UK SPF PLENARY

Thursday 24 July 2025
14:00 – 16:00

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

Plenary Agenda

14:00 – 14:10	Intro & keynote speakers	Abhaya Sumanasena, **UK SPF** & **Real Wireless**
14:10 – 14:25	Spectrum policy for the future of connectivity	Sophie Lyddon, **DSIT**
14:25 – 15:30	Wireless communications policy: reflections on the road ahead Presentations and Q&A	Paul Febvre, **UKTIN NTN WG** Jussi Kahtava, **Samsung** Simon Saunders OBE, **Federated Telecoms Hubs**
15:30 – 15:35	Steering Board update	Abhaya Sumanasena, **UK SPF** & **Real Wireless**
15:35 – 15:55	Cluster Chair updates	UK SPF Cluster Chairs
15:55 – 16:00	AOB and Close	Abhaya Sumanasena, **UK SPF** & **Real Wireless**

Intro & Welcome

Dr Abhaya Sumanasena, Real Wireless & UK SPF Chair

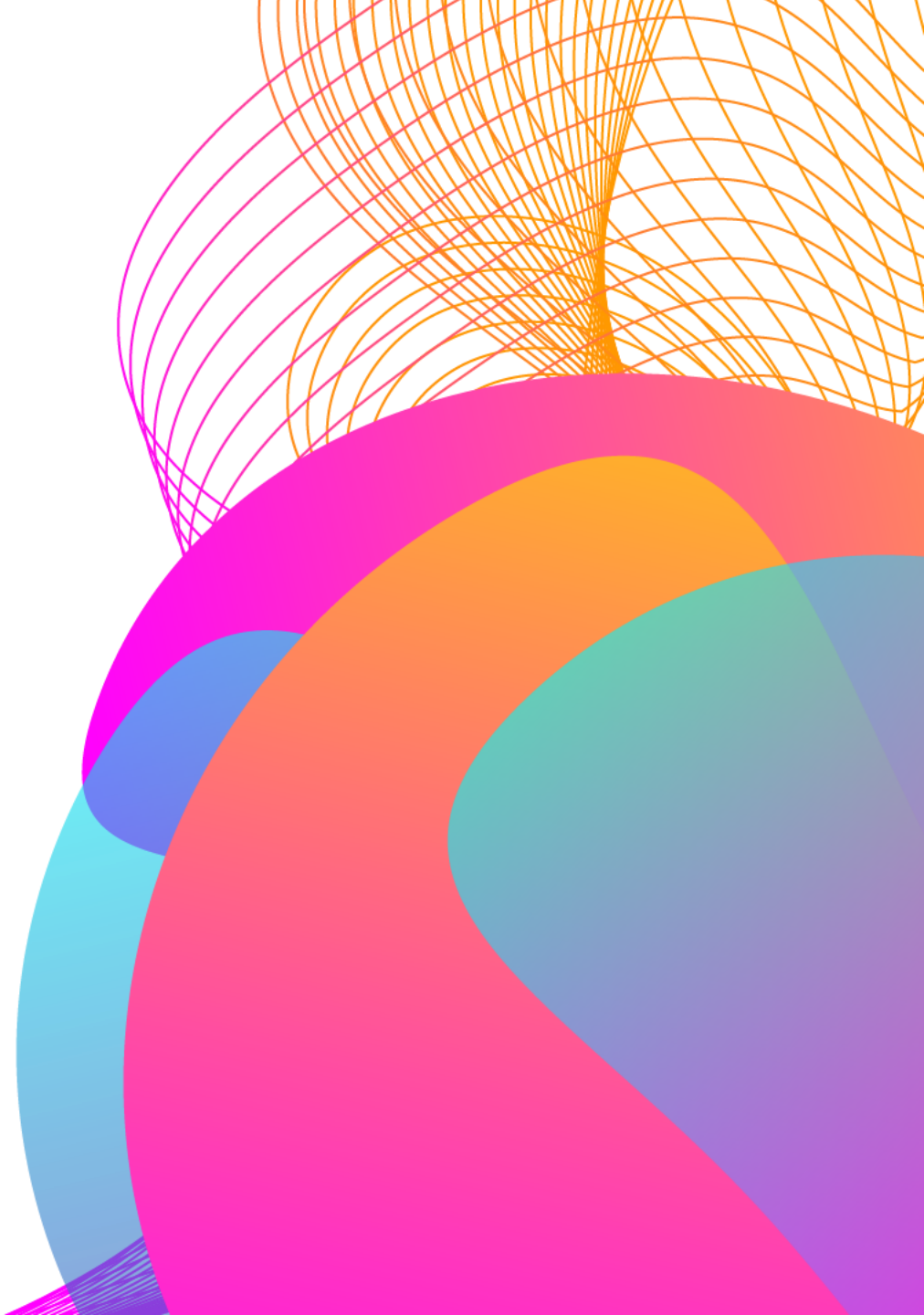
Spectrum policy for the future of connectivity

Sophie Lyddon, DSIT

Department for Science, Innovation & Technology

Spectrum Policy Forum

Sophie Lyddon
Head of Spectrum Policy, DSIT



DSIT SPECTRUM POLICY TEAM

Department for Science, Innovation & Technology

Head of Spectrum Team
Sophie Lyddon

Deputy Director, Technology, Spectrum and Strategy
Catherine Page

Spectrum Innovation
Laura Mejuto Iglesias

Domestic Spectrum
Ed Freeman

International Spectrum
Hugh Sharman

Spectrum Governance
Ian Dewhurst

Spectrum Policy Advisor
Johanna Ekloef

Spectrum Policy Advisor
Jibril Farah

STRATEGIC DEFENCE REVIEW

Department for Science, Innovation & Technology

- Published 02 June 2025: government accepted and endorsed all recommendations in the review.

- Establishing a more lethal 'integrated force' equipped for the future, and strengthened homeland defence: five domains.

- Establish a new Cyber and Electromagnetic Command to lead overarching strategy on electro-magnetic warfare, shape standards in alignment with NATO, and provide single point of contact for armed forces on CyberEM.

- Spectrum Coordination Office to coordinate spectrum operations, support civilian-military coordination.

THE 10 YEAR INFRASTRUCTURE STRATEGY

Department for Science, Innovation & Technology

- Published 10 June 2025: aligns with government's mission to take a 'digital first' approach and ensure that digital infrastructure is at the heart of future infrastructure projects.

- Highlights that, as the National Infrastructure Commission recommended, telecommunications needs must be considered for individual sectors – across the energy, water and transport sectors.

- Commits government to working closely with Ofcom and other relevant regulators to set out the government's assessment of the telecommunications needs for given sectors by the end of 2026.

THE INDUSTRIAL STRATEGY

Department for Science, Innovation & Technology

- Published 23 June 2025: 10-year plan to increase business investment and grow the industries of the future in the UK.

- Six frontier technologies, including Advanced Connectivity Technologies (ACT)

- Digital and Technologies Sector Plan: 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.

PUBLIC SECTOR SPECTRUM FRAMEWORK

Department for Science, Innovation & Technology

- Published 09 July 2025: an enduring framework with a focus on periodic reviews of Crown spectrum demand, reviewed alongside inputs from Ofcom on demand for spectrum access from civil users, and innovative approaches to enabling shared use of spectrum.

