UK SPF Future Spectrum Policy Summit

Thursday 21 May 2026

09:00 – 16:30

Housekeeping

- This session is held under Chatham House rule – please do not record this session
- Slides will be shared with speakers' permission
- Unless you are a speaker, please keep yourself on mute and your camera off

10am	Intro & keynote speakers	Dr Abhaya Sumanasena Chair of the UK SPF and Real Wireless
11am	Coffee Break	All
11.30am	First impressions: SPF study Future spectrum users' demand	Scott McKenzie Coleago Consulting
11.45am	Economics of spectrum and impact on UK	Tony Lavender UK SPF Cluster 3 Chair and Plum Consulting
12.30pm	UK SPF Q2 2026 Plenary and cluster updates	Luigi Ardito Chair of the UK SPF Steering Board and Qualcomm
1pm	Networking lunch	All
2pm	JOINER and the future of connectivity in the UK	Professor Simon Saunders University of Bristol and JOINER NSF
2.15pm	Initial findings: Spectrum landscape lunar communications	Dr Abhaya Sumanasena Chair of the UK SPF and Real Wireless
2.30pm	Panel: Developing a regulatory approach to lunar communications	Laura Iglesias Department of Science, Innovation and Technology
3.10pm	Coffee Break	All
3.40pm	Panel: The future of critical communications	Janette Stewart Analysys Mason
4.30pm	Networking drinks	All

Intro & Keynotes

Dr Abhaya Sumanasena, Real Wireless & UK SPF Chair

realwireless.

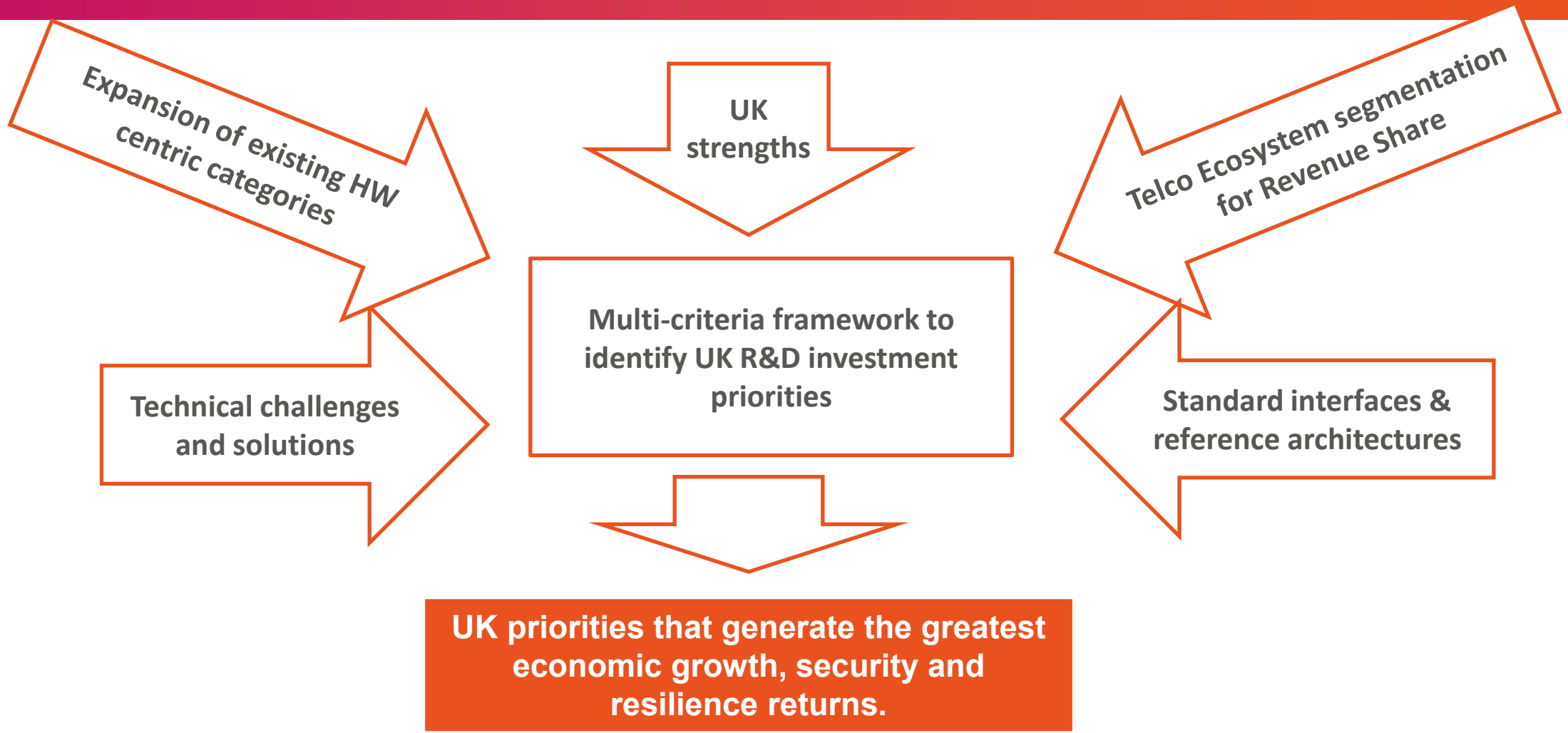
independent telecoms experts

A framework to identify UK R&D investment priorities

Dr Abhaya Sumanasena, Real Wireless

realwireless.

Developing a framework to identify UK R&D investment priorities



realwireless.

Identifying UK priorities

- The goal is to identify categories where **UK has the greatest opportunity to engage in commercially significant global revenue pools**.
  - This will help frame these categories as **potential targets for R&D investments** that can **promote SME participation** and support and **economic development**.
- The revenue generated **reflects commercial activity, investment priorities & the activation of the supply chain**.
  - Relying solely on revenue share for R&D prioritisation would lead to underinvestment in some of the UK's most strategically significant opportunities.
- The **multi-criteria framework with a** broader assessment will address this limitation:

1. **Growth rate.** E.g. NTN software categories are growing from near-zero — exceptional CAGR figures that do not show up in absolute revenue share.
2. **Strategic leverage** in certain categories supports ecosystem development, while their absence restricts value generation. Investing in these areas can also boost innovation and R&D, fostering long-term economic growth.
3. **UK competitive position.** UK competitiveness reflects what UK companies can actually compete for, accounting for both capability and market structure, representing a direct channel of benefits to the UK economy.
4. **Supply chain and sovereign resilience.** Some areas highlight the need for UK indigenous capabilities alongside commercial returns, particularly when technology supports government or Defence communications.

R&D priority tier results – an example outcome

Weights	W1	W2	W3	W4	W5

Rank	Funding category	C1 Mkt Size	C2 Growth	C3 Strategic	C4 UK Comp.	C5 Sovereign	Revenue share	Weighted Score (/5)	R&D Priority Band
1	Category 1								Tier 1
2	Category 2								Tier 1
3	Category 3								Tier 1
4	Category 4								Tier 1
5	Category 5								Tier 2
6	Category 6								Tier 2
7	Category 7								Tier 2
8	Category 8								Tier 2
9	Category 9								Tier 2
10	Category 10								Tier 2
11	Category 11								Tier 3
12	Category 12								Tier 3
13	Category 13								Tier 3
14	Category 14								Tier 3

realwireless.

Contact:

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realwireless.
independent telecoms experts

Julia Criado

Radio Spectrum Policy Group (RSPG)

EUROPE'S SPECTRUM POLICY HORIZON

Coordination, WRC-27 and future access models in Europe's spectrum agenda

Keynote | 21 May 2026 | London

UK SPF Future Spectrum Policy Summit 2026

Julia Criado | RSPG

OPENING FRAME

Three opening signals

Spectrum policy is no longer a niche telecom file. It now sits at the intersection of growth, resilience and strategic autonomy.

01 **Competitiveness, resilience and security**

Spectrum now underpins mobile, satcom, public protection, industrial digitalisation and critical services.

02 **EU Coordination and harmonization**

Europe needs enough harmonisation to create scale — without erasing national security, geography and market realities.

03 **Preparation is ongoing**

For WRC-27 and 6G, the decisive choices are made during the study and alignment phase, not in the final conference room.

A EUROPEAN FRAMEWORK WITH NATIONAL JUDGEMENT

Coordination without full centralization

EU-scale harmonisation

Where scale, equipment ecosystems and cross-border predictability matter most.

National implementation

Where security, defence, borders, terrain and incumbent use require flexibility.

Evidence-led market design

Where awards, obligations and access models must follow actual use cases

The practical objective is not maximum uniformity. It is enough alignment to create scale and credibility, while preserving room for national execution.

THE REAL WRC-27 WORK HAPPENS BEFORE 2027

The preparation phase is where choices harden: Priorities, trade-offs and red lines

Studies and trade-offs

Clarify where Europe needs flexibility, where it needs red lines, and where coexistence can be made credible.

EU and CEPT alignment

Develop EU positions aligned with EU policies to promote and defend them internationally.

Negotiation and coalition-building

Arrive with a coherent narrative, ready to build alliances beyond Europe.

IMT / 6G candidate bands

Satellite and NTN expansion

Science and passive services

Cross-service coexistence rules

WRC-27 is not just an ITU conference. It is the point where industrial strategy, technical coexistence and geopolitical coordination meet.

SHARING AND ACCESS

Access models should reflect operational reality

Exclusive licensed access

Best where investment certainty, QoS and national coverage remain the priority.

Geographic or local sharing

Useful where demand is localised and under-use can be unlocked without harming incumbents.

Time-based or coordinated use

Relevant when access can be scheduled, bounded or tied to clear operating conditions.

More dynamic models

Promising — but only when governance, databases and enforcement are mature enough.

Sharing is not an objective in itself:

- Case-by-case, band-by-band, incumbent-by-incumbent
- Protect investment incentives and service reliability
- What sounds persuasive in theory must still prove workable in practice

PREPARING FOR 6G WITHOUT FRAGMENTING THE ECOSYSTEM

Upper 6 GHz is increasingly central to Europe’s 6G debate — but scale, optionality and affordability must remain the guiding principles

In Europe, upper 6 GHz is increasingly at the centre of the 6G capacity discussion. But future band decisions should not be framed as a race to multiply options. They should be guided by a disciplined objective: enable innovation while preserving scale, investment credibility and affordable deployment.

Scale first	Too many divergent band options weaken the equipment ecosystem, slow down standardisation and make deployment more expensive.
Keep optionality	Europe should prepare for future capacity needs without locking itself too early into rigid assumptions or premature choices.
Protect affordability and coexistence	Future harmonisation must remain credible in practice: respectful of incumbents, enforceable in real conditions, and supportive of cost-efficient deployment.

