Notice of proposed variation of Everything Everywhere's 1800 MHz spectrum licences to allow use of LTE and WiMAX technologies

Notice of proposed licence variation

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Contents

Section 1

Summary

1.1 This document gives notice of our intention to vary Everything Everywhere's (EE) 1800 MHz Wireless Telegraphy Act 2006 licences to allow the use of LTE and WiMAX technologies in this band. We invite comments on this proposal by 17 April 2012.

1.2 This notice is in response to a request from EE to authorise the use of LTE technology under their licences for 1800 MHz spectrum. It follows the European Commission's adoption of a harmonisation decision requiring all EU Member States to designate and make available 900 MHz and 1800 MHz spectrum for LTE and WiMAX use.

1.3 LTE/WiMAX services are not currently widely available to citizens and consumers in the UK. There is however widespread demand for mobile data services in the UK, and that demand is growing significantly. The availability of new high-speed mobile data services is likely to bring material benefits to consumers and citizens.

1.4 If we were to vary EE's licence now, it would be likely to be the only entity capable of providing LTE/WiMAX services on a national basis for a period of time. In accordance with the relevant legal framework, we have therefore considered whether there is a risk of distortion to competition arising from authorising EE's 1800 MHz licences for LTE and WiMAX technologies. For the reasons set out in this document we do not consider that any material risk of distortion to competition will arise if we vary EE's licence as requested.

1.5 Nonetheless, to the extent that any such risk might arise, we have gone on to assess whether there would be any objectively justifiable, proportionate, non-discriminatory and transparent measures which would address such risk. In particular, we have considered the extent to which the benefits to consumers and citizens which we believe will arise from the availability of new LTE services might be outweighed by any temporary or longer term distortion of competition in such services to the detriment of citizens and consumers.

1.6 As our view is that there is no material risk of a distortion of competition if EE is permitted now to use the 1800MHz band to deploy LTE and/or WiMAX technologies, we propose to vary EE's 1800 MHz licences as soon as practicable, subject to this consultation.

Section 2

Introduction

2.1 On 23 November 2011 we received an application from EE for variation of its 1800 MHz licences to allow use of LTE[1] technology in those frequencies. The application encompasses all frequencies currently licensed to EE in the 1800MHz band, i.e. the 2x15 MHz that it undertook to divest as a result of its merger in 2010 and the 2x45 MHz it will retain. This document sets out our consideration of that application.

Structure of document

2.2 This document is structured as follows.

- Section 3 sets out the applicable legal framework.
- Section 4 sets out certain facts which we consider are relevant to EE's licence variation application.
- Section 5 explains why we believe that authorising the use of LTE and WiMAX[2] technologies under EE's 1800 MHz licences will not give rise to a material risk of a distortion of competition.
- Section 6 nonetheless goes on to consider, .to the extent that any such risk might arise, whether there would be any objectively justifiable, proportionate, non-discriminatory and transparent measures which would address such risk. We consider both the possibility of a temporary distortion to competition and the possibility of an enduring distortion to competition.

2.3 This document should be read together with the annexes. This document, together with those annexes, as a whole comprises an impact assessment.

[1] LTE: Long Term Evolution, the next evolution of cellular mobile technologies, part of the family of standards developed by standardisation body 3GPP that includes 3G/UMTS/HSPA, designed to provide high speed data services. WiMAX: Worldwide Interoperability for Microwave Access, another wireless technology suitable for high speed data services, developed by standardisation body IEEE.
[2] WiMAX: Worldwide Interoperability for Microwave Access, another wireless technology suitable for high speed data services, developed by standardisation body IEEE.

Section 3

Legal framework

3.1 The European Commission's Radio Spectrum Committee ("RSC") Decision 2009/766/EC[3] (the "3G RSC Decision"), as amended by Decision 2011/251/EU[4] (the "LTE RSC Decision"), requires us to designate and make available the 900 MHz and 1800 MHz spectrum bands[5] for LTE and WiMAX by 31 December 2011.

3.2 The Competition Appeal Tribunal's judgment in *Telefónica O2 Limited v Office of Communications*[6] makes clear that the obligation to designate and make available only extends to putting in place any measures necessary to ensure that, by 31 December 2011, any legal impediment to the bands being authorised for use with LTE and WiMAX technology is removed. However, authorisation of particular undertakings to use this spectrum for LTE and WiMAX can only take place after implementation of the necessary authorisations and/or licence amendments under the Authorisation Directive[7].

3.3 There are no legal impediments in the UK to the use of the 900 MHz and 1800 MHz bands for LTE or WiMAX technology.

3.4 As indicated above, on 23 November 2011 we received an application for variation of EE's 1800 MHz licences to allow the deployment and use of LTE technology in those frequencies. This document sets out our consideration of that application.

3.5 Any application for a licence variation falls to be considered in accordance with the requirements of the Authorisation Directive and the Framework Directive[8] as implemented by the Wireless Telegraphy Act 2006 (The "2006 Act") and the Communications Act 2003 (the "2003 Act").

3.6 The intention of the LTE RSC Decision of 18 April 2011 is that the 900 MHz and 1800 MHz bands should be harmonised for LTE and WiMAX use across the EU and that Member States must remove any impediment to the authorisation of those bands for such use by the end of 2011.

3.7 Further, on 15 February 2012, the European Parliament and the Council adopted a Decision implementing the first Radio Spectrum Policy Programme[9] (the "RSPP Decision"). In particular, this requires Member States to authorise the use of,

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[3]Commission Decision of 16 October 2009 on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community.
[4]Commission Implementing Decision of 18 April 2011 amending Decision 2009/766/EC on the harmonisation of the 900 MHz and 1800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community.
[5] 900 MHz band: 800-915 MHz paired with 925-960 MHz. 1800 MHz band: 1710-1785 MHz paired with 1805-1880 MHz.
[6][2010] CAT 25, Case Number: 1154/3/3/10.
[7]Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive) as amended by Directive 2009/140/EC.
[8]Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive) as amended by Directive 2009/140/EC and Regulation 544/2009.
[9]http://register.consilium.europa.eu/pdf/en/11/st16/st16226.en11.pdf

amongst others, the harmonised 900 and 1800 MHz bands by the end of 2012for high speed electronic communication services.

3.8 Therefore, given that the 1800 MHz spectrum has already been designated and made available for 4G use, we consider EE's application in light of the requirement to authorise such use of the spectrum.

3.9 Article 14 of the Authorisation Directive requires that rights of use (in this case a wireless telegraphy licence) "*may only be amended in objectively justified cases and in a proportionate manner, taking into consideration, where appropriate, the specific conditions applicable to transferable rights of use for radio frequencies*".

3.10 More generally, in carrying out our regulatory tasks, including considering the case for amending rights of use, we are required to take all reasonable measures which are aimed at achieving the objectives set out in Article 8 of the Framework Directive. Article 8 requires national regulatory authorities to promote competition, *inter alia*:

3.10.1 by ensuring that there is no distortion or restriction of competition in the electronic communications sector; and

3.10.2 by encouraging efficient use and ensuring the effective management of radio frequencies.

3.11 This is reflected in our duties under the 2003 Act and the 2006 Act, in particular in:

3.11.1 our principal duty to further the interests of citizens in relation to communications matters and consumers, where appropriate by promoting competition;

3.11.2 the requirement to secure the optimal use of the spectrum; and

3.11.3 the requirement to have regard to the desirability of promoting the efficient management and use of the part of the electromagnetic spectrum available for wireless telegraphy.

3.12 Reflecting these requirements, the 3G RSC Decision at Recital 14 notes that differences in the existing national situations could result in distortion of competition, and the existing regulatory framework gives Member States the tools they need to deal with these problems in a proportionate, non-discriminatory and objective manner, subject to the provisions of EU law including the Authorisation and Framework Directives.

Process for considering a licence variation request

3.13 In terms of process, Article 14 of the Authorisation Directive requires that Member States must ensure that, except where proposed amendments are minor and have been agreed with the licensee:

3.13.1 notice of the proposed change is given in an appropriate manner; and

3.13.2 interested parties, including users and consumers, are allowed a sufficient period of time to express their views on the proposed amendments (such time to be no less than four weeks except in exceptional cases).

3.14 The 2006 Act sets out in Schedule 1 a process for the variation of wireless telegraphy licences. In the case where a variation is proposed by the licensee, we are under no obligation (under the 2006 Act) to consult on the proposal.

3.15 Section 7 of the 2003 Act provides that where we are proposing to do anything for the purposes of or in connection with the carrying out of our functions, and it appears to us that the proposal is important, then we are required to carry out and publish an assessment of the likely impact of implementing the proposal, or a statement setting out our reasons for thinking that it is unnecessary to carry out such an assessment. Where we publish such an assessment, stakeholders must have an opportunity to make representations to us about the proposal to which the assessment relates.

3.16 The variation of EE's 1800 MHz licence to allow LTE use of the relevant frequencies is not likely to be considered to be a minor variation by interested third parties. On that basis, notwithstanding that the variation is at the request of and therefore with the consent of the licensee, we consider that we should give interested third parties an opportunity to make representations on our proposal to vary the licences. Further, it is our view this is not a case in which any exceptional circumstances exist such that the period for making any such representations should be reduced from the default minimum of at least four weeks.

Section 4

Factual background

4.1 This section sets out certain facts relevant to assessing whether any competitive distortion would arise from varying EE's 1800 MHz licences to authorise LTE and WiMAX use. We:

4.1.1 explain which spectrum bands are used for the provision of mobile services in the UK;

4.1.2 explain the European Commission's decision in relation to the T-Mobile/Orange joint venture[10] as relevant to our assessment; and

4.1.3 consider the timeframes for the availability of other spectrum in future.

4.2 In Section 5 we go on to assess, in light of these facts, whether varying EE's 1800MHz licences now might give rise to a material risk of a distortion of competition. In doing so we focus mainly on LTE rather than WiMAX, as we understand that it is more likely that the relevant spectrum bands will be used to provide LTE services, given the current relative lack of support for WiMAX technologies.

Current mobile spectrum holdings and technologies

4.3 There are over 76 million subscriptions to mobile services in the UK. The voice and data services these consumers currently enjoy rely on the use of three frequency bands, namely 900 MHz, 1800 MHz and 2.1 GHz.

