



Variation of Concurrent Spectrum Access 1781 MHz Licence

A consultation on a request for variation of a
Spectrum Access licence in the concurrent spectrum bands
1781.7-1785 MHz paired with 1876.7-1880 MHz

	Consultation
Publication date:	29 April 2016
Closing Date for Responses:	31 May 2016

About this document

This document discusses our provisional proposal to grant a licence variation request submitted by TalkTalk plc in relation to its Concurrent Spectrum Access licence. The variation would facilitate the deployment of low-powered LTE apparatus that is currently available within the EU.

TalkTalk is one of 12 licensees authorised to use the 3.3 MHz of shared spectrum in the 1800 MHz band, 1781.7-1785 MHz paired with 1876.7-1880 MHz, also known as 'the DECT Guardband'. The licences were issued as technology neutral, subject to compliance with interface requirements IR2014 (GSM) or IR2045 (Concurrent 1781 MHz band) with a restriction to low-powered use.

The variation request seeks a modification to the permitted out-of-block emissions to allow the deployment of currently available femtocell technology without the need for additional filtering which would be required under the current licence terms.

We set out our preliminary view of the implications of this for co-spectrum and adjacent services and our provisional conclusion to grant the request.

We invite comments on this proposal by 31 May 2016.

Contents

Section		Page
1	Executive Summary	3
2	Introduction	1
3	TalkTalk's licence variation request	6
4	Ofcom's assessment of the out-of-band interference effects of the proposed licence changes	9
5	Ofcom's assessment of the in-band interference potential of the proposed licence changes	13
6	Competition, innovation and investment	15
Annex		Page
1	Responding to this consultation	17
2	Ofcom's consultation principles	19
3	Consultation response cover sheet	20
4	Consultation questions	22
5	Out of band emissions study	23
6	LTE to DECT coexistence study	24
7	LTE to DECT coexistence report	25
8	TalkTalk Licence and proposed technical changes	26

Section 1

Executive Summary

- 1.1 This document consults on a request by TalkTalk Limited for a variation of its Concurrent Spectrum Access 1781 MHz Wireless Telegraphy Act licence to change the permissible out-of-block emissions to facilitate use of 3GPP¹ compliant LTE² femtocells.
- 1.2 In 2006, Ofcom held an award process to allocate the spectrum by auction³ to a number of users, each sharing access to the band on a coordinated basis. 12 successful bidders received licences with identical terms and conditions of access to the spectrum, to be shared on a coordinated basis.
- 1.3 Although technology neutral, the licence was drafted before LTE was standardised in 3GPP and the permissible out-of-block emissions are based on a narrowband standard that is limiting to technologies developed subsequently because of the need for filtering in order to meet the licence conditions.
- 1.4 The proposed change would permit licensees to deploy 3GPP compliant LTE apparatus without the need for additional filtering. The variation, if granted, would be available on request to any holder of a Concurrent Spectrum Access 1781 MHz licence, some of whom have also expressed interest in the use of LTE.
- 1.5 The requirement to coordinate prospective assignments would remain in order to protect current GSM users of the band and to accommodate new GSM and LTE deployments and it is proposed that the current coordination process would be revised to facilitate this.
- 1.6 Ofcom has reviewed the technical evidence submitted by TalkTalk (reports compiled by Real Wireless), has considered the potential impacts to adjacent users and to concurrent sharers of the band and has reached the provisional conclusion that it is appropriate for us to grant TalkTalk's variation request. Ofcom has duties under UK and European law to remove obstacles to the provision of electronic communication networks and services, also to promote optimal use of the radio spectrum.
- 1.7 We note that the industry's Engineering Code of Practice (ECoP) appears oriented towards GSM technology and that some of the processes set out for considering other technologies are not consistent with the approach taken by TalkTalk.
- 1.8 Our proposal is that we should grant the requested variation and invite licensees to consider revising the ECoP to facilitate the deployment of a range of technologies within the band.
- 1.9 Comments on Ofcom's provisional conclusion that we should grant the requested variation are invited by 5pm on 31 May 2016. Subject to consideration of responses we intend to vary TalkTalk's WT Act licence as soon as practicable and to make that variation available to other eligible licensees on request.

¹ 3GPP – Third Generation Partnership Project, a collaboration between telecommunication standards development bodies

² LTE – a 4G standard for wireless communication

³ http://stakeholders.ofcom.org.uk/spectrum/spectrum-awards/awards-archive/completed-awards/award_1781/

Section 2

Introduction

Scope of this document

- 2.1 In this section we outline the relevant factual background to the Concurrent Spectrum Access 1781 MHz licences and set out TalkTalk's request for a licence variation. We then discuss the applicable legal and analytical framework applied in reaching our provisional conclusion.
- 2.2 Section 3 discusses the changes being requested, sections 4 and 5 consider Ofcom's assessment of the variation request and the potential impact on affected spectrum users of permitting the relaxation of out-of-block emission limits. Section 6 sets out Ofcom's preliminary conclusion.

