



Response to Ofcom's consultation on:

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

(Issued by Ofcom on 29 April 2016)

BT plc
31 May 2016

Summary of BT's views

BT concurs that, subject to appropriate technical limits and suitable coordination arrangements between licensees, the benefits of varying the concurrent spectrum access licences to facilitate deployment of standardised LTE based femtocells is likely to outweigh the potentially negative effects that this could have on other in-band and adjacent band technologies.

The technical studies supplied alongside the consultation are helpful as they illustrate the additional or increased interference effects that could arise from this change. We have evaluated these carefully and in Annex 1 to this response we provide our comments on the studies and our suggestions of how our outstanding technical concerns can be addressed.

Although in principle we can support the planned licence variation, we are concerned to ensure that equitable access to the spectrum will be properly managed in practice, given that sharing between wideband and narrowband technologies introduces new challenges. Timely agreement of a revised Engineering Code of Practice (ECoP) document, containing suitably modified technical/policy measures to manage the more challenging inter-operator coordination and increased interference risks between nearby deployments, will be of critical importance in this regard.

Given the critical dependency on the revised ECoP for ensuring the management of potential interference between new and existing deployments and securing a harmonious growth in use of the band by all licensees, we would propose that licence variations are not formally granted until the revised Engineering Code of Practice has been drafted to Ofcom's satisfaction and circulated for approval by the licensees. The associated database of deployed equipment is also important and should remain an integral part of the coordination arrangements.

Responses to the consultation questions

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

BT recognises that introduction of standard LTE equipment in this band could be of interest to licensees and could be beneficial to consumers. However, this needs to be balanced against the additional interference that may be caused to adjacent systems, in particular DECT, as well as the impact it may have on the existing narrowband low power GSM deployments that currently co-exist nearby one another, as they only use a fraction of the available bandwidth rather than the entire bandwidth that LTE technology would use.

BT in principle agrees with the proposal to modify the spectrum emission mask to facilitate future deployment of *standard* LTE femtocells. However, the coordination between existing and new low power GSM deployments and LTE deployments is more problematic than the original and existing scenario where operators share the spectrum for low power GSM. Whilst the separation distance between GSM and LTE access points may be half that between GSM and GSM access points, in the case of LTE the whole spectrum will be used at the location rather than a fraction of it as is typically the case with GSM technology today. This means co-located installations would be very problematic.

The necessary increased coordination restrictions would to an extent diminish the value of the spectrum and would therefore to an extent offset increase in value that might arise from the possibility to use new technologies.

As explained in Annex 1, we would propose to limit the power of wideband base stations in the licence in order to protect DECT, given that both systems are likely to be permanently deployed and potentially close to each other in the indoor scenarios envisaged for the licenced use.

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

It is important that new low power GSM or low power LTE deployments respect the need to protect systems already deployed and thus a coordination zone needs to be defined within the Engineering Code of Practice and the associated database needs to be kept up to date with systems deployed. In Annex 1 we elaborate on the appropriate elements to include in the ECoP.

It is also important that deployments are not speculatively entered in to the database and that it is limited to systems actually to be brought in to use within a short period (we suggest 60 days). Furthermore, where a customer contract terminates and the low power 1800MHz system ceases to be operated by that licensee at a given location, there must be an obligation to immediately delete the entry from the database.

Given the critical importance of the updated Engineering Code of Practice and its associated database of deployments, we propose that licence variations should not be granted by Ofcom until a revised draft of the ECoP has been prepared to Ofcom's satisfaction and circulated for agreement by the licensees.

Annex 1: Technical analysis of potential interference from LTE to GSM and DECT

Introduction

This annex considers the effect of a wideband LTE signal being transmitted in the concurrent shared access (CSA) band, which for the downlink uses the uppermost 3.3MHz part of the GSM 1800MHz downlink band (known as the 'DECT guard band') at 1876.7 – 1880MHz. The uplink uses 1781.7 – 1785MHz, which is the uppermost part of the 1800MHz GSM uplink band. Because both uplink and downlink in the CSA band is in guard bands and the spectrum is shared between many licensees, the allowed transmit power is reduced, hence the existing use for low-power (LP-) GSM.

GSM is a narrow-band signal, each carrier is 180kHz wide, and the licence limits the transmit power in this bandwidth to around 22.5dBm per carrier (or 29.5dBm with agreement from other parties).

