

Spectrum Sandboxes

Request for Information (RFI) on the modelling and testing of spectrum sharing between networks to help ensure efficient use of spectrum in the UK.

Department for Science, Innovation and Technology

Issue Date: 6 December 2023

1. Spectrum Sharing – Policy Background

Any device that communicates wirelessly needs spectrum. The sectors that therefore rely on this finite resource are varied and include mobile, Wi-Fi, broadcast, public sector, earth observation, and programme-making and special events (PMSE). As demand for spectrum continues to grow the challenge to accommodate new applications, as well as existing services increases. Maximising the availability of spectrum is therefore more important than ever and shared use of spectrum (spectrum sharing) is an important part of this.

Spectrum sharing has been used for many years in the UK, examples include PMSE sharing with broadcast TV, fixed links sharing with satellite earth stations and thousands of business radio users sharing the same band. In 2019, Ofcom took a pioneering step forward in enabling localised access to spectrum bands that support mobile technology with its [spectrum sharing framework](#), extending the UK's sharing landscape. The framework introduced Shared Access Licences (SAL) for localised access to a number of bands and Local Access Licences (LAL) which enable access to unused spectrum licenced to national mobile operators.

Our [Wireless Infrastructure Strategy](#) and [Spectrum Statement](#), both published in April 2023, set out government's commitment to spectrum sharing. We expect spectrum sharing to be an integral feature of future networks, including 6G, and recognise that to realise the full potential of sharing we need to be exploring the possibilities now.

Ofcom's current open consultation on [supporting increased use of shared spectrum](#) in the SAL bands, as well as its consultation earlier this year, which invited comments on [hybrid sharing and enabling both licensed mobile and Wi-Fi users to access the upper 6 GHz band](#), have sought to explore new possibilities for how to develop spectrum sharing in the UK. Ofcom also recently published a [discussion paper](#) that considered the role of spectrum sharing to meet the growing demands of next generation wireless broadband networks.

2. Testing innovative approaches to spectrum-sharing: the 'spectrum sandbox' model

Ofcom also set out its plans for spectrum sandboxes in its Spectrum Roadmap, to inform the development of new solutions for enhanced sharing. The funding announced in the [Autumn Statement](#) will support a number of these sandboxes, exploring sharing between networks.

The primary objective of the sandboxes would be to provide data and inform government and Ofcom on the possibilities and role of more intensive spectrum sharing, supported by an appropriate authorisation model.

Specifically, we see that sandbox projects could provide the following sources of information:

- Practical measurements of real wireless networks and testing of new spectrum sharing solutions to establish opportunities for more intensive sharing without harmful interference.

- System simulations and modelling to extend the applicability of the practical measurements and other data sources to other sharing parameters and scenarios, larger-scale network scenarios and differing spectrum management techniques.
- Analyses of the economic benefits and costs of the above and of the regulatory approaches that may be required to enable the above.

This project(s) will run for one year (March 2024 to March 2025). It is expected that data will be shared openly and freely throughout. A report to Ofcom and government, detailing the findings in each of these areas, will be produced by each consortium at the end of the project(s).

Outputs and Deliverables

The table below summarises the three work packages we currently see as being provided by the sandbox project(s).

- Work package 1 (WP1) – Spectrum Sandbox testbeds
- Work package 2 (WP2) – Simulation and modelling
- Work package 3 (WP3) – Economic and regulatory assessment

Phase	Focus
1. Practical measurements, data sharing and spectrum sharing experiments via Spectrum Sandbox	<p>Collaborative development and use of testbeds to allow field measurements, collection and sharing of data and testing of new spectrum sharing solutions, within a temporary spectrum sandbox context. This will inform the selection of parameters for the simulations and validate and illustrate their outcomes. At least one pair of sharing systems should be evaluated in this work package.</p> <p>Outputs</p> <ul style="list-style-type: none"> - Test report, setting out the detailed results from the testing, comparing system performance under conventional operation and under more intensive spectrum sharing. - Report and proof of concept demonstration on potential for sharing of usage and interference data for regulatory purposes, setting out the potential benefits, associated challenges, and recommendations for the future operation of such systems. This should include visualisation, such as a map-based representation of the data allowing analysis by location, frequency and time. - Archive of measurement and performance data captured during testing.
2. Simulation and modelling	<p>The primary objective of WP2 is to identify the lessons learnt from WP1 and assess the applicability of the sharing solutions developed in WP1 to a wider range of technical parameters, locations, frequencies and technologies than would be feasible in the measurements. It is envisaged that WP2 will make extensive use of computer simulations and modelling. The modelling and simulation work will set up a numerical assessment of a range of sharing systems drawn from the list of examples set out below. It</p>

