

Your response

Executive Summary

The University of Strathclyde has been at the forefront of shared spectrum technology in the UK and other parts of the world for at least a decade. We played a key role in the development of the UK's TV White Space (TVWS) shared spectrum framework (for which regulations were put in place on 31st Dec 2015), and we are now active participants in the DCMS-funded 5G RuralFirst project, within which we are responsible for devising and deploying the next generation of '5G-friendly' dynamic spectrum access (DSA) solutions.

We believe strongly that dynamic, automated control of access to spectrum represents the most effective way to maximize spectrum utilization and, ultimately, has the potential to result in the best use of spectrum for the benefit of people and businesses in hard-to-reach communities where spectrum is often under-utilized.

We also believe that 5G presents an opportunity to explore new ways of doing things, and that it should be more than simply an extension of 4G or 3G or 2G. We include within this view innovative business models incorporating concepts such as neutral hosting and national roaming, as well as innovative ways of sharing of spectrum for the benefit of the people and businesses of the UK. This is closely aligned with DCMS's Statement of Strategic Priorities (SSP) and its Future Telecoms Infrastructure Review (FTIR). There exists a clear opportunity to deliver on several of these through an ambitious and innovative approach in the upcoming spectrum awards and in spectrum policy in general.

MNO's current use of spectrum in rural areas is highly 'inefficient', and many parts of the UK are likely to remain insufficiently connected for many years unless affordable access to spectrum is made possible in locations where the main MNOs are not deploying. Ofcom's proposal to allow shared access is welcome, but we firmly believe that this can be more effectively and more efficiently implemented via DSA. The technology exists today, and the approach can, if deemed necessary, be implemented using an 'outside in' approach starting with rural locations in the first instance, where the results are likely to be most beneficial. Furthermore, we believe that in order to maximize spectrum utilization more generally, DSA should be applied not only to the 'shared bands' but also to the 700 MHz and 3.4-3.8 GHz bands, as this would allow Ofcom considerable flexibility in controlling access to spectrum in different scenarios and situations.

Responses to Consultation Questions

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.	Confidential? – N We welcome the proposal for shared access; however, we feel that this would be more efficiently implemented using Dynamic Spectrum Access (DSA) from the outset. Furthermore, we believe that DSA could (and should) be applied to the 3.4-3.8 GHz and 700 MHz bands, too. Such an approach would allow Ofcom considerable flexibility in controlling access to spectrum in different

	<p>scenarios, and it could be implemented in stages, starting with relatively simple models for rural areas in the immediate term, followed by more refined models in due course.</p>
<p>Question 2: (Section 3) Are there other potential uses in the three shared access bands that we have not identified?</p>	<p>Confidential? – N</p> <p>The potential uses identified by Ofcom seem basically reasonable, although we do wonder if the 1800 MHz band will actually offer sufficient bandwidth to provide significantly improved mobile coverage. We would expect that new, currently unforeseen, uses may emerge in the future if flexible and affordable spectrum access policies are in place.</p>
<p>Question 3: (Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?</p>	<p>Confidential? – N</p> <p>Ofcom’s proposal to start with a traditional, manual licensing approach followed by a shift to an automated, DSA-based approach later seems likely to introduce unnecessary difficulties and complications. We believe that DSA is now an established concept, and it could be implemented relatively easily from the outset in the three shared access bands as well as in other bands.</p>
<p>Question 4: (Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?</p>	<p>Confidential? – N</p> <p>Suitable equipment is being developed for use in the US for CBRS, which uses DSA techniques that build upon the techniques that were developed for dynamically accessing TV White Space (TVWS) spectrum. We believe that lessons from the TVWS development could, if desired, be used to inform a relatively simple approach being adopted, thereby, for example, alleviating individual radios from having to have any special built-in features in relation to DSA. We would be happy to elaborate further on some of these thoughts should this be of interest to Ofcom. In essence, we believe that the required equipment exists currently.</p>
<p>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.</p>	<p>Confidential? – N</p> <p>Yes, the proposal seems to make sense.</p>
<p>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.</p>	<p>Confidential? – N</p> <p>By limiting the sharing to just the three bands being proposed, it is entirely possible that some uses might be inhibited. For example, the 1800 MHz band may not contain sufficient bandwidth, while the 3.8-4.2 GHz band may not be available soon enough.</p>

