Your response

Question	Your response
Question 1: (Section 3) 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.	Yes to both parts. Secondly, we're happy for Ofcom to take a role in allocating licenses on a first-come-first-served basis, without relying on the permission of existing licensees, or requiring a traditional auction. Our experience is in DECT-GB in particular, where we saw the licensing regime was initially attractive, but lost momentum, and is now is a brake on exploitation. Allowing others to exploit the spectrum alongside the existing licensees allows us as a UK based infrastructure vendor to sell and manage network equipment direct to the end customer, without relying on any commercial intermediary. Ip.access has supplied equipment into the DECT-GB space for years, and has become disappointed by the inability or unwillingness of existing licensees to exploit the many opportunities that exist in the space. To the first part, we're happy that the same regime is applied to all three bands, since the more spectrum that is available, and the more freely available, the better.
Question 2: (Section 3) Are there other potential uses in the three shared access bands that we have not identified?	In our activities in the CBRS market in the US, we have identified private networks for enterprise applications as a key segment. Within that segment, professional voice services – that's to say press-to-talk, group call, open channel – are an important application, as existing P25 and MPT.1327 technology ages, and the market demands broadband data as well as voice, and on user devices that are more like those they already use on commercial networks. This is applicable to both the B3 and B40 spectrum. Another application that we have promoted for many years that could use this spectrum efficiently is the so-called "neutral host" application, extending existing MNO coverage indoors by applying MOCN (for instance) to the

	radio and allowing existing MNOs to broadcast their network identifiers on the private network segment. In this way private users can extend a network for their own use, but also provide coverage for their customer and visitors with commercial cellular subscriptions. Business users – such as hotel chains, shopping malls, shared workspace landlords - have long been unhappy with failure of MNOs to provide multi-operator coverage except in the largest of venues. This spectrum sharing would allow the industry to tap this unaddressed market and satisfy a large amount of pent-up demand. The application described in the consultation has a similar goal achieved through a roaming agreement, but such roaming leads to QoE difficulties where the handset clings to its home network, even if the roaming network is far stronger and better quality. There are two alternatives to this – one is the MOCN based one described, where the handset sees the private network as part of the MNO network, and the second is where the private network operator will issue its own SIMs which can then roam onto the commercial network as the user leaves the vicinity of the private network. Both applications are viable to us, and are being actively pursued in the CBRS context.
Question 3: (Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?	No further comments
Question 4: (Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?	The DSA model we are deploying with in the US is the CBRS one. We see the imminent maturation of the eco-system, as the Spectrum Access System (SAS) deployers (Federated Wireless, Google, Commscope, and others) achieve their FCC approvals, and go live within a few months. On the infrastructure side, the basestations and the software to access the SASes is pretty simple and well proven. The unproven part of DSA in the US is the algorithmic one, on two levels. In terms of spectrum coordination, the SASes run propagation models which may or may not be appropriate to the deployment scenario, and so the spectrum may be over- or under-utilised. Time is needed to optimise these algorithms, especially as the deployments densify. Secondly, the SAS providers are competitive to

	some extent, and so they will be under commercial pressure to tweak their algorithms to re-use spectrum as densely as possible (to maximise the lease revenue) and the consequences of that in terms of interference coordination are not yet apparent. There is at least the possibility of a "tragedy of the commons" emerging, as SAS providers compete to allocate spectrum ever more cheaply and densely. A third issue with CBRS in the US is that it is a new band, and so the penetration of devices to exploit it may be slow, though they are beginning to emerge. In the UK case, though, in at least the B3 and B40 cases, and if Ofcom becomes the sole SAS operator (which the tone of this consultation suggests it is minded to be), many of these issues disappear. There is already highly penetrated handset availability for the existing B3 and B40 spectrum. There is no looming Tragedy of the Commons if Ofcom is the sole SAS operator, and the algorithms that Ofcom already uses in its coordination activities today can be codified and embodied in the SAS with confidence. The SAS servers themselves may be acquired, in principle at least, from any of the approved US providers, and there are many providers of infrastructure with SAS clients already embedded including, but not limited to ip.access.
Question 5: (Section 4) Do you agree with our proposal for the low power and medium power licence? Please give reasons supported by evidence for your views.	Broadly yes. We don't see a market for high power wide area coverage using this spectrum. Wide area low density applications such as ESN or search and rescue would be better served by 700MHz spectrum – see responses to Section 8.
Question 6: (Section 4) Are there potential uses that may not be enabled by our proposals? Please give reasons supported by evidence for your views.	All the applications you've described, plus the others we discuss in the response to Q2 above, seem to be allowed by the proposal, but see the response to Q7 below which described an urban medium power FWA application that does not seem to be envisaged by these proposals.
Question 7: (Section 4) 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.	We can see some significant applications for Medium Power licenses in urban deployments, based on the following experience. In 2016 we worked on an FWA project with Microsoft in the UK – project Belgrade

