



Vodafone Response to Ofcom Consultation: Enabling opportunities for innovation

Shared access to spectrum supporting mobile technology



Introduction

Vodafone welcomes the opportunity to comment on Ofcom's latest proposals with respect to spectrum sharing. Ensuring efficient usage of spectrum is one of Ofcom's primary statutory duties, and sharing spectrum to maximise utilisation is a weapon in Ofcom's arsenal.

However, fulfilment of this statutory duty is nuanced – the goal should not be to ensure that spectrum is used efficiently in the context of utilisation to the maximum technical extent, rather the focus should be on ensuring that the maximum societal and economic gain is extracted from spectrum usage. The distinction is important in considering certainty of access – there is little benefit in extracting the next percentage point of spectrum efficiency dynamically at a specific point in time, if the user cannot be assured of continuity of access that is commensurate with being able to develop a business case to invest. From this perspective, we must be careful not to drive investment in complex systems targeted at reaching the maximum utilisation of spectrum, if the “capacity” yielded is not practicably usable because no commercial concern would invest if they could not have assured access for a number of years into the future.

Vodafone considers that Ofcom has struck the right balance of providing the facility to share spectrum with a potential evolution to automation in the future, without trying to “boil the ocean” by having automated database-facilitated licensing as a launch capability.

Answers to Questions

Question 1: Do you agree with our proposal for a single authorisation approach for new users to access the three shared access bands and that this will be coordinated by Ofcom and authorised through individual licensing on a per location, first come first served basis? Please give reasons supported by evidence for your views.

Vodafone is in broad agreement.

3.8GHz band

On the 3.8-4.2GHz band, we note that rather than adopting the multiple-tier approach that was advocated by Ofcom historically, the proposal amounts to a “first come first served” approach, where incumbent users happen to have been first in the queue. This has important implications - whilst we agree that the prospect of new earth stations is low, we do consider that there will be scope for further deployments at existing earth stations, largely in the direction of existing satellites. If we interpret Ofcom's proposals correctly, incumbent satellite users will only have protection for existing links, rather than full protection of the site in question (so, if for example an existing earth station's links were all in the frequency range 3.8-4.0GHz, these would be protected, but the operator would have little certainty that a deployment above 4.0GHz could be permitted). This represents an opportunity cost that goes beyond allowing new entrants to opportunistically use “spare” spectrum, as it is preventing that spectrum from being subsequently used by the incumbent application.



Satellite earth stations are not readily portable, so moving geographically would not be an option. Similarly, C-band frequencies are not used without reason, so there is a real prospect that there would be no scope to use an alternative frequency band. Following the release of the 3.6GHz band for mobile usage, we consider that the 3.8-4.2GHz band will become increasingly congested at the locations concerned, limiting the possibility of sticking within existing frequencies – satellite operators are currently investing to migrate links into the 3.8GHz band so it would be unfortunate if the spectrum sharing initiative were to then further restrict their usage of that band.

Vodafone therefore proposes that when protecting incumbent satellite users, when requested by the licensee Ofcom should provide protection on the azimuth/elevation of existing satellites for the full 400MHz of the band, rather than narrowly the specific frequencies that are in usage when the sharing policy is launched.

1800MHz band

Vodafone is comfortable with the approach proposed for the 1800MHz band.

The frequencies concerned cannot be readily repurposed for nationally-licensed high power mobile services, absent this either being in a competitively-distorting manner (as the band is adjacent to BT frequencies hence only of use to them) or involving a disproportionately costly band reorganisation (to allow another licensee to be adjacent to the concurrent band hence benefit from its award as nationally licensed).

Concurrent/shared access therefore remains the most efficient usage of the band, and we are now comfortable that Ofcom can make appropriate safeguards to protect both existing users of the concurrent band, and nearby high power users.

We agree that Option Three (Ofcom taking over coordination) is the best approach.

Question 2: Are there other potential uses in the three shared access bands that we have not identified?