Background to licence variation request

- 2.3 Licences for use of the 1781.7-1785 MHz and 1876.7-1880 MHz bands are held by 12 companies:

BT Telecommunications PLC
 BT Onephone Limited
 COLT Mobile Telecommunications Limited
 FMS Solutions Limited
 Mundio Mobile Limited [* formerly Mapesbury Communications Limited]
 TalkTalk Communications Limited [* formerly Opal Telecom Limited]
 PLDT (UK) Limited
 Shyam Telecom Limited
 Telefónica (UK) Limited
 Teleware plc
 UK Broadband Limited
 Vodafone Limited

(* Company name may have subsequently changed and will be updated when licences are next re-issued or varied).

- 2.4 Spectrum in the 1800 MHz band was first licensed for GSM1800 (2G) to mobile network operators in the early 1990s. As a precautionary measure, it was decided to create a guardband of 3.3 MHz between GSM use and the DECT cordless telephony allocation of 1880 – 1900 MHz.
- 2.5 However, studies suggested that low power use in the band would not adversely impact either GSM or DECT users and, in 2006, Ofcom held a wireless telegraphy award process⁴ to allocate use of these radio frequency bands to a number of users, each sharing access to the bands across the UK but on the basis that such access was to be coordinated between them.
- 2.6 The auction determined the number of sharing licensees as well as the price bid by each bidder. All successful bidders received wireless telegraphy licences with identical terms and conditions of access to the spectrum.

⁴ http://stakeholders.ofcom.org.uk/spectrum/spectrum-awards/awards-archive/completed-awards/award_1781/

- 2.7 These licences required licensees to agree how to coordinate assignments and share the spectrum, through an industry “Engineering Code of Practice” (ECoP) and, as part of this, a registration database was set up by the industry to manage the assignments made.

Variation Request

- 2.8 TalkTalk plc has submitted a request for a variation to its Concurrent Spectrum Access licence, to change the permissible out-of-block emissions to facilitate use of 3GPP compliant LTE femtocells⁵ operating at maximum of 24 dBm in-band, noting the need for an appropriate or revised Interface Requirement to facilitate such use.
- 2.9 No change would be required to existing in-band power spectral density limits which would have a carrier-centre frequency of 1878.4MHz. However, other factors including the ECoP and the coordination with other licensees would need also to be considered as part of the solution.
- 2.10 Although the original licensing concept was ‘...not [to] specify particular categories of permitted use, which could limit the efficient use of the Spectrum Bands ...’ the licence was drafted before LTE was standardised in 3GPP⁶. Wideband technology (such as CDMA2000 1x) was considered and is allowed, however the permissible out-of-block emissions specified in the licence are derived from 3GPP TS 05-05 – the standard for GERAN (GSM/EDGE Radio Access Network) systems, a narrowband standard which is limiting to technologies that developed subsequently. The use of later-standardised wideband technologies requires the licence to contain revised out-of-block conditions to be compatible with those technologies.
- 2.11 Since all the licences are the same, the considerations are the same across all of the licences, and in the interests of fairness Ofcom considers that it should offer the same variation, if granted, to any eligible holder of a licence in this category.

Legal Framework

- 2.12 The applicable legal framework derives from our duties under both European and domestic legislation, specifically from:
- the Common Regulatory Framework⁷ for electronic communications networks and services, in particular, the Framework Directive and the Authorisation Directive – together with a number of Decisions that apply to these specific spectrum bands; and
 - the Communications Act 2003 (the “2003 Act”) and the Wireless Telegraphy Act 2006 (the “2006 Act”) which transpose the provisions of those directives into national law.

⁵ “Local Area BS, 3GPP TS 36.104 (<http://www.3gpp.org/dynareport/36104.htm>)

⁶ The 3rd Generation Partnership Project (3GPP) is a collaboration between groups of telecommunications associations, that maintains and develops standards for 2G, 3G and 4G technologies, including GSM, UMTS and LTE.

⁷ The Common Regulatory Framework comprises the Framework Directive (Directive 2002/21/EC), the Authorisation Directive (Directive 2002/20/EC), the Access Directive (Directive 2002/19/EC), the Universal Service Directive (Directive 2002/22/EC) and the Directive on privacy and electronic communications (Directive 2002/58/EC), as amended by the Better Regulation Directive (Directive 2009/140/EC).

European Law

- 2.13 There are a number of European Directives and Decisions that relate specifically to the 1800 MHz frequency band.
- 2.14 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”.
- 2.15 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 in the provision of electronic communications networks and services by, amongst other things by ensuring that there is no distortion or restriction of competition in the electronic communications sector and by encouraging efficient use and ensuring the effective management of radio frequencies; and
 - to contribute to the development of the internal market by, amongst other things, removing obstacles to the provision of electronic communications networks and services at a European level and encouraging the interoperability of pan-European services.

The 2003 Act and the 2006 Act

Duties

- 2.16 The requirements of Article 8 of the Framework Directive are given effect to by our duties under the 2003 Act (in particular section 3 and 4) and the 2006 Act (in particular section 3).
- 2.17 Our principal duty under the 2003 Act is to further the interests of citizens in communications matters, and the interests of consumers in relevant markets, where appropriate by promoting competition.
- 2.18 By virtue of our principal duty, we are required to secure (amongst other things) the optimal use for wireless telegraphy of the electro-magnetic spectrum, and the wide availability throughout the UK of a wide range of electronic communications services.
- 2.19 In performing those duties, we are also required to have regard to various matters where they appear to us to be relevant in the circumstances, including the desirability of promoting competition in relevant markets, the desirability of encouraging investment and innovation in relevant markets, and the desirability of encouraging the availability and use of high speed data transfer services throughout the UK.
- 2.20 In furthering the interests of consumers, we must have regard in particular to the interests of those consumers in respect of choice, price, quality of service and value for money.