- Primary goals in establishing this framework include:
  - ensuring that Crown spectrum users have access to the spectrum they need to support strategic government priorities and deliver critical services.
  - ensuring efficient use of spectrum and enable opportunities to maximise spectrum value and support growth by sharing spectrum with civil applications, where possible.

SPECTRUM SANDBOX REPORTS; RESILIENCE ACTION PLAN

Department for Science, Innovation & Technology

- Spectrum Sandbox reports published 09 July 2025, alongside the Public Sector Spectrum Framework.
- These reports were the final reports produced by each sandbox consortia as part of the March 2024-March 2025 programme.
- Resilience Action Plan - published 14 July and highlights the UK Telecoms Lab as an HMG investment in resilient infrastructure

STATEMENT OF STRATEGIC PRIORITIES

Department for Science, Innovation & Technology

- SSP consultation published 21 July 2025 and is open for responses until 23:59 on 18 September.
- This document sets out the government's priorities across telecoms, spectrum and postal services. Ofcom must have regard to the statement when exercising its regulatory functions.
- Areas of focus include spectrum sharing and innovation, supporting space ambitions, PMSE, FOTV, utilities, transport, and the public sector.

Wireless communications policy: reflections on the road ahead

Paul Febvre, UKTIN NTN WG

Jussi Kahtava, Samsung

Simon Saunders OBE, Federated Telecoms Hubs

UKTIN

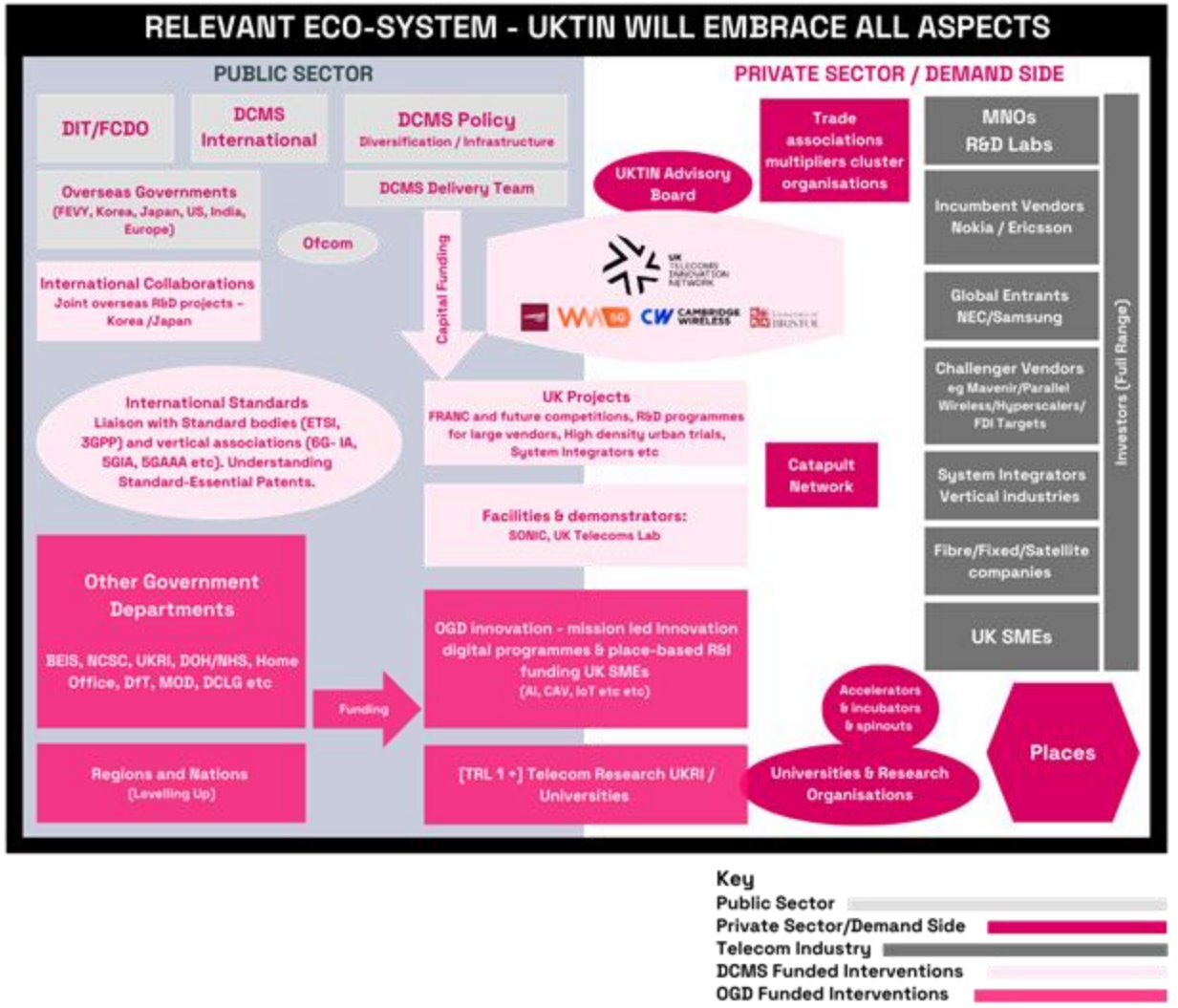
OVERVIEW
Summary of Findings
Spectrum Policy Forum July 2025

Paul Febvre, Cranfield University

1. CONTEXT

COMPLEX & FRAGMENTED ECOSYSTEM

- The global telco sector is potentially transforming from into a more open networking ecosystem
- An opportunity and challenge vital to the UK's Security and Economic interests
- A complex fragmented ecosystem that requires coordinated strategy led by experts