4.4 Table 1 details the mobile network operators' (MNOs) existing spectrum holdings.[11]

Table 1: MNOs' existing UK spectrum holdings

Licensee	Amount of 900 MHz spectrum held (2x... MHz)	Amount of 1800 MHz spectrum held (2x... MHz)	Amount of 2.1 GHz paired spectrum held (2x... MHz)
Telefónica	17.4	5.8	10
Vodafone	17.4	5.8	14.6
EE (current)	0	60	20
EE (post divestment)	*0*	*45*	*20*
H3G	0	0	14.8

4.5 There are differences in both the technologies that are authorised for use in these bands, and in the equipment that is available on the market for use in these bands. These differences change over time as new technologies emerge and MNOs and consumers exercise choice in deciding what equipment and services to purchase.

[10] Case No COMP/M.5650, *T-Mobile/Orange.*

[11] The MNOs' holdings also include further spectrum at 2.1 GHz, referred to as unpaired spectrum, to which they have been holding rights since 2000. However, this spectrum is not in use and we are not aware of any suitable equipment being commercially available.

Table 2 provides an overview of the current situation. Current technologies are 2G/GSM, suitable for voice and low speed data services, and 3G/UMTS/HSPA[12] suitable for voice and the higher speed data services currently available.

Table 2: Technologies authorised and available today in UK mobile bands

	900 MHz band	1800 MHz band	2.1 GHz band
Technologies covered in licences	2G/GSM 3G/UMTS/HSPA	2G/GSM 3G/UMTS/HSPA	3G/UMTS/HSPA
Equipment available on the market	2G/GSM 3G/UMTS/HSPA	2G/GSM LTE	3G/UMTS/HSPA

4.6 Tables 1 and 2 show that all MNOs hold 2.1 GHz spectrum that is suitable for the provision of higher speed data services using 3G/UMTS/HSPA, but only two of the four existing MNOs hold additional spectrum suitable for these services, i.e. Telefónica and Vodafone who each hold rights to 900 MHz frequencies. Telefónica has been using some of its 900 MHz spectrum to provide 3G services since early 2011[13] and there have been reports that Vodafone plans to use some of its 900 MHz holdings to provide 3G services in future and has been preparing for this change.[14]

4.7 The 1800 MHz spectrum that EE, Telefónica and Vodafone hold is authorised for 3G/UMTS/HSPA use, but there is no user equipment available to support such use at present and no clear prospect of this changing in the near term.

4.8 LTE, the next generation of mobile technology following 3G/UMTS/HSPA, is not yet authorised for use in the UK in any of the spectrum bands widely used for mobile services internationally.[15]

The T-Mobile/Orange merger decision

4.9 On 11 January 2010 France Télécom and Deutsche Telekom notified the establishment of a joint venture company (now EE) to the European Commission (the "Commission") under the EC Merger Regulation.[16]This joint venture was established by France Télécom and Deutsche Telekom contributing their respective subsidiaries Orange UK and T-Mobile UK to EE.

4.10 Pursuant to this notification, the Commission considered whether the transaction would significantly impede effective competition in the common market or a substantial part of it. In doing so, the Commission assessed the incremental effect of the T-Mobile/Orange concentration on the assumption that the 1800 MHz spectrum would be authorised for LTE use in advance of the 800 MHz and 2.6 GHz spectrum becoming available for such use. In undertaking this assessment, the Commission

[12]3G is a family of mobile technologies that deliver voice and data services. UMTS is the original version of 3G. HSPA is its current, most advanced version. In this Notice, we use the term HSPA to refer to all versions of HSPA, including HSPA+ and DC-HSPA.
[13] http://mediacentre.o2.co.uk/Press-Releases/O2-first-to-switch-on-new-superfast-3G-900MHz-network-2f8.aspx.
[14]*Financial Times*, 2 May 2011
[15] We note that UK Broadband is authorised to use LTE and WiMAX technology in the 3.5 and 3.6 GHz bands in the UK.
[16]Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation).

identified a concern that the combined entity could be the only MNO with a clear path to full coverage maximum-speed LTE technology in the UK, as against the counterfactual that there would be two MNOs in that position, with 1800 MHz spectrum, in absence of the merger.[17] The Commission felt that a merger without remedy could result in a bifurcation of the market in years to come, with the combined entity being the only MNO in the UK able to offer LTE technology at the best possible speeds with full coverage.

4.11 In its assessment, the Commission made the following assumptions about the availability of 800 MHz and 2.6 GHz spectrum: that the 800 MHz band would become available for use by the end of 2013 and that the 2.6 GHz band would be available for use immediately after the auction (which was expected at the time to take place in 2011) but would be subject to certain restrictions on its use in certain geographic areas until sometime in 2013 or 2014[18]. The Commission considered that it is possible to launch an LTE network by coupling sub 1 GHz spectrum and 2.6 GHz spectrum[19] but noted that there were strong grounds to conclude that the merging parties could have a significant technological and marketing advantage over competitors in light of their ability to offer superior network quality in terms of maximum download speed, and potentially also in terms of consistency of provision of lower download speeds. The Commission also noted that the merging parties would have a significant time advantage due to the uncertain timing of the auction and the time needed to clear the 800 MHz spectrum.

4.12 It was in light of these conclusions that the Commission considered that there were serious doubts as to the merger's compatibility with the common market in relation to the wholesale and retail telecommunications markets over the next few years as a result of the concentration of the 1800 MHz spectrum.[20]

4.13 As a result, France Télécom and Deutsche Telekom submitted various commitments to address the Commission's concerns. This included a commitment to divest 2x15 MHz of 1800 MHz spectrum on a specific timescale, specifically: 2x10 MHz of 1800 MHz spectrum[21] is to be cleared and all related licences to be surrendered (where the spectrum has not been divested) to Ofcom by no later than 30 months after the 800 MHz and 2.6 GHz spectrum auction ends and no later than 30 September 2013; and a further 2x5 MHz of 1800 MHz spectrum[22] is to be cleared and all related licences to be surrendered (where the spectrum has not been divested) to Ofcom by no later than 30 September 2015.[23] The overall effect of these commitments is to require that by 30 September 2013 at the latest 2x10 MHz of 1800 MHz spectrum is cleared and available for use by someone other than EE and that by 30 September 2015 a further 2x5 MHz of 1800 MHz spectrum is to be similarly cleared and made available to the same party.

4.14 The Commission considered these commitments were sufficient to address the competition concerns it had identified. As a result, it cleared the proposed transaction by declaring it compatible with the common market and with the functioning of the EEA agreement. In reaching this decision, the Commission was satisfied that any advantage accruing to EE from being the only undertaking with a clear path to full

[17] See paragraphs 122 and following of the European Commission's decision dated 1 March 2010.
[18] Paragraph 116 of the T-Mobile/Orange decision.
[19] Paragraphs 128 and 135 of the T-Mobile/Orange decision.
[20] Paragraph 138 of the T-Mobile/Orange decision.
[21] At 1721.7 – 1731.7 MHz paired with 1816.7 – 1826.7MHz.
[22] At 1731.7 – 1736.7 MHz paired with 1826.7 – 1831.7MHz.[22]

coverage maximum-speed LTE technology in the UK up until the divestment spectrum could be used by another operator to provide LTE services did not significantly impede effective competition in the common market or a substantial part of it.

4.15 The Commission took its decision in March 2010 in the knowledge that LTE could be deployed in the 1800 MHz band at any point from that time onward subject to authorisation to do so by Ofcom. The Commission therefore considered that the acquirer of the divestment would be capable of exerting effective competitive pressure on EE using the divestment spectrum up to three years after EE's earliest possible use of LTE for the first tranche of 2x10 MHz of the divestment and up to five years for the full divestment of 2x15 MHz. As two years have passed since the date of the Commission's decision, these time periods are now in fact considerably shorter.

4.16 Although the 800 MHz and 2.6 GHz spectrum auction is now expected to start in the fourth quarter of 2012, the date for the availability of that spectrum has not changed materially (see below). Therefore, the relevant assumptions underpinning the Commission's decision largely remain valid.

4.17 In factoring the merger and the merger commitments into our assessment we must also comply with Article 21 of the EC Merger Regulation which provides:

"…2. Subject to review by the Court of Justice, the Commission shall have sole jurisdiction to take the decisions provided for in this Regulation.

3. No Member State shall apply its national legislation on competition to any concentration that has a Community dimension..."

4.18 In light of the above, in reaching our view, we have taken as established the Commission's conclusion that the commitments are sufficient to address the competition concerns the Commission identified.

A significant amount of additional mobile spectrum will be available for LTE in 2013

4.19 There is a significant amount of additional spectrum suitable for the provision of mobile services, including using LTE technology, which will become available in 2013. There are two sources of this spectrum (i) spectrum to be divested by EE as part of its merger commitments made to the European Commission, and (ii) spectrum to be auctioned by Ofcom.

EE's Divestment spectrum

4.20 As explained above, as a result of the commitments given by France Télécom and Deutsche Telekom, EE must divest 2x15 MHz of 1800 MHz spectrum, with 2x10 MHz of 1800 MHz spectrum to be made available by no later than 30 September 2013, and a further 2x5 MHz of 1800 MHz spectrum to be made available by no later than 30 September 2015.

Spectrum to be auctioned by Ofcom

4.21 In early 2013,Ofcom intends to award at auction at least 2x90 MHz of paired spectrum suitable for mobile services at 800 MHz and 2.6 GHz band.[24] We anticipate that the 800 MHz band will be available for use nationally by the end of 2013. Similarly, we anticipate that the 2.6 GHz will be widely available for use by the end of 2013 and nationally by the end of Q1 2014.

4.22 The main technology available for use in the 800 MHz and 2.6 GHz band is LTE. LTE user equipment, in particular dongles,[25]is available now, and we believe that a wide range of devices capable of using these bands, including smartphones, will be available across the EU from 2013.[26]

4.23 The amount of spectrum becoming available at 800 MHz and 2.6 GHz is at least twice the amount that EE will hold at 1800 MHz following the divestment in 2013 and 2015.There are 2x30 MHz available at 800 MHz and at least 2x60 MHz available at 2.6 GHz. This offers a relatively large scope for different combinations of 800 MHz and 2.6 GHz as well as for the number of parties that could hold them.

