Notice of Co-ordination Procedure required for 3G or 4G deployment under the Public Wireless Network Licences covering the 900 MHz band

Coordination procedure

Date: 09 July 2013

Contents

Section 1

Introduction

1.1 This document specifies the coordination procedure that Ofcom considers is necessary to ensure the protection of existing GSM-R equipment from potential harmful interference from the deployment of 3G or 4G equipment in the neighbouring spectrum bands (the E-GSM bands 880 – 890 MHz paired with 925 – 935 MHz). Ofcom is imposing this procedure under paragraph 5 of schedule 1 of the 900 MHz Public Wireless Network Licences.

1.2 For any 3G or 4G sites that are likely to exceed the protection threshold, this document specifies the co-ordination procedure that must be followed before that site can be brought into operation.

1.3 The procedure applies to the protection of GSM-R base station sites and GSM-R train mounted equipment in operation at the time a new 3G or 4G site is deployed or its technology or eirp changed such that thresholds specified in Tables 1 and 2 (or any higher level previously coordinated between the 900 MHz and GSM-R operators) are breached. The coordination procedure is not applicable to the protection of future GSM-R base stations from 3G or 4G sites already in operation at the time they are deployed or existing 3G sites that undergo a technology change to 4G where there will not be a breach of any of the thresholds in Tables 1 and 2 (or any higher level previously coordinated between the 900 MHz and GSM-R operators).

1.4 It should be noted that this coordination procedure replaces the previous version of 26 January 2012. This updated version expands this procedure to include sites operating 4G technology in the 900 MHz band and take account of any power increases as a result of Ofcom's Statement on Requests for Variation of 900 MHz, 1800 MHz and 2100 MHz Mobile Licences published on 09 July 2013.

1.5 We define a 3G site as one with UMTS transmissions, operated in accordance with the relevant 900 MHz Public Wireless Network Licences; and a 4G site as one with LTE or WiMAX transmissions and operated in accordance with the relevant 900MHz Public Wireless Network Licences.

Section 2

GSM-R Information

2.1 In order to be protected from harmful interference from 3G or 4G equipment operating in the bands 880.1 – 890.1 MHz paired with 925.1 – 935.1 MHz, the GSM-R operator must make the following information available to the 900 MHz 3G or 4G operators.

2.2 For each operational GSM-R base station (GSM-R BTS) location requiring protection[1]:

- Site location identification;
- Co-ordinates (6 figure NGR);
- Antenna height above ground level in metres;
- Antenna gain including cable losses in dBi; (for the purposes of establishing whether coordination is required the antennas may be assumed to be omni-directional),

2.3 For each section of track where operational train mounted GSM-R receivers require protection from harmful interference from 3G or 4G equipment operating in an adjacent band, the GSM-R operator must provide the location of each section of track and, where appropriate, its height above ground level. In cases where track height is not specified the 900 MHz operators should assume the track is at ground level.

2.4 For GSM-R train mounted equipment (GSM-R MS) the following should be assumed:

- Antenna height, 4.5 meters above track level;
- Antenna gain, 2 dBi (omni-directional).

2.5 The GSM-R operator should initially provide the information required in 2.2 and 2.3 within 30 working days of publication of the previous interim coordination procedure and maintain it up-to-date on a frequency to be determined by them.

2.6 No 900 MHz 3G or 4G equipment likely to be affected by this coordination notice should be brought into operation until the information required in 2.2 and 2.3 has been supplied or within 30 working days of publication of the previous interim procedure, whichever is the sooner.

2.7 It should be noted that protection can only be afforded to GSM-R equipment where the information specified above is made available. In cases where some of the information specified in 2.2 is not available the following default values may be assumed instead:

- Antenna height above ground level: 26 metres
- Antenna bore-sight gain including cable losses: 14 dBi
- Antennas are omni-directional

[1] GSM-R operators supplied a similar database in excel format to ATDI /Mott McDonald for use in the report 'A review of sharing constraints in the 876-880 and 921-925MHz bands, published 6th September 2006. Page 66.