Upper 6 GHz may be central to the debate, but the real objective is a credible path to scale to 6G not limiting, when possible, the access to the band to license-exempt services

WORKING TOGETHER WHERE IT MATTERS

A practical agenda for continued cooperation

01	**Sustain a serious WRC-27 dialogue**	Disciplined contact where positions, studies and coalition-building matter.
02	**Share coexistence evidence**	Especially where satellite, mobile, public-sector or scientific uses compete in hard bands.
03	**Keep talking on critical communications and NTN**	These are increasingly strategic, operational and cross-border in their consequences.
04	**Align where it creates scale**	Research, standards, testing and equipment ecosystems do not benefit from unnecessary fragmentation.

Close cooperation remains possible where interoperability, scale and credibility matter to both sides

A PRACTICAL TEST FOR THE ROAD AHEAD

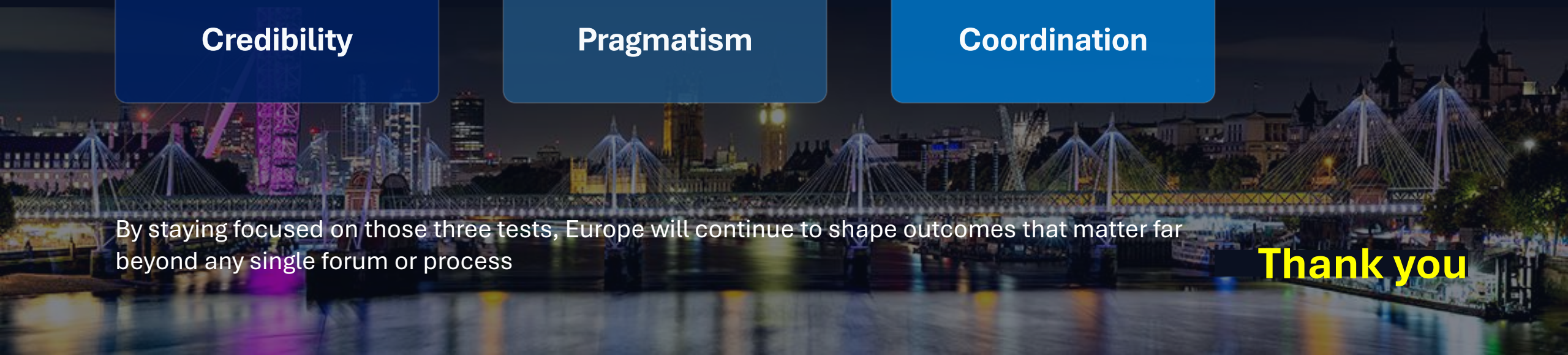
In spectrum policy, ambition matters only when it can be delivered in practice

The next phase of spectrum policy will be shaped not just by vision, but by execution.
The real test is whether key choices are credible, pragmatic and coordinated.

Credibility

Pragmatism

Coordination



By staying focused on those three tests, Europe will continue to shape outcomes that matter far beyond any single forum or process

Thank you

Chris Woolford

Ofcom

Spectrum:
Enabling a Wireless Future

Chris Woolford

Director, International Spectrum Policy

May 2026


LOOKING BACK
LOOKING FORWARD

Enabling wireless services in the UK economy

OBJECTIVES

- Assure stakeholder access to spectrum and mitigate harmful interference through licensing, planning, monitoring and compliance activities that enable wireless services
- Identify and make available spectrum to meet evolving needs of sectors, including mobile broadband and space services
- Evolve our spectrum management frameworks to support increased efficiency of use, enhance speed and flexibility of access and improve spectrum availability
- Lead and influence international discussions on spectrum access while effectively representing UK interests

PRIORITIES

- **Spectrum management infrastructure**
- **Mobile spectrum release, authoirisations and auctions**
- **Investing in the space sector**
- **International engagement**

Spectrum Group Leadership Team

David Willis
Group director

Lucy Eccles

Gideon Senensieb
Terrestrial Spectrum Policy & Awards

Nina Percival
Non-Terrestrial Spectrum Policy & Authorisations

Steve Leach
Technology Policy

Martin Fenton
Technology Policy

Policy

Operations/Services

Tech Lead

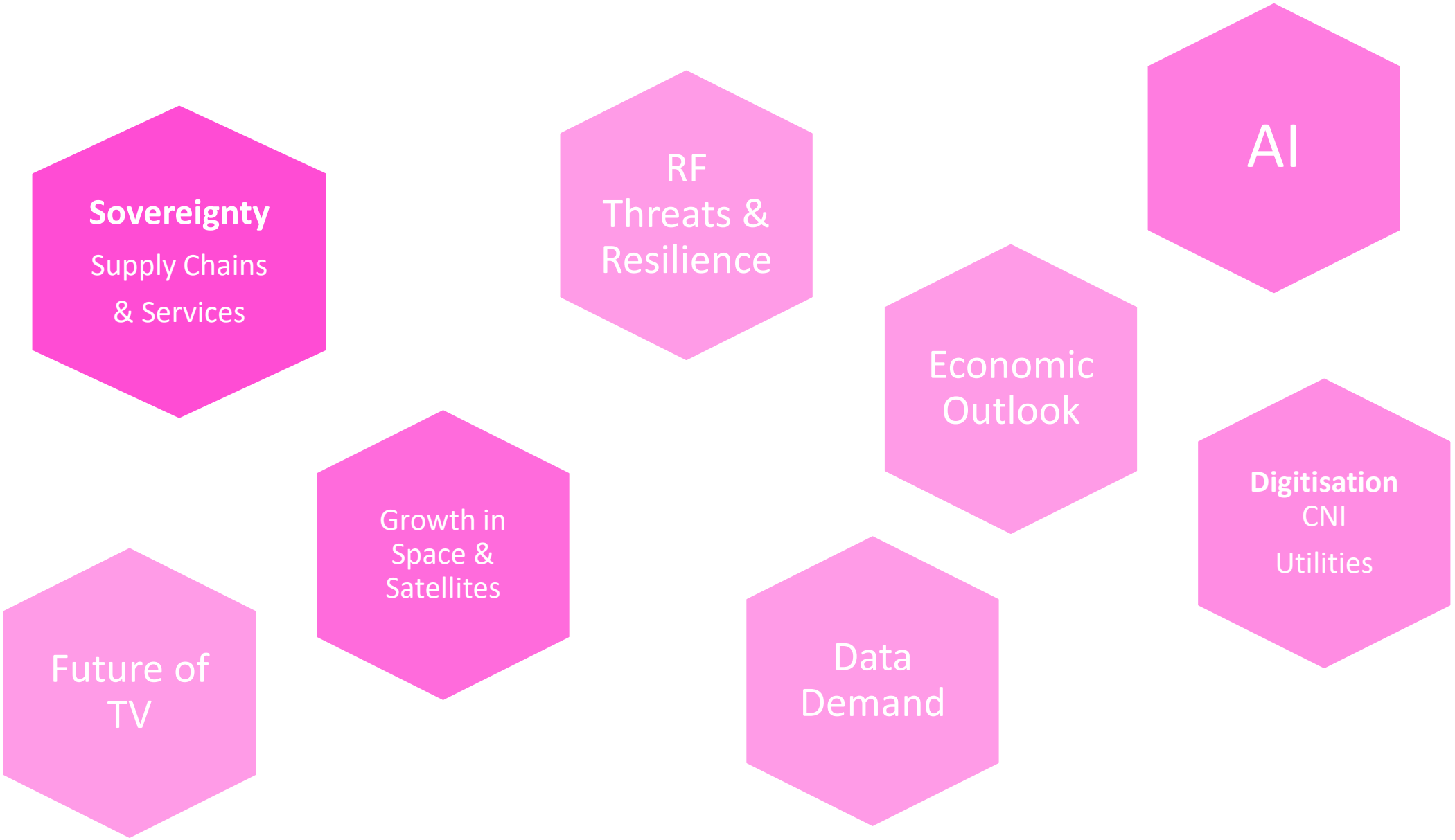
Specialists

Chris Woolford
International Spectrum

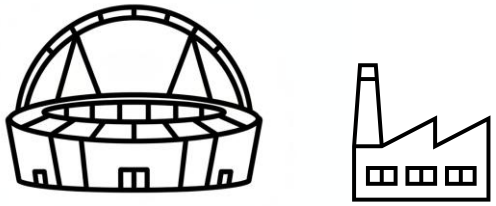
Armelle Boisset
Spectrum Engineering & Systems

David Ashcroft
Spectrum Assurance, Compliance and Licensing

Navigating change and uncertainty



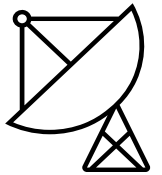
Looking back



mmWave
National and Local

Consumer Information
Map Your Mobile

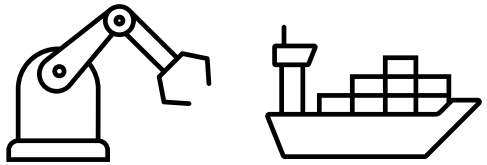
‘Pop up’ 5G
2.3 GHz



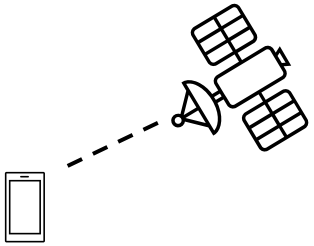
NGSO Gateways
Q/V & E

Rail Ops and Blue Light
1.9 GHz

5G Fixed Wireless Access
VodafoneThree spectrum
5.8 GHz Licence Exempt

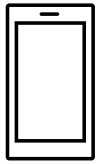


Shared Access
3.8-4.2 GHz harmonisation
mmWave

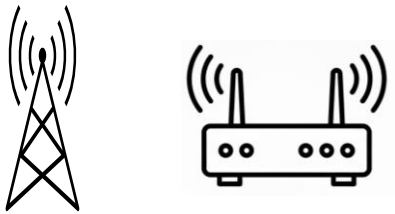


D2D – IMT
VMO2, VodafoneThree

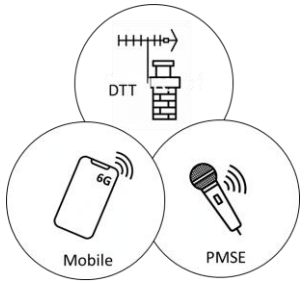
Work in progress & looking forward



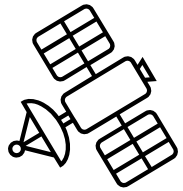
Mobile
1.4 GHz Auction & ALF
Rural Spectrum Sharing



