# Hub in all Spectrum Connectivity Call for Proposals

## Introduction and Background

EPSRC and DSIT have funded three Hubs focusing on Future Telecommunications, together with a national experimental infrastructure. These are

- PlaTform Drlving The UltimAte CoNnectivity (TITAN) <u>TITAN</u>
- Hub in All Spectrum Connectivity (HASC) <u>HASC</u>
- Communications Hub for Empowering Distributed clouD Computing Applications and Research (CHEDDAR) <u>CHEDDAR</u>
- Joint Open Infrastructure for Networks Research (JOINER) JOINER

Additionally, a Federated Telecoms Hub brings together these initiatives. Federated Telecoms Hub

More information can be found about each on the respective websites. A summary of the HASC programme can be found in an appendix to this document.

#### Aims and scope of this call

HASC has set aside approximately £700k (80%FEC) to fund projects which reinforce the HASC programme with a focus on achieving impact. We particularly encourage projects that:

- Address critical research challenges related to the efficient use of spectrum and its evolution in the context of future technologies and standards such as 6G, IEEE 802.11 etc.
- Expand the HASC network by integrating new expertise and institutions
- Forge strong partnerships with industry leaders, ensuring active participation and knowledge transfer
- Have a clear path to exploitation or impact (through industrial collaboration/input to a specific standard or similar )
- Showcase early 6G experiments and trials including making use of the JOINER infrastructure to enable collaborative research and drive national pilots

Part of the mission of the Hubs is to offer a springboard for early career researchers (ECRs) and to promote equality, diversity and inclusion (EDI), so applications that help to advance these aspects of the Hubs are encouraged.

## Eligibility

Funding is subject to EPSRC rules and eligibility. A key goal of the call is to expand the scope and membership of the Hubs, and to ensure that the work in these projects is connected to the core research programmes. For these reasons:

- Projects must include one Co-I from the original HASC proposal (these are listed in the Appendix), so that projects are linked to the core Hub research programme. Projects cannot be led by a Co-I on this list;
- Each investigator can only be involved in two maximum proposals.

### Scale of project and timing

We have £700k (80%FEC) to allocate, so projects greater than £150k will need strong justification. Projects smaller than £50k are unlikely to yield the benefits we would like to achieve and will need similarly strong justification. We intend to have contracts in place for projects to start on 1 July 2025. They must complete by the end of April 2026, when the grant finishes.

### Assessment and Evaluation

A review team including the HASC leadership and external representation will review and decide on the applications received. Proposals may require a further iteration and re-review before an accept or decline decision is made.

All proposals will be evaluated according to the evaluation criteria below

- The potential to produce tangible impact, as evidenced by a clear explanation of how this will be achieved
- The quality/excellence of the proposed research and innovation
- The plan, proposed resources and management of the project with a particular focus on the ability to deliver the project and complete spending by 30<sup>th</sup> April 2026.

Funding will be allocated considering the evaluation against these criteria..

## **Application Process**

Applications should be made to HASC. We will be using submit.com to manage the application process and links to this will be made available shortly.

The Applicant(s) should include the information requested on the application form, using not more than four sides of A4-with one additional side allowed for references if required (11pt Arial, 2 cm margins), including.

- Technical description and plan for the project with measurable goals. This should include a brief description of the state of the art in the area, and how the proposal relates to this
- A clear explanation about how it contributes to and complements the Hub objectives
- The name and position and track record of the lead applicant, focusing on research relevant to the proposal
- Parties involved and their roles and include researcher names if they are known. If recruitment is required, please briefly explain steps that will be taken to ensure a diverse set of applicants and the delivery against the ambitious timeline. For industrial partners outline their involvement in the project and their contribution.
- Any actions to promote EDI in the execution of the project
- A brief project plan, including the start and end dates and milestone dates if applicable-please include measurable goals (and intermediate milestones if applicable).
- Applicants will also be asked to fill in an online form, including a brief project abstract
- Detailed JeS-type costing (equipment cost is not permitted) to execute the project (See note on costing below)

- The award requested from the Hub
- The contributions from each of the parties and co-funders (if applicable). We do not require formal letters of support. However, if possible, please email or similar communication from the industrial partners who will be involved, detailing their interest, in order to strengthen the case for the application.

Arrangements for the administration of successful awards will be made in collaboration with the awarding Hub and require a formal Project agreement. This Agreement will include the project scope and schedule, ownership and use of inputs and results including IP, contributions, liabilities etc.