Vodafone has not identified any further use cases, however the whole point of innovative sharing is that we should not seek to second-guess what innovations will drive new use cases – the model should be flexible enough to cope with any eventuality.

Question 3: Do you have any other comments on our authorisation proposal for the three shared access bands?

Vodafone has no further comments.



Question 4: What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?

Vodafone has no comment on equipment availability. However, it does seem that Dynamic Spectrum Access (DSA) will inherently impose costs on equipment being deployed, and initial up-front complexity in getting spectrum sharing enabled (when compared to a more simplistic approach of Ofcom coordinating deployments). We note the inordinate complexity that was involved in the white space trials, for what ultimately was very low volume deployments that could have probably been far more effectively coordinated by simple knowledge of the multiplexes used by Digital Terrestrial Television (DTT) and manual comparison with Ofcom's Programme Making and Special Events (PMSE) database. We are concerned that DSA is a technology solution looking for a problem, and although we do not oppose its introduction in the UK, the business case is far from proven.

Against this backdrop, we consider that Ofcom's approach is a measured one. It makes sense to enable sharing on a manually coordinated basis initially, and then move to a more automated approach if it can be justified both in terms of removing cost and expediting approvals (to the extent that any delay in approving usage is choking innovation – which requires evidence). Only if that semi-automated approach can be proven to be causing undue costs and stifling innovation should an evolution to a fully-automated approach such as DSA be considered.

Vodafone is not anti-DSA, but we need evidence that a commercial use case that would involve investment is really going to stand or fall according to a few days delay waiting for a licence to be issued. If the case is so perilous, then we question whether scarce spectrum resource should be set aside for it. In summary, implementing DSA solely because it's a neat technology solution would be wholly wrong – a business case must be proven.

Question 5: Do you agree with our proposal for the low power and medium power licence? Please give reasons supported by evidence for your views.

Question 6: Are there potential uses that may not be enabled by our proposals? Please give reasons supported by evidence for your views

Vodafone considers the approach pragmatic, and is not aware of any applications that wouldn't be enabled.

Question 7: Do you agree with our proposal to limit the locations in which medium power licences are available? Please give reasons supported by evidence for your views.

Vodafone agrees. We would be uncomfortable if medium power licences in the 3.8GHz band were to allow mobile applications, because of the prospect of inadvertent usage near incumbent users – restricting to



Fixed Wireless Access (FWA) with both the base station and associated terminals being licensed is more appropriate.

Question 8: Do you have other comments on our proposed new licence for the three shared access bands?

Vodafone has no specific comments.

Question 9: Do you agree that our standard approach to non-technical licence conditions is appropriate? Please give reasons supported by evidence for your views.

On the whole, Vodafone agrees. However, given the nature of the proposed fees (which will be on a cost-recovery basis rather than being on an Administered Incentive Pricing (AIP) basis), we do consider that there should be stronger “use it or lose it” provisions in place. In this context, clause 3(e) of the licence, allowing Ofcom to revoke it for spectrum management purposes with five years’ notice, should have a considerably shorter notice period put in place where the licensee can be demonstrated to be not using the spectrum in question. We accept that it may be disproportionate for Ofcom to be actively monitoring usage by licensees, but where a prospective new entrant has applied but is rejected by Ofcom and then establishes there doesn’t appear to be any usage, this should be a trigger for Ofcom to investigate.

Question 10: Are you aware of any issues regarding numbering resources and Mobile Network Codes raised by our proposals which we have not considered here?

A Mobile Network Code (MNC) will be required where the network operator will be operating its own core network and issuing its own IMSIs. We should state at the outset that this is not Vodafone’s preferred model for cooperative community initiatives.