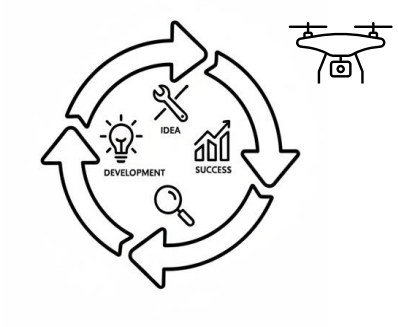
Mobile & Wi-Fi
Upper 6 GHz



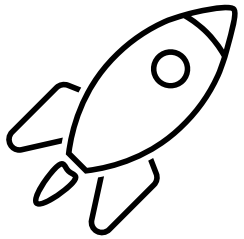
Sub 1 GHz
PMSE Review, CNI



2GHz Mobile Satellite
Licences expire May ‘27



Innovation
Trial Licenses & drones



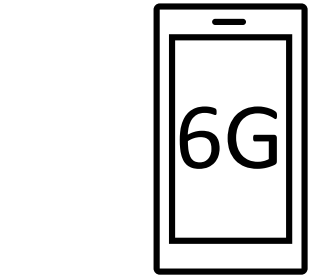
Space Launch

Spectrum Assurance
e.g. Jammers

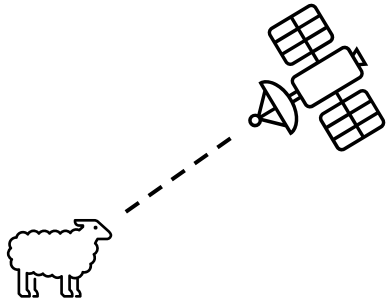
Licensing Systems
Simplification & Speed

International and preparation for WRC-27

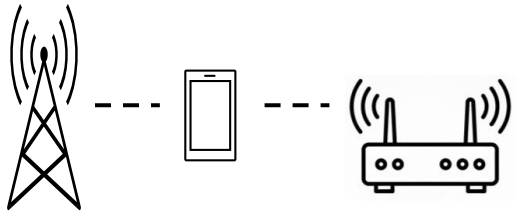
WRC-27
Shanghai



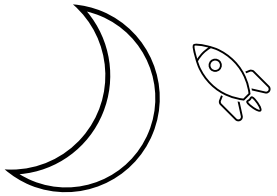
AI 1.7
4.4-4.8, 7-8, 15 GHz



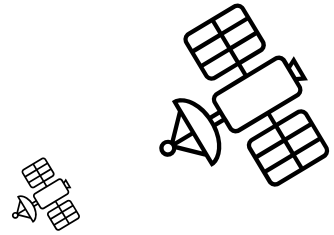
MSS allocations
Satellite IoT



Mobile <-> Wi-Fi Interop



Science services
(incl. lunar comms)



NGSO & GSO coexistence
+ many other satellite issues

Final remarks

Profile of spectrum continues to rise

- Rapid technical development
- Increasing market complexity
- More stakeholder interest
- International frameworks remain key
- Significant geopolitical interest

Ofcom is promoting an agile and flexible approach to spectrum management, supporting spectrum sharing, in a more dynamic, complex and uncertain world

Coffee break

11:00 – 11:30

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4.30pm	Networking drinks	All

First impressions: SPF study Future spectrum users' demands

Scott McKenzie, Coleago Consulting

uk spectrum policy forum

Future Users Spectrum Demand Project - Introduction

21st May 2026

Scott McKenzie
Nick Fookes
Julian Garrett

coleagoconsulting

Coleago Consulting Limited

Telecoms strategy consultancy

- Founded in 2001
- Based in the United Kingdom
- Global client base
- Experience based consulting
- Leading adviser
  - Fibre
  - Spectrum
  - Telecoms regulation
- Also provide training courses
  - Mini Telecoms MBA
  - Leadership
  - Regulation
- Advised UKSPF previously on UHF band studies

Future spectrum user demand

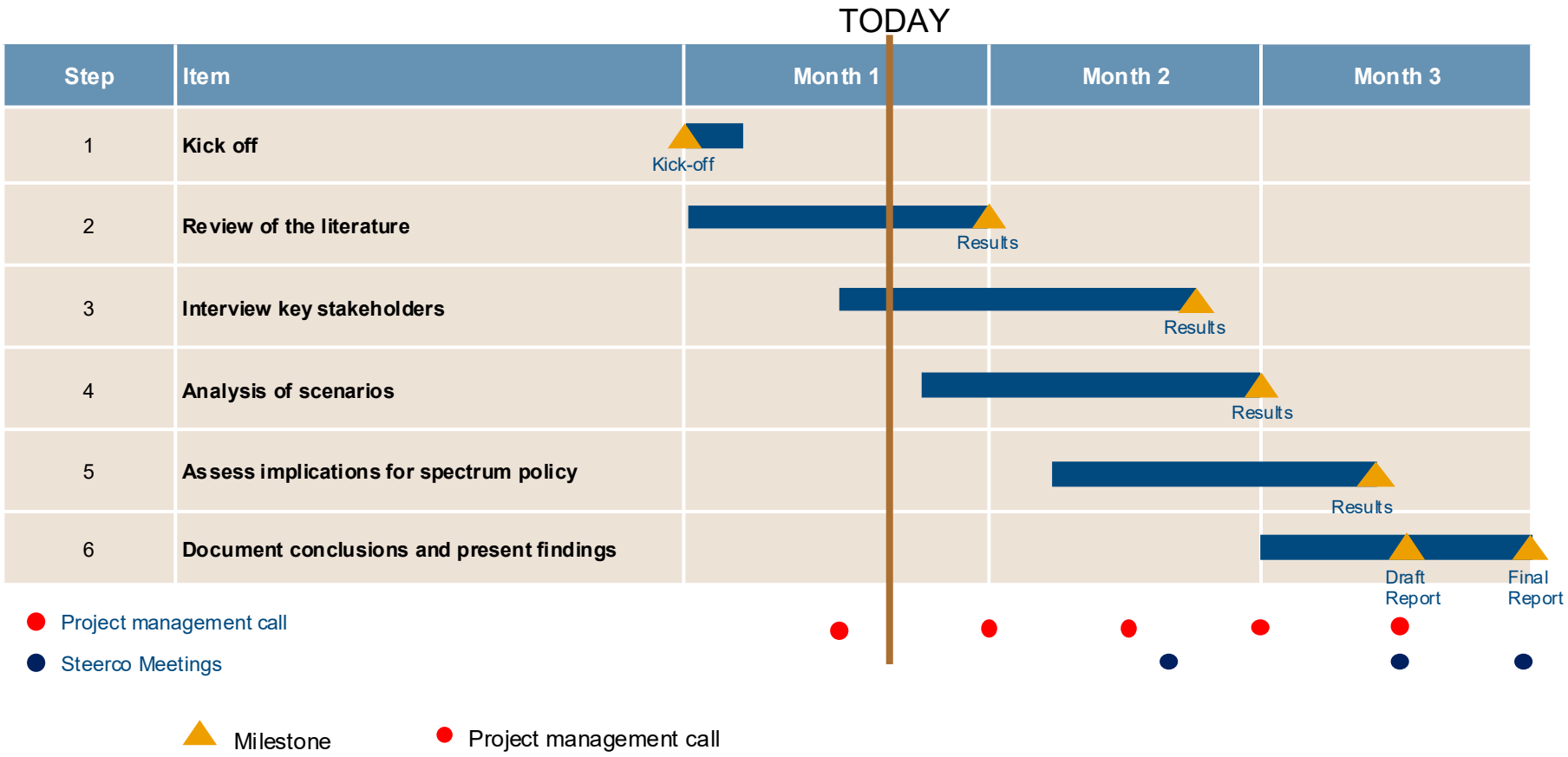
Rapid wireless growth will potentially strain available UK spectrum without future planning.

- An independent UKSPF study to assess future spectrum demand over the next 10–15 years, aligned to national strategies and treating spectrum as a public good.
- Focus on under-represented, cross-sector use cases (i.e. not areas already heavily analysed), defining priority use cases and forecasting demand under multiple scenarios.
- Evaluate technology and access models (e.g., sharing/local licensing, 5G Advanced/6G/NTN) and produce a qualitative valuation framework capturing economic, social and safety-critical value.

We have a six-step process to answer the key questions

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Kick off	**Review of the literature**	**Interview key stakeholders**	**Analysis of scenarios**	**Assess implications for spectrum policy**	**Document conclusions and present findings**
– Kick off workshop to introduce the team members – Confirm our understanding of the project scope and priorities – Agree the methodology and key deliverables for the project	–We will aim to collect most of the information needed for the study. This will include: • Evidence on existing market and technology trends affecting future communication needs • Industry and regulator views on the long-term future use cases – Sources include: • Government Industrial, Defence and Infrastructure Strategies • 5G-ACIA reports • BEREC reports • GSA reports • GSMA reports • 6GIA research	–Prepare a list of questions, tailored to each stakeholder type, to ensure a structured dialogue –Interview up to 20 key stakeholders, e.g.: Ofcom; DSIT; MNOs; Satellite Operators; Emergency Services; 5G-ACIA; Industry Associations; Equipment Vendors; the Home Office; the MOD. Potentially other SPF members and outside economists. Engage with stakeholders for additional information as required. –All interviews to be conducted under Chatham House rules if requested	–Review results of previous steps and identify 2–3 common use cases –Build 10 to 15-year demand scenarios for each case –Develop key dimensions of the scenarios including potential technical options and spectrum needs – Assess impact on users as well as the qualitative value to the UK	–Assess how spectrum policy will need to vary considering the use cases and determine the options most likely maximise the value to the UK –This will include: • Dynamic and flexible access models (e.g. sharing, short-duration and local licensing) for cross-sector demand. • Reprioritisation and potential reallocation of key bands • A qualitative valuation framework capturing economic, social and resilience benefits	–Draft report of analysis and conclusions and present findings to UK SPF –Prepare final report and presentation
–Data collection and agreement on the methodology and deliverables	**–Understanding the market and technology landscape for future use cases**	**–Understanding the stakeholder viewpoints**	**–Outline two to three main scenarios for future use**	**–A set of recommendations on the future use of the spectrum**	**–Report and presentation**

We aim to deliver our final report by the 6th August



Status update

Activities
• Literature search ongoing
• Information request sent out to UKSPF members
• Interviews have started: • UKSPF members (1 complete and 1 scheduled) • internal Coleago experts

Risks Items
• Amber Flag - Only two responses to our UKSPF member information request so far • CONTRIBUTIONS WELCOME

Example use cases being considered

Potential categories[1]	Description	Availability/Opportunity Matrix
Rural Reserve	A spectrum-access portfolio for open, semi-open and closed rural/remote networks, to support critical connectivity use cases such as: • Agritech: monitoring, telemetry and automation • Rural/remote drone communications and infrastructure support • Distributed Energy Resources telemetry, SCADA[2] • Local Government: wide-area comms and asset monitoring in remote areas • Edge computing (where backhaul may be weak) • Field communications (field engineers, etc)	 • In the major candidate bands (b39, n77) – there is infrastructure vendor support • Demand highest in non-served and underserved rural regions, with other use-cases (agritech etc) providing demand • Many vendors support b39 (LTE) and n77(5G) (Note: no Google support b39)

Note 1: Prioritising under-represented/fragmented sectors (not consumer MBB or areas Ofcom/trade bodies already cover) and keep the initial framing tech- and band-agnostic.
Note 2: Supervisory Control And Data Acquisition

Example use cases being considered

Potential categories[1]	Description	Availability/Opportunity Matrix
Terrestrial D2D communications	• Device-to-Device communications and connectivity tethering needs for ESN (note, this may be out of scope as ESN is not an under-represented/fragmented vertical) • Capability might be extended to allow emergency calls/messages in coverage blackspots to be routed via other consumer handsets to a network • D2D comms between drones/robots to facilitate connectivity tethering when operating in coverage blackspots	 • Strong Customer Demand for extended range services – especially Emergency services when migrated from 390MHz to 700MHz • Early Commercial release from suppliers for D2D-MCX context (Release 17/18)

Note 1: Prioritising under-represented/fragmented sectors (not consumer MBB or areas Ofcom/trade bodies already cover) and keep the initial framing tech- and band-agnostic.