- 2.21 In performing our principal duty, we must have regard in all cases to the principles under which regulatory activities must be transparent, proportionate, consistent and targeted only at cases in which action is needed.
- 2.22 The 2006 Act requires us, amongst other things, to have regard to the desirability of promoting the efficient management and use of the part of the electromagnetic spectrum available for wireless telegraphy. It also requires us to ensure that wireless telegraphy licence conditions are objectively justified in relation to the networks and services to which they relate, non-discriminatory, proportionate and transparent.

Powers

- 2.23 Section 9 of the 2006 Act gives Ofcom the power to grant wireless telegraphy licences subject to such terms as Ofcom thinks fit.
- 2.24 Schedule 1(6) of the 2006 Act gives Ofcom a general discretion to vary wireless telegraphy licences and sets out the process that Ofcom must follow.
- 2.25 Ofcom has a broad discretion under Schedule 1(6) of the 2006 Act to agree to vary licences but there are some limitations on that discretion. These include the following:
- UK obligations under EU law or international agreements where use of spectrum has been harmonised: Ofcom will not agree to remove restrictions from licences or other changes that would conflict with the UK's obligations under international law;
 - Ofcom must comply with any direction from the Secretary of State under section 5 of the 2003 Act or section 5 of the 2006 Act;
 - Ofcom must act in accordance with its statutory duties, including the duty to ensure optimal use of the spectrum;
 - General legal principles, which include the duties to act reasonably and rationally when making decisions and to take account of any legitimate expectations;
 - Any restrictions on variation contained in the relevant licences themselves, subject Schedule 1(8)(5) of the 2006 Act.

Process for considering a licence variation request

- 2.26 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:
- notice of the proposed change is given in an appropriate manner; and
 - 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).
- 2.27 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.

Framework for analysis of licence variation requests

- 2.28 In section 4, the analytical framework we have applied in considering this variation request reflects our relevant regulatory objectives and our statutory duties, as set out above. Of particular relevance to our assessment are our principal duties, which are to further the interests of citizens in relation to communications matters; to further the interests of consumers in relevant markets, where appropriate, by promoting competition; and to promote optimal use of spectrum.
- 2.29 We have considered both the likely impact on competition of granting the variation and the likely impact on spectrum management, in particular the impact on existing licensed or exempted use of adjacent spectrum.

Impact of proposed licence changes on competition, innovation and investment

- 2.30 In deciding whether to vary TalkTalk's licence as requested, we have considered the extent to which varying the licence would:
- further the interests of consumers by, for example, encouraging innovation, investment and the availability and use of mobile services throughout the UK; and result in better choice, price, quality of service and value for money; and/or
 - give rise to a material risk of a distortion of competition to the detriment of consumers such that any benefits to consumers resulting from varying those licences without delay would be outweighed by the detriment to consumers resulting from such a distortion of competition.

Impact of proposed licence changes on other users of the radio spectrum: in-band and out-of-band

- 2.31 Ofcom's general policy is to set technical restrictions that are the minimum necessary to provide adequate protection against harmful interference. This is because optimal use of the radio spectrum is more likely to be secured if users decide, rather than Ofcom dictates, the way in which technology is used or a service is provided in a particular frequency band.
- 2.32 Imposing the minimum necessary constraints will increase users' flexibility and freedom to respond to changing conditions and to make best use of the valuable spectrum resource.
- 2.33 Following on from this, we have considered whether granting the variation would be consistent with the minimum necessary to provide adequate protection against harmful interference.
- 2.34 With regard to our assessment of harmful interference, we have considered separately in-band and out-of-band interference.
- 2.35 As well as our consideration of the proposed variation and technical assessment, we attach at Annexes 5, 6 and 7 the technical evidence provided by TalkTalk in technical reports prepared by Real Wireless.