	(https://www.microsoft.com/en-us/research/project/project-belgrade/). This used LTE-FDD Band 13 (700MHz, TVWS in the UK) to provide internet access to the unconnected in the city of Cambridge – people with poor credit, a prison record or other ineligibility for regular fixed broadband. It was a success, and we looked forward to deploying it commercially, but the uncertainties as to the future of TVWS spectrum in the UK inhibited investment. With the proposals to regularise and stabilise spectrum access in this consultation, this application could be revived. We note the words of paragraph 4.17, and would like to use them as a way of deploying urban fixed wireless broadband in the UK. There is definite market pull for this kind of application which we can provide evidence of in follow up.
Question 8: (Section 4) Do you have other comments on our proposed new licence for the three shared access bands?	No further comments
Question 9: (Section 4) Do you agree that our standard approach to non-technical licence conditions is appropriate? Please give reasons supported by evidence for your views.	We agree with the approach. Especially important is the long (5y) notice period for any revocation.
Question 10: (Section 4) Are you aware of any issues regarding numbering resources and Mobile Network Codes raised by our proposals which we have not considered here?	No comment
Question 11: (Section 5) Do you agree with the proposed technical licence conditions for the three shared access bands? Please give reasons supported by evidence for your views.	Broadly, yes. Two clarification questions 1. Given the TDD nature of the spectrum for B40 and 3.8-4.2GHz, are the power limits defined as peak values or averaged over the TDD frame, assuming all sub-frames are carrying full-buffer traffic? 2. The limit in uplink power for fixed terminals defined as EIRP seems unusual to us. We're not experts at FWA, but we have seen solutions that rely on the high uplink antenna gain (with much higher uplink EIRP) to provide a good system performance. For small numbers of terminals, we think the EIRP limits for medium power basestations as given will lead to a highly unbalanced link. This definition

	forces the application to be last-mile point-to-multipoint applications, and is not suitable for middle-mile point-to-point links. Was it intended to rule out point-to-point links as a potential application for this spectrum?
Question 12: (Section 5) 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.	As described in the response to Q11, we believe the EIRP limits for medium power fixed access applications are too low in the uplink to allow point-to-point use with a balanced link. With an even UL:DL TDD split, and assuming the same noise figure for the receivers at both ends of the link, the SINR at the terminal receiver will be roughly 19dB higher than at the basestation. The system is therefore uplink limited, and at 23dBm EIRP, the useful range for useful throughput will be too low for typical middle mile point-to-point applications.
Question 13: (Section 5) Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.	No comment
Question 14: (Section 5) 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?	We think it is very likely that 5G NR equipment deployed in this band will have adaptive antenna technology. On the one hand, you could adopt your existing strategy, which if we read it correctly, assumes that both basestation and terminal antennas are omnidirectional for the purposes of coordination. This will give a conservative, safe answer. On the other hand, along with adaptive antenna technology, it is safe to assume that 5G NR equipment will come with a high degree of power control. For mobile terminals, therefore, the omnidirectional limits are highly over cautious. The antenna beams will be focused on the specific link, and the likelihood of interference with a neighbouring basestation or terminal is low and transient. For fixed terminals though, there is a small, but persistent likelihood that a basestation and a terminal in one allocation may be in line with a basestation or a terminal in an adjacent allocation and therefore delivering a