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David Tanner

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Panel: Economics of spectrum and impact on UK

- Chair: Tony Lavender, Senior Advisor, Plum Consulting
- Theo Spathopoulos, Senior Specialist in Spectrum Standardisation and UK SPF Steering Board Vice Chair, Nokia
- Scott McKenzie, Director, Coleago Consulting
- Detlef Fuehrer, Director Spectrum Management and Regulatory, Hewlett Packard Enterprise
- Calum Gruer, Principal Economist, Ofcom
- Shamil Jobanputra, Principal, Regulatory Affairs, BT

UK SPF Plenary

Luigi Ardito, UK SPF Steering Board Chair & Qualcomm

UK SPF Steering Board update – Luigi Ardito, SB Chair

Announcements

- The UK Spectrum Policy Forum (UK SPF) has commissioned Real Wireless to map the spectrum landscape for lunar communications.
- The UK SPF has also commissioned Coleago Consulting to conduct a study on future spectrum users and demand.
- Cluster 1 Chair position is open to members from industry.

Topics for potential UK SPF research projects

1. Market mechanisms to facilitate public sector spectrum access from 2030 onwards including private networks
2. Next-generation spectrum sharing for wireless technologies
3. International spectrum harmonisation
4. Enabling spectrum monitoring innovation
5. Future regulation of satellite downlink and possible options for authorisation
6. Flexible use in 470-694 MHz band

Steering Board Activities and Objectives

Drone/UAV development was identified as a priority area at the recent Steering Board meeting, with an opportunity highlighted for a coordinated techUK/UK SPF activity.

Emerging spectrum requirements were noted to align closely with SAL discussions on innovative spectrum sharing, with agreement to engage the Future Connectivity Hubs to strengthen collaboration and support industry-led, commercially focused research into spectrum sharing technologies.

Join the UK SPF!

Update from Cluster 2

Bob Stewart, UK SPF Cluster 2 and University of Strathclyde

Update from Cluster 3

Tony Lavender, UK SPF Cluster 3 and Plum Consulting

Update from Cluster 4

Kumar Singarajah, UK SPF Cluster 4 and Euroma

Cluster 4 Update (May 21, 2026)

Kumar Singarajah

UK, ITU-R, CEPT / EU and other RTO activities 'picked up speed in 2026 for ITU-WRC-2027. Industry interest / engagement increasing as result !

Envisaged scope of Cluster 4 workshops in 2026 / 2027 as below.

For 2026:

I. An April 2026 Workshop on WRC-2027 AI 1.15 etc on Lunar Communications etc .
II. An early July 26, 2026 workshop on WRC-2027 on D2D / MSS topics or spectrum aspects of C / Ku band NTN.
III. A September / October 2026 workshop on – TBD - ITU-R etc work on GEO on Non-GEO satellite system sharing
IV. A mid / late Q4 2026 with 2-3 non European NRA or RTO representatives to provide perspectives on key topics for ITU WRC- 2027.
V. [A Q4 possible first workshop of spectrum / EM authorisation aspects of free space optical communications – TBD - subject to SPF SB]

For 2027:

I. A early Q1 2027 workshop on WRC-2027 AI 1.7 (IMT-2030 etc
II. Two further Workshops in Q1 / Q2 / Q3 2027 – with focus on some "hot potato" WRC-2027 topics.
III. A possible Workshop in Q2 2027 on ideas / proposals for WRC-2027 AI 10 viz WRC-2031 agenda.
IV. In early December 2027, Workshop with a "Review / Perspectives of 2027" .

SPF members encouraged to offer presentations re above.

Networking lunch

13:00 – 14:00

10am	Intro & keynote speakers	Dr Abhaya Sumanasena Chair of the UK SPF and Real Wireless
11am	Coffee Break	All
11.30am	Initial findings: SPF study Future spectrum users' demand	Scott McKenzie Coleago Consulting
11.45am	Economics of spectrum and impact on UK	Tony Lavender UK SPF Cluster 3 Chair and Plum Consulting
12.30pm	UK SPF Q2 2026 Plenary and cluster updates	Luigi Ardito Chair of the UK SPF Steering Board and Qualcomm
1pm	Networking lunch	All
2pm	First impressions: SPF study Future spectrum users' demand	Professor Simon Saunders University of Bristol and JOINER NSF
2.15pm	Initial findings: Spectrum landscape lunar communications	Dr Abhaya Sumanasena Chair of the UK SPF and Real Wireless
2.30pm	Panel: Developing a regulatory approach to lunar communications	Laura Iglesias Department of Science, Innovation and Technology
3.10pm	Coffee Break	All
3.40pm	Panel: The future of critical communications	Janette Stewart Analysys Mason
4.30pm	Networking drinks	All

JOINER and the future of connectivity in the UK

Professor Simon Saunders, University of Bristol

JOINER

We Experiment.
We Collaborate.
We Innovate.

National Spectrum Facility

Update for UK Spectrum Policy Forum

JOINER Mission

A national shared infrastructure turning Advanced Connectivity Technologies (ACT) R&I into deployment-ready solutions

Experimental Facility:

Connected, federated labs and facilities and testbeds under a common operations and governance framework

R&I Capability:

Delivering Experimentation as a Service (EaaS) in order to advance cross-sector solutions

Industry Engagement:

Driving industrial experimentation and solutions to accelerate market readiness

International Engagement:

Aligning with global partners, comparators and standards to drive standardisation strategies in coordination with FTH

Public & Third Sector Engagement:

Providing expert evidence and analysis on regulation, policy & digital transformation

Capital Investment:

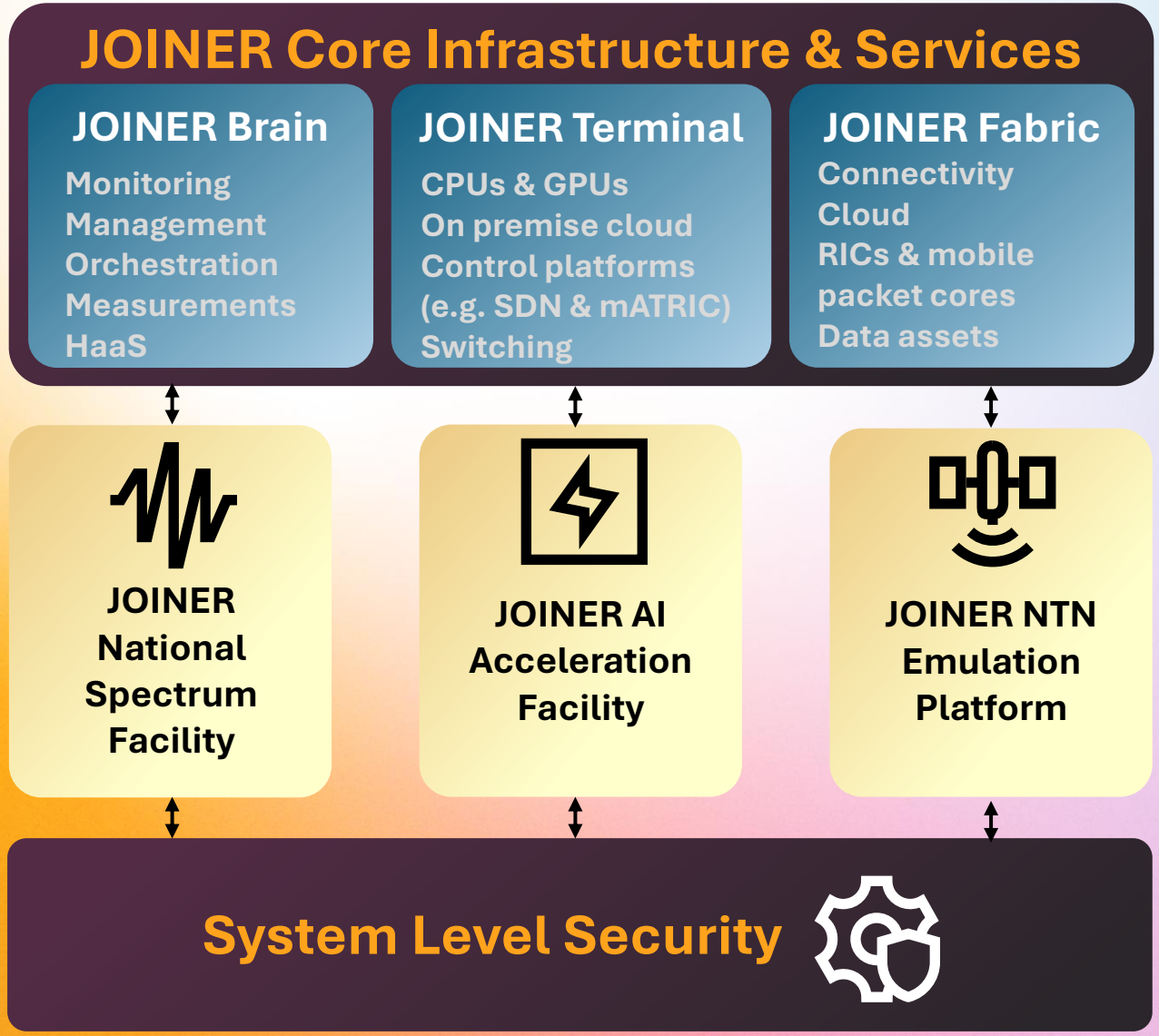
Bridging global productive capital with UK startups, scale-ups and enterprise in coordination with FTH for spin-outs

Skills Development:

Building national capability in advanced connectivity through hands-on training on the JOINER platform

Showcasing UK's ACT capabilities through demonstrated impact

What JOINER Offers



The big picture – future spectrum management needs research and innovation

DSIT's Spectrum Statement 2023 calls for:

A renewed focus on innovation in wireless technology, enhanced sharing of spectrum bands, continuing to expand the frontiers of usable spectrum, advanced spectrum management techniques, improved interference management, monitoring and resilience will enable us to significantly improve spectrum availability, ensuring that spectrum access is not a limiting factor on the UK's economic and societal potential.

Ofcom's Spectrum Management Strategy 2014 identifies areas which need research:

Adopting **technologies that enable more efficient use** of spectrum will be crucial, but the there will still be increased pressures on spectrum, especially in concentrated geographical locations

As there is no unused spectrum across many frequencies, the growth in competing spectrum demands will need to be addressed by a mix of **spectrum re-purposing** to higher value uses and greater use of **spectrum sharing**

We will place a growing emphasis on four aspects of how we manage spectrum:

- Exploring **new forms of spectrum sharing** and extending **sharing across new bands**
- Maintaining our increased focus on understanding the **coexistence challenges** associate

DSIT's Statement of Strategic Priorities to Ofcom

Strategic Priority 2: Driving growth through maximising access to spectrum

We must continually strive to maximise access to and use of spectrum for the growing number of wireless applications across the economy. This will require a range of measures, including implementing new spectrum management techniques, adopting innovative technologies that enhance spectrum efficiency, and enhancing spectrum sharing, where appropriate. For example, dynamic and automated spectrum access could hold potential for more efficient spectrum access.