Section 3

TalkTalk's licence variation request

Concurrent Spectrum Access Licences

- 3.1 In 2006 Ofcom held an auction for the spectrum 1781.7 – 1785.0 MHz paired with 1876.7 – 1880.0 MHz⁸. Twelve licences were awarded, each having equal rights to shared use of the whole spectrum range, subject to coordination with other sharers. The licences were technology neutral, referencing the Interface Requirements IR 2014 (GSM) and IR 2045 (Concurrent Spectrum Access).
- 3.2 The award was held before LTE was standardised in 3GPP. Wideband technology (such as CDMA2000 1x) was considered and is allowed, however the permissible out-of-block (OOB) emissions specified in the licence are derived from 3GPP TS 05-05 – the standard for GERAN (GSM/EDGE Radio Access Network) systems.
- 3.3 A condition in the licences required the development of an industry 'Engineering Code of Practice' (ECoP) to facilitate sharing within the band. The licence stated that if a Code was not agreed, Ofcom would impose a code under the licence. The Code was finally developed by the "Mobile 200 Group" which was formed by the industry in connection with the Federation of Communications Services (FCS). The version of the ECoP adopted, by the majority of licensees, was version 1.2 dated 9 September 2008. A registration process for new installations, to manage the coordination of sites was also created.
- 3.4 The licences require each licensee to "...use its best endeavours to adhere to..." the ECoP. However the ECoP recognises that "...where there are inconsistencies or contradictions between [the] ECoP and the Licences the Licence shall take precedence".
- 3.5 The ECoP sets out engineering assumptions based on the deployment of GSM technology, which some licensees have done. The ECoP also set guidelines for assessing compatibility when introducing alternative technologies into the band, including an obligation to use a SEAMCAT® (Spectrum Engineering Advanced Monte Carlo Analysis Tool) study to address compatibility issues.

TalkTalk's licence variation request

- 3.6 TalkTalk approached Ofcom in 2014 to request a variation to their Concurrent Spectrum Access licence 291498, held since 2 May 2006 in the company's former name "Opal Telecom Limited", for the use of the spectrum bands 1781.7 – 1785.0 MHz paired with 1876.7 – 1880.0 MHz.
- 3.7 The variation requested is to change the permissible OOB emissions to facilitate use of 3GPP compliant LTE equipment operating within the existing in-band power spectral density (PSD) limits. While the licence permits the use of LTE already, without this change UK-specific equipment would be required that would substantially reduce the commercial viability of the Band, compared with using available apparatus already on the market within Europe.

⁸ http://stakeholders.ofcom.org.uk/spectrum/spectrum-awards/awards-archive/completed-awards/award_1781/

- 3.8 TalkTalk suggests that the proposed variation, if granted by Ofcom, would allow market mechanisms to develop new and innovative services without causing interference to users of the same or adjacent spectrum. In support of the request, TalkTalk presented a report commissioned from Real Wireless ‘Out of Band Emissions in the DECT guard band’ (13 May 2014) which is attached at Annex 5.
- 3.9 The technical changes for the requested variation are to the permissible out of block emissions in the downlink frequencies which would amend two of the tables in the schedule to the licence by adding the highlighted new values and deleting the previous ones shown struck through:

Permitted frequency band 1876.7 – 1880.0 MHz	
Frequency range as measured from the lower frequency of the frequency band	Maximum mean EIRP density dBm/kHz
-6.2 to -3.2 MHz	-55
-3.2 to 0.0 MHz	$-45 + 10 \times (\Delta_{FL}^* - 0.2)/3$
-0.0 to -0.1 MHz	$-33.6 + 153.3 \times \Delta_{FL}^*$
-0.1 to -0.3 MHz	$-49 + 20 \times (\Delta_{FL}^* + 0.1)$
-0.3 to -0.9 MHz	-53
-0.9 to -1.5 MHz	-56
-1.5 to -5.7 MHz	-74

* Note: Δ_{FL} is the offset from the lower edge of the relevant Permitted Frequency Band in MHz (it has values between 0 and - 0.3 MHz).

Permitted frequency band 1876.7 – 1880.0 MHz	
Frequency range as measured from the higher frequency of the frequency band	Maximum mean EIRP density dBm/kHz
0.0 to 0.05 MHz	$-23 - 60 \times \Delta_{FH}^*$
0.05 to 0.1 MHz	$-26 - 153.3 \times (\Delta_{FH}^* - 0.05)$
0.1 to 2.8 MHz	$-45 - 10 \times (\Delta_{FH}^* - 0.2)/3$
2.8 to 5.8 MHz	-55
0.05 to 0.2 MHz	$-26 - 153.3 \times (\Delta_{FH}^* - 0.05)$
0.2 to 0.4 MHz	$-49 - 20 \times (\Delta_{FH}^* - 0.2)$
0.4 to 1.0 MHz	-53
1.0 to 1.6 MHz	-56
1.6 to 5.8 MHz	-74

* Note: Δ_{FH} is the offset from the upper edge of the relevant Permitted Frequency Band in MHz (it has values between 0 and + 0.4 MHz).

- 3.10 Additionally, the varied licence would need to refer to an appropriate Interface Requirement for LTE. The appropriate IR is Interface Requirement IR 2087 (LTE and WiMAX equipment in 900 MHz and 1800 MHz Bands) which extends to the whole 1800 MHz frequency range, including the concurrent frequencies.

Discussion with other Concurrent licensees

- 3.11 TalkTalk hosted a meeting on 9 October 2014, inviting participation from other Concurrent Spectrum Access (CSA) licensees and it was apparent that there were mixed views but some interest in the potential use of LTE from a number of attendees.
- 3.12 It was noted that a SEAMCAT study had not been provided as recommended by the ECoP. TalkTalk said that SEAMCAT is a software package developed with CEPT for statistical modelling of compatibility/coexistence between radio communications systems in the same or adjacent frequency bands however its statistical nature creates problems in establishing clear assessments of the impact of a new technology.
- 3.13 Instead TalkTalk proposed to adopt a conservative, precautionary approach based on deterministic minimum coupling loss (MCL) calculations. MCL methods are widely used amongst regulators to ensure compatibility between systems. In the MCL method the minimum isolation between transmitter and receiver to avoid unacceptable interference is evaluated. This isolation is determined for specific scenarios of potential interference between systems, which represent challenging but realistically plausible values of spacing, power levels and emission characteristics. Fading characteristics can be included to ensure that the result is spectrally efficient.
- 3.14 TalkTalk has proposed an alternative method to the SEAMCAT study referred to in the ECoP and we have published the technical evidence TalkTalk has submitted as annexes to this consultation. The position of the ECoP is discussed in section 5 and Ofcom recommends that the process should be updated by industry to facilitate the deployment of a range of technologies including both GSM and LTE.