	<p>should include all of those sharing systems assessed in WP1, adding others to be proposed. It will assess the performance of those systems as the sharing conditions are varied over a wider range than those in the measurements, for example with respect to spacing between systems or transmit powers.</p> <p>Outputs</p> <ul style="list-style-type: none"> - Simulation and modelling results, providing the outcomes of the work and the associated findings for the potential for more intensive sharing for the systems considered and under different input parameters and for the frequency assignment procedures specified by WP3. - Data catalogue, listing all input data and parameters with associated sources and rationale.
3. Economic and regulatory analysis	<p>WP3 will assess the economic value of sharing solutions, using a case study approach for which the key inputs will be test results on system performance from WP1 and scaling factors from WP2. The purpose of WP3 outputs is to form part of the evidence base for future policy development relating to spectrum sharing.</p> <p>Drawing on the findings from WP1 and 2 and the cost-benefit analysis, this work package will also suggest options to explore for potential regulatory mechanisms and tools that maximise the benefits of shared and hybrid licencing approaches in a spectrum band.</p> <p>Outputs:</p> <ul style="list-style-type: none"> - Cost-benefit analysis of scenarios tested in WP1 and WP2 against the counterfactual (eg. exclusive licenses and license-exempt bands). - Discussion of options to maximise the benefits of shared and hybrid licensing approaches and tools required to implement these in practice.
4. Final report	<p>A final report to government from each consortium, bringing together the outputs from these three work packages will be produced at the end of the project(s) alongside a verbal presentation.</p>

Test systems ‘pairs’ of spectrum could include, but are not limited to:

1. Wi-Fi and mobile
2. Independently operated private networks
3. Mobile and fixed links
4. Mobile and NGSO satellite: direct to device satellite in mobile bands
5. Mobile and NGSO satellite: terrestrial mobile in FSS or MSS bands.
6. Mobile and airborne NTN: airborne base stations in mobile bands
7. UWB and Mobile
8. Mobile/other networks and Defence systems
9. Receive-only users (such as scientific applications) and mobile

This list is not exhaustive, and we would welcome other suggested pairings.

At least one pair of systems should be studied within WP1, but preferably more. These, plus additional pairs should be considered in WP2.

Key Expected Milestones

These dates are indicative and for information only and are subject to change at DSIT's sole discretion.

Date	Action
December 2024	DSIT Spectrum Sandbox Workshop - Virtual (Hosted by TechUK)
January 2024	Competition launches
March 2024 – March 2025	Project Delivery
31/03/2025	DSIT funding ends.

Supplier Requirements

It is expected that each sandbox project would be run by either an individual organisation delivering all three work packages, or separate organisations running a work package or two each but working in a close consortia format. In a consortia scenario, a project lead would need to be appointed.

To successfully deliver the research DSIT require suppliers to have a range of expertise and access to resources, such as:

1. Good knowledge of the telecommunications sector, as well as of other sectors currently using or expecting to use spectrum in the UK;
2. Practical experience of wireless network deployment and operation;
3. Access to existing relevant real-world equipment or representative prototype equipment for WP1;
4. Good knowledge of authorisation mechanisms;
5. Proven commercial and project management skills to deliver research projects of similar scope particularly delivery of R&D projects in this sector;
6. Robust knowledge of quantitative data collection and data analysis methodologies, and ability to design and apply specific methods;
7. Knowledge of discounted cost-benefit analysis;¹
8. Clear knowledge of the format and style required to report research results, and ability to report research information clearly.

¹ This may draw on approaches as set out in HM Treasury's Green Book or Magenta Book, for example.

3. Response Request

Respondents are invited to provide responses to the following request for information:

Ref	Question	Response
1. Capability and Contact		
1.1	Please provide details about your business' capability to meet the above-mentioned supplier requirements. (This could include but is not limited to: relevant experience, qualifications, professional accreditations etc.)	
1.2	Please provide details about your business' links and experience working with the telecommunications, and/or other relevant spectrum-user industries with a premium on research and delivering R&D projects and how these link to the supplier requirements set out above.	
1.3	Please provide details about capabilities sought from potential partners/subcontractors/prime contractors/individual contractors etc. in delivery of the requirements.	
2. Requirements		
2.1	In respect of the delivery are the stated objectives and timelines achievable in your view? How could they be adjusted to be more achievable whilst still serving our stated purpose?	
2.2	Are there any other areas of study that you feel are missing from the work packages?	
2.3	We aim to divide the competition budget to deliver multiple sandboxes. For example, we might expect to have three sandbox projects, with each project delivering against all three work packages. If we therefore delivered the three sandbox projects at £1.5M each, do you still feel the budget is feasible?	

2.3	How would bidders ensure data is shared effectively between the work packages and those actors within a consortium?	
2.4	What approach would you propose for the outputs stated? Please include information on stakeholder engagement and research strategies/techniques	
2.5	What do you see as the key risks and issues with our stated approach and how would you address them?	
2.6	Are any parts of this requirement unclear? If so, please list any queries or clarification questions.	
2.7	Is there anything further you would wish to add?	