UK Digital and Technologies Sector Plan (2025):

"Ensuring spectrum availability to support ACT by working with international counterparts ahead of the World Radio Conference 2027 and collaborating with Ofcom to promote efficient, innovative spectrum allocation and regulation, which continues to support the development and deployment of ACT. "

Three approaches to addressing spectrum scarcity / delivering spectrum abundance

New Spectrum
- Sub THz
- mmWave
- Clearance/refarming

- Well researched
- Unattractive/costly to industry for wide area
- Increasingly limited

Main focus for JOINER NSF

Spectrum Efficiency
(Intra system)
- Modulation & coding
- Antenna techniques (MIMO etc)
- Resource allocation, traffic management and steering
- Densification

- Limited by Shannon and costs
- Heavily researched

Spectrum Sharing
(Inter system efficiency)

- Relatively little research – big scope for originality
- Only approach which can deliver order of magnitude gains
- Aligned with DSIT/Ofcom spectrum strategies

Supporting spectrum research across the stack

Regulatory and policy evolution

Automated and dynamic allocation

Multi access control

Intelligent scheduling

Interference mitigation and control

Transceiver efficiencies

Propagation and channel modelling

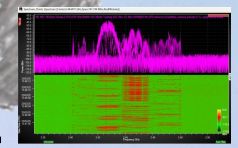
Monitoring and mapping

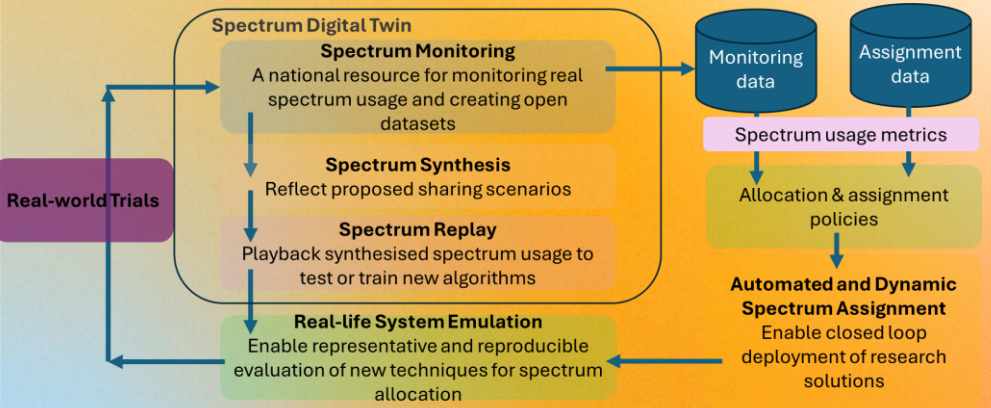
Opportunities for innovation at all layers – but progressive move towards data, automation and intelligence

JOINER National Spectrum Facility

What is JOINER NSF:

- A UK-wide facility for spectrum management research and innovation.
- Supports DSIT and Ofcom goals to innovate for efficient spectrum usage.
- Linked with JOINER Brain and Fabric for real-time, real-world data and analytics at scale
- Focused research on sharing between heterogeneous networks for 10x prime spectrum availability





What you can do with it:

- **Monitor:** Track live spectrum use and build datasets.
- **Emulate:** Recreate RF scenarios for testing and optimisation.
- **Assign:** Trial automated and dynamic spectrum sharing.
- **Replay:** Simulate and analyse spectrum activity.
- **Collaborate:** Explore tech, policy, and economic models.
- **Train:** Build skills and tools for AI and 6G spectrum use.

JOINER NSF Advisory Board

- Provides independent guidance to JOINER NSF to ensure relevance to stakeholders, inform R&I directions and build connections
- Reports into main JOINER Governance Board
- Independently chaired: Raj Sivalingam (ex Spectrum Policy Forum, DSIT Head of Spectrum)

Public sector

Department for Science, Innovation, & Technology

Ofcom

Ministry of Defence

Academia

Queen's University Belfast

University of Oulu

University of Bristol

Industry

vodafone

Qualcomm

uk spectrum policy forum

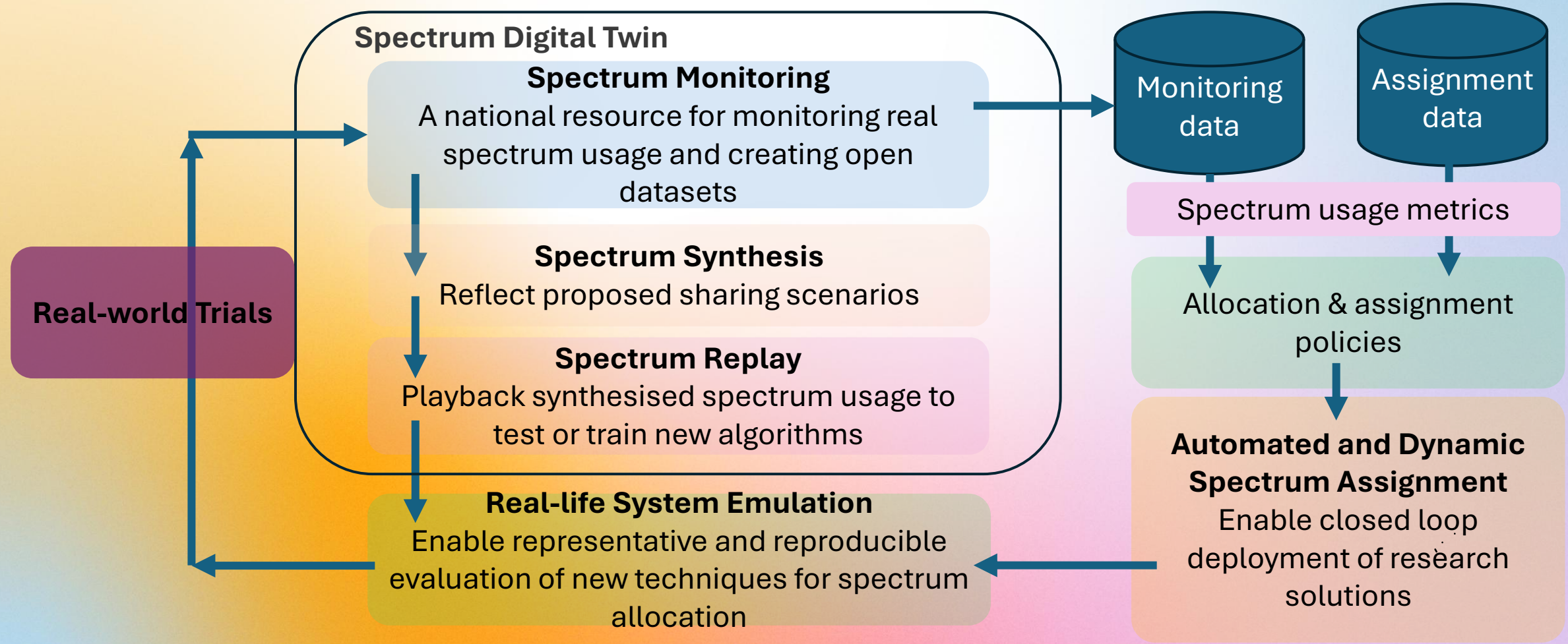
Additional members

John Chapin (US, independent)

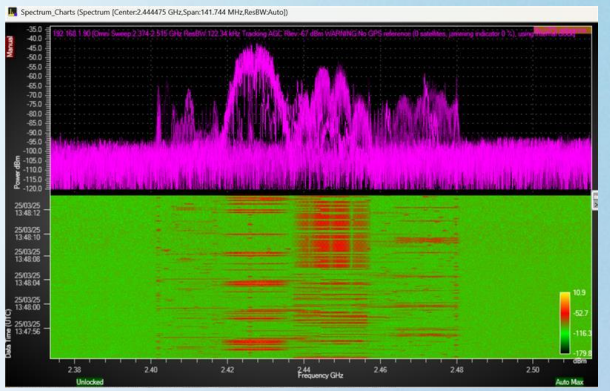
Martin Wren-Hilton (independent)

JOINER has demonstrated the value of a National Spectrum Facility… These capabilities are unique within the UK academic and private sectors, providing the foundations for appropriate decisions to be made on UK spectrum usage to

JOINER-NSF Functions

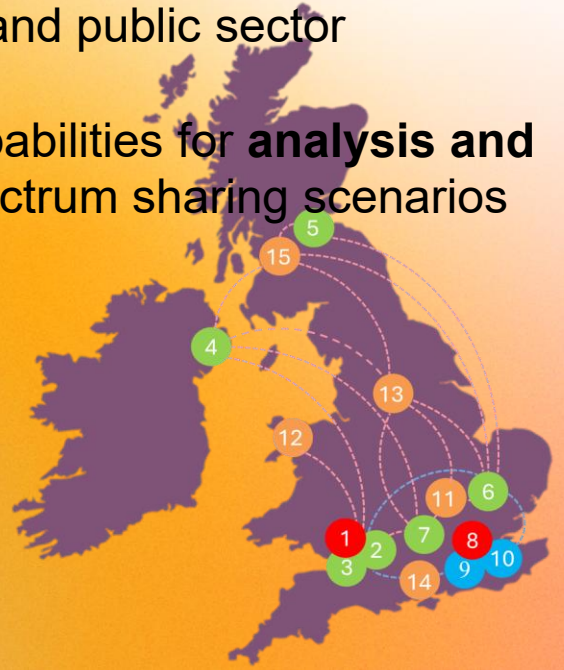


JOINER NSF Features



Current capabilities

- Spectrum **monitoring** 10 MHz – 8 GHz, four sites live, four in progress, plus mobile
- Spectrum **sharing** projects in progress in close collaboration with industry and public sector
- Spectrum **advisory** board in place with DSIT, Ofcom, industry and public sector representation
- Experimental capabilities for **analysis and synthesis** of spectrum sharing scenarios



Phase I
Phase II
Phase III
Phase III+

Plans

Coverage - Extend spectrum monitoring to most JOINER terminal locations

Capability - Extend selected nodes to 40 GHz

Densify – Develop low-cost mobile sensors and integrate data

Interconnect - Combine with spectrum monitoring efforts in EU (incl. Ireland) and US

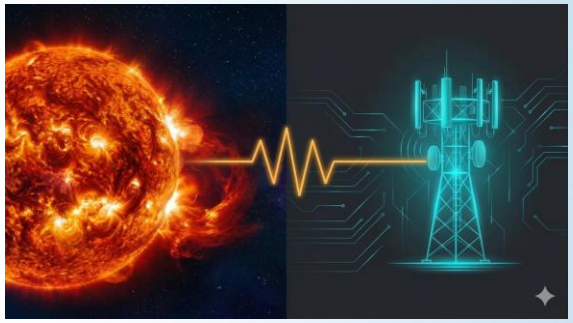
Assignment - Develop dynamic spectrum assignment to real-time operational state