<p>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.</p>	<p>Confidential? – N Yes, this seems reasonable, at least initially. However, we believe that this could be managed and potentially adapted more effectively by DSA.</p>
<p>Question 8: (Section 4) Do you have other comments on our proposed new licence for the three shared access bands?</p>	<p>Confidential? – N No further comments, other than to re-iterate our view that a DSA approach from the outset makes better sense, and also that this should be applied to other bands such as 700 MHz and 3.6-3.8 GHz, too.</p>
<p>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.</p>	<p>Confidential? – N The non-technical licence conditions seem reasonable, but we believe that they could be implemented more effectively via automated DSA.</p>
<p>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?</p>	<p>Confidential? – N We have no view on this.</p>
<p>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.</p>	<p>Confidential? – N We are generally in agreement with the proposed technical licence conditions, although would highlight that there are some specific use-cases (particularly in rural communities, as found by the 5G RuralFirst project), where higher uplink speeds are required. In TDD bands, this is often achieved by using more UL sub-frames (such as mode 0). We recognize the importance of coordinating sub-frames between proximate users, and suggest that consideration be given as to how to permit such usage where it is not detrimental to other users.</p>
<p>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.</p>	<p>Confidential? – N We have no specific view on this.</p>
<p>Question 13: (Section 5) Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.</p>	<p>Confidential? – N The proposed coordination parameters seem reasonable. We believe that an automated implementation would be the optimal approach.</p>
<p>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</p>	<p>Confidential? – N We have no specific view on this, but we note that a DSA-based approach would provide a framework that would allow flexibility to adapt</p>

<p>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?</p>	<p>to new technologies as and when they become available.</p>
<p>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?</p>	<p>Confidential? – N We have no specific view on this.</p>
<p>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.</p>	<p>Confidential? – N The cost-based approach and the calculations seem reasonable in principle. However, we believe that an automated DSA-based approach to spectrum management would ultimately lead to lower operating costs for Ofcom, albeit there would be some up-front development costs that may need to be factored in if deemed appropriate.</p>
<p>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.</p>	<p>Confidential? – N We have no specific view on this.</p>
<p>Question 18: (Section 8) Do you agree with our proposal for the Local Access licence? Please give reasons supported by evidence for your views.</p>	<p>Confidential? – N We support the principle of allowing access by third parties to awarded spectrum in locations where it is not being used by the MNO who owns the licence to use it. However, it is not clear how an objection by an MNO would be assessed as ‘reasonable’ or ‘unreasonable’, nor is it clear how transparent such discussions between Ofcom and the MNO would be.</p>
<p>Question 19: (Section 8) Do you have any other comments on our proposal?</p>	<p>Confidential? – N We welcome Ofcom’s proposals to allow sharing of awarded spectrum that is not in use. However, we favour an automated DSA-based approach for managing access to this spectrum by third parties. We believe that this is do-able today, and that it would provide flexibility and efficiencies that would allow the more effective overall use of spectrum.</p>
<p>Question 20: (Section 8) What information should Ofcom consider providing for potential applicants in the future and why would this be of use?</p>	<p>Confidential? – N Maps of actual spectrum usage would be useful, as it would allow potential applicants to work out in advance what spectrum they might consider requesting.</p>
<p>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</p>	<p>Confidential? – N The idea of granting a licence for a minimum of three years seems well-intentioned, with the</p>

<p>licence term of three years?</p>	<p>aim of giving certainty to third-parties so that they may make investment decisions with confidence. However, some licences might be required for a far shorter duration, depending on the specific applications and business models being deployed.</p>
<p>Question 22: (Section 8) Do you have any other comments on the proposed Local Access licence terms and conditions?</p>	<p>Confidential? – N We have no further comments on this.</p>
<p>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.</p>	<p>Confidential? – N The cost-based approach and the calculations seem reasonable in principle. However, we believe that an automated DSA-based approach to spectrum management would ultimately lead to lower operating costs for Ofcom, albeit there would be some up-front development costs that may need to be factored in if deemed appropriate.</p>