement bandwidth used for GSM unwanted emissions varies with the distance from the channel. Up to 1,800 kHz, the measurement bandwidth is 30 kHz beyond this figure the measurement bandwidth is 100 kHz. Where it is preferred to use a constant figure of 30 kHz the figures should be reduced by 5.24 dB above 1800 kHz.

Unwanted Emissions

A.4 The figures for the unwanted emissions shall include the following figures which have been sourced from 3GPP 45.005.

kHz	900 MHz	
	MS	BS
100	+0.5	+0.5
200	-30	-30
250	-33	-33
400	-60	-60
600 – 1,800	-60	-67
1,800 – 3,000	-63	-70
3,000 – 6,000	-65	-72
>6,000	-71	-80

A.5 If this table were normalised to a measurement bandwidth of 30 kHz the bottom three rows would be amended as shown:-

¹ The 3rd Generation Partnership Project (3GPP) is a collaboration agreement that was established in December 1998. The collaboration agreement brings together a number of telecommunications standards bodies which are known as "[Organizational Partners](#)". The current Organizational Partners are ARIB, CCSA, ETSI, ATIS, TTA, and TTC.

	900 MHz	
kHz	MS	BS
1,800 – 3,000	-68.24	-75.24
3,000 – 6,000	-70.24	-77.24
>6,000	-76.24	-85.24

A.6 The spurious emissions will be calculated as follows:-

GSM 900 -36 dBm per 100 kHz

Intermodulation

A.7 Intermodulation figures are:-

900 MHz -49 dBm

GSM Unwanted Emissions Profile

Base Stations

A.8 GSM 900 Emissions Profile