Section 3

Co-ordination process

3.1 The 900 MHz operator, using the data supplied by the GSM-R operator (see Section 2 above), must establish if a proposed 3G or 4G site is likely to breach the coordination thresholds specified in tables 1 and 2 below. These thresholds are specified relative to the antenna connector of the GSM-R equipment (hence the relevant GSM-R antenna gain in the direction of the 3G or 4G base station should be taken into account in the assessment). In carrying out this assessment the 900 MHz operator must use the appropriate propagation model from those listed in annex 2. If direct line of sight exists between the 3G or 4G base station and the GSM-R location requiring protection, the free space path-loss (FSPL) model should be used. In other cases the Okumura-Hata model may be used. Where it is not clear whether direct line of sight exists or not, the FSPL model should be used.

3.2 This coordination procedure applies for the protection of GSM-R base stations (GSM-R BTS) and train mounted receivers (GSM-R MS).

3.3 If, as reasonably determined by the 900MHz operator, the thresholds specified in tables 1 and 2 are not likely to be breached, then no coordination is required.

3.4 If any of the thresholds specified in tables 1 and 2 are likely to be breached, the 3G or 4G site cannot be brought into operation until it has been successfully coordinated with the GSM-R operator.

3.5 When coordination is required, the 900 MHz operator will contact the GSM-R operator with details of the proposed 3G or 4G site. If no acknowledgment is received within 30 working days, the site is deemed to be coordinated.

Table 1 Coordination thresholds – GSM-R MS.

Equipment	Frequency band	Coordination threshold	Comment
GSM-R MS	924.7 – 924.9 MHz	-107 dBm	3G or 4G OOB emissions
GSM-R MS	924.9 – 925.1 MHz	-89 dBm	Selectivity (1st adjacent channel)
GSM-R MS	925.1 – 925.3 MHz	-57 dBm	Selectivity (2nd adjacent channel)
GSM-R MS	925.3 – 925.5 MHz	-49 dBm	Selectivity (3rd adjacent channel)
GSM-R MS	925.5 – 925.7 MHz	-38 dBm	Blocking (1st offset)
GSM-R MS	925.7 – 926.5 MHz	-33 dBm	Blocking (2nd offset)
GSM-R MS	926.5 – 927.9 MHz	-23 dBm	Blocking (3rd offset)
GSM-R MS	927.9 – 934.9 MHz	-23 dBm	Blocking (4th offset)

Table 2 Coordination thresholds – GSM-R BTS.

GSM-R BTS	880.1 – 889.9 MHz	8 dBm	Blocking

Note:

The coordination thresholds have been derived from the Blocking Characteristics and Reference Interference Levels specified in GSM 05-05: Sections 5.1 and 6.3. We have assumed a GSM-R minimum planning level of -98 dBm.