We recognise that the big four mobile operators do not have a monopoly on ideas when it comes to improving coverage, and we welcome community initiatives that can extend the footprint of mobile service. However, we believe the model of those deployments being fully-fledged mobile networks with their own core is fraught with difficulty when compared to the alternative that they provide a radio access capability into the mobile operator core. A fully-fledged approach implies core-core network interconnect, meaning that the community initiative must fully comply with all of the security protocols that are required for that, keeping in mind that the mobile networks provide critical national infrastructure. Further, it implies a roaming model: the majority of mobile operators have been clear in our opposition to national roaming, and it would also be impracticable for a community initiative to negotiate global roaming relationships in order that their customers be able to travel internationally. We therefore consider that any consideration of independent mobile network deployments should be seen through the lens that the national mobile networks are unlikely to be encouraging of interconnection on a core network basis. We have been working



to devise a reference structure whereby community initiatives provide a neutrally-hosted access layer for the national mobile networks.

Against this backdrop, we do not see an issue with numbering and MNC resources, because both would be obtained from existing mobile network operator stocks.

In the alternative that we are incorrect and a core-core interconnect model does develop, then Ofcom should be very concerned:

- MNCs are a finite resource. The utilisation currently only stands at around 25%, but fundamentally there are only 200 MNCs available to Ofcom, and there is no easy mechanism to extend this, and
- The 07 part of the numbering plan is a scarce resource. Numbers are assigned in blocks of 100k numbers and this cannot be readily reduced as it has implications for the arrangements of international roaming. A village initiative being assigned 100k numbers would be a profoundly inefficient usage of numbering resources.

Question 11: Do you agree with the proposed technical licence conditions for the three shared access bands? Please give reasons supported by evidence for your views.

Question 12: Are there other uses that these bands could enable which could not be facilitated by the proposed technical licence conditions? Please give reasons supported by evidence for your views.

Vodafone believes that the proposed licence conditions are suitable to launch the spectrum sharing initiative. It would be appropriate to periodically review the technical licence conditions to verify that they represent a reasonable compromise between ensuring coexistence while not impeding innovative applications.

Question 13: Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.

Question 14: What is your view on the potential use of equipment with adaptive antenna technology (AAS) in the 3.8-4.2 GHz band? What additional considerations would we need to take into account in the technical conditions and coordination methodology to support this technology and to ensure that incumbent users remain protected?

Vodafone agrees the proposed coordination parameters. We believe that further industry engagement is required on the usage of AAS.



Question 15: Do you agree with our proposal not to assign spectrum to new users in the 3800-3805 MHz band and the 4195-4200 MHz band?

Yes, Vodafone agrees with this proposal. Further, we believe that in order to make most efficient usage of spectrum, and best allow the flexibility to change licensing arrangements should there be a global evolution to high power usage in the band, it may be best to manage the band such that shared usage is clustered towards the top wherever possible.

Question 16: Do you agree with our fee proposal for the new shared access licence? Please give reasons supported by evidence for your views

Vodafone agrees with the proposal, so long as (per our response to Question Nine) the licences contain a “use it or lose it” clause to guard against intentional spectrum hoarding, or inadvertent failure to relinquish unused licences.

We do not, however, agree with Ofcom’s proposals that incumbent users continue to pay on an AIP basis. It is clear that the only difference between incumbent licensees and newly sharing licensees are the nature of the application, and that the incumbents were already front of the queue in a “first come first served” basis.

In the event that Ofcom accepts our proposal in response to Question One that the full 400MHz be protected for satellite earth stations, then we can accept that there is special treatment which merits continued charging on an AIP basis.

However, if that isn’t adopted, then the incumbent users are getting no better treatment than the new entrants. Ofcom has concluded that new entrants are practicably blocking nobody so an administrative fee will suffice. The only argument that satellite is different can be because the exclusion footprint is greater, but the *quid pro quo* is that Ofcom needs to demonstrate that a series of small exclusion footprints (for each new entrant) doesn’t practicably exclude anyone but an equal-sized larger one (for an earth station) does exclude other users – this analysis has not been done. It is therefore difficult to see what value the incumbent user is blocking other than new entrants, and difficult to see why incumbent licensees should pay any more than the new entrants.

Question 17: Do you agree with our proposal to change the approach to authorising existing CSA licensees in the 1800 MHz shared spectrum? Please give reasons supported by evidence for your views.