Section 4

Ofcom's assessment of the out-of-band interference effects of the proposed licence changes

- 4.1 Ofcom has considered TalkTalk's variation request in accordance with our regulatory objectives and statutory duties
- 4.2 We asked TalkTalk to provide evidence relating to the compatibility of the proposed LTE use with DECT devices used on a licence exempt basis in the adjacent frequency band 1880 – 1900 MHz. This information was provided in the reports by Real Wireless, published at Annexes 6 and 7.
- 4.3 Similarly, the use of adjacent spectrum by EE below the Concurrent band was also considered in these reports, noting that as the higher powered service using similar technology, it was considered unlikely that any effect to EE's use of spectrum would be significant or noticeable.
- 4.4 We consider that the technical evidence submitted to support the request addresses concerns that we had raised with TalkTalk regarding the potential impact on use of adjacent bands. In particular, whether varying the licence would be consistent with setting the technical conditions at the minimum necessary to provide adequate protection to potentially affected spectrum users (outlined in Figure 1) in, and adjacent to, CSA downlink band (1876.7-1880.0 MHz) against harmful interference.
- 4.5 We consider that the technical studies submitted, results of practical tests carried out and review of CEPT reports support a case for allowing the use of 3GPP-compliant devices and indicate that this would not cause harmful interference to adjacent systems.
- 4.6 We summarise below the technical findings on the potential impact on adjacent spectrum users (EE Ltd and DECT) and other CSA licensees that has assisted us in reaching our provisional conclusion.

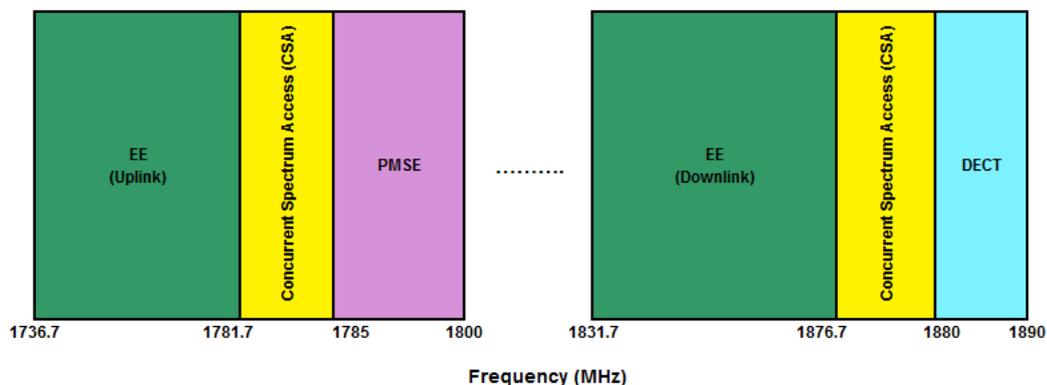


Figure 1: Spectrum use adjacent to CSA band

- 4.7 A comparison of existing and proposed unwanted emission limits for the 1876.7-1880 MHz downlink band is shown in Figure.2. Proposed permissible out-of-block (OOB) emissions are based on 3GPP LTE local area base station⁹ while there is no change in the in-band maximum mean EIRP density.
- 4.8 Impact on spectrum use from the proposed use of LTE and its uplink transmission in the CSA band (1781.7-1785 MHz) remains consistent with the existing licence conditions however the probability of interference may increase with wider bandwidths and more widespread use but we consider this is unlikely to be problematic.

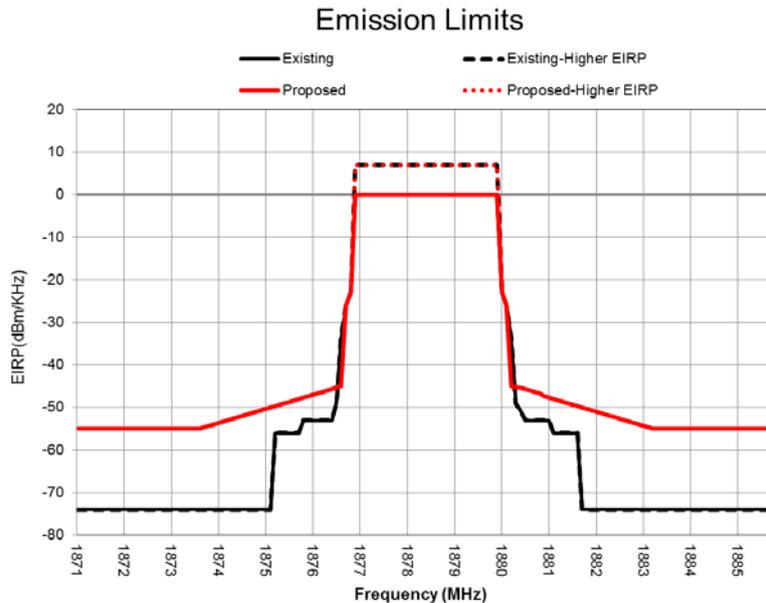


Figure 2: Existing and proposed Maximum Mean EIRP Density and Permissible Out-of-Block Emissions limits