Spectrum digital twin - Extend spectrum emulation capability to sites beyond Bristol using additional software radios (SDRs)

Integrated TN/NTN spectrum management – Joint projects with JOINER NTN theme team

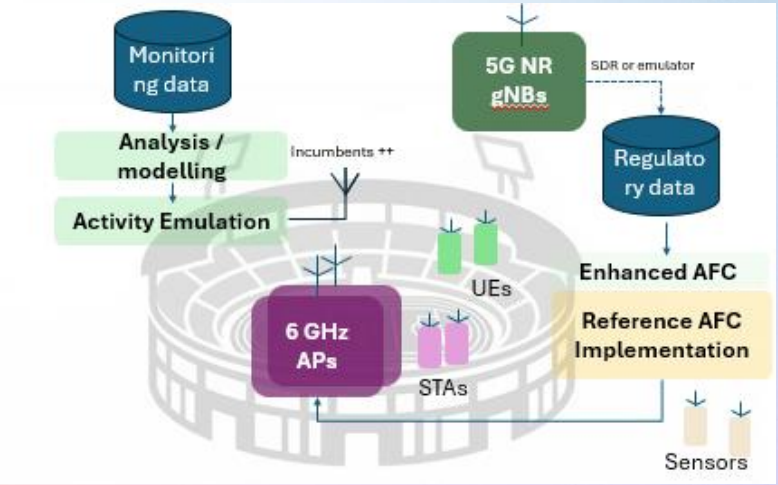
Support spectrum projects using the facility by academia, industry and public sector

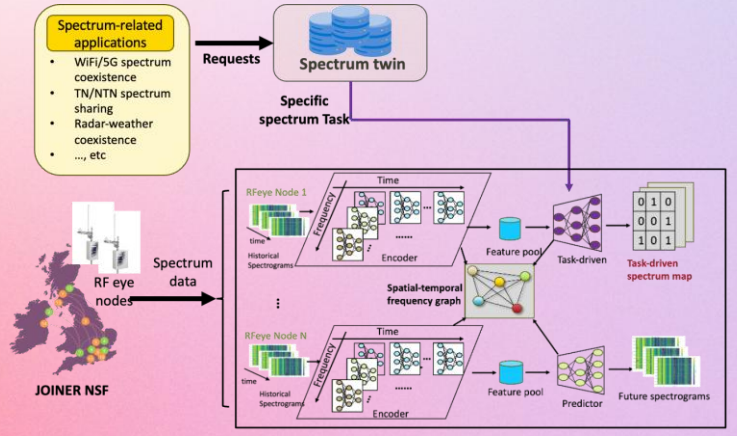
Spectrum Projects



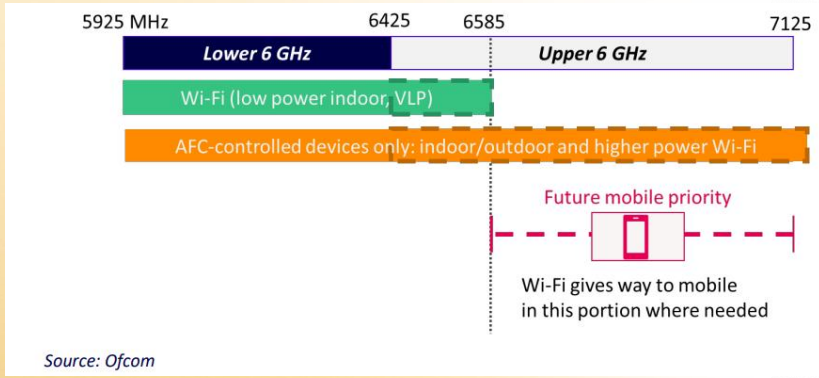
Current Project Areas

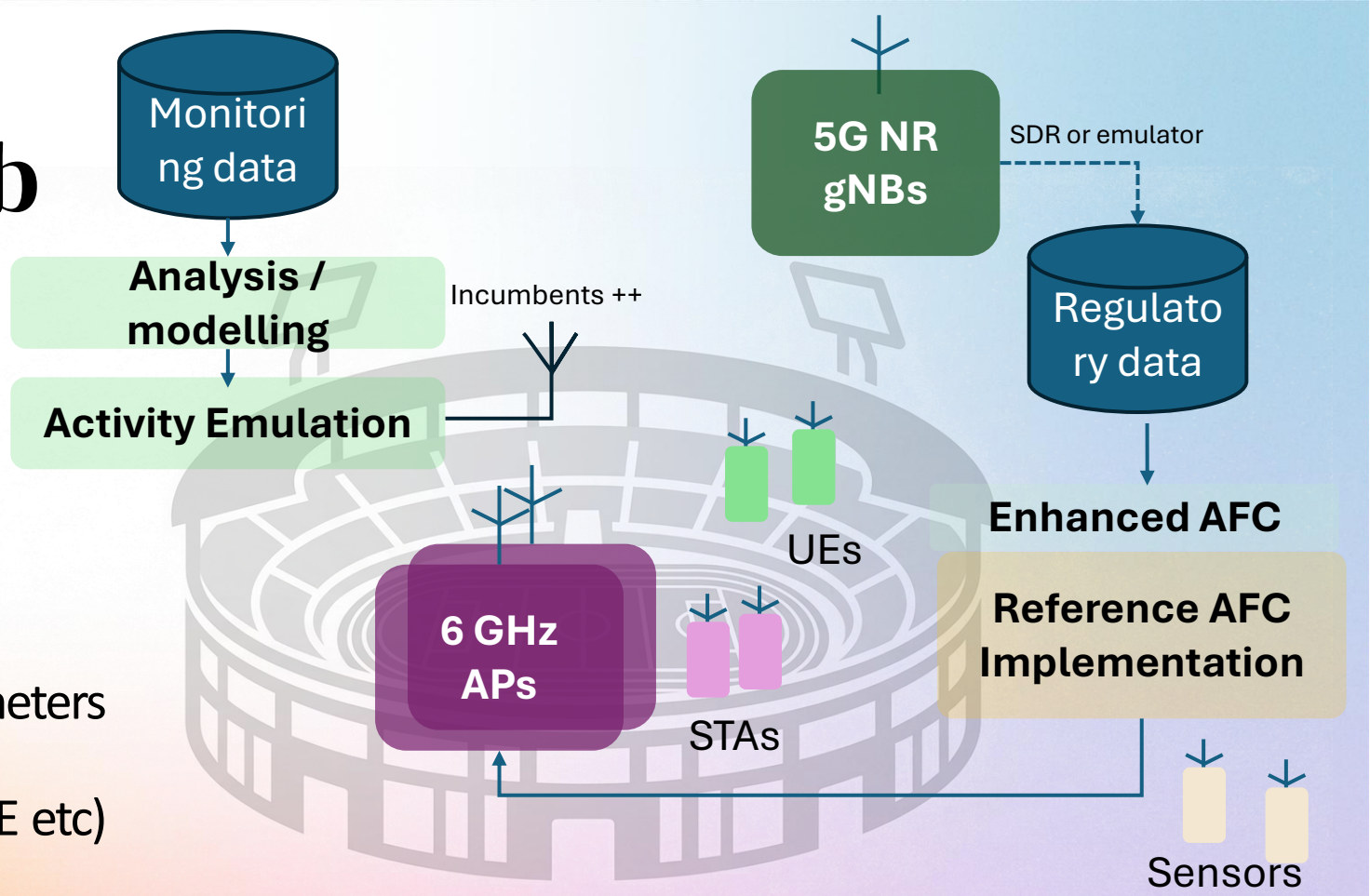
- Solar noise effects on mobile networks
- Sharing in upper 6 GHz band
- Study on MNO terrestrial sharing
- Study on MNO TN/NTN sharing
- Utilising maritime spectrum
- AI-driven spectrum mapping





JOINER NSF
6 GHz sharing lab





To address:

- Realistic mobile/Wi-Fi coexistence parameters in special use cases (e.g. stadiums)
- Adequacy of incumbent (fixed links, PMSE etc) protections
- Reliability and security of AFC mechanisms
- Behaviours of Wi-Fi APs and STAs
- Sovereign AFC implementation
- Opportunities for enhancements to Ofcom 'baseline' spec (incorporate sensing, enhanced modelling, cross tech signalling etc.)

Support from industry and public sector

“We believe that JOINER has demonstrated the value of a National Spectrum Facility. …These capabilities are unique within the UK academic and private sectors, providing the foundations for appropriate decisions to be made on UK spectrum usage to maximise its intrinsic value.”

- **Vodafone**

“JOINER NSF plays a crucial role in strengthening the evidence base around spectrum innovation and future connectivity, providing government with timely and credible insight as technologies and markets evolve. Its work on priority policy areas such as satellite and mobile/Wi-Fi coexistence illustrates the programme’s unique value in bringing together UK academia, industry and policymakers to give the UK an early, evidence-led edge in translating spectrum innovation into growth and real-world deployment.”

- **DSIT**

Initial findings: Spectrum landscape for lunar communications

Dr Abhaya Sumanasena

Head of Policy and Regulation, Real Wireless

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independent telecoms experts