LTE is a wideband signal, and the entire 3.3MHz bandwidth will be occupied by a single 3MHz LTE carrier (RBs = 15), and the licence limits this to around 35dBm (or 42dBm with agreement from other parties). The increase over GSM is because the licence specifies the maximum transmit power as a density, which is 0dBm/kHz (or +7dBm/kHz with agreement of all parties).

We are concerned that the presence of wideband transmissions in the 3.3MHz CSA band, such as from the LTE signal, will cause increased interference to GSM users that are trying to co-exist across the same band, and also that the potentially high power of a wideband signal will increase the impact on DECT receivers in the 1880 – 1900MHz band.

Co-existence between low power GSM and low power LTE

The impact of LTE interference to GSM is studied by Real Wireless [1], and we can see that the interference is increased because of the presence of the wide-band LTE signal that occupies the entire spectrum over which other LP-GSM systems are trying to operate. Figure 16 in the referenced report shows that interference causes significant degradation in call success rate, particularly for an LTE UE into a GSM base-station, with up to four floors separation. It is possible that LTE UEs will be present in the same vicinity as LP-GSM systems currently deployed in offices. We think that the assumption by Real Wireless that the UEs will be power controlled down to a lower level may not be valid, since they may be attached to a distant eNB.

We also noticed a curious effect in the results from the work in [1]. In tables 14 and 18, the impact of the interferer seems to get worse as the interferer distance increases (the furthest right-hand columns of both tables show this). We would like to understand what is causing this effect.

Potential interference with DECT

The impact of LTE interference into DECT has also been studied by Real Wireless [2], and also the impact of GSM interference into DECT has been well studied by others [3,4]. The impact to DECT from either GSM or LTE is dominated by blocking or adjacent channel rejection, since the CSA band is off to the side the DECT band. The impact of LTE will be greater than GSM, because (a) DECT has ARQ and hopping schemes that somewhat work around the frame structure of the GSM transmissions and (b) LTE being a wideband and a more continuous signal will generate greater power in the adjacent channel.

Real Wireless has also conducted some lab measurements of LTE interference into DECT [5]. We are finding it difficult to have a high degree of confidence in these tests, because

- (a) we note that the eNB transmission powers during the test were 18 – 20dBm total eirp depending on eNB manufacturer, which is lower than the existing or proposed licence limit,
- (b) we could not find any information about the distance between the DECT fixed part and portable part that was used during these tests, only that the FP was located ‘as far as possible’ from the PP (at the top of page 13),
- (c) we could not find any information about which channels the DECT equipment was using.

Potential solution

Licence conditions

In order to mitigate the impact of interference of LTE into co-channel GSM and into DECT, the licence and the ECoP should be modified.

For the licence, we propose a change in the limits in section 9 to read something like 0dBm/kHz or 7dBm/kHz with an additional constraint of 24dBm maximum EIRP, or 31dBm maximum EIRP with agreement. This will allow continued use of LP-GSM, assuming one carrier per BS, and would allow the LTE femtocells to operate at 24dBm. It would however substantially limit the risk of a wideband signal to cause blocking of DECT.

Engineering Code of Practice (ECoP)

For the ECoP, the maximum base station EIRP of 24/31dBm for LTE equipment would need to be included from above, plus detail of the separation distance that must be respected around existing GSM deployments if deploying LTE equipment that uses the entire available bandwidth. A further option for situations where existing deployment makes GSM/LTE sharing unfeasible is to limit the LTE signal to 50% of the band, which would allow a 1.4MHz LTE carrier to be used and leave space for several GSM carriers. It is important that the relevant changes to the ECoP are drafted and in place before the LTE deployments begin and hence the licence variations should be issued once the drafting work is done.

References

- [1] RF co-existence analysis of (DECT) guard-band LTE to DECT and GSM. Real Wireless report to Talk Talk, February 2015 (supplied as annex 6 to the consultation).
- [2] Out of band emissions in the DECT guard band. Real Wireless report to Talk Talk, 13 May 2014 (supplied as annex 5 to the consultation).
- [3] Evaluation of DECT / GSM 1800 Compatibility, ERC report 100, CEPT, February 2000
- [4] DECT properties and radio parameters relevant for studies on compatibility with cellular technologies operating on frequency blocks adjacent to the DECT frequency band. ETSI TR103-089, v1.1.1, January, 2013.
- [5] LTE Femtocell to DECT Co-existence Measurements. Real Wireless report to Talk Talk, February 2015 (supplied as annex 7 to the consultation).