Licensed Mobile Spectrum below 1876.7 MHz

- 4.9 EE Ltd is licensed to use the spectrum (1831.7-1876.7 MHz paired with 1736.7-1781.7 MHz) immediately below the concurrent allocation as shown in Figure 1. The assessment provided by Real Wireless (see Annex 5) which is based on deterministic minimum coupling loss (MCL) approach suggests that the proposed OOB limits would have a negligible impact on either GSM or LTE handsets that may be operating or could be deployed in 1831.7-1876.7 MHz.
- 4.10 For LTE handsets, the Adjacent Channel Interference (ACI) increases by a small fraction, ranging from 0.02 dB to 0.09 dB depending on the proximity to the band edge. ACI is mainly dominated by the Adjacent Channel Selectivity (ACS) of the handset's receiver and the difference between existing and proposed limits is insensitive to the coupling loss values assumed.
- 4.11 For GSM handsets, ACS dominates the ACI in the first or second GSM carriers adjacent to the CSA band. Beyond 300 kHz of frequency separation, the ACI is dominated by the proposed OOB limits and sensitive to coupling loss values assumed. However, even in the worst case scenario, the increase in separation distance to achieve an equivalent ACI to the existing limit is around 4.2m (56%).

⁹ 3GPP TS 36.104 V13.1.0 (2015-09), Section 6.6, Table 6.6.3.2A-2 (<http://www.3gpp.org/dynareport/36104.htm>)

- 4.12 In addition, CEPT Report 40¹⁰ which deals with the technical conditions for the use of these frequency bands concludes that for LTE systems complying with LTE Standards:
- *“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”*
 - *“No frequency separation required between LTE channel edge and the UMTS carrier’s channel edge between a neighbouring LTE network and a UMTS network.”*
 - *“No frequency separation required between LTE channel edges between two neighbouring LTE networks”*
- 4.13 Based on the technical evidence presented by Talk Talk/Real Wireless and also CEPT Report 40 recommendations, our provisional conclusion is that the proposed licence conditions to facilitate the use of LTE technology in the CSA band has no additional significant impact on the operation of licensed mobile spectrum below 1876.7 MHz.

DECT Spectrum above 1880 MHz

- 4.14 The band 1880 – 1900 MHz is authorised on a licence exempt basis for DECT for private self-provided communication. DECT supports ten carriers (F0 to F9) each about 1 MHz with F9 being the first adjacent to CSA band.
- 4.15 Our impact assessment on whether the use of LTE in the adjacent band would significantly impact DECT to a greater extent than the currently authorised GSM use includes the findings of deterministic MCL studies followed by extensive coexistence measurements conducted by Real Wireless (see Annexes 6 and 7: LTE to DECT coexistence study and measurement report).
- 4.16 MCL results suggest that for DECT channels F9 to F7, ACI is dominated by the ACS performance of DECT and hence the difference between the proposed and existing OOB limits is negligible.
- 4.17 On the remaining DECT channels (F6 to F0), proposed OOB emission contribution is around 3 dB higher than the existing limits and also sensitive to coupling loss values assumed. However, even in the worst case scenario where a victim DECT system is unable to control the interference environment, the increase in separation distance to achieve an equivalent ACI to the existing limit is around 3.6m (48%).
- 4.18 Although the above may suggest that LTE can have an effect across all DECT channels whereas GSM has negligible effect on DECT channels F7 – F0, the coexistence measurements carried out by Real Wireless using a range of DECT devices with more, worse interference geometries than in the MCL analysis show that in practice, operational use of the DECT channels would not be impaired.

¹⁰ 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)”
<http://www.ero-docdb.dk/docs/doc98/official/Pdf/CEPTRep040.pdf>

4.19 We have also reviewed previous CEPT work, i.e. ERC Report 100¹¹, ECC Report 96¹² and CEPT Report 41¹³ that present the compatibility evaluation of GSM, UMTS, LTE/WiMAX technologies and DECT systems, respectively. The most recent of these is CEPT Report 41 which endorses the findings of previous studies with the following relevant conclusions

- *“Interference created by the LTE/WiMAX1800 system would be similar to the interference created by GSM1800. No guard band is therefore required between LTE/WiMAX1800 and DECT allocations, provided that DECT is able to properly detect interference on closest DECT carriers (9-7) and escape to more distant carriers (6-0)”.*
- *“When pico-cellular LTE/WiMAX1800 BS is deployed inside of the building in co-existence with DECT deployed in the same building indoor area, 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. In such circumstances, interference can be mitigated by space separation of 65m or more; external filters on indoor pico-cellular LTE/WiMAX 1800; or avoiding adjacent frequencies.”*

4.20 Taking together the findings of compatibility studies, coexistence measurements and CEPT Report 41 recommendations, our provisional conclusion is that any additional interference caused by adopting the proposed OOB emissions would not cause any significant impairment to the operation of DECT systems.