Independent study on spectrum landscape for lunar communications

UK SPF Spectrum Policy Summit, 21 May 2026

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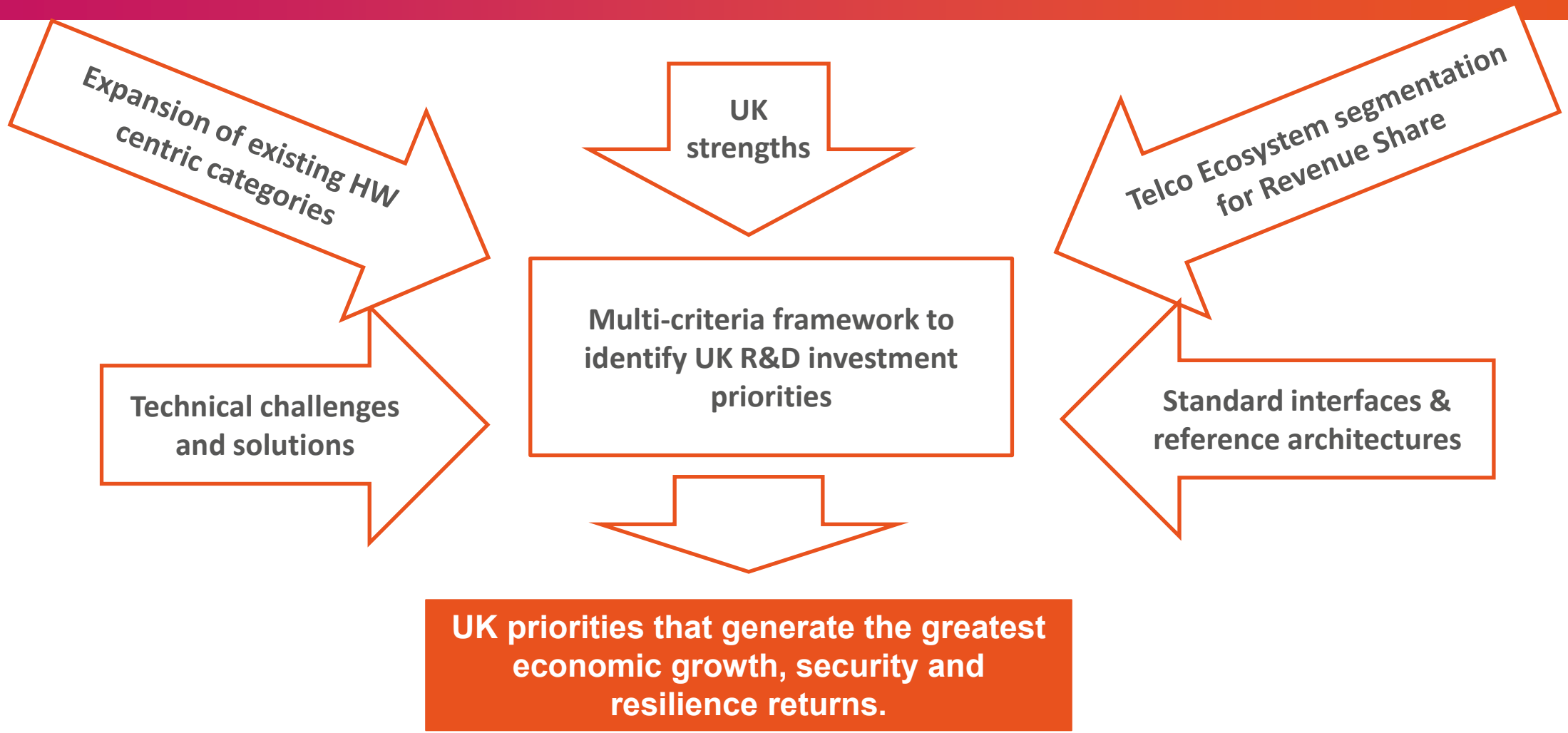
Developing a framework to identify UK R&D investment priorities



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R&D priority tier results – an example outcome

Weights	W1	W2	W3	W4	W5

Rank	Funding category	C1 Mkt Size	C2 Growth	C3 Strategic	C4 UK Comp.	C5 Sovereign	Revenue share	Weighted Score (/5)	R&D Priority Band
1	Category 1								Tier 1
2	Category 2								Tier 1
3	Category 3								Tier 1
4	Category 4								Tier 1
5	Category 5								Tier 2
6	Category 6								Tier 2
7	Category 7								Tier 2
8	Category 8								Tier 2
9	Category 9								Tier 2
10	Category 10								Tier 2
11	Category 11								Tier 3
12	Category 12								Tier 3
13	Category 13								Tier 3
14	Category 14								Tier 3

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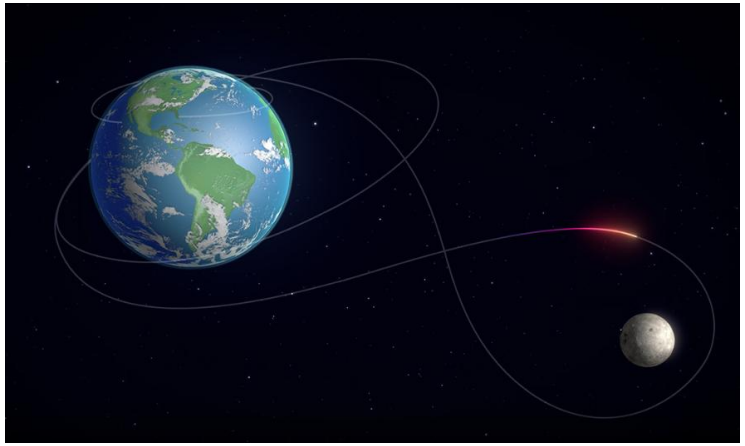
Agenda

- Introduction
- Focus of the study on the spectrum landscape for lunar communications
- Next steps

Introduction

- Lunar missions are accelerating globally; **human return could begin ~2026**, alongside expanding commercial activity
- All missions **rely on radio spectrum** for Earth–Moon links; success depends on reliable, interference-free communications
- A **flexible, scalable communications architecture** is needed to support multiple users and **varied operational scenarios** on the surface and in orbit
- Cislunar and lunar relay systems, as well as data services, are emerging, with efforts toward developing an "internet-like" network for lunar operations.



Artemis II Flight Path

- International agency collaboration and government-funded pathfinder missions are building interoperability and enabling space commerce
- Communications infrastructure development is increasingly **driven by public–private partnerships** across the lunar ecosystem
- Regulatory gaps in lunar communications create interference/disruption risks; ITU is exploring improved spectrum coordination frameworks

Objectives of the study

1. **Lunar spectrum requirements & coexistence assessment:** quantify medium/long-term requirements across various communications links, and emerging **cislunar PNT**; assess coexistence with **terrestrial services (e.g., IMT)**
2. **Spectrum band suitability & gap analysis**: evaluate candidate frequency bands for availability, technical fit, propagation, and coexistence constraints; pinpoint regulatory/ operational/ coordination gaps and sharing opportunities, reflecting ITU studies and administrations' positions
3. **Far-side & shielded-zone coordination framework:** determine connectivity needs (incl. **relay dependencies**), set **interference-avoidance** measures, and propose protections for **radio-quiet science** while enabling **mission-critical comms**
4. **Licensing, coordination & regulatory reform package:** propose best-practice models for **mission-specific licensing, shared access, and multi-user orbital infrastructure**; recommend **licence conditions, enforcement**, and updates to **ITU/CEPT/SFCG** processes and **Radio Regulations**
5. **Strengthen UK capability & collaboration:** identify **UK companies and R&D** in cislunar communications and propose **industry–government–Ofcom mechanisms** to accelerate innovation and deployment

1.1 Lunar spectrum requirements: From mission links to lunar infrastructure

Key message:
Lunar communications are moving from one-off mission links to a shared, multi-operator infrastructure layer.

- **Past:** lunar communications were mission-specific, mainly agency-led, and handled through existing Space Research Services (**SRS**) allocations and bilateral coordination.
- **Present:** Artemis, CLPS, Chang'e, ISRO, JAXA, ESA Moonlight, **Pathfinder** and commercial landers are creating a denser lunar operating environment.
- **Future: LunaNet**, driven by Artemis-era requirements, introduces an interoperable "network of networks" for lunar communications and PNT.
- **China is already operationally ahead:** Queqiao-1, Queqiao-2, Tiandu-1/2 and the DRO-A/B/L experiment show a transition from relay missions to early lunar comms/navigation infrastructure.
- **Why the report matters:** existing **SRS**, **ISS** and ITU frameworks were not written for commercial, multi-user, safety-critical lunar services.

The policy question is no longer "which mission gets which frequency?" but "how do multiple operators safely share a lunar communications environment?"

1.2 Coexistence assessment: SRS enables lunar links, but may not scale to a commercial Moon

Key message:
Existing Space Research Service (SRS) allocations can support lunar links, but they were designed for research missions, not a commercial lunar network. LunaNet tries to address that operational gap.

- **SRS baseline:** lunar missions can use existing SRS allocations across S, X, K/Ka and related bands, subject to ITU coordination.
- **LunaNet distinction:** LunaNet separates functions across proximity links, direct-to-Earth links, crosslinks, contingency modes and PNT, rather than treating spectrum as mission-by-mission.
- **Policy nuance:** SRS permits S-band Moon-Earth links (as seen in Chinese networks), but **LunaNet favours X-band** to reduce congestion with near-Earth SRS assets, and Ka-band for high-datarate links.
- **Main coexistence challenge:** future lunar systems must share spectrum locally across landers, rovers, relays, PNT services, surface networks, EVA, in a multi-operator framework. Far-side and astronomy considerations are critical.
- **Market risk:** will likely not see spectrum trading, but will see de-facto priority by early relay/PNT service providers.

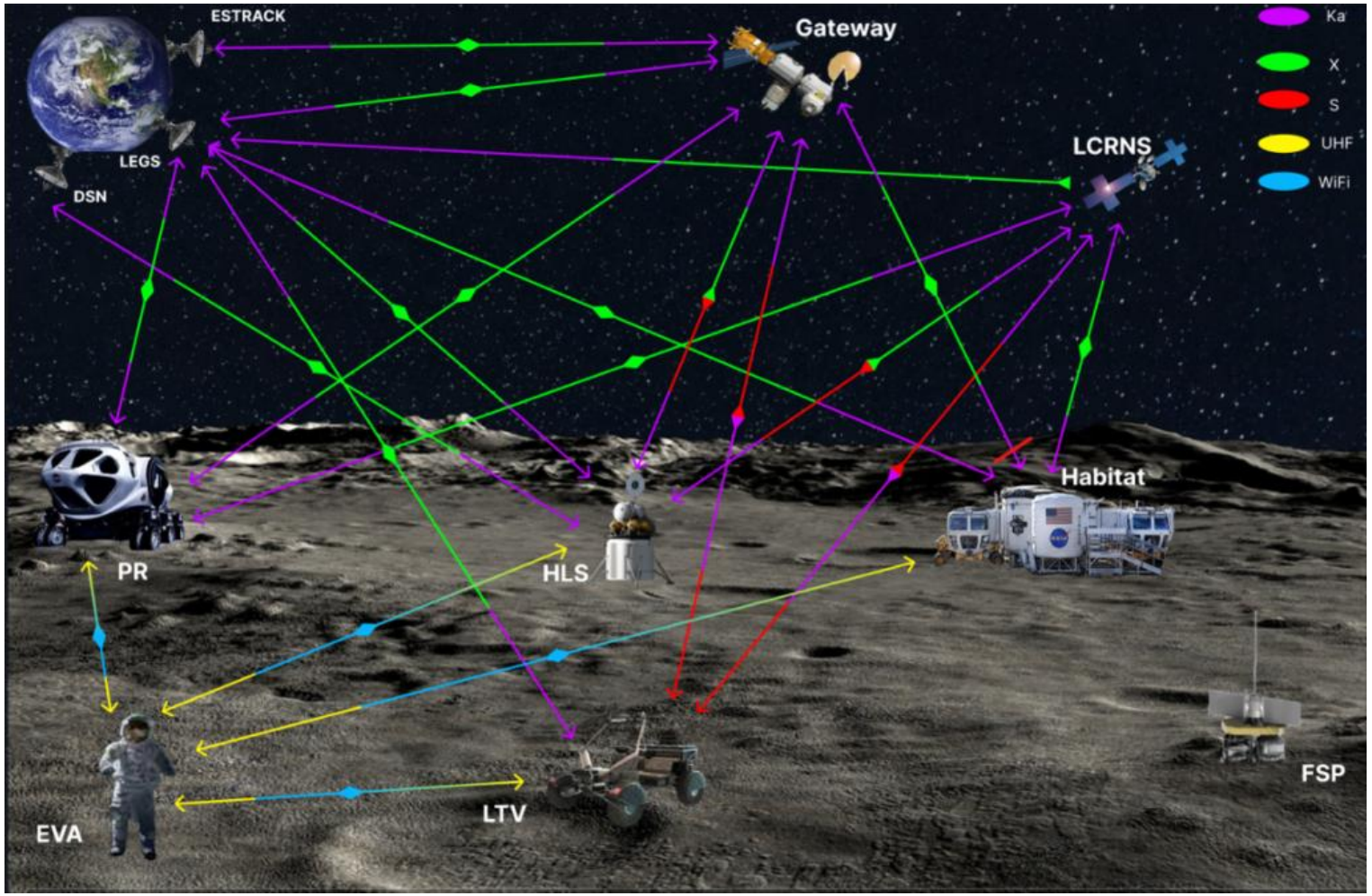
The policy question is no longer "which mission gets which frequency?" but "how do multiple operators safely share a growing lunar communications environment?"