Vodafone accepts the proposed changes, but considers that prior to introduction, Ofcom should carry out an audit of actual usage by CSA licensees to cleanse the data. We consider it likely the industry coordination database over-states the level of deployment, and that some licence-holders will relinquish their licences as part of this process.



Question 18: Do you agree with our proposal for the Local Access licence? Please give reasons supported by evidence for your views.

Question 19: Do you have any other comments on our proposal?

Vodafone has long argued for the possibility to voluntarily lease our spectrum where it is not in use and is unlikely to be in use for the foreseeable future:

- We recognise that there are circumstances where we can work with third parties to improve coverage.
- Given our commitment to meeting the needs of the enterprise sector, we will continue to build on this by providing compelling services particularly with the advent of 5G network slicing. For example, we are open to providing coverage solutions for hard to reach areas, such as that recently provided for JCB¹. However, we acknowledge that there may be edge cases where a standalone network could be more attractive to enterprises and would work with them in such scenarios.

On this basis, we welcome Ofcom's proposals, which effectively provide a mechanism to sub-let spectrum, but using a different licensing model.

Whilst being supportive, we do have a series of caveats:

1. We have some concerns about being unable to manage an unquantified volume of applications, particularly as it will impose a cost on our business to assess whether authorising the usage is possible. For this reason, we reserve the right to manage throughput by deferring authorisation of requests where they are above a reasonable level.
2. It would be inappropriate if the first we know of the request is when approached by Ofcom. We would therefore expect the applicant to contact us in the first instance, and there will be a presumption of rejection if we receive requests from Ofcom without first having being able to discuss the nature of the application in advance.
3. We would expect that any agreement by Vodafone for Ofcom to over-license our spectrum would be accompanied by a commercial agreement between Vodafone and the prospective sharer. This is to protect both parties – Vodafone in that we can factor in the application to our network planning tools, and the prospective sharer in that they can be sure
 - a. that Vodafone will not deploy high power mobile services (recall that nothing in the over-licensing process prevents Vodafone from using its licensed frequencies),

¹ Vodafone mini masts make big difference to JCB Staffordshire quarries,
<https://mediacentre.vodafone.co.uk/news/mini-masts-jcb-staffordshire-quarries/>



- b. that Vodafone will not trade away the spectrum within the sharing-licence term, and
- c. that there will be a framework for what happens at the end of the initial three year term.

We do not rule out there being a monetary consideration associated with this commercial agreement. In cases where it is to our mutual benefit there need not be a charge, but where the prospective sharer intends to offer a competing service using spectrum already licensed to Vodafone at considerable expense (recognising our investment of nearly £1.5Bn on spectrum over the last decade), we would expect to see recompense reflecting our opportunity costs.

- 4. Where the sharer provides service that is available to Vodafone customers, we would expect this to be counted in any assessment that Ofcom may make about the level of Vodafone's coverage.

So long as Ofcom can confirm that it agrees these caveats, Vodafone is happy to support the proposals.

Question 20: What information should Ofcom consider providing for potential applicants in the future and why would this be of use?

Vodafone cannot support the concept of Ofcom publishing information about the usage of spectrum by mobile operators. This information is extremely commercially sensitive, can be extrapolated to give an indication of network utilisation, and is provided to Ofcom under specific terms which do not extend to the wider publication of that information. We would not consent to information being published on that basis.

We could accept an approach whereby potential applicants approach Ofcom to get information about whether a particular spectrum band is in use by an operator in a specific location (i.e. information request, rather than information publication), with Ofcom providing contacts for the relevant operator should the prospective sharer wish to advance discussions any further, for example exploring whether currently-unused spectrum is likely to remain so.

Question 21: Do you agree with our proposal to have a defined licence period and do you have any comments on the proposed licence term of three years?