	permanent interfering signal if they're co-channel. Therefore, a coordination method that increases the allowed EIRP in the case of an adaptive antenna deployment, but with the capability of raising an alarm where an accidental alignment of basestations and terminals in adjacent allocations creates interference. Such an alarm would be most usefully generated in the context of DSA, where it can be delivered by the victim to its SAS, which can then dynamically take the appropriate spectrum re-allocation action.
Question 15: (Section 5) 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?	No comment
Question 16: (Section 6) Do you agree with our fee proposal for the new shared access licence? Please give reasons supported by evidence for your views.	A fee structure based on an administrative cost recovery is welcome. However, we do see the likelihood of a bimodal market, where demand on a site is either very low or very high, and for some sites perhaps both at different times of day. In situations where demand does outstrip supply, for business planning reasons, we would like to see the basic administrative cost basis of the fee structure retained, and to avoid surge pricing or other price-based demand management methods. We'd also like to see provision to prevent "squatting" where a non-practicing entity gets the rights to the spectrum at the Ofcom price and sells them on to a real user at an inflated rate. All of this is hypothetical at this point, but the basic principle of enabling spectrum access at modest and stable cost to users who are directly operating the spectrum to the benefit of consumers and enterprises is the target. As a secondary comment, have you compared this fee structure with likely CBRS SAS access fees in the US? Without divulging particulars, it seems somewhat more expensive, though not cripplingly so.
Question 17: (Section 7) 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.	Yes. We have sold equipment into the Dect Guardband space for many years, and have seen the market stagnate as many of the existing licensees have lost the motivation to deploy for a number of reasons. Allowing third parties, such as enterprises and end users

	directly to source equipment which is authorised to use this spectrum would be a great fillip to this market. We see a lot of direct evidence of market pull for this both from enterprises and, through our own switchboard, of end-user demand for self-deployed cellular access. Of course, we still need the network connection, but we also have partners who are ready and able to provide this in a neutral host or roaming basis, if only they had access to the spectrum. This change breaks that log-jam.
Question 18: (Section 8) Do you agree with our proposal for the Local Access licence? Please give reasons supported by evidence for your views.	Yes we do. We have spent many years marketing private network and shared spectrum neutral host solutions in response to demand from the so-called middleprise of enterprise buildings. We've even taken meetings with Ofcom on the subject. This segment includes buildings between 30,000 and 500,000 sq. ft. and is too small to gain the interest of any operator to improve its coverage. And in many instances the venue requires multi-operator service to meet its customer service goals. In the end, they resort to Wi-Fi which brings no revenue to the MNO, hardly any to the venue, and little satisfaction to the end user. In the same category are rural deployments which have too little traffic to make dedicated sites commercially viable for the operator, but where local entrepreneurs are willing and able to deploy on their behalf. We are encouraged by the experience of Ch4lke Mobile in deploying in such a model. It proves it is viable. It can be repeated across the country, indoors and outdoors, where spectrum is underutilised, yet service demand is unmet.
Question 19: (Section 8) Do you have any other comments on our proposal?	Three comments: 1. Is it possible to add clarity to the phrase "reasonable objection" when it comes to evaluating a spectrum request? As phrased, it seems very easy for the MNO to raise enough of an objection to deter investment and prevent deployment, while not actually being obliged to deploy themselves within a

	meaningful timeframe. 2. As an alternative, we would like to propose that a spectrum request triggers a "build-operate-transfer" timeline, where, unless the MNO actually has deployment plans in train, then the spectrum requestor can build their network and operate it. They can then either continue to operate, with the MNO having an option to rent capacity on it, in a shared access model, or for the network to be transferred to the MNO and operated by them. This gives the requestor some assurance of return either in income terms, from renting capacity to the operator, or in capital terms, from selling the network back to them. 3. We are concerned about the incumbent's right to "overbuild" and its consequences, as expressed in 8.23. Having acquired a "Local" license, should the new licensee not acquire the rights to peaceful enjoyment of the spectrum? Would it not be better, rather than face the new licensee with the threat of overbuild, to offer them the opportunity, or the obligation, to extend the incumbent's network on their behalf on request. Such an obligation would provide some basic assurance for the new licensee's business, rather than threaten to undermine it from the outset.
Question 20: (Section 8) What information should Ofcom consider providing for potential applicants in the future and why would this be of use?	No comment
Question 21: (Section 8) 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 are concerned that the 3yr license period is too short. In the US, the CBRS PAL license period was debated heavily, and was extended from 3y (with no right of renewal) to 10y (with an expectation of renewal), on the basis that 3y was too short a period for most ROI calculations. Of course, it's too early to tell which is right, but 3y is a very short payback period for any sort of capital intensive investment such as this.

Question 22: (Section 8) Do you have any other comments on the proposed Local Access licence terms and conditions?	No further comments
Question 23: (Section 8) Do you agree with our fee proposal for the new local access licence? Please give reasons supported by evidence for your views.	We are in favour of a flat one-off fee for business planning reasons. The level of the fee seems reasonable.