¹¹ ERC Report 100, “Evaluation of DECT/GSM1800 compatibility, February 2000”:

<http://www.erodocdb.dk/Docs/doc98/official/pdf/REP100.PDF>

¹² ECC Report 96, “Compatibility between UMTS 900/1800 and systems operating in adjacent bands, April 2007”:

<http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP096.PDF>

¹³ 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, November 2010”:

<http://www.erodocdb.dk/docs/doc98/official/pdf/CEPTRep041.pdf>

Section 5

Ofcom's assessment of the in-band interference potential of the proposed licence changes

- 5.1 There are 12 concurrent users of this band having equal rights to shared use of the whole spectrum range subject to coordination with other sharers. The permissible OOB emissions specified in the licence are derived from 3GPP GSM systems.
- 5.2 The submitted technical evidence suggest that LTE deployment within the shared band would require approximately $\frac{1}{2}$ the separation distance from a GSM user than for GSM-GSM users, noting however that alternative frequencies could not be used as the LTE carrier occupies nearly the whole bandwidth.
- 5.3 There has been limited deployment of GSM use in the band over the ten years since the award. Existing use would, under the current registration / co-ordination process be afforded protection from incoming services while, going forward, deployment in any location would be on a "1st come" basis.
- 5.4 The lack of use of this band after ten years of licensing arguably demonstrates that it has not been used effectively. A number of other concurrent licensees have expressed the view that a variation, to permit a small power increase and modified out of band characteristics that would facilitate the use of commercially available off-the-shelf LTE apparatus, would be helpful in bringing the band into more effective use.
- 5.5 Granting the variation would not prejudice the continued and future use of GSM. However, not granting the variation would be likely to stifle innovation and impede the opportunity for next-generation services to develop in the band.

Engineering Code of Practice ('ECoP')

- 5.6 The 2006 award set a requirement for licensees to agree and implement the ECoP in order to facilitate sharing and coordination of deployments. As part of this, the industry set up a registration process for new assignments. We note that several licensees have not deployed apparatus or offered services and therefore, relatively few licensees are registering assignments in the industry tool.
- 5.7 In Ofcom's view, the choice of technology should not be a critical factor as the shared nature of the spectrum is inherent in this licensing arrangement and, with low-power use, coordination distances are likely to be relatively short. The key issue is to ensure that the registration and coordination of assignments is appropriate to minimise the risk of interference to previously deployed systems.
- 5.8 The ECoP states that, where introducing a new technology, a licensee must produce a SEAMCAT® (Spectrum Engineering Advanced Monte Carlo Analysis Tool) study to support its proposal. TalkTalk however has commissioned studies from Real Wireless using a minimum coupling loss method that it believes provides a better measure of compatibility between systems.

- 5.9 The licences require each licensee to “...*use its best endeavours to adhere to...*” the ECoP. The ECoP also requires the Mobile 200 group to review its suitability for the agreed purpose and to update it. The licences state that this should be done to ensure the objectives in Schedule 1, paragraph 5 (b) to secure efficient spectrum use and allow competing services to use the spectrum.
- 5.10 Ofcom has the existing right under the Licence Schedule 1, paragraph 5(g) to require licensees to adhere to a revised set of principles necessary for achievement of that objective.

Section 6

Competition, innovation and investment

Introduction

- 6.1 This section deals with the impact of the proposed variation on competition and, together with the spectrum management assessments in sections 4 & 5 above and the technical studies in annexes 5-7, forms Ofcom's impact assessment of the licence variation request.
- 6.2 In deciding whether to vary the relevant licence as requested, we have considered the extent to which varying licences would:
- further the interests of consumers by, for example, encouraging innovation, investment and the availability and use of mobile services throughout the UK; and result in better choice, price, quality of service and value for money; and/or
 - give rise to a material risk of a distortion of competition to the detriment of consumers such that any benefits to consumers resulting from varying those licences without delay would be outweighed by the detriment to consumers resulting from such a distortion of competition.

Impact on competition

- 6.3 Ofcom considers that in general spectrum liberalisation should be highly beneficial to competition, by removing unnecessary constraints on the competitive process. In our view, the requested variation would be likely to strengthen competition in the provision of services and is likely to facilitate wider and more effective use of the spectrum than has been the case to date.

Potential impact for consumers

- 6.4 A number of other concurrent licensees, including some that have already deployed GSM services within the bands, have indicated that they would welcome the proposed variation. TalkTalk has requested a variation that will facilitate the deployment of LTE apparatus commonly available in Europe and that variation, if granted, would be available to other eligible Concurrent licence holders.
- 6.5 This could lead to wider product availability for the band and create a wider range of services and an increased number of market players that generally would intensify the competitive process, which ultimately benefit consumers. If a current licensee decided against developing services, the opportunity remains for trading which could be facilitated by the increased choice of technology.