We believe that three years represents a reasonable default term for the licences. Any shorter, and we would have doubts of the ability of the sharer to recover their deployment costs within the licence term. Any longer, and it will be impossible for Vodafone to give a commitment that we're not going to be using a frequency band at a given location. We consider it would be appropriate to grant shorter terms if this is proposed by both the licensed mobile operator and the sharer. For longer terms, we believe that the initial term would be three years, with extensions thereafter. Vodafone would expect that a sensible sharer would initiate discussions about extensions after two years (if this is their desire), and that the associated commercial agreement described in our response to Questions 18/19 would reflect this.



Where a sharer knows at the outset that they need a term longer than three years, then we consider that this should be accommodated via the commercial agreement – the initial spectrum licence term would remain at three years but the sharer would have assurance that we would support the application to extend the licence at the end of the term.

Question 22: Do you have any other comments on the proposed Local Access licence terms and conditions?

Vodafone does not agree that the licence should be tradeable. This would remove certainty from the incumbent mobile operator about the trustworthiness of the sharer that they have authorised to use spectrum. For example whilst the terms of the licence ensures in principle that the sharer vacates the spectrum at the end of term, in practise if they do not decommission the equipment, it will be the mobile operator that is faced with the difficulty of being unable to access their own spectrum (we note, for example, that Ofcom tends to take the position that mobile operators cannot expect to have “clean” spectrum and will only pursue interference cases that emerge for a mast already in live service, rather than interference which is preventing the usage of spectrum in a particular area). For an initial application, we are able to carry out due diligence on the applicant, but allowing them to trade the spectrum licence would render that due diligence meaningless. We could accept trading where consent is given by the licensed mobile operator, but in practical terms, this would not be significantly different to the recipient re-applying for the licence.

We note that Ofcom states that where an applicant is deploying mobile service², they will need to adopt the appropriate in and out of block power limits. This should not apply solely to applicants wishing to deploy a mobile service, but to anyone applying to use the band. Also, whilst we would not wish to proscribe operating at the full power limit of the incumbent mobile licensee, we would expect that lower powers would be the norm – for the avoidance of doubt Vodafone is far more likely to consent to low power than high power applications, as the impact on our network is more limited.

We further note that Ofcom states that where an applicant is deploying a TDD system outdoors or in shared indoor locations, there will be a requirement to synchronise with other users in the band or use a restrictive mask³. This is not quite correct. For the 3.4GHz (and prospective 3.6GHz) bands, the applicant should always be required to synchronise with other users in the band and to use the specified Frame Structure in all cases; the alternative of a restrictive mask only means that the applicant isn't restricted to a 3:1 Frame Structure – synchronisation is still required⁴. Ofcom cannot relax this requirement as it would impact on incumbent usage. Consideration will also need to be given to the notification regime for other incumbent users in the

² Consultation para 8.22

³ *ibid*

⁴ See for example Vodafone licence 1151573 para 13d) “*the Licensee shall ensure that frames start at a common reference time so that all licensees’ frames are aligned and transmissions synchronised*”
https://www.ofcom.org.uk/data/assets/pdf_file/0016/114271/SA-3.4-GHz-LICENCE-Vodafone-1151573-1-12-04-18w.pdf



band – for example were Three to consent to over-licensing of their 3460-3480MHz spectrum at a given location, as an adjacent user it would be beneficial for Vodafone to be made aware. In any case, as incumbent licensees are likely to consider proposing changes to the technical terms of the licences to better accommodate 5G frame structures, we suggest that Ofcom be cautious when considering requests in this band in the short term.

Otherwise, Vodafone supports the terms as proposed by Ofcom.

Question 23: Do you agree with our fee proposal for the new local access licence? Please give reasons supported by evidence for your views

In principle, Vodafone agrees with the approach advocated by Ofcom. However, the analysis seems to have missed that (depending upon the application) Ofcom may need to liaise with more than one mobile operator to secure consent (for example if the application spans more than one operator's frequencies). For this reason, the application fee should be on a per application per donor mobile operator basis – for example an application spanning two operator frequencies should be priced at £1900 (double the cost of a single operator).

Vodafone Ltd

March 2019