#### Important note about costing

Our funds come from an EPSRC grant where the balance of funds available in each of the categories are fixed.

For this call the table below sets out the proportion under which costs must be claimed (assuming a nominal £100k (100% FEC) grant.

Resource Name	Values for £100k(100%FEC)
Directly Incurred Costs	
Consumable Purchases	£8,939.87
Staff Costs	£30,233.17
Travel & Subsistence	£4,687.87
Directly Allocated Costs	
FEC DAC Investigators	£4,689.37
FEC DAC Estates	£13,415.33
FEC DAC Inf Technicians	£415.38
FEC Indirect Costs	£37,619.01
Total	£100,000

#### **Non-Academic Collaborators**

For external collaborators, the terms of a research collaboration will be based on the established principles of Industry-University collaborations in the UK as set out in the Lambert Toolkit.

#### Contact details:

HASC Please email [hasc-enquiries@eng.ox.ac.uk]

## Appendix 1: Hub Summaries

## Future Communications Hub on All Spectrum Connectivity

Understanding how to best use established and emerging frequency bands across the wireless and wired spectrum is a key challenge for future communications systems. This hub brings together a network of researchers and institutions with world-leading capabilities and facilities to answer this question and deliver innovation in the use and exploitation of future wired and wireless spectrum. The core consortium consists of the University of Oxford, Queens University Belfast, the University of Bristol, the University of Cambridge, University College London, Imperial College London, and the University of Southampton.



## Programme

Figure 1 shows the organisation of the programme. Research will address four challenges.

## **C0: Modelling (led by Oxford)**

This will bring together existing models of different parts of the wired and wired network to create an holistic model that allows comparison of different approaches to end-to-end connectivity using wireless.

## Key Milestones/Goals

- Initial model completed using existing data/base models
- Measurements of test environments across ranges of frequencies for validation and model development
- Models incorporating advanced Physical Layer (including MIMO, RIS and other elements)
- Models incorporating adaptivity.

## C1: Connectivity (led by UCL)

Partners in this challenge will demonstrate wired/wireless connectivity if different regimes (THz/optical/mm wave etc.) in order to validate aspects of the modelling. They will also develop designs and strategies for implementing the interfaces between different channels.

#### Key Milestones/Goals

- Spectrum map showing capabilities of different wired and wireless channels
- Spectrum optimisation and interference management strategies
- Demonstration of end-to-end connectivity using combination of wired/wireless channels including
  - Tbps optical wireless distribution
  - Demonstration of THz over Fibre
  - Demonstration of PON/optical wireless interface
- Demonstration of capabilities using new fibre types

#### C2: Adaptivity and efficient and reliable networks (led by Bristol)

This will examine techniques to interface and switch between the different methods of connectivity, including AI/ML. Both theoretical and practical aspects will be investigated.

#### Key Milestones/Goals

- Development and initial demonstration of ML techniques for coordinated spectrum management across all spectrum regions
- Management tools addressing co-optimisation of spectrum resource, security, accessibility, sustainability.
- Demonstration and implementation of prototype controllers

#### C3: Security (led by Cambridge)

This will examine the combination of QKD and classical wired and wireless communications, as well as physical layer security and other techniques that use properties of the PHY layer.

#### Key Milestones/Goals

- Combined operation of quantum ATM and fibre network
- Study of optical/RF PLS techniques
- Demonstration of quantum secure Open RAN network
- Development/demonstration of entanglement-based approaches

# Appendix 2: Current Hub 'Core' Investigators

Name	Organisation
Professor Bruno Clerckx	Imperial College London
Dr Ayush Bhandari	Imperial College London
Professor Kin Leung	Imperial College London
Professor Simon Cotton	Queen's University of Belfast
Professor Michalis Matthaiou	Queen's University of Belfast
Dr Hien Ngo	Queen's University of Belfast
Dr Okan Yurduseven	Queen's University of Belfast
Professor Alwyn Seeds	University College London
Dr Martyn Fice	University College London
Professor Dimitra Simeonidou	University of Bristol
Dr Shuangyi Yan	University of Bristol
Professor Richard Penty	University of Cambridge
Dr Michael Crisp	University of Cambridge
Professor Harald Haas	University of Cambridge
Dr Iman Tavakkolnia	University of Cambridge
Professor Dominic O'Brien (PI)	University of Oxford
Dr Justin Coon	University of Oxford
Professor Periklis Petropoulos	University of Southampton