Licences and development of future services

- 6.6 While Ofcom has not undertaken a detailed analysis of competition, it is felt that liberalisation of the spectrum to facilitate the use of 4G / LTE technology is therefore likely to result in a wider range of choice for consumers, with the possibility of innovative new services being developed.
- 6.7 Only modest deployments within the spectrum have been made to date. Opening the band to newer technology could encourage licensees now to take forward developments where perhaps they had previously been reluctant to commit investment.

Ofcom's provisional conclusion

- 6.8 The 1781 MHz concurrent spectrum band has been only lightly used over the 10 years since award. Several of the 12 licensees have not deployed services and, of those that have shown activity, the extent of service roll out is modest.
- 6.9 Having considered our duties under the 2003 and 2006 Acts which are described in chapter 1, Ofcom's provisional conclusion is that it is appropriate for us to grant TalkTalk's variation request. The same licence variation would be available on request to any holder of a Concurrent Spectrum Access 1781 MHz licence.

Question 1: Do you have any comments on Ofcom's proposal to grant the variation request?

- 6.10 Ofcom considers that the existing engineering principles under the current ECoP are sufficient to enable roll-out of LTE services in the band. Ofcom recommends that the industry should review and update the ECoP to ensure that in future the objective referred to in the Licence Schedule 1, paragraph 5 (b) continues to be secured. Should these principles not be sufficient in future to avoid in-band interference between licensees, Ofcom has the existing right under the Licences Schedule 1, paragraph 5(g) to impose a new set of principles necessary for achievement of that objective.

Question 2: Do you have any comments on Ofcom's proposal to recommend the development of a new or revised coordination process?

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 31 May 2016**.
- A1.2 Ofcom strongly prefers to receive responses using the online web form at <http://stakeholders.ofcom.org.uk/consultations/talk-talk-licence-variation/>, 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 cliff.mason@ofcom.org.uk attaching 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.
- Cliff Mason
Desk 3:188
Spectrum Group
Riverside House
2A Southwark Bridge Road
London SE1 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 your response could include direct answers to the questions asked in this document, which are listed together at Annex 4. It would also help 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 Cliff Mason on 020 7783 4353.

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/terms-of-use/>

Next steps

- A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in Summer 2016.
- 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/email-updates/>

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 Steve Gettings, Secretary to the Corporation, who is Ofcom's consultation champion:

Steve Gettings
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7783 4652

Email steve.gettings@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 <http://stakeholders.ofcom.org.uk/consultations/consultation-response-coversheet/>.
- 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 cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title: Variation of Spectrum Access 1781 MHz Licence

To (Ofcom contact): Cliff Mason

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	<input type="checkbox"/>	Name/contact details/job title	<input type="checkbox"/>
Whole response	<input type="checkbox"/>	Organisation	<input type="checkbox"/>
Part of the response	<input type="checkbox"/>		

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

Consultation questions

A4.1 Ofcom invites response to the following two questions:

Question 1: Do you have any comments on Ofcom's proposal to grant the variation request?

Question 2: Do you have any comments on Ofcom's proposal to recommend the development of a new or revised coordination process?

Annex 5

Out of band emissions study

A Real Wireless Study for TalkTalk

A5.1 [Out of Band Emissions in the DECT Guard band v1.11, 13 May 2014](#)

Annex 6

LTE to DECT coexistence study

A Real Wireless Study for TalkTalk

A6.1 RF co-existence analysis of DECT guard-band LTE to DECT and GSM V1.0

Annex 7

LTE to DECT coexistence report

A Real Wireless Report for TalkTalk

A7.1 LTE Femtocell to DECT coexistence measurement .

Annex 8

TalkTalk Licence and proposed technical changes

- A8.1 TalkTalk's Wireless Telegraphy Act licence: "Concurrent Spectrum Access for the use of the spectrum bands 1781.7 – 1785.0 MHz paired with 1876.7 – 1880.0 MHz" was granted on 2 May 2006.
- A8.2 It has not been varied or re-issued previously and is currently in the name of Opal Telecom Limited, the company's previous name. The company details will be updated when the licence is varied or re-issued.
- A8.3 The following version of the licence shows the two tables of values to be deleted and the proposed replacement tables, amending the permitted out-of-block emissions in the 1876.7-1880.0 MHz band. There are no changes proposed for the 1781.7-1785.0 MHz band, nor for existing in-band power spectral density limits.
- A8.4 There are a number of necessary updates that will also be required including:
- To update references to the Wireless Telegraphy Acts 1949 and 1998, now superseded by the Wireless Telegraphy Act 2006;
 - To apply current Ofcom licence formatting and, where appropriate, to align the wording of standard terms and condition common throughout other licences;
 - To remove references in Schedule 1 to "Site Clearance", a process that ceased to apply to this licence class on 31 August 2007;
 - To remove Schedule 2 that states the licence fee paid. Ofcom will shortly be consulting on the level of annual spectrum fees for which these licences will become eligible after May 2016, ten years following the initial award.
- A8.5 These updates are largely administrative in nature and will be proposed to the licensee(s) in the form of a draft licence to replace their current version.
- A8.6 [TalkTalk \(Opal Telecom\) 1781 MHz Concurrent Spectrum Access Licence and proposed technical changes.](#)