When LTE use is likely to be possible

4.24 As shown in Table 2, LTE user equipment is available now at 1800MHz. If authorised to do so, we estimate that it would take EE a number of months from the time of authorisation to be ready to launch LTE services commercially, with a minimum level of coverage (though potentially it could take rather more time). If we were to vary EE's licence in, say, Q2 2012, we estimate that the earliest EE would be able to deploy LTE services in the 1800 MHz band would be from the end of Q3 2012 onwards.

4.25 The acquirer of the divestment spectrum would likely need to conduct network testing and related activities before being able to launch a commercial service using the first tranche of the divestment. In view of the need to conduct these activities, we anticipate that the acquirer of the divestment would have the capability to use the first tranche of the spectrum to launch LTE services 1-2 months after the spectrum was made available. On the basis of the timescales in the commitments, this means that we estimate that the acquirer of the divestment spectrum should be able to use the first tranche of 2x10 MHz of 1800MHz spectrum to offer LTE services in Q4 2013 at the earliest.

4.26 Telefónica and Vodafone could also in theory use their spectrum holdings in the 900 MHz and 1800 MHz bands to provide LTE services (subject to their licences being varied to permit such use). However, in practice, we recognise that their smaller holdings in the 1800 MHz bands are less attractive individually for LTE use: they each hold 2x5.8 MHz and we expect MNOs to prefer to use channels of at least 2x10 MHz (and, where possible, probably 2x15 MHz or 2x20 MHz) for high speed services

[24]800 MHz band: 791-821 MHz paired with 832-862 MHz; 2.6GHz band (paired spectrum): 2500-2570 MHz paired with 2620-2690 MHz.
[25]A dongle refers to a small piece of equipment that can plug into an electronic device, typically a computer, and enable that device to connect to a wireless network and get services such as internet access.
[26] See for example the GSA's "LTE developments worldwide" slide 9 dated 20 January 2012, available at http://www.gsacom.com/gsm_3g/info_papers.php4 and press announcements regarding the launch of LTE smartphone, such as http://www.telecoms.com/39611/first-european-lte-phone-coming-to-vodafone-germany/.

using LTE. We also recognise that no LTE equipment is currently available in the 900 MHz band. Neither Telefónica nor Vodafone has applied to have their licences similarly varied to date.

4.27 So far as use of their spectrum holdings in the 900 MHz band is concerned, in the January 2012 consultation,[27] we set out our view of the scope for using LTE technology through time in the spectrum bands suitable for mobile services in the UK. The two main factors we identified were (i) when LTE equipment was likely to be available to support high data speeds for a particular band, and (ii) whether it was likely to be commercially profitable for licensees to introduce LTE technology in the 900 MHz, 1800 MHz and 2.1 GHz bands, for example in light of the current extent of use of 2G and 3G technology in those bands and of the ability of user equipment (e.g. smartphones, dongles) currently in the hands of consumers to use those bands with 3G or LTE technology.

4.28 Based on these considerations, our view is that it is unlikely that the 900 MHz band will be used for LTE until after the 800 MHz and 2.6 GHz bands become available for use. Our understanding is also that the 2.1 GHz band is likely to be used for 3G services for some time yet, and that LTE equipment is unlikely to be available for that band for at least a few years.

4.29 By contrast, we expect LTE to be deployed in the 800 MHz and 2.6 GHz bands soon after they become available; winners of rights to use these frequencies are likely to have sufficient time between the conclusion of the award process in 2013 and the availability of the 800 MHz and 2.6 GHz spectrum across the majority of the UK to prepare an LTE launch by the end of 2013, should they wish to do so.

Time periods relevant to our assessment of potential competitive advantages

4.30 On the basis set out above, we consider that if we were to authorise the use of LTE and WiMAX in the 1800 MHz band, there would be a 15 month period (the "Interim Period") between the earliest time when EE could use the 1800 MHz band to provide LTE services (end Q3 2012) and the earliest time when EE's competitors would be able to launch LTE services using the 800 MHz and 2.6 GHz bands across a majority of the UK (end 2013).

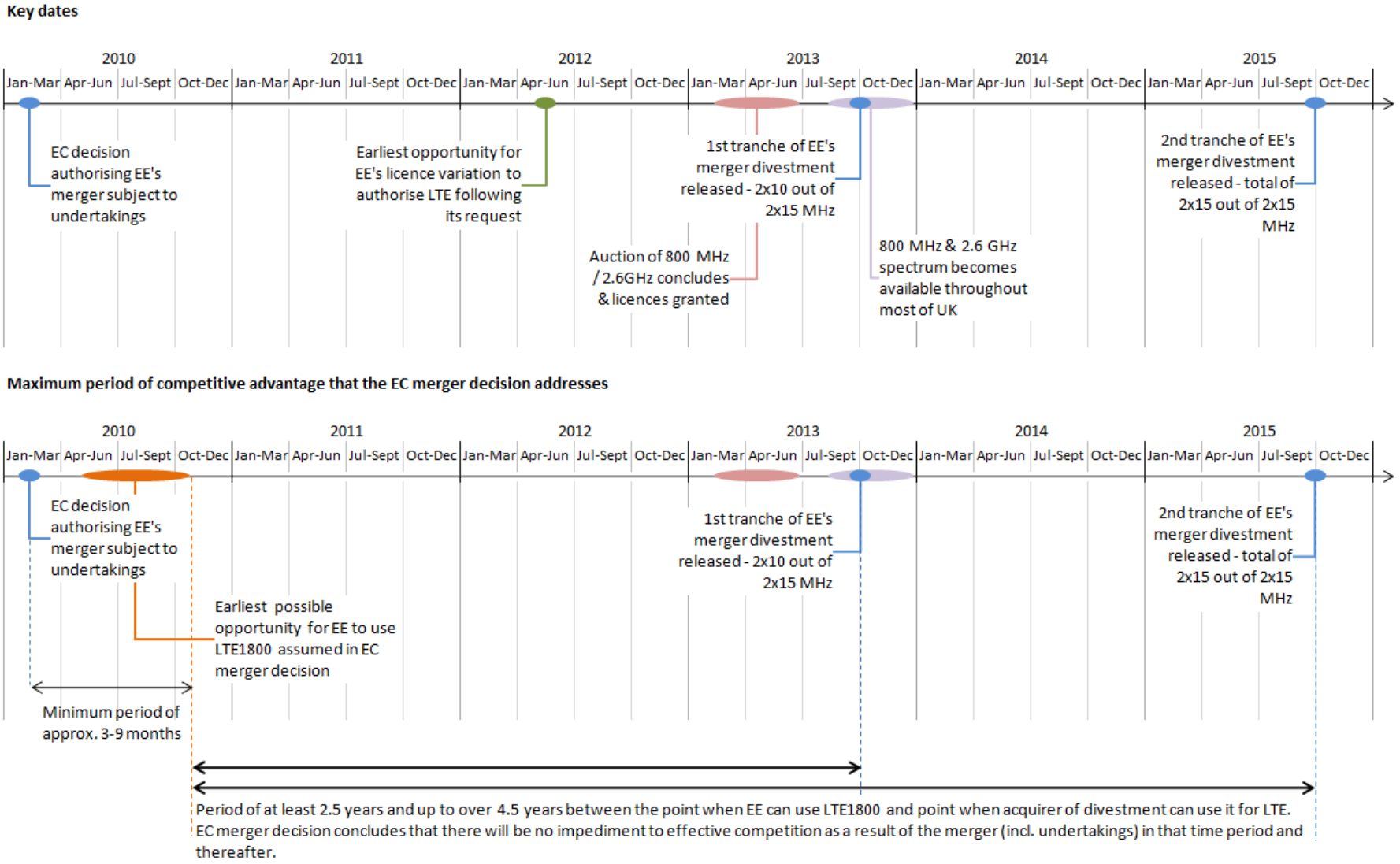
4.31 For the first 13-14 months of the Interim Period only EE would have a clear path to full coverage services at maximum speed using LTE technology. However, as noted above, during the final 1-2 months of the Interim Period, the acquirer of the divested 1800 MHz spectrum should also be able to offer LTE services using the first tranche of 2x10 MHz of 1800MHz spectrum divested by EE (ahead of availability of the full 2x15 MHz).

4.32 We note that because the 800 MHz and 2.6 GHz band will become gradually available across the UK during 2013, this definition of the Interim Period is likely to overstate the period during which EE is likely to be the only operator able to offer an LTE service.

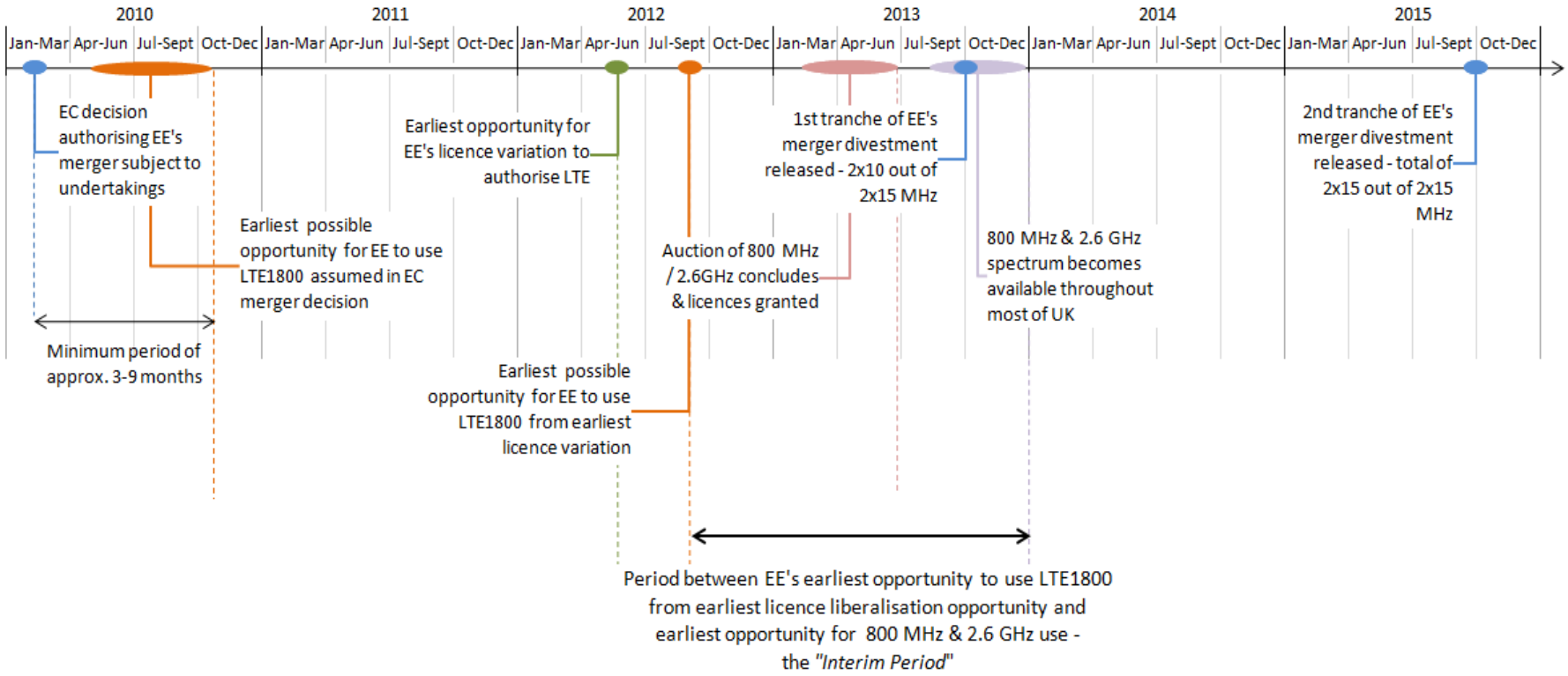
4.33 Figure 1 illustrates the milestones involved and highlights the Interim Period.