References

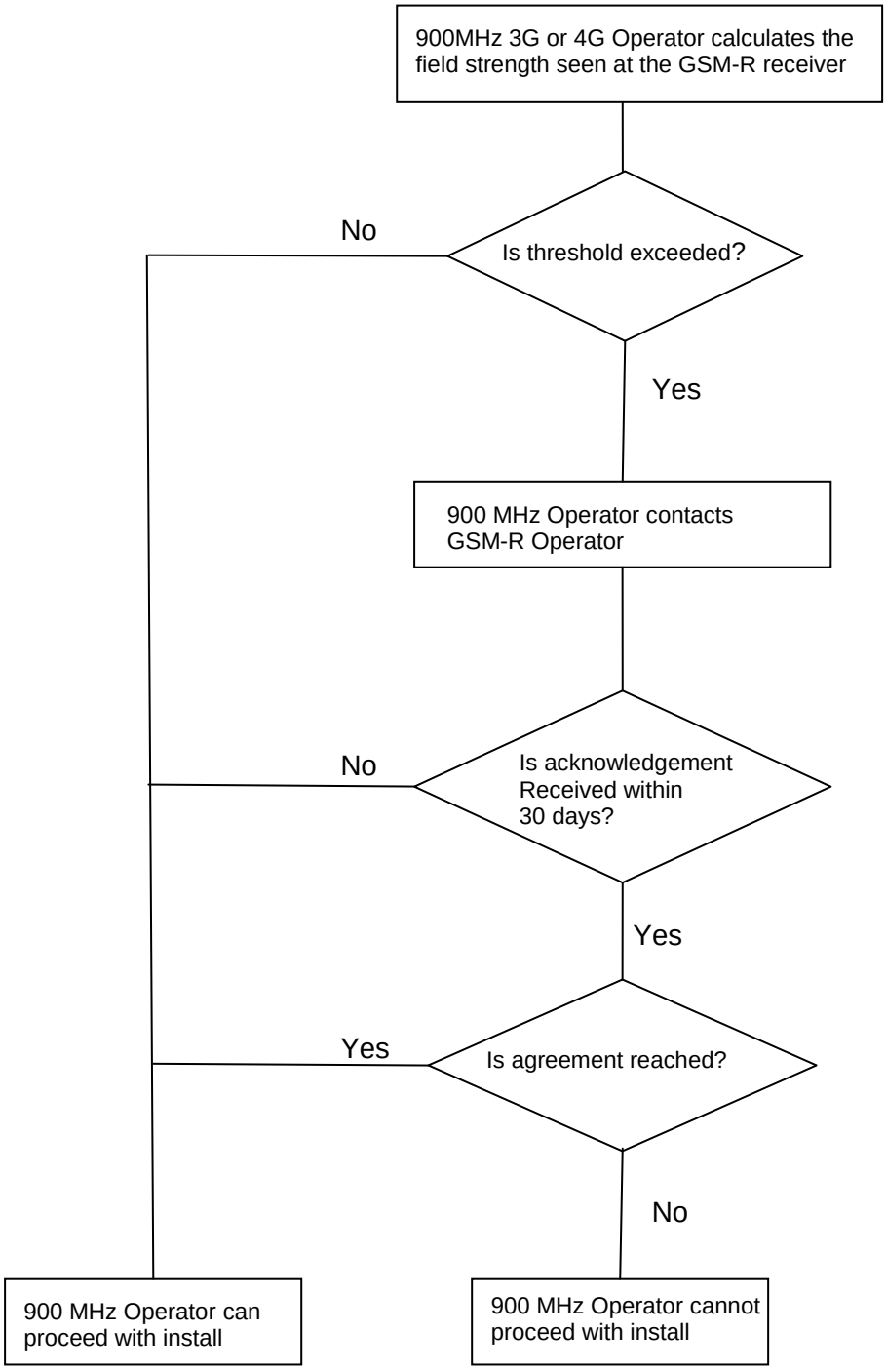
ECC report 96, Compatibility between UMTS900/1800 and systems operating in adjacent bands, Krakow , March 2007

3GPP TS 05.05 v8.20.0 (2005-11)

Annex 1

Co-ordination flow chart

A1.1 A flow diagram illustrating the co-ordination procedure is shown below.



Annex 2

Propagation models

Free space path loss.

If a direct line of site (LOS) exists between the proposed base station and the GSM-R equipped railway track, the Free Space Path Loss model as shown in the equation below[2] should be used.

$$FSPL = 32.5 + [10\log [\{(h_{tx} - h_{rx})^2/1000^2\} + d^2]] + 20\log(f)$$

Where ;

f is the carrier frequency (MHz)

d is the horizontal separation between the transmit and receive antenna (km)

h_{tx} is the height of the transmit antenna (m)

h_{rx} is the height of the receive antenna (m)

Okumura - Hata

The Okumura-Hata propagation model may be used, in accordance with the equations[2] shown below.

Urban areas	$L_{dB} = A+B \log R-E$
Suburban areas	$L_{dB} = A+B \log R-C$
Open areas	$L_{dB} = A + B \log R-D$

Where

$A = 69.55 + 26.16 \log f - 13.82 \log h_b$
$B = 44.9 - 6.55 \log h_b$
$C = 2(\log(f/28))^2 + 5.4$
$D = 4.78(\log f)^2 - 18.33 \log f + 40.94$
$E = 3.2(\log(11.75h_m))^2 - 4.97$

And,

f is the frequency (MHz)
h_b is the height of the base station , valid between 30m – 200m
h_m is the height of the mobile , valid between 1m - 10m

The model is valid for frequencies between 150 -1500 MHz,

[2] CEPT SEAMCAT, page 184 and 187
http://seamcat.iprojects.dk/attachment/wiki/Manual/PropagationModels/ExtendedHata/Hata-and-Hata-SRD-implementation_v1.pdf,