Notional Lunar Surface Scenario

Earth Links:
X-band = TT&C
Ka-band = Data

Orbit-Surface:
S-band
Ka-band

Surface Links:
S-band
UHF
Lo-Ra
Bluetooth
Wi-Fi
4G/LTE/5G



[Source: COMSAT Architects]

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2.1 Far-side operational requirement: Silence needs infrastructure

Key message:
The far side is scientifically valuable because it is quiet, but far-side science and operations require communications, relay, PNT and spacecraft systems that are not quiet.

- **The paradox:** Astronomers want radio silence, but far-side missions need relay satellites, surface radios, timing, emergency links and store-and-forward data.
- **Existing operator reality:** China already operates far-side relay infrastructure through Queqiaos & DROs (but also pioneering far-side astronomy); NASA, ESA, JAXA, ISRO, and commercial entities are moving toward relay and PNT architectures.
- **Not just intentional transmissions:** Orbiters, relays and surface systems also generate broadband EMI, harmonics, spurious emissions and platform noise.
- **Current EMI compliance is not enough:** A spacecraft can be acceptable by normal spacecraft standards and still be too noisy for sensitive radio astronomy. Starlink impact on earth-based astronomy is a good (bad?) example.
- **Operational issue:** Relay orbiters overflying the Shielded Zone may need scheduled quiet periods, beam constraints, power management or receive-only modes

The far side should be treated as a protected operational environment, not simply a “no transmit” zone.

2.2 Coordination framework: Balancing science protection and lunar infrastructure

Key message:
The UK can help turn high-level Shielded Zone principles into practical operating rules for spacecraft, relays and commercial services.

- **Existing baseline:** ITU Article 22 recognises the Shielded Zone of the Moon (SZM) and prohibits harmful interference to radio astronomy and passive services, with limited exceptions.
- **Grey lines:** Current rules do not fully define harmful interference, relay overflight behaviour, commercial operator obligations, broadband spacecraft EMI, or enforcement.
- **Balance should look like:** Protected observing windows, coordination arcs, exclusion zones, power limits, spectral masks, guard bands and auditable transmission logs.
- **Requirements to levy on spacecraft:** Far-side emission management plan, declared antenna patterns, spurious-emission limits, EMI characterisation, relay duty-cycle controls and contingency-mode disclosure.

The UK position should (probably) be: quiet when needed, connected when required.

3.1 Spectrum band suitability & gap analysis
ITU-R work update

- WRC-27 agenda item 1.15
  - *to consider studies on frequency-related matters, including possible new or modified space research service (**space-to-space**) allocations, for future development of communications **on the lunar surface** and **between lunar orbit and the lunar surface**, in accordance with Resolution **680 (WRC-23)**;*
  - There are 11 frequency bands being studied.

- Working Party (WP) 7B (Space radiocommunication applications) is responsible fore the WRC-27 Agenda Item 1.15.
  - About 55/64 sharing study cases agreed at the start of this study cycle have been completed
  - The remaining studies are expected to be available by Sept 2026 WP 7B
  - A significant number of updates to the Sharing Studies document

3.2 Spectrum band suitability & gap analysis
Current status of the sharing studies

- 390 – 406.1 MHz FIXED, MOBILE, MOBILE-SATELLITE(Earth-to-space), MOBILE-SATELLITE(space-to-Earth), RADIO ASTRONOMY, STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE
- 420 – 430 MHz FIXED, MOBILE except aeronautical mobile, RADIOLOCATION
- 440 – 450 MHz FIXED, MOBILE except aeronautical mobile, RADIOLOCATION, FIXED

Total of 30 MHz limited to outside the SZM

- 2400-2690 MHz MOBILE RADIOLOCATION, RADIODETERMINATION-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth), MOBILE-SATELLITE (Earth-to-space), FIXED-SATELLITE (space-to-Earth), FIXED-SATELLITE (Earth-to-space), MOBILE (identified for IMT), MOBILE (identified for HIBS), BROADCASTING-SATELLITE, AERONAUTICAL RADIONAVIGATION, RADIOASTRONOMY RADIO ASTRONOMY (SZM)
- 3500 – 3800 MHz FIXED, FIXED SATELLITE(space-to-Earth), MOBILE (identified for IMT), RADIOLOCATION (R2 & 3), FIXED SATELLITE (Earth-to-space)
- 5150 – 5570 MHz FIXED SATELLITE (space-to-Earth), MOBILE except aeronautical mobile, AERONAUTICAL MOBILE, AERONAUTICAL RADIONAVIGATION, FIXED, RADIOLOCATION, SPACE RESEARCH (active), RADIONAVIGATION, MARITIME RADIONAVIGATION
- 5570 – 5725 MHz RADIOLOCATION, FIXED, AERONAUTICAL RADIONAVIGATION, MARITIME RADIONAVIGATION, MOBILE except aeronautical mobile
- 5775 – 5925 MHz FIXED, SATELLITE(Earth-to-space), RADIOLOCATION, FIXED, MOBILE
- 7190 – 7235 MHz FIXED, MOBILE, SPACE RESEARCH(Earth-to-space), RADIOASTRONOMY (SZM)
- 8450 – 8500 MHz FIXED, MOBILE except aeronautical mobile, SPACE RESEARCH(space-to-Earth)

Total of 1410 MHz

- 25.25 – 28.35 GHz FIXED, FIXED (identified for HAPS), INTER SATELLITE, MOBILE, FIXED SATELLITE(Earth-to-space)

Total of 3100 MHz

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4. Licensing, coordination & regulatory reform considerations

- International coordination activities
  - The fundamental principles for all activities on the Moon are outlined in the **Outer Space Treaty** (OST) of 1967,which emphasises **peaceful use, resource sharing**, and **international cooperation**.
  - Coordination activities take place through the ITU
- Domestic licensing through national authorities
  - In accordance with the Space Industry Act 2018 (SIA) and the Outer Space Act 1986 (OSA), in the UK, the **CAA** and **Ofcom** play key roles in overseeing the licensing of radio stations operating on spacecraft.
  - The **communication links will require separate wireless telegraphy licenses**.
  - The working approach is **collaborative but informal**: regulators and operators **agree on best practice** through iterative discussion rather than against defined regulation.
  - While this approach is pragmatic, it does not scale well in a multi-operator environment

5.1 Accelerate innovation and deployment
UK strengths and limitations

- The UK is relatively a **minority player in cislunar operations,** but has a **strong track record of shaping international standards** and space law beyond what its operational footprint might suggest.

- Our **strengths** include:
  - Lunar Pathfinder, Moonlight participation, **Goonhilly**, and a growing commercial ecosystem provide genuine anchors.
  - **Strong supply chain position**
    - UK excels in components, payloads, onboard computing, and subsystems
    - Key contributor to international programmes (e.g. Artemis ecosystem)

- Limitations include:

  - Limited role in mission operations
    - Few (if any) UK-based mission operators or infrastructure providers
    - Most missions involving UK hardware are regulated internationally (US/EU/Japan/etc)

5.2 Accelerate innovation and deployment
Potential barriers and strategic implications

- **Capital constraints** are one of the primary barriers
  - UK market struggles to support high-CAPEX lunar infrastructure
  - Limits the ability to develop landers, relay systems, or full mission capability
- Dependence on international frameworks
  - UK actors often follow ESA-led specifications and decisions
  - Limited direct influence on global regulatory direction
- Emerging but small operational footprint
  - Early steps (e.g. Lunar Pathfinder, startups), but scale remains low
  - Anticipated role remains “supplier, not operator”
- Strategic implication for UK
  - Critical need to protect and enhance supply chain leadership
  - Opportunity to shape regulation despite limited operational presence

Next steps

- ✓ KO meeting on the 29th of April
- ✓ UK SPF Spectrum Policy Summit on the 22nd of May

- SPF Steering Board update on the 2nd of July
- **Report delivery** to the SPF Steering Committee Early July
- **Report launch** at UK SPF Plenary: Wed, 15th of July 1400-1600 hrs

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realwireless.
independent telecoms experts

Developing a regulatory approach to lunar communications

- Chair: Laura Iglesias, Innovation Lead Spectrum Team, DSIT
- Sam Richads, Founder & Director, Meridian Space Comman
- Matthew Cosby, CTO, Goonhilly
- Paul Febvre, Professor, Cranfield University
- Simon Sunders OBE, Professor, University of Bristol
- Umair Naeem, Technical Lead on Lunar Comms Programmes, MDA

Coffee Break

15:10 – 15:40

10am	Intro & keynote speakers	Dr Abhaya Sumanasena Chair of the UK SPF and Real Wireless
11am	Coffee Break	All
11.30am	Initial findings: SPF study Future spectrum users' demand	Scott McKenzie Coleago Consulting
11.45am	Economics of spectrum and impact on UK	Tony Lavender UK SPF Cluster 3 Chair and Plum Consulting
12.30pm	UK SPF Q2 2026 Plenary and cluster updates	Luigi Ardito Chair of the UK SPF Steering Board and Qualcomm
1pm	Networking lunch	All
2pm	JOINER and the future of connectivity in the UK	Professor Simon Saunders University of Bristol and JOINER NSF
2.15pm	Initial findings: Spectrum landscape lunar communications	Dr Abhaya Sumanasena Chair of the UK SPF and Real Wireless
2.30pm	Panel: Developing a regulatory approach to lunar communications	Laura Iglesias Department of Science, Innovation and Technology
3.10pm	Coffee Break	All
3.40pm	Panel: The future of critical communications	Janette Stewart Analysys Mason
4.30pm	Networking drinks	All

Panel: The future of critical communications

- Chair: Janette Stewart, Partner, Analysys Mason
- Cristina Data, CEO, JRC
- Noel Kirkaldy, Head of Spectrum Management, Mission Critical Enterprise, Nokia
- Justin Moore, Principal Policy Advisor, Ofcom

AOB & Close

Dr Abhaya Sumanasena, UK SPF Chair