4. RFI Instructions

To respond to this RFI, please **prepare a response using the above template**. Responses should be limited to a maximum of 4 sides of A4.

Please forward your response via email to fnpcommercial@dsit.gov.uk by **no later than 12pm (noon) on 20 December 2023**.

Respondents are invited to provide short summaries of company information to inform DSIT's approach. Should the decision be made to formally complete this requirement, any information provided must be re-submitted as part of the formal procurement process.

In your response, please provide a named point of contact in your organisation, with phone number and email address, who can answer questions in relation to your response.

Depending on the volumes of responses, DSIT may contact you to discuss the response: either individually or as a group call with other respondents.

Contact Details

We welcome any feedback on the above questions, including any comments, questions or recommendations on the feasibility and appropriateness of this project.

Please email fnpcommercial@dsit.gov.uk with any feedback or questions by **12 pm on 13 December 2023**.

5. Conditions of Participation

This early engagement exercise in no way intends to guarantee that any of the services will be tendered.

Should DSIT choose to act on the outcome of this RFI, any information as required by that process and provided by the Respondent through this engagement exercise must be re-submitted.

DSIT reserves the right to amend or change any aspects discussed in this exercise.

In submitting a response, the Respondent is made aware that this is for information purposes only. The response shall not be binding on the Respondent nor on DSIT.

The Respondent takes part in this RFI, with the express understanding that there is no binding commitment on DSIT to engage further with the Respondent.

DSIT reserves the right to discuss, for the purpose of clarification, any aspect of a response with the relevant Respondent.

By submitting a response to this RFI, the Respondent authorises DSIT to share information with other central government bodies.

DSIT reserves the right to cancel this market engagement exercise at any point.

The Respondent accepts that their participation in the RFI is voluntary and does so at its own risk and bearing its own costs. Under no circumstances will DSIT be liable for any costs or expenses borne by or on behalf of the Respondent or any party associated with this procurement process.

Respondents acknowledge that the RFI contains information that is preliminary and may change considerably with future planning.

DSIT is under no obligation to accept any RFI response.

No information submitted by recipients in response to this RFI will impact your eligibility to compete for any future opportunity or impact the selection of suppliers(s) for tender submission or award.

This early engagement exercise in no way intends to guarantee that any of the services will be tendered.

Should DSIT initiate a procurement related to this RFI, any information as required by that process and provided by the Respondent through this engagement exercise must be re-submitted.

Please note that not responding to this Request for Information, does **not** exclude you from being involved in these sandboxes in due course.

Annex 1 - Privacy Notice

The following is to explain your rights and give you the information you are entitled to under the Data Protection Act 2018 and the General Data Protection Regulation (“the Data Protection Legislation”). This notice only refers to your personal data (e.g. your name, email address, and anything that could be used to identify you personally) not the content of your response to the Request for Information (RFI).

One element of personal data will be collected: the name and email address of the point of contact (POC) you provide for networking purposes (POC Data), Table 2 Section 2.

1. The identity of the data controller and contact details of our Data Protection Officer

The Department for Science, Innovation and Technology (“DSIT”) is the data controller. The Data Protection Officer can be contacted at dcmsdataprotection@dcms.gov.uk

You can find out more here:

<https://www.gov.uk/government/organisations/department-for-science-innovation-and-technology/about/personal-information-charter>

2. Why we are collecting your personal data

POC Data: This personal data is being collected to facilitate the networking of potential providers to enable collaboration within the supply chain and improve commercial outcomes.

3. Our legal basis for processing your personal data

POC Data: Consent is sought in the RFI form (Table 2, section 2.6) for DSIT to collect and share this personal data with other RFI respondents, for the purposes outlined above.

4. With whom we will be sharing your personal data

POC Data will be shared with other respondents to this RFI who also provide POC Data for networking and collaboration purposes. The Department reserves the right not to share information with RFI respondents for any reason, including, but not limited to, respondent credibility, suitability for engagement etc.

If you want the information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence. In view of this, it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

5. For how long we will keep your personal data, or criteria used to determine the retention period.

Your personal data will be held for two years after receipt. This is so that the department is able to contact you regarding the market engagement process.

6. Your rights, e.g. access, rectification, erasure

The data we are collecting is your personal data, and you have considerable say over what happens to it. You have the right:

- to see what data we have about you
- to ask us to stop using your data, but keep it on record
- to have all or some of your data deleted or corrected, in certain circumstances.
- to lodge a complaint with the independent Information Commissioner (ICO) if you think we are
- not handling your data fairly or in accordance with the law.

You can contact the ICO at <https://ico.org.uk>, or telephone 0303 123 1113. ICO, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.

7. Your personal data DSIT processes may be sent overseas by virtue of sharing the Company Data with other organisations who may process data overseas.

8. Your personal data will not be used for any automated decision making.

9. Your personal data will be stored in a secure government IT system.