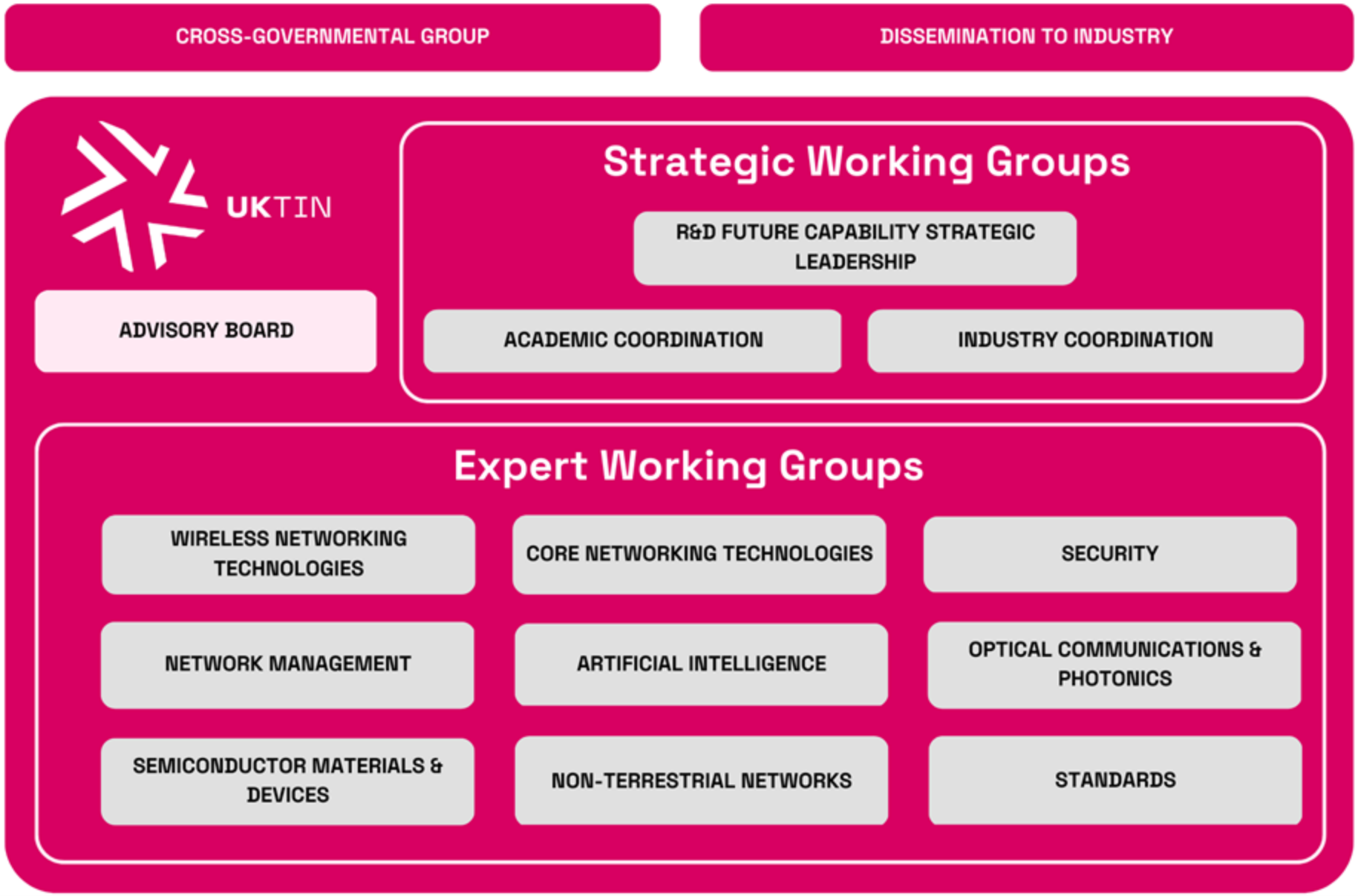


2. AIMS

- **VISION**. A thriving, resilient, and diversified UK telecoms ecosystem that attracts investment, and drives innovation and growth
- **MISSION.** Transform the UK telecoms innovation ecosystem, by forging connections and aligning the sector, enabling the UK to capitalise on its strengths as new opportunities emerge in telecoms.
- **PROPOSITION.** UKTIN is an inclusive and collaborative forum for the UK telecoms innovation ecosystem, bringing together industry, government, and academia to catalyse R&D investment, cooperation, and commercialisation

The Expert Working Groups (EWGs), Strategic Working Groups (SWGs) and Advisory Board (AB)

- Strengths
- Gaps
- Overlaps
- Roadmap



5 Adoption WGs: Regional, Transport & Logistics, Health & Social Care, Agri-Tech, Manufacturing

3. KEY OUTPUTS

TECHNOLOGY ROADMAP.

- Insights into the future of telecoms innovation in the UK
- Potential for investment in UK industry

- **PRIORITIES.**
  - Sovereignty & Security of supply chain
  - Focus on resilience of critical infrastructure
  - Align with National Missions: Establish a National Institute
  - Synthesise & Harmonise priorities across DSIT, UKRI & MOD

- **RECOMMENDATIONS.**
  - Build Capacity by supporting innovation through a portfolio of interventions. Apply a portfolio approach.
  - Commit long term funding across government cycles.
  - Incentivise Cross-Sector Collaboration
  - Prioritise skills development and adoption
  - Strengthen Regional cluster implementation

1) Insights from the AI Experts Working Group

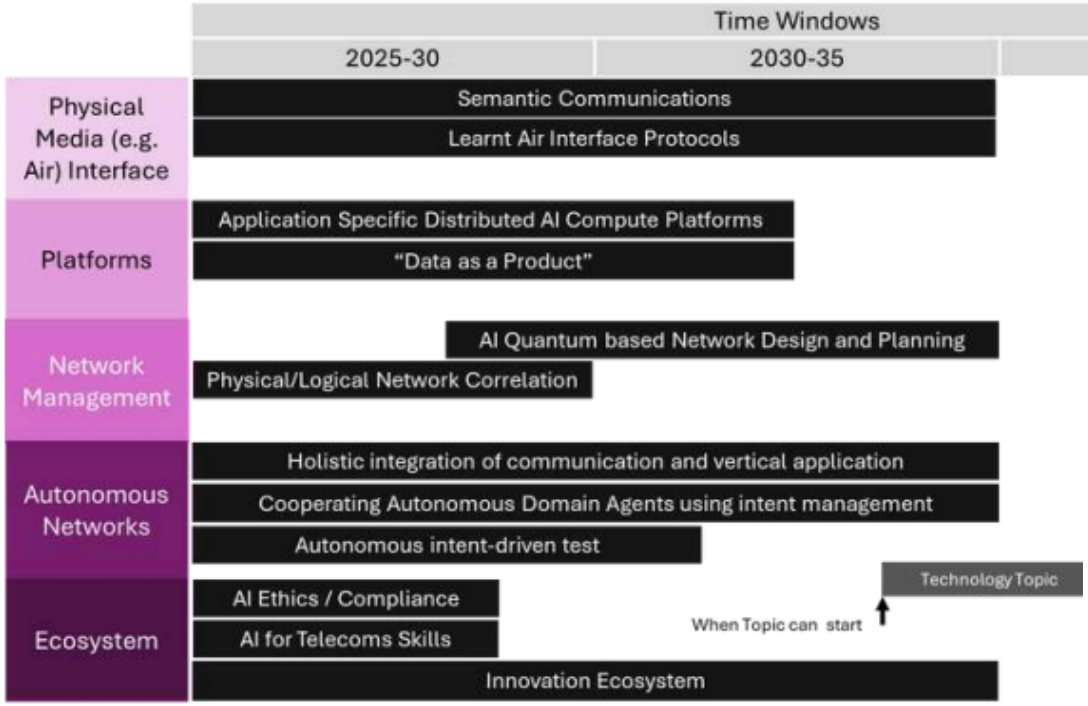


Figure 4: AI-EWG Roadmap for AI in Telecoms

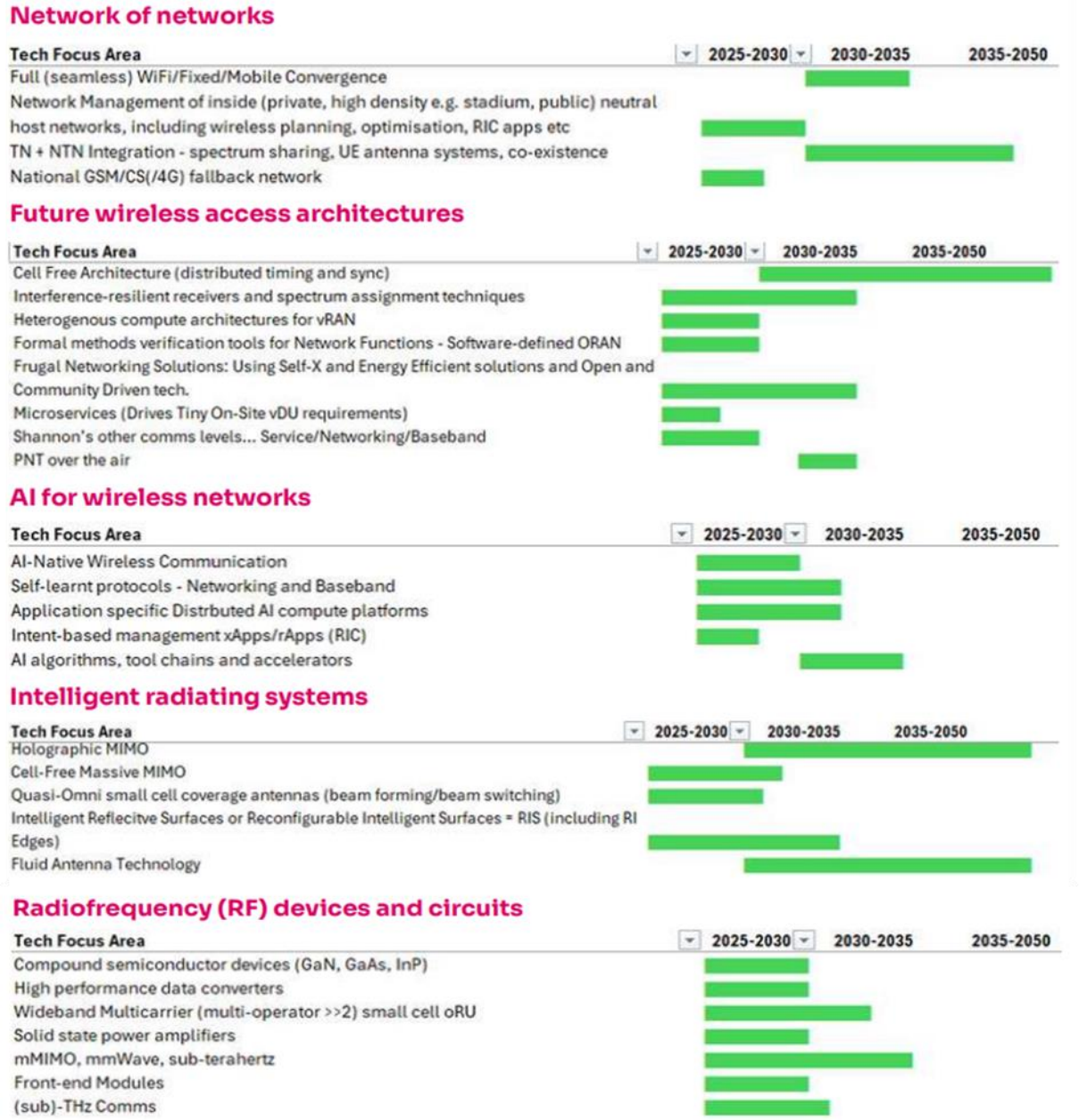
Technology Topic	Ranking	
	Average	Median
Cooperating Autonomous Domain Agents using intent management	**1**	**1**
Holistic integration of communication and vertical application	**2**	**4**
Efficient Application-Specific Distributed AI Compute Platform	**3**	**3**
Autonomous intent-driven test	**4**	**2**
Semantic Communications	**5**	**3**
Learnt Air Interface Protocols	**5**	**5**
Physical & Logical Network Correlation	**5**	**5**
Data as a Product	6	6
AI (Quantum) based Network Design and Planning	7	7

Table : 1 Ranking of the technology topics based on AI-EWG expert opinion (BOLD = selected for consideration)

Key Requirements:

- Telecoms-specific AI Ethics & Regulatory Compliance resources and specialist support
- Assessment and planning of long-term telco-specific AI skills requirements for the UK
- Access to funding for telecom-specific AI innovation by entrepreneurs and startups

2) Insights from the Wireless Experts Working Group



Highlighted Challenges:

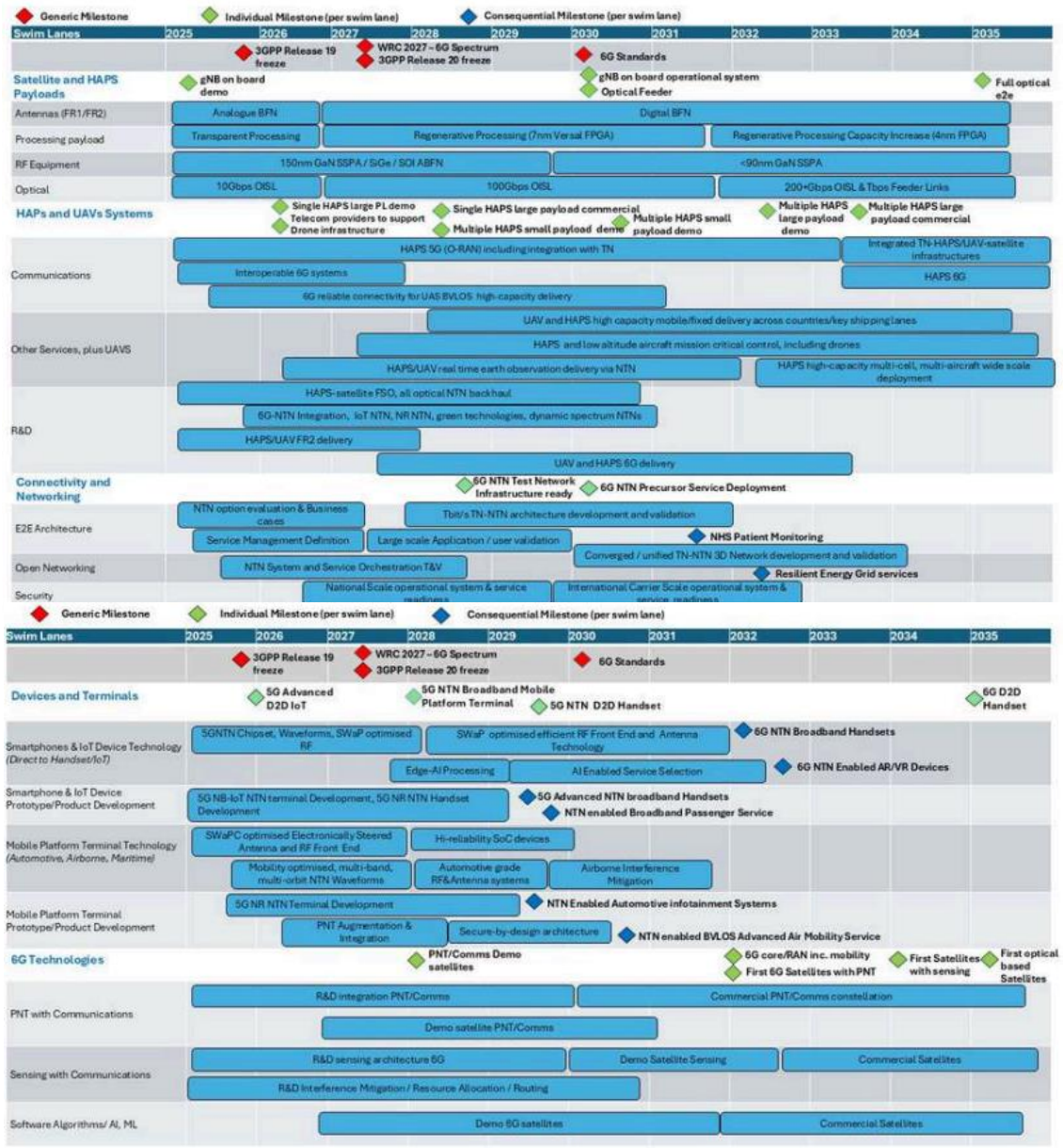
- WiFi/ Fixed/ Mobile convergence
- Network Management, neutral hosting
- Wireless Planning (and Monitoring)

- TN+NTN integration
- Spectrum sharing
- UE Antenna systems
- Co-existence

Thematic Cross-cutting Requirements:

- Wireless security
- Resilience
- Sustainability

3) Insights from Non-Terrestrial Network Experts Working Group



High Level considerations

- HAPS and Satellites both have relevance
- Direct-Device generate opportunities for scale
- Services include from Comms, PNT & sensing
- AI integration and automation prevalent

Key Challenges:

- Disruption in business models
- Interoperability between TN & NTN systems
- Interference Mitigation Techniques
- Spectrum sharing policies

4) Insights from the Security Experts Working Group

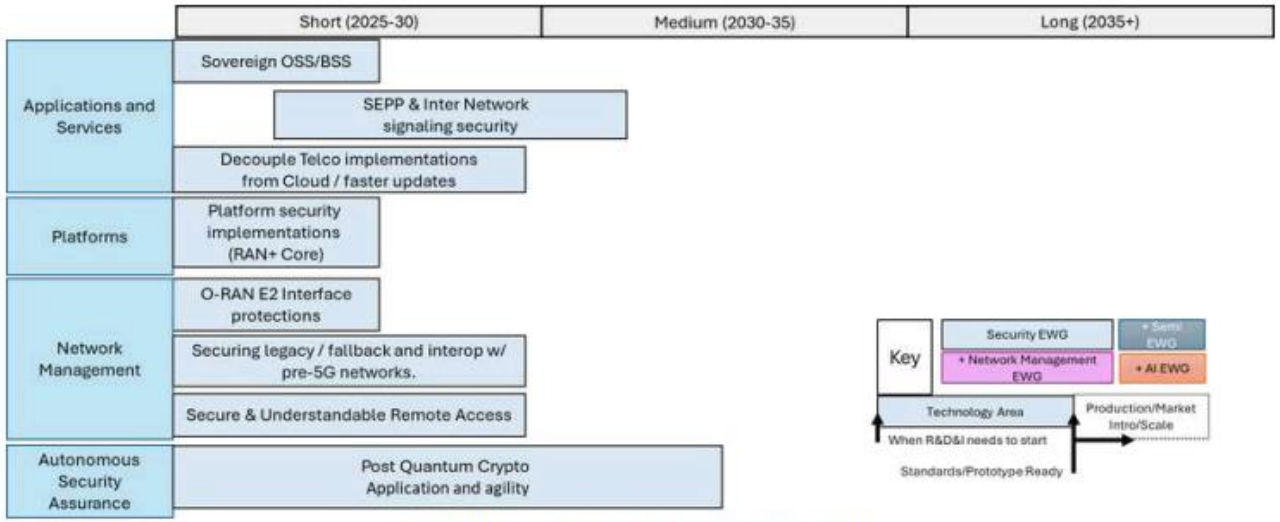


Figure 1: Security EWG Technology Roadmap

Technology Roadmap Focus Areas	Topic	EWG Synergy				
		WN	Semi	NM	Stand	AI
Applications and Services	Sovereign OSS / BSS		(✓)	✓	✓	✓
	SEPP & Inter Network / signalling security	✓		✓	✓	✓
	Decouple Telco implementations from Cloud / faster updates	✓		✓	✓	✓
Platforms	Platform security implementations (RAN + Core)		✓	✓		✓
Network Management	O-RAN E2 Interface protections			✓		✓
	Securing legacy / fallback and interop w/ pre-5G networks			✓		
	Secure & Understandable Remote Access			✓	✓	✓
Autonomous Security Assurance	Post Quantum Crypto Application & Agility		✓	✓	✓	✓

Table 1 Topic TRL score and synergies with other EWGs

Top 5 Security related R&D topics:

- SEPP & Inter Network/ signalling security
- Platform security implementations
- RAN & Core Secure & Understandable remote access
- Securing legacy/ fallback and interop with pre-5G networks
- Decouple Telco implementations from Cloud / faster updates

Other considerations:

- Quantum-safe cryptography

Security underpins all aspects of the systems

5) Insights from the Network Management Experts Working Group

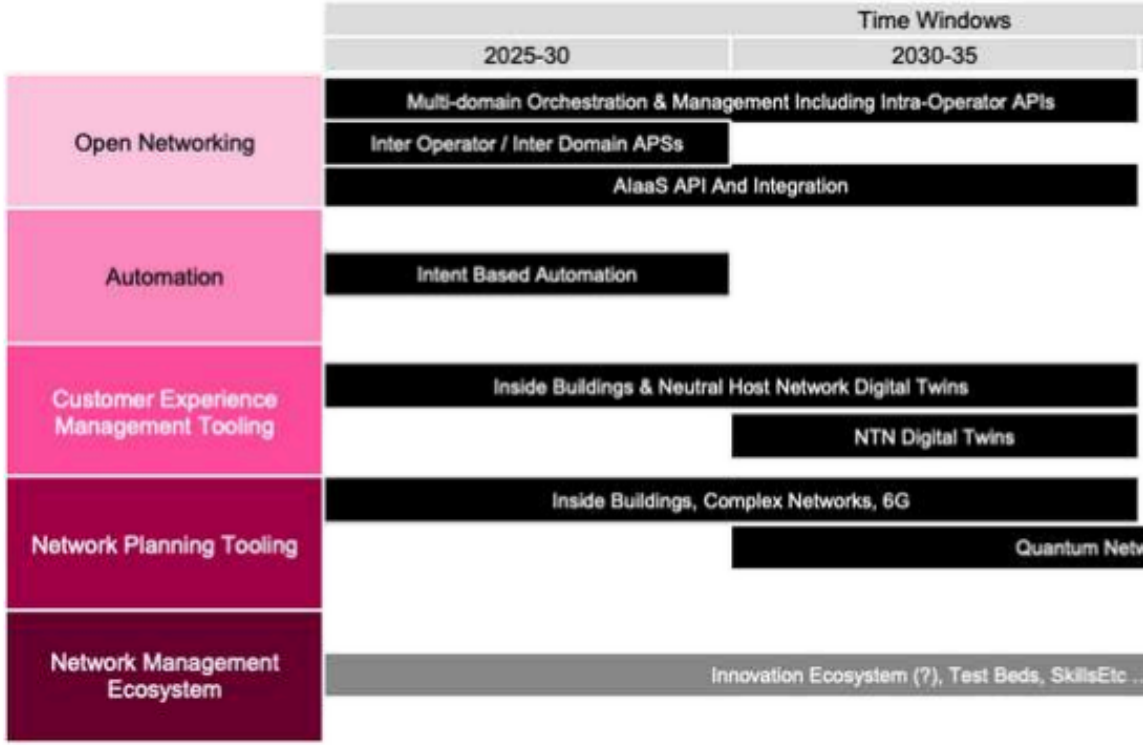


Figure 5: NM-EWG Roadmap for Network Management Technologies in Telecoms

Highlighted Challenges and Opportunities :

- Open Networking
- Automation (Zero-touch NM)
- Customer Experience
- Network Planning Tooling
- Network Management Ecosystems

Thematic Cross-cutting Challenges:

- Explainable/ Trustworthy AI for mission critical systems
- Seamless integration of AI into systems & workflows
- Transition from network management
  → service management paradigms

6) Insights from the Core Network Tech Experts Working Group

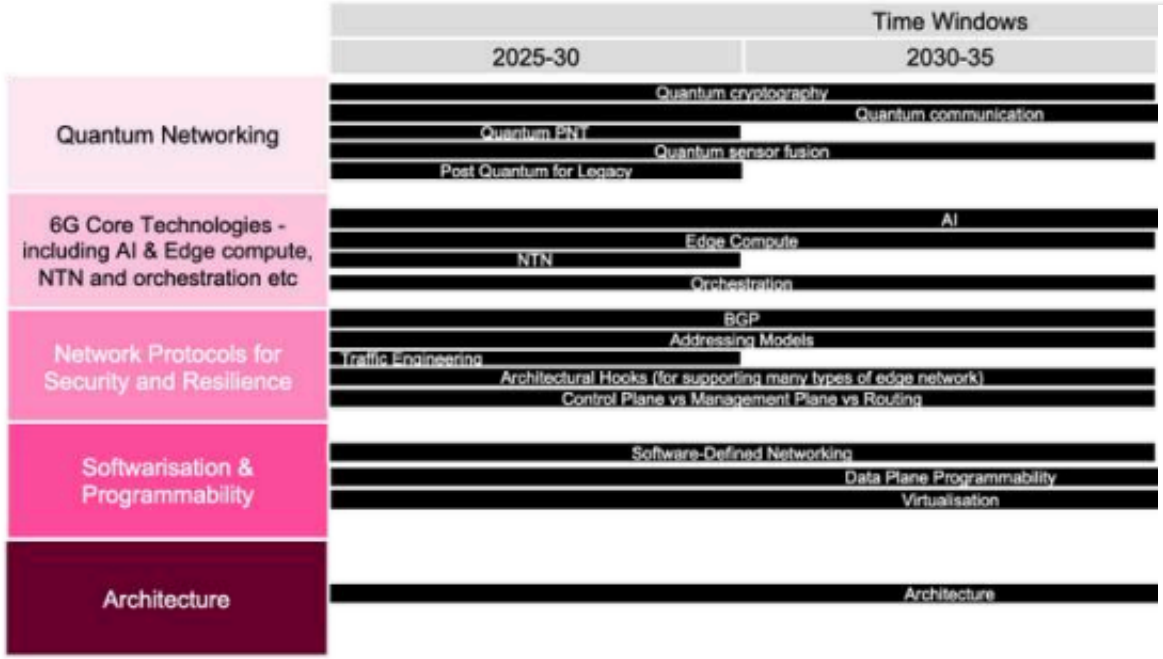


Figure 6: Core-EWG Roadmap for Core Networking Technologies i

Highlighted Challenges and Opportunities :

- Quantum Networking & QKD
- 6G Core Technologies, Integrated AI/Edge, NTN
- Network Protocols for Security & Resilience
- Softwarisation and Programmability
- Future Telecoms Architecture

Thematic Cross-cutting Challenges:

- Software defined networks and systems
- Complexity derived cyber-vulnerabilities

7) Insights from the Optical Comms Experts Working Group

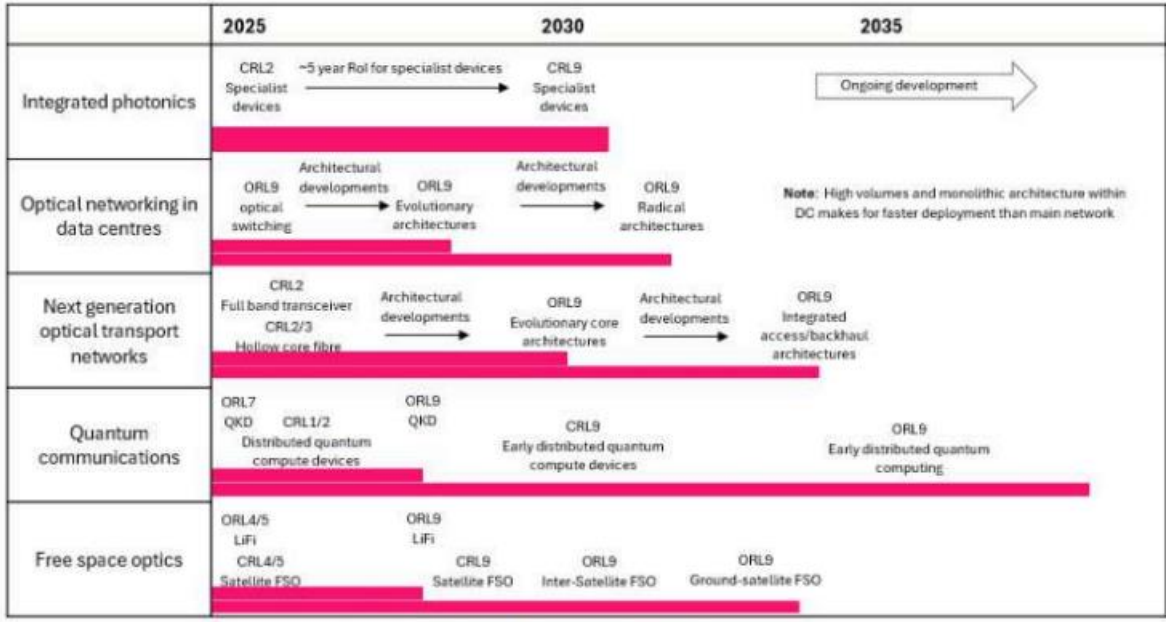


Figure 7: Development Timelines

Highlighted Challenges and Opportunities :

- Integrated Photonics
- Optical Networking in Data Centres
- Next Gen Optical Transport Networks
- Quantum Communications
- Free-Space Optics

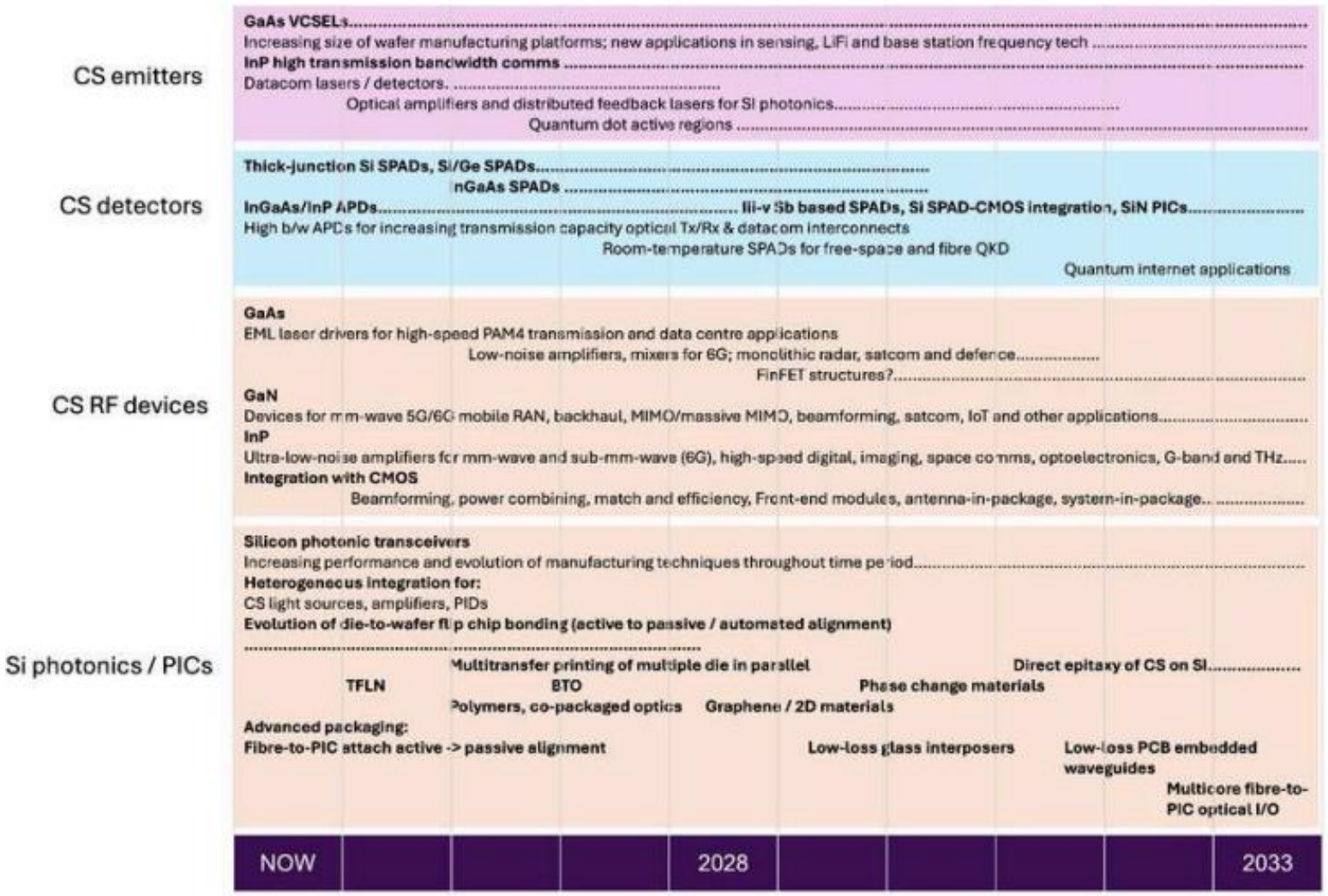
Cross-cutting considerations

- Supply chain resilience (eg Semiconductor & fibre)
- Security architectures

Spectrum and regulatory considerations

- Free-space optics vs mmWave or sub-THz systems

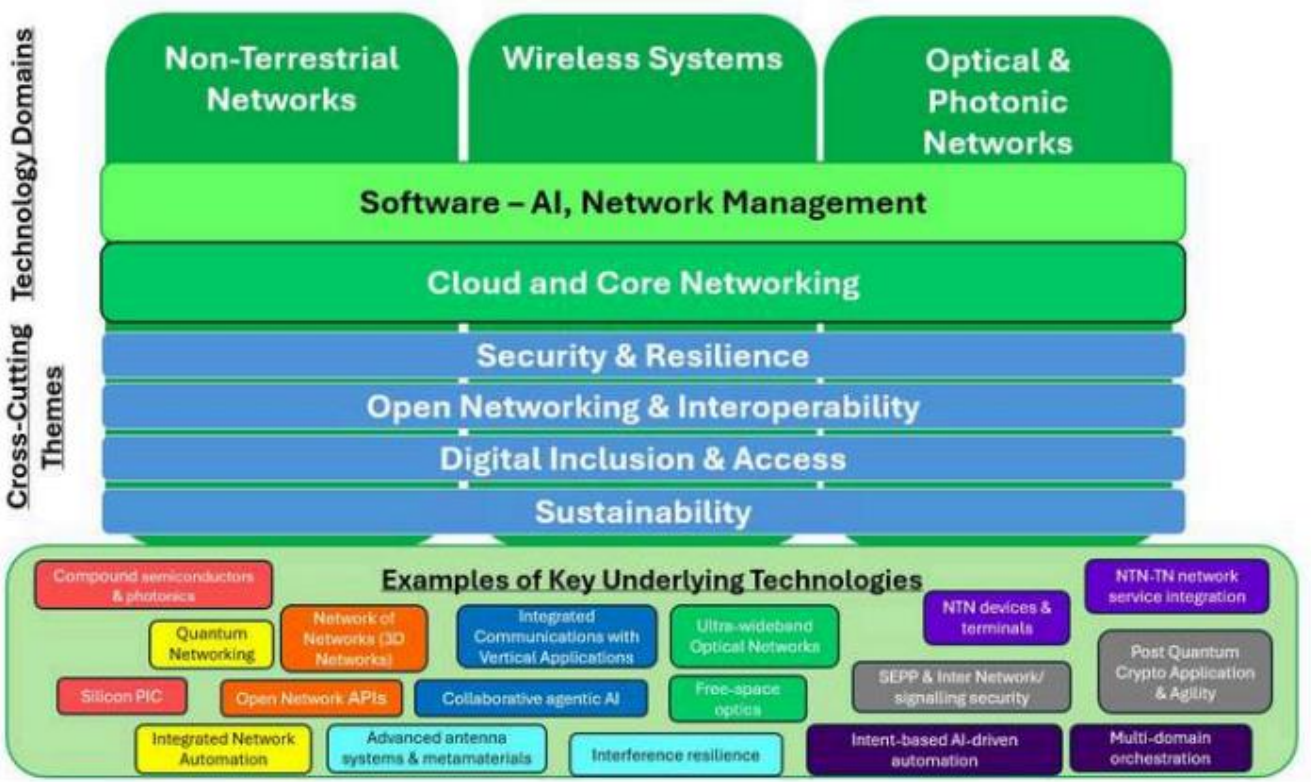
8) Insights from the Semiconductors Experts Working Group



General Recommendations

1) Recognition
2) Coordination
3) Scale-Up
4) Resilience & Security
5) International Partnerships
6) Infrastructure Investments

9) Insights from the Standards Experts Working Group → Future Capabilities Leadership Forum



The Expert Working Groups (EWGs), Strategic Working Groups (SWGs) and Advisory Board (AB)

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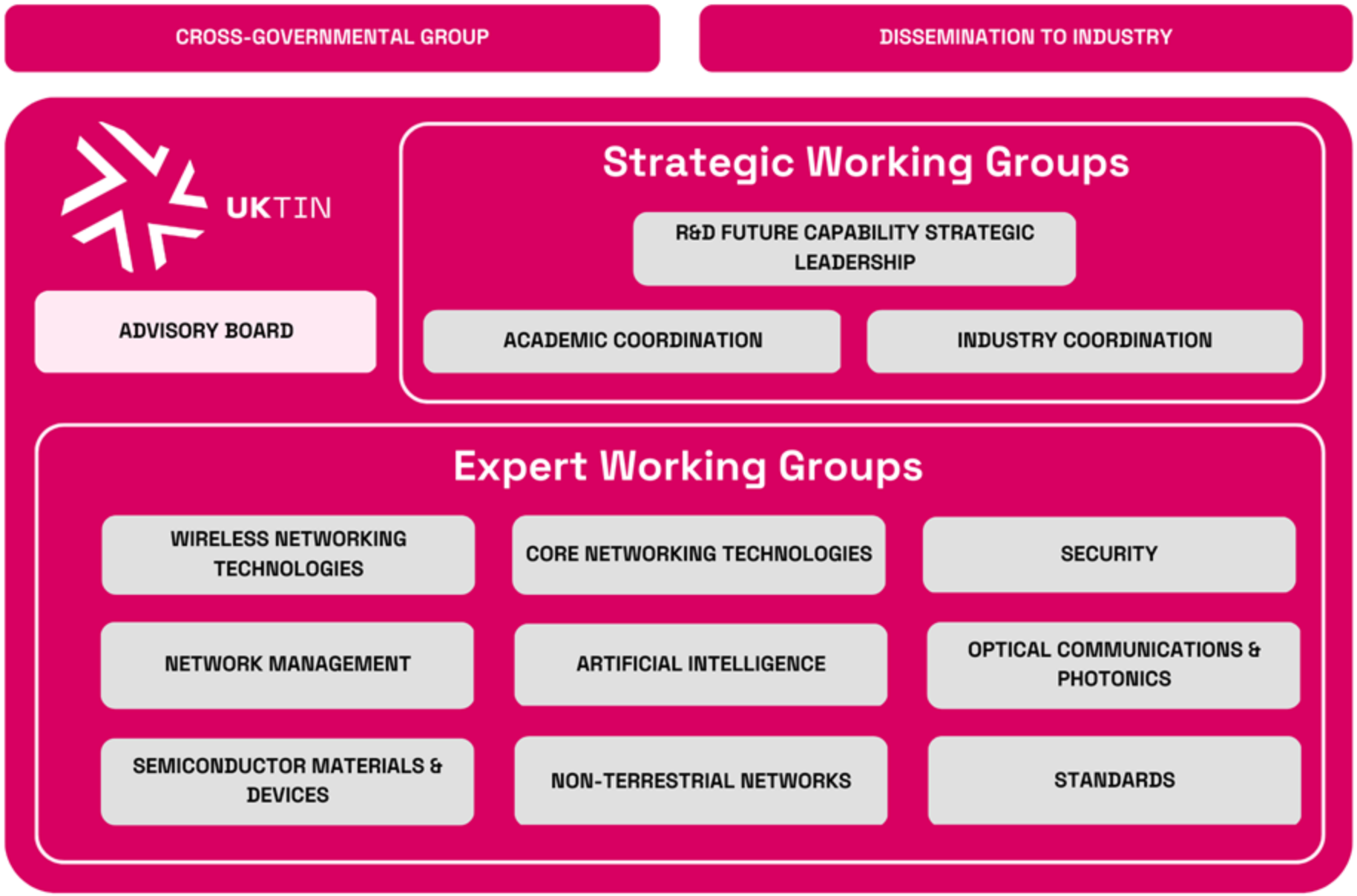


5 Adoption WGs: Regional, Transport & Logistics, Health & Social Care, Agri-Tech, Manufacturing

Spectrum Policy Forum Considerations

- Q&A / Discussion on Implications and Next Steps

Thank you

Samsung Research

UK SPF Plenary: Update on the ITU-R WP 5D (IMT technologies)

Jussi Kahtava, SRUK

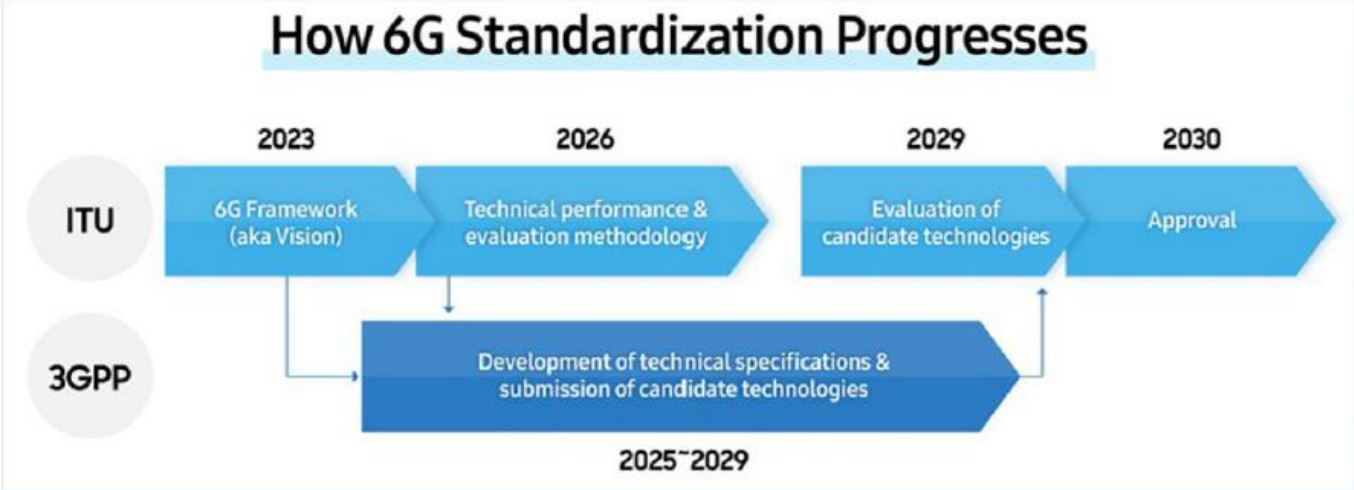
24/07/2025