[27] http://stakeholders.ofcom.org.uk/binaries/consultations/award-800mhz/annexes/2nd_Condoc_Annex_6.pdf

Figure 1: illustration of timelines



Periods of potential competitive advantages



Section 5

No material risk of distortion of competition

5.1 Taking account of the factors which we set out in Section 4, we now consider whether there is a material risk of a distortion of competition arising if we agree to amend EE's licences to allow its 1800 MHz spectrum to be used for LTE and WiMAX technologies.

5.2 In assessing EE's application, we consider:

5.2.1 the likely benefits accruing to citizens and consumers from LTE services;

5.2.2 the extent to which a material risk of distortion of competition might arise if we amend the relevant licences to allow the spectrum to be used for LTE and WiMAX technologies; and

5.2.3 if so, whether there are any objectively justifiable, proportionate, non-discriminatory and transparent measures which we should take to address, in particular any competitive distortion identified. In particular, we have considered the extent to which the benefits to consumers and citizens which we believe will arise from the availability of new LTE services might be outweighed by any temporary or longer term distortion of competition in such services to the detriment of citizens and consumers.

Citizen and consumer benefits

5.3 Our principal duty is to further the interests of citizens in relation to communications matters and consumers, where appropriate by promoting competition.

5.4 There has been an explosion in the use of mobile data services in the last couple of years, both through the take-up of dongles connecting PC/laptops to the internet and through the increasing use of data services on mobile handsets[28]. This rapid growth in data services is expected to continue in at least the short term.[29]

5.5 The Government has recognised the importance of data services, including mobile broadband and has set out an ambition to provide superfast broadband to at least 90 per cent of premises in the UK and to provide universal access to standard broadband with a speed of at least 2Mbps[30]. As part of this, in addition to the substantial funds that the Government is investing to support the provision of fixed broadband services, the Government has also announced that it will invest up to £150 million to improve mobile coverage in the UK for the five to ten per cent of consumers and businesses that live and work in areas where coverage is poor or non-existent.

[28] In our Communications Market Report: UK of 4 August 2011, we estimate that data volume increased by a factor of 38 in the three years to the end of 2010.
[29] For further discussion see: http://stakeholders.ofcom.org.uk/market-data-research/other/technology-research/2011/4G-Capacity-Gains/
[30] See http://www.culture.gov.uk/what_we_do/telecommunications_and_online/7763.aspx

5.6 LTE and WiMAX technologies are designed to provide high speed mobile data services. LTE technology specifically, has a number of advantages of over 3G/UMTS/HSPA technology because underlying differences in these technologies enable LTE to operate more efficiently with respect to the use of spectrum. Specific aspects of network performance where LTE delivers advantages over 3G/UMTS/HSPA, include greater cell spectral efficiency, improved latency, scope to prioritise traffic and the potential for higher peak data rates.

5.7 We have therefore gone on to consider whether these benefits translate into a significant competitive advantage for EE (essentially by way of first mover advantage) such that there is a material risk that competition would be distorted and where the benefits of avoiding that competitive distortion outweigh the costs in terms of citizen and consumer benefits forgone by delaying the availability of new services. We have therefore, considered whether there is a risk of distortion to competition arising from authorising EE's 1800 MHz licences for LTE and WiMAX technologies.

Differences in frequency bands

5.8 We recognise that differences in the frequencies held can affect the ability of operators to deliver different service quality dimensions. Besides affecting how early LTE services can be launched, the types and quantities of spectrum held can influence the coverage and capacity that an operator can deliver and whether they can offer high peak data rates.[31]

5.9 As a result, there will be different strengths and weaknesses associated with holding a combination of 800 MHz and 2.6 GHz spectrum relative to holding a large block of 1800 MHz spectrum. For example, for high speed mobile data services, 2x15 MHz or 2x20 MHz of 1800 MHz spectrum may have advantages over a combination of 800 MHz and 2.6 GHz spectrum, for example because of the scope to offer maximum download speeds over a larger coverage area in a macrocell network and to deploy LTE earlier. However, a portfolio combining 800 MHz and 2.6 GHz spectrum may have advantages over 2x15 or 2x20 MHz of 1800 MHz spectrum alone in other dimensions, for example because of the quality of coverage it can provide in certain locations.[32]

5.10 Despite these differences, we consider it likely that, viewed in the round, an operator that holds a combination of 800 MHz and 2.6 GHz spectrum will be able to compete effectively with an operator with 1800 MHz spectrum.

Potential competitor advantages

5.11 In view of the technical advantages of LTE, there are likely to be some competitor advantages associated with holding spectrum suitable for delivering LTE services ahead of competitors; although the extent of these is unclear. We consider these competitor advantages in our January 2012 consultation. We provisionally conclude that:

[31]We set out the relative properties of mobile spectrum bands and the types of services they are likely to support in our January 2012 consultation. See section 4 in the main document and section 3 of Annex 6 of the January 2012 consultation.
[32]In the *T-Mobile/Orange* merger decision, the Commission recognised the capabilities that a combination of 800 MHz and 2.6 GHz spectrum would offer to compete with an 1800 MHz LTE offering (see paragraphs 128 and 135 in particular).

- there are advantages of LTE over HSPA, both from the perspective of the operator and the consumer;

- it is unclear the extent to which consumers are likely to value the features that LTE can deliver over and above HSPA in the short term, and therefore the extent to which holding spectrum suitable for early deployment of LTE will deliver significant competitor advantages;

- similarly, it is unclear how much consumers value high peak data rates or how much consumers value applications and services that rely on high peak data rates;

- it may be that the features associated with LTE and high peak data rates are only valued by a small group of consumers, particularly in the early stages of LTE deployment; and

- indeed, for a period, there could be advantages of HSPA over LTE because of a larger range or stock of compatible user devices.

5.12 Overall, we consider that it is possible that those operators with spectrum suitable for LTE may be at an advantage when competing for certain segments of services or customers as compared with operators that do not have spectrum suitable for offering LTE services and high peak data rates.

5.13 In view of the potential competitor advantages associated with early access to LTE, we have considered whether liberalising EE's 1800 MHz would materially risk distorting competition.

5.14 The extent to which any competitor advantages could lead to a distortion in competition would depend on:

i) whether technical advantages associated with having spectrum suitable for LTE and high peak data rates translate into significant commercial advantages;

ii) whether such advantages accrue over a significant period of time either because:

a. there is a significant gap in timing between when liberalised 1800MHz spectrum can be used for LTE and when other spectrum suitable for LTE is made available (the Interim Period); or

b. the competitor advantages are enduring beyond the Interim Period due to first mover advantages;

iii) other considerations, such as:

a. whether competitors might have wholesale access to LTE services during the Interim Period; and

b. the scope for competitors without 1800 MHz spectrum to respond, e.g. by accelerating investment in LTE or upgrading HSPA (thereby reducing the potential effect of (i) and (ii) above).

5.15 There is no material risk of a distortion of competition As explained above, given we consider it likely that an operator that holds a suitable combination of 800MHz and 2.6GHz spectrum will be able to compete effectively with an operator that holds 1800MHz spectrum, our assessment is focussed on whether a distortion to competition might arise during the Interim Period (which ends at the earliest time when EE's competitors would be able to launch LTE services using the 800 MHz and 2.6 GHz bands across a majority of the UK (end 2013)).

5.16 In the *T-Mobile/Orange* decision, the Commission effectively took the view that the acquirer of the divestment spectrum would be able to compete sufficiently effectively with EE to remove its serious doubts over the effects of the merger. This was on the basis of the acquirer being able to have access to the first 2x10 MHz of divested spectrum from end September 2013 and the full 2x15 MHz from end September 2015. The Commission also clearly assumed that EE would be able to offer LTE services in advance of the divestment spectrum actually being divested (i.e. during most of the Interim Period we identified earlier and indeed even longer given that the Commission decision assumed that EE might deploy LTE considerably earlier than now).[33]

5.17 For this reason, we consider that any potential competitive distortion which might arise as a consequence of the merger from use by EE of the 1800 MHz spectrum to provide LTE services during the Interim Period and prior to September 2013, when the first tranche of divestment spectrum is available for nationwide use by the acquirer, has been addressed by the commitments given to the Commission by EE's parent undertakings as part of the merger process. The Commission was satisfied that those commitments addressed the competition concerns that it had identified.

5.18 Furthermore, winners of 800 MHz and 2.6 GHz spectrum in the forthcoming auction would be able to compete with EE (and the acquirer of the divestment spectrum, if not a winner of 800MHz and 2.6GHz spectrum) in the provision of LTE services from late 2013. Those competitors would be able to launch LTE services from the end of 2013 (i.e. at the end of the Interim Period). The period of time between the availability for use of the first tranche of divestment spectrum and the 800 MHz and 2.6 GHz spectrum is some 3 months at most, as discussed in section 4. There is in our view therefore little material difference in position between the ability of the acquirer of the divestment spectrum, and the winners of the 800 MHz and 2.6 GHz spectrum (if different) from being able to compete effectively with EE. As a result, we do not consider that any further competitive distortion (i.e. beyond any distortion that is addressed by the merger commitments) is likely to arise in the period between the availability of the first tranche of divestment spectrum and the national availability of the 800 MHz and 2.6 GHz spectrum.

5.19 As a result, our provisional conclusion is that there is no material risk of a distortion of competition if EE is permitted to use the 1800MHz band to deploy LTE and/or WiMAX technologies at the earliest opportunity.

[33] See in particular paragraph 128 of the T-Mobile/Orange decision.

Section 6

Assessment assuming material risk of distortion of competition

6.1 Notwithstanding our view that liberalising EE's 1800 MHz spectrum now would not give rise to a material risk of any distortion to competition, we nonetheless go on to consider, to the extent that any such risk might arise, whether there would be any objectively justifiable, proportionate, non-discriminatory and transparent measures which would address such risk. We consider both the possibility of a temporary distortion to competition and the possibility of an enduring distortion to competition.

Temporary competitor advantage in the Interim Period associated with liberalisation of 1800 MHz for LTE

Risk of distortion arising from a competitor advantage

6.2 We consider first the possibility of a temporary distortion to competition which does not endure beyond the Interim Period.

6.3 As outlined in Section 4 and highlighted in Figure 1, if EE's 1800 MHz licences were liberalised for LTE as soon as possible, the duration of any advantage that EE may have as a result, would in this alternative be for approximately up to 15 months.

6.4 The extent of any competitive distortion from liberalisation of EE's 1800 MHz spectrum during this period is likely to be limited by a number of factors. For example, if temporary advantages associated with early deployment of LTE are significant, liberalisation of EE's 1800 MHz spectrum could result in responses from competitors. Such responses could, for instance, take the following forms:

- the acquirer of the 1800 MHz divestment spectrum deploying LTE rapidly;
- other competitors deploying more advanced HSPA technology so that it delivers some of the advantages associated with LTE technology;
- competitors taking measures to help accelerate the ecosystem for LTE in other spectrum bands; and
- competitors deploying LTE with 800 MHz and 2.6 GHz sooner than they would otherwise have done.

6.5 We also note that there are other operators that hold small quantities of 1800 MHz spectrum (Telefónica and Vodafone hold 2x5.8 MHz of 1800 MHz spectrum each). Although these quantities may be too small to offer attractive LTE services individually, it may be possible for them to offer more competitive LTE services through spectrum sharing (subject to the relevant licences being varied to permit LTE

use). Any network or spectrum sharing arrangements would be subject to the requirements of competition law.[34]

Assessment of potential measures to address any such temporary distortion to competition

6.6 We have identified three broad measures which we consider could address any material risk of distortion of competition:

a) delay variation of the relevant licences until new spectrum is available for others to compete with the LTE-based services that EE (and the acquirer of the divestment) could offer;

b) require EE (and/or the acquirer of the divestment spectrum) to offer regulated wholesale access to their LTE or WiMAX services provided using 1800 MHz; or

c) redistribute the rights to use the 1800 MHz spectrum.

Delaying liberalisation

6.7 Delaying liberalisation to address any distortion to competition would result in LTE services not being available until sometime after the auction. This would make at least some consumers worse off, relative to liberalising EE's 1800 MHz spectrum as soon as possible, because they would have to wait longer to enjoy the benefits of LTE. It would not make any consumers better off during the Interim Period, since it would not bring any benefits in terms of increasing the number of competitors with access to LTE1800.

6.8 Therefore, we consider that for delay to liberalisation of EE's 1800MHz licences to be appropriate and proportionate, any distortion to competition would at least have to endure beyond the Interim Period and the associated costs to consumers would have to exceed any benefits they enjoy from liberalisation during the Interim Period. Without any enduring costs, consumers will in our view be better off with early liberalisation (relative to delayed liberalisation). Consumers will have the option of buying new LTE services which would otherwise not be available in addition to existing services

Regulated access

6.9 An alternative option would be to impose regulated wholesale access on EE as a condition of liberalisation.

6.10 In principle, imposing regulated wholesale access on EE has the potential to benefit consumers by increasing competition (although there are likely to be limitations to the intensity of competition it can support and risks of unintended consequences). More competitors could potentially provide services similar to those that could be provided using LTE by EE and/or the acquirer of the divestment spectrum. However, the efficacy of this option as a measure to address any competitive distortions is limited by the time that it would take to put effective regulated wholesale access arrangements into place.

[34] We discuss network and spectrum sharing agreements in more detail in our March 2011 consultation: http://stakeholders.ofcom.org.uk/binaries/consultations/combined-award/annexes/Annex_6.pdf

6.11 As set out in the advice we provided to Government on the competition and consumer issues relating to liberalisation of 900 MHz and 1800 MHz spectrum for UMTS (the "3G liberalisation advice"),[35] there are a number of challenges associated with designing and implementing regulated wholesale access arrangements. Regulated wholesale access is very different to commercial access. The commercial interests of the parties are unlikely to be aligned. The access provider is unlikely to have a real incentive to give access on acceptable terms, for a number of reasons. For example, in the earlier part of development of its own new LTE services, the access provider is likely to be focused on the technical and commercial challenges of its own requirements. There would likely be challenges and potential tension on resource use from attempting to accommodate the different requirements of a beneficiary of regulated access.

6.12 In addition, even after a regulated wholesale access agreement is in place, the access provider may have an incentive to try to frustrate access through the way the agreement is implemented at an operational level. The situation may be different from a normal commercial relationship where, to some extent at least, parties may be prepared to work together to make access arrangements work successfully. This tends to mean that regulated access agreements have to be sufficiently detailed and well specified to ensure that in practice the access providers are unable to frustrate access.

6.13 It is possible to address the challenges that regulated access specifically raises. However, this is unlikely to be straightforward, and so would take a potentially lengthy period of time. We anticipate that reaching a point at which regulated access to LTE services provided at 1800 MHz would work sufficiently well for one or more competitors to be effective would likely take of the order of 12 to 18 months at least. It follows therefore that, in practice, imposing regulated access would be unlikely to increase the number of competitors with access to LTE1800 during the Interim Period (compared to the number that would have access if we liberalised EE's 1800 MHz spectrum as soon as possible).

6.14 Furthermore, there would be a significant risk of regulatory failure associated with imposing regulated access. For example, regulated terms that are too generous to access seekers could disincentivise investment by the access provider and consequently be detrimental for consumers. In contrast, access terms that are not sufficiently generous could render the measure ineffective in terms of addressing any competitive distortions.

6.15 Given that it is unlikely to be practical to decide on and implement the details of regulated access on appropriate terms during the Interim Period and that, in any case, regulated access may not necessarily be effective and involves potential risks of unintended consequences, we do not consider that regulated access would be an appropriate and proportionate measure to address any temporary competitive distortion.

Redistributing rights of use

6.16 Redistributing rights of use for 1800 MHz spectrum would require the licensee(s):

a) to clear some spectrum of existing use; and

[35]Advice to Government on the consumer and competition issues relating to liberalisation of 900 MHz and 1800 MHz spectrum for UMTS, 25 October 2010: http://stakeholders.ofcom.org.uk/binaries/consultations/spectrumlib/annexes/government-advice.pdf

b) to accommodate that existing use with their remaining spectrum resources.

6.17 Any such redistribution would be a significant intervention. Depending on the amount and timing of redistribution, it would raise material risks of disruption to existing services and, as a result, potential consumer losses. An appropriate process to manage these risks would require careful consideration and would need to incorporate sufficient periods of time for the affected licensees to update their network to make up for the reduction in their ability to deliver services resulting from a reduction in spectrum resources.

6.18 The type of activities that the licensee would need to carry out include assessing which geographical areas would suffer from capacity shortfalls because of reduced spectrum resources, what options are available in those locations to address the shortfalls and how to allocate resources to implement the selected options. In practice, this would be likely to lead to requirements for modification to existing network sites and new network sites in certain locations. This work may involve civil engineering, negotiations with site owners and planning applications amongst other things. We discuss the issue of redistributing rights of use in the 3G Liberalisation Advice.[36]

6.19 Overall, the lead times for the release of a material block of spectrum in a way that does not raise the risk of significant consumer detriment are considerable, and are likely to be longer than the Interim Period and therefore ineffective in terms of increasing the number of competitors with access to LTE1800 during that Interim Period. Furthermore, any quicker redistribution would be a significant intervention and would raise material risks of disruption to existing services and could result in consumer losses.

Conclusion

6.20 Even if there was a material risk of a temporary distortion of competition following liberalisation of EE's 1800MHz licences, for the reasons set out above, we consider that the most appropriate and proportionate action would be for us to liberalise EE's licences as soon as possible.

Enduring competitive advantage associated with liberalisation of 1800 MHz for LTE

6.21 We now consider the possibility of a distortion to competition which endures beyond the Interim Period.

6.22 In this alternative, if EE were able to provide LTE services and high peak data rates ahead of its competitors and was able to establish and maintain a first mover advantage which persisted even once other operators were able to deploy LTE (i.e. using divestment 1800MHz, 800 MHz and 2.6 GHz spectrum), this could reduce competitive intensity and the benefits to consumers over the longer term.

6.23 An enduring first mover advantage might arise if, for example, EE:

- gains a reputation for offering high quality mobile data services; and/or

[36] http://stakeholders.ofcom.org.uk/binaries/consultations/spectrumlib/annexes/annexes-to-advice.pdf

- is able to lock in customers and market share during the Interim Period (for example, due to contract terms and length and cost of contract termination, as well as non contractual switching costs).

6.24 We considered the scope for enduring first mover advantages associated with having an early route to LTE and peak data rates in our January 2012 consultation.[37] We considered:

- The factors that could lock in customers during the first mover period are unlikely to be significant. In any case, these factors may also undermine the first mover advantage of launching LTE early since lagging firms may be protected by their existing customers' inertia.

- Also, even if early LTE customers are completely locked in, the pool of potential customers will be expanding over time as people upgrade. For enduring first mover advantages to be significant a national wholesaler would have to lock-in not only early adopters but many other potential LTE customers.

- Finally, it is also plausible that a first mover may find itself at a competitive disadvantage in the longer term compared to other competitors that deploy LTE at a later date. A competitor with an early route to LTE may face uncertainty in offering a new set of services. Later LTE providers may benefit from a first mover's investment in developing LTE service and consumer demand and could for example 'free ride' on this.

6.25 In light of the above, we consider that liberalisation of EE's 1800 MHz spectrum for LTE is unlikely to lead to an enduring competitor advantage even if it led to competitor advantage in the Interim Period. However, for completeness we consider below the situation where liberalisation would result in an enduring competitor advantage, and consider whether there are appropriate and proportionate measures which we could take to address any such enduring advantage.

Assessment of potential measures to address any enduring distortion to competition

6.26 If EE were to have an advantage which was enduring beyond the Interim Period, it is possible that the costs to consumers after the Interim Period from liberalising EE's 1800 MHz spectrum could outweigh the benefits they would enjoy from liberalisation during the Interim Period.

6.27 In the presence of enduring first mover advantages, it may be appropriate and proportionate to delay liberalisation in those circumstances where the benefits of avoiding a competitive distortion outweigh the costs, in terms of consumer benefits foregone from delaying the availability of new LTE services.

6.28 The shorter the duration of any first mover advantage following the Interim Period, the more likely that liberalisation of EE's 1800 MHz spectrum for LTE as soon as possible brings net benefits to consumers. However, the magnitude of any first mover advantage is unlikely to be independent of the magnitude of the consumer benefits from early liberalisation. The circumstances under which the costs of liberalising as soon as possible (in the form of distorted or reduced competition after the Interim Period) may be material are also likely to be the same circumstances in which the

[37] http://stakeholders.ofcom.org.uk/binaries/consultations/award-800MHz/annexes/2nd_Condoc_Annex_6.pdf

benefits (from the earlier availability of high quality LTE services in the Interim Period) would be material. For example, the greater the advantages of LTE over HSPA, the greater the risk and potential magnitude of a first mover advantage, but also the greater the likely consumer benefits from liberalisation as soon as possible.

6.29 In light of the above, it is in our view unlikely that it would be appropriate and proportionate to delay liberalisation on this basis. We consider that even if there were some enduring competitor advantages as a result of liberalising EE's 1800 MHz spectrum for LTE as soon as possible, the costs associated with any distortion to competition would be unlikely to outweigh the benefits to consumers from having early access to new and improved mobile services – particularly given the correlation between any distortion of competition and the scale of consumer benefits in the Interim Period.

6.30 Furthermore, there may be unintended consequences of delaying liberalisation of EE's 1800 MHz spectrum for LTE, such as reducing the incentives on other competitors to respond to an early launch of LTE services in a way that is beneficial for consumers (for example, by deploying the latest standard of HSPA more quickly than they would otherwise have done).

6.31 For the reasons set out above, we consider that imposing regulated access to 1800 MHz spectrum and redistributing the rights to use 1800 MHz spectrum would be unlikely to increase competition during the Interim Period and therefore unlikely to reduce the magnitude or duration of any first mover advantage. Even if it were possible to impose regulated access or redistribute 1800 MHz spectrum rights more quickly, in the alternative where there was an enduring first mover advantage, we consider that it is unlikely that these measures would be appropriate and proportionate given the likely extent of benefits to consumers where there is a risk of distortion to competition and the risks of regulatory failure.

6.32 Therefore, even in the alternative where there was an enduring competitor advantage associated with liberalisation of EE's 1800 MHz spectrum for LTE, it is our view that the most appropriate and proportionate action would still be for us to liberalise EE's 1800 MHz spectrum for LTE as soon as possible in the interests of citizens and consumers.

Section 7

Conclusions

7.1 Our view is that there is no material risk of a distortion to competition as a result of liberalisation of EE's 1800 MHz licences for LTE and WiMAX technologies. Indeed, it is in our view in the interests of consumers and citizens for EE's licences to be liberalised as soon as possible.

7.2 We are therefore proposing to agree to EE's request to vary its 1800MHz licences to permit the deployment and use of LTE and WiMAX technology. The variation that we are intending to make is set out in Annex 5. Interested parties are invited to comment on any aspect of this proposal. The deadline for responses is 17 April.

7.3 Telefónica and Vodafone also hold licences for use of 1800 MHz spectrum. If we received similar licence variation requests in respect of those licences, our current view is that we would be minded to deal with them in a manner similar to our proposed approach to EE's request.

Annex 1

Responding to this consultation

How to respond

A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 17 April 2012**.

A1.2 Ofcom strongly prefers to receive responses using the online web form at https://stakeholders.ofcom.org.uk/consultations/variation-1800mhz-lte-wimax/howtorespond/form , as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email 1800mhzlib@ofcom.org.ukattaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Jon Higham
Floor 3
Spectrum Policy Group
Riverside House
2A Southwark Bridge Road
LondonSE1 9HA

A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6 It would be helpful if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Jon Higham on 020 7981 3673.

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether

all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accoun/disclaimer/

Next steps

A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in May 2012.

A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

EmailGraham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.

A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your coversheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name

Signed (if hard copy)

Annex 4

Technical conditions for use of LTE and WiMAX at 1800 MHz in the UK

Introduction

A4.1 This Annex sets out our assessment of the impact authorising use of LTE and WiMAX within the spectrum licensed to EE at 1800MHz would have on other radio services and users. It focuses on the potential for harmful interference that LTE and WiMAX services could cause to users of adjacent and near adjacent bands. It does not consider the impact of interference on 1800MHz spectrum use from users of adjacent bands.

A4.2 The structure of this annex is as follows:

- Details of allocations and uses adjacent to the 1800 MHz band.
- A summary of the research conducted to date; primarily this is the compatibility analyses conducted by CEPT.
- A summary of our conclusions regarding technical compatibility.

Adjacent bands

A4.3 The following frequency allocations and uses have been considered within the scope of our analysis as they are in the vicinity of the 1800MHz band:

Table 3: 1800 MHz UK allocations and uses

Band (MHz)	Uses	Notes
1690 – 1710	Meteorological Satellite	
1698 – 1700	Fixed Links	Emergency Services use, paired with 1668-1670 MHz.
1710.1 - 1721.7	GSM1800 Uplink	Licensed to Telefónica and Vodafone for GSM and UMTS.
1721.7 - 1736.7	GSM1800 Uplink	Licensed to EE for GSM and UMTS. To be divested as part of the France Télécom and Deutsche Telekom commitments given as part of the *T-Mobile/Orange* merger.
1736.7 - 1781.7	GSM1800 Uplink	Licensed to EE for GSM and UMTS.
1781.7 - 1785.0	Concurrent Spectrum Access Uplink	Technology neutral, but we understand all current installations use GSM technology.
1785.0 - 1800.0	PMSE	Coordinated by JFMG in Great Britain only

		(not Northern Ireland).
1785.0 - 1805.0	Spectrum Access in Northern Ireland	Licences awarded by auction in 2007 in Northern Ireland by the UK and the Republic of Ireland. Licensed to Personal Broadband UK Ltd
1790.0 - 1798.0	Emergency Services	
1805.1 - 1816.7	GSM1800 Downlink	Paired with 1710.1 - 1721.7 MHz.
1816.7 - 1831.7	GSM1800 Downlink	Paired with 1721.7 - 1736.7 MHz.
1831.7 - 1876.7	GSM1800 Downlink	Paired with 1736.7 - 1781.7 MHz.
1876.7 - 1880.0	Concurrent Spectrum Access Downlink	Paired with 1781.7 - 1785.0 MHz.
1880 - 1900	DECT	

A4.4 In addition to the frequency assignments identified in Table 3 above, the UK Frequency Allocation Table identifies specific Ministry of Defence sites where coordination or restrictions apply.[38]

Out of Band Emissions

A4.5 The requirements for Out of Band (OOB) emissions in EN301 908-14 for LTE base stations with channel bandwidths of 5,10, 15 or 20 MHz and EN301 908-22 for WiMAX base stations with channel bandwidths of 5 or 10 MHz are identical to those in EN 301 908-3 for UMTS base stations operating in the 1800MHz band. There is an additional OOB emission requirement for LTE base stations and 10MHz WiMAX base stations at a frequency separation of more than 10 MHz from the channel edge that is more restrictive than the UMTS requirement.

A4.6 The requirements for OOB emissions in EN301 908-13 for LTE mobile stations with a channel bandwidth of 5 MHz and in EN301 908-21 for WiMAX mobile stations with a 5 or 10MHz channel bandwidth are broadly equivalent to those in EN 301 908-2 for UMTS mobile stations operating in the 1800MHz band.

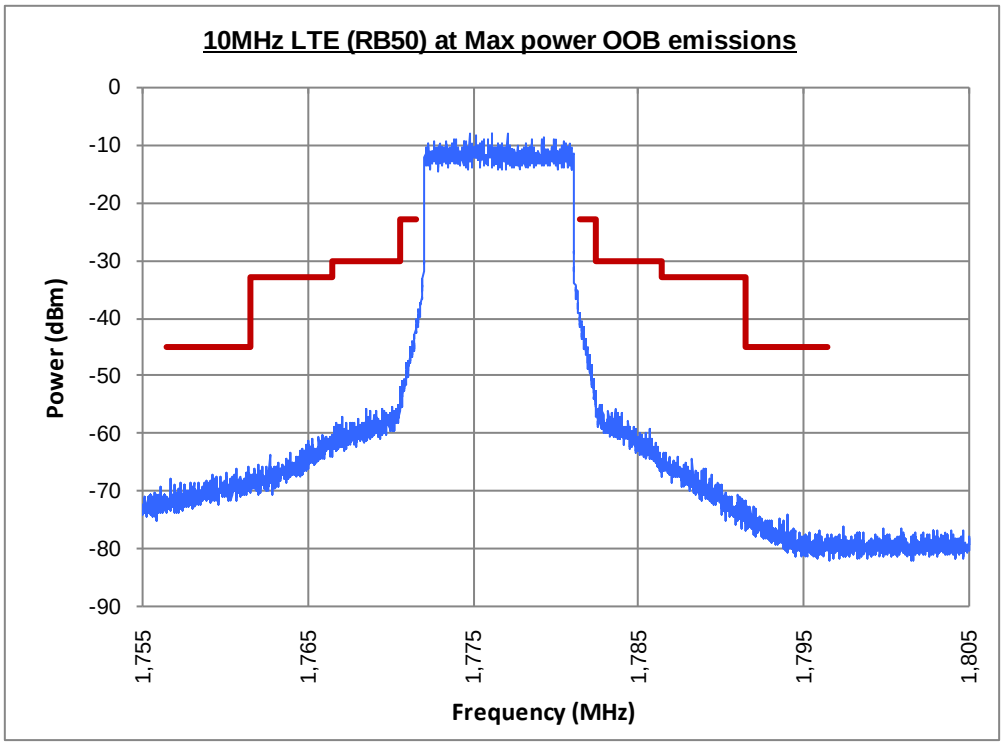
A4.7 However, for LTE channel widths of 10, 15 and 20MHz the OOB emission levels at frequencies greater than 6 MHz and less than one channel width from a channel edge are permitted to be 12dB higher than for an equivalent 5 MHz UMTS channel.

A4.8 Ofcom has undertaken measurements of OOB emissions from a number of available LTE devices as part of its ongoing work on the forthcoming 800 MHz and 2600 MHz award. In addition, Ofcom has undertaken measurements of the OOB emissions from an LTE device operating in Band 3 (the 1800 MHz band). Ofcom's results indicate that the level of OOB emissions in practice often fall to levels significantly lower than those permitted by ETSI EN301 908-13 as the frequency

[38] http://stakeholders.ofcom.org.uk/spectrum/spectrum-management/UK-FAT-Table-2010/

separation from the block edge increases. These results are shown in Figure 1 below.

Figure 2: OOB emissions measured from an LTE device operating at 1800MHz (red line shows the spectral emissions mask in the standard with all measurements normalised to a 10 kHz measurement bandwidth)



CEPT Studies on Compatibility

A4.9 Ofcom has undertaken no detailed analysis of the compatibility of LTE systems with those operating in or adjacent to the 1800 MHz bands. We have instead relied on the work undertaken in CEPT when making our assessments.

A4.10 Ofcom has not undertaken measurements of blocking to LTE receivers or to the receivers of services in adjacent or near adjacent bands. The blocking characteristics of LTE receivers are set out in relevant ETSI standards.

A4.11 CEPT has published two reports on compatibility of LTE and WiMAX systems with those operating in adjacent bands. The CEPT reports are:

- CEPT Report 40: "Compatibility study for LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands)"[39]; and
- CEPT Report 41: "Compatibility between LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands) and systems operating in adjacent bands".[40]

[39] http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP040.PDF
[40] http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP041.PDF

A4.12 Table 4 contains relevant extracts from these CEPT reports:

Table 4: Relevant Summary conclusions from CEPT Reports[41]

Section of Report	Band/Scenario (interferer >victim)	Summary Result
Report 41, Section 9	1710 MHz. LTE/WiMAX MS to METSAT Earth station receivers	The METSAT Earth stations have been adjacent to GSM1800 for many years, and have not experienced interference from GSM MS transmissions. CEPT has stated that it is believed that the interference from LTE/WiMAX UE to METSAT Earth Stations operating in adjacent frequency band is unlikely to be a problem.
Report 41, Section 11	1710 MHz/1785 MHz/1805 MHz. LTE/WiMAX BS to fixed service	Compatibility between UMTS and Fixed Services operating in co-frequency and adjacent bands was studied and reported in ERC Report 065 [42] and ERC Report 064 [43]. As described in these two ERC Reports, the critical interference scenarios are between UMTS BS and Fixed Service stations. CEPT has concluded that these Reports are also applicable to LTE/WiMAX. The Fixed Service frequency range is adjacent to LTE/WiMAX1800 UL at 1710 MHz and 1785 MHz. The potential interference, if any, will be between Fixed Service and LTE/WiMAX1800 BS at 1805 MHz. The interference analysis method used in the two ERC Reports can be used to derive the coordination distance, that is the separation distance between LTE/WiMAX BS and Fixed Service stations as a function of frequency separations between LTE/WiMAX base station and Fixed service station, as an interference prevention solution, as described in ERC Reports 064 and 065.

[41] The conclusions in this table are transcribed directly from the CEPT report.
[42] ERC Report 065 "Adjacent band compatibility between UMTS and other services in the 2 GHz band", November. 1999. http://www.erodocdb.dk/Docs/doc98/official/pdf/REP065.PDF
[43] ERC Report 064 "Frequency sharing between UMTS and existing fixed services", May 1999 http://www.erodocdb.dk/Docs/doc98/official/pdf/REP064.PDF

Section of Report	**Band/Scenario (interferer >victim)**	**Summary Result**
Report 41, Section 8	1880 MHz. LTE/WiMAX BS to DECT BS/MS	CEPT has concluded that the interference created by the LTE/WiMAX1800 system would be similar to the interference created by GSM1800. CEPT has stated that no guard band is required between LTE/WiMAX1800 and DECT allocations, provided that DECT is able to properly detect interference on closest DECT carriers F9-F7 and escape to more distant carriers F6-F0 within 1880 - 1900 MHz. CEPT has concluded that LTE/WiMAX1800 macro-cells can be deployed in the same geographical area in co-existence with DECT which is deployed inside of the buildings, as the interference between DECT RFP and PP and macro-cellular LTE/WiMAX1800 BS and UE is not a problem; When pico-cellular LTE/WiMAX1800 BS is deployed inside of the building in co-existence with DECT RFP and PP deployed in the same building indoor area, CEPT has concluded that some potential interference is likely to exist from indoor pico-cellular LTE/WiMAX1800 BS to DECT if they are placed too close and they are operating in the adjacent channel at 1880 MHz;
Report 40, Section 9 Section 10, Section 11	LTE complying with LTE Standards, as published by ETSI, in particular EN301908-1, EN301 908-13, EN301908-14, and EN301908-11	CEPT has concluded that a frequency separation of 200 kHz or more between LTE channel edge and the GSM carrier's channel edge between a neighbouring LTE network and a GSM network is required. No frequency separation is required between LTE channel edge and the UMTS carrier's channel edge between a neighbouring LTE network and a UMTS network. No frequency separation is required between LTE channel edges between two neighbouring LTE networks. CEPT has concluded that these recommended technical conditions could be relaxed at a national level based on agreement between operators.

Summary

A4.13 The CEPT has conducted an assessment of the compatibility of LTE and WiMAX systems operating in the 1800 MHz band with other services operating in, adjacent to, or nearly adjacent to the 1800 MHz band. As the issue of compatibility with adjacent bands has already been considered in depth by the CEPT we have not conducted any further work of our own in relation to this issue.

A4.14 The CEPT analyses suggests that in most cases there is likely to be little impact on adjacent or near adjacent bands as a result of permitting the use of LTE in addition to the currently permitted UMTS and GSM technologies. However, the aforementioned CEPT analyses suggest that some coordination between users might be required to:

- Ensure a 200kHz channel edge separation between LTE and adjacent GSM use
- manage the risk of interference with fixed (point-to-point) links operating adjacent to the 1800 MHz band
- Ensure appropriate frequency separation is maintained between LTE and PMSE use.

A4.15 The CEPT's suggestion with regard to maintaining a separation of 200kHz from GSM is consistent with current UK licence conditions for UMTS. We propose to ensure the relevant conditions are maintained for LTE / WiMAX within the proposed licence variation.

A4.16 With regard to fixed (point-to-point) links and PMSE, we note that coordination with GSM and UMTS is not currently considered necessary. Our expectation is that this would remain the case for LTE.

A4.17 CEPT has not specifically studied compatibility of the:

- use permitted in 1785-1805 MHz band in Northern Ireland;
- Emergency services systems operating in the 1790-1798 MHz band on the UK mainland.

A4.18 For these services and technologies we note that the ETSI standards permit greater levels of OOB emissions for wide channel LTE systems than would be permissible if a UMTS carrier was being used. However, we also note with reference to Figure 2 that the OOB emissions in practice are significantly below the limits required by the ETSI standard.

A4.19 As neither CEPT nor Ofcom has undertaken detailed analysis of the services and uses identified in paragraph A4.17, we cannot rule out the possibility that some additional measures may be required in order to ensure that these can continue to coexist with mobile services in the 1800 MHz band if a channel width greater than 5 MHz is deployed by EE close to the top of the band. Our current expectation is that any issues should be capable of being addressed by provisions already within EE's licence (e.g. the co-ordination and sharing procedures). However, we will give further consideration to this issue in advance of varying the licence.

A4.20 If further measures are required to address the impact of LTE on the services and uses identified in paragraph A4.17 we would not expect any such additional measures to extend to frequencies lower than 1766.7 MHz in the uplink 1800MHz band even in the worst case.

Annex 5

Draft varied licences

A5.1 This annex provides a draft of EE's licences with changes giving effect to the proposed variation underlined.

Wireless Telegraphy Act 2006
Office of Communications (Ofcom)

PUBLIC WIRELESS NETWORK LICENCE – DRAFT SUBJECT TO REVIEW

This Licence replaces the Licence issued by the Office of Communications (Ofcom) on dd mm yyyy to Everything Everywhere Limited.

Licence no. **x**

Date of issue: **dd m yyyy**

Fee payment date: **31 January** (annually)

1. Ofcom grants this licence to

Everything Everywhere Limited
("the Licensee")
Hatfield Business Park
Hatfield
Hertfordshire
AL10 9BW

to establish, install and use radio transmitting and receiving stations and/or radio apparatus as described in the schedule(s) (herein after together called "the Radio Equipment") subject to the terms, set out below.

Licence Term

2. This Licence shall continue in force until revoked by Ofcom or surrendered by the Licensee.

Licence Variation and Revocation

3. Pursuant to Schedule 1(8) of the Wireless Telegraphy Act 2006 ("the 2006 Act"), Ofcom may not revoke or vary this Licence under Schedule 1(6) of

the 2006 Act save at the request or with the consent of the Licensee except:

(a) in accordance with clause 6 of this Licence;

(b) in accordance with Schedule 1 paragraph 8(5) of the 2006 Act;

(c) for reasons related to the management of the radio spectrum, provided that in such case the power to revoke may only be exercised after five years notice is given in writing and after Ofcom has considered any pertinent factors;

(d) if, in connection with the transfer or proposed transfer of rights and obligations arising by virtue of the Licence, there has been a breach of any provision of Regulations made by Ofcom under the powers conferred by section 30(1) and (3) of the Act[44]

(e) if there has been a breach of any of the terms of this Licence or the schedule(s) hereto.

Changes

4. This Licence may not be transferred. The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30 of the Act.[45]

5. The Licensee must give prior or immediate notice to Ofcom in writing of any change in the details of the name and/or address recorded in paragraph 1 of this licence.

Fees

6. The Licensee shall pay Ofcom the relevant fee as provided in section 12 of the 2006 Act and the Regulations made thereunder on or before the fee payment date shown above each year, or on or before such dates as shall be notified in writing to the Licensee, failing which Ofcom may revoke this Licence.

Radio Equipment Use

7. The Licensee must ensure that the Radio Equipment is constructed and used only in accordance with the provisions specified in Schedule 1 of this Licence. Any proposal to amend any detail specified in Schedule 1 of this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.

[44] These are regulations on spectrum trading.
[45] See Ofcom's website for the latest position on spectrum trading and the types of trade which are permitted.

8. The Licensee must ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.

Access and Inspection

9. The Licensee shall permit a person authorised by Ofcom:

(a) to have access to the Radio Equipment; and

(b) to inspect this Licence and the Radio Equipment,

at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

Modification, Restriction and Closedown

10. A person authorised by Ofcom may require the Radio Equipment, or any part thereof, to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:

(a) a breach of this Licence has occurred; and/or

(b) the use of the Radio Equipment is causing or contributing to undue interference to the use of other authorised radio equipment.

11. Ofcom may in the event of a national or local state of emergency being declared require the Radio Equipment to be modified or restricted in use, or temporarily or permanently closed down either immediately or on the expiry of such period as Ofcom may specify. Ofcom shall exercise this power by a written notice served on the Licensee or by a general notice applicable to holders of this class of Licence.

Geographical Boundaries

12. This Licence does not authorise the establishment and use of the Radio Equipment on the Isle of Man or any of the Channel Islands.

Interpretation

13. In this Licence:

(a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of stations and installation

and use of apparatus for wireless telegraphy as specified in section 8(1) of the 2006 Act;

(b) the expression " interference" shall have the same meaning that it has under the 2006 Act (Section 115);

(c) the expression "inspect" includes examine and test;

(d) the schedule forms part of this Licence together with any subsequent schedule(s) which Ofcom may issue as a variation to this Licence at a later date; and

(e) the Interpretation Act 1978 shall apply to the Licence as it applies to an Act of Parliament.

Issued by Ofcom

Office of Communications

SCHEDULE 1 TO LICENCE NUMBER: **x**

Licence Category: **Public Wireless Network**

This schedule forms part of licence no **x**, issued to **Everything Everywhere Limited**, the Licensee on **dd mm yyyy**, and describes the Radio Equipment covered by the Licence and the purpose for which the Radio Equipment may be used.

Description of Radio Equipment Licensed

1. In this Licence, the Radio Equipment means the base transceiver stations or repeater stations forming part of the Network (as defined in paragraph 2 below).

Purpose of the Radio Equipment

2. The Radio Equipment shall form part of a radio telecommunications network ("the Network"), in which User Stations which meet the appropriate technical performance requirements as set out in the relevant Wireless Telegraphy (Exemption) Regulations made by Ofcom communicate by radio with the Radio Equipment to provide a telecommunications service.

Approved Standards for the Radio Equipment

3. The Radio Equipment covered by this Licence shall comply with the appropriate Interface Requirement (IR 2014 – Public Wireless Networks and/or IR 2019 – Third Generation Mobile and/or IR 2087 - 900 / 1800 MHz LTE and WiMAX) or for equipment placed on the market before 8 April 2000, is required to be type approved in accordance with a recognised technical performance standard relating to the service licensed.

Special Conditions relating to the Operation of the Radio Equipment

4.

(a) During the period that this Licence remains in force and for 6 months thereafter, the Licensee shall compile and maintain accurate written records of:

(i) The following details relating to the Radio Equipment:

a) postal address;

b) National Grid Reference, (to 100 Metres resolution);

c) antenna height (AGL) and type;

d) radio frequencies in operation;

(ii) a statement of the number of subscribing customers using the Network;

and the Licensee must produce the above records when a person authorised by Ofcom requires him to do so.

(b) In respect of femtocell equipment and smart/intelligent low power repeater equipment, the conditions relating to the keeping of records contained in sub-paragraphs 4(a)(i)(a), 4(a)(i)(b) and 4(a)(i)(c), shall not apply.

(c) The Licensee shall inform Ofcom of the address of the premises at which this Licence and the information detailed at sub-paragraph (a) above shall be kept.

(d) The Licensee must submit to Ofcom copies of the records detailed in sub- paragraph (a) above at such intervals as Ofcom shall notify to the Licensee.

(e) The Licensee shall, upon request, supply Ofcom or any person authorised on their behalf with the name and address of any subscribing customers to the Network, or require its agents to provide such information on its behalf.

TECHNICAL PERFORMANCE REQUIREMENTS

5. The Radio Equipment shall be operated in compliance with such co-ordination and sharing procedures as may be considered necessary and notified to the Licensee by Ofcom (formerly the Radiocommunications Agency).

The Licensee must ensure that the Radio Equipment performs in accordance with the following technical performance requirements.

Frequencies of Operation

6. The Radio Equipment may operate on any of the following frequency bands:

Base Transmit / Mobile Receive	Base Receive / Mobile Transmit
[1846.7 – 1876.7 MHz – EE's 1800 MHz licences	**1751.7 – 1781.7** MHz under one of
1816.7 – 1846.7 MHz – 1800 MHz licence]	**1721.7 – 1751.7** MHz under EE's other

RF Carrier Spacing

7. In the absence of bilateral or multilateral agreements which have been notified to Ofcom specifying alternative arrangements between the licensee and the licensee(s) of neighbouring networks the licensee must ensure that in respect of the frequencies set out at paragraph 6 of this schedule:

- the centre frequency of any of their GSM carriers is 100 kHz or more inside any edge of their permitted frequency bands; and
- the centre frequency of any of their UMTS carriers is 2.7 MHz or more inside any edge of their permitted frequency bands where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum;
- the centre frequency of any of their UMTS carriers is 2.5 MHz or more inside any other edge of their permitted frequency bands;
- the channel edge of any of their LTE channels is 200 kHz or more inside any edge of their permitted frequency bands where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum;
- the channel edge of any of their LTE channels does not extend beyond their permitted frequency bands;
- the channel edge of any of their WiMAX channels is 200 kHz or more inside any edge of their permitted frequency bands where a neighbouring licensee has deployed a GSM carrier or carriers (including GSM-R) in the immediately adjacent spectrum; and
- the channel edge of any of their WiMAX channels does not extend beyond their permitted frequency bands.

ITU Class of Emission

8.

For GSM:	**271KG7W**
For UMTS:	**5M00D7W**
For 1.4 MHz LTE:	**1M40D7W**
For 3 MHz LTE:	**3M00D7W**
For 5 MHz LTE:	**5M00D7W**
For 10 MHz LTE:	**10M0D7W**
For 15 MHz LTE:	**15M0D7W**

For 20 MHz LTE: 20M0D7W

For 5 MHz WiMAX: 5M00D7W
For 10 MHz WiMAX: 10M0D7W

Maximum Permissible e.i.r.p.

9. The maximum e.i.r.p. per carrier for GSM is **32** dBW.
The maximum e.i.r.p. per carrier for UMTS is **32** dBW
The maximum e.i.r.p. per carrier for LTE is **31** dBW per 5 MHz
The maximum e.i.r.p. per carrier for WiMAX is **31** dBW per 5 MHz

Interpretation

10. In this Schedule:

(a) "e.i.r.p." means the effective isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);

(b) "IR" means a United Kingdom Radio Interface Requirement published by Ofcom in accordance with Article 4.1 of Directive 1995/5/EC of the European Parliament and of the Council on radio equipment and telecommunications terminal equipment (RTTE) and the mutual recognition of their conformity.

(c) "ITU" means the International Telecommunications Union, and "Class of Emission" shall have the meaning as defined in the ITU Radio Regulations Appendix 1.

(d) "RF" means Radio Frequency;

(e) "User Station" means any vehicle mounted or hands portable mobile station designed for mobile use and/ or any station designed or adapted to be established and used from static locations which meet the appropriate technical performance requirements as set out in the Wireless Telegraphy (Exemption) Regulations and either complies with the appropriate Interface Regulation listed in paragraph 3, or for equipment placed on the market before 8 April 2000, is type approved in accordance with a recognised technical standard relating to the service licensed.

(f) "A femtocell" is a base station of the Network which operates at a power not exceeding 20dBm e.i.r.p. per carrier which may be established by customers of the Network but which is or will be used only by and under

the control of the Network, following the establishment of a telecommunications link between the femtocell and the Network;

(g) A "smart/intelligent low power repeater" is a repeater of the Network which operates with power not exceeding 24dBm e.i.r.p. per carrier, which may be established by customers of the Network who have written agreements with the Licensee and:

- The Licensee has ultimate control of the repeater, i.e. each individual repeater can be disabled remotely by the Licensee;
- The repeater operates only on the Licensee's frequencies and with their valid Public Land Mobile Network Identifier;
- Must not cause undue interference to other spectrum users; and
- The repeater only transmits on the Licensee's Base Receive frequencies when actively carrying a call (voice, video or data) or signalling from serviced handsets.

(h) "GSM system" means an electronic communications network that complies with GSM standards, as published by ETSI, in particular EN 301 502 and EN 301 511 and "GSM" means pertaining to such a network or its Radio Equipment;

(i) "GSM-R" means the variant of GSM for railways as specified in IR2064; and

(j) "UMTS system" means an electronic communications network that complies with the UMTS standards as published by ETSI, in particular EN 301 908-2, EN 301 908-3 and EN 301 908-11 and "UMTS" means pertaining to such a network or its Radio Equipment.

(k) <u>"LTE system" means an electronic communications network that complies with the LTE standards as published by ETSI, in particular EN 301 908-1, EN 301 908-13, EN 301 908-14, EN 301 908-15 and EN 301 908-11 and "LTE" means pertaining to such a network or its Radio Equipment.</u>

(l) <u>"WiMAX system" means an electronic communications network that complies with the WiMAX standards as published by ETSI, in particular EN 301 908-1, EN 301 908-21 and EN 301 908-22 and "WiMAX" means pertaining to such a network or its Radio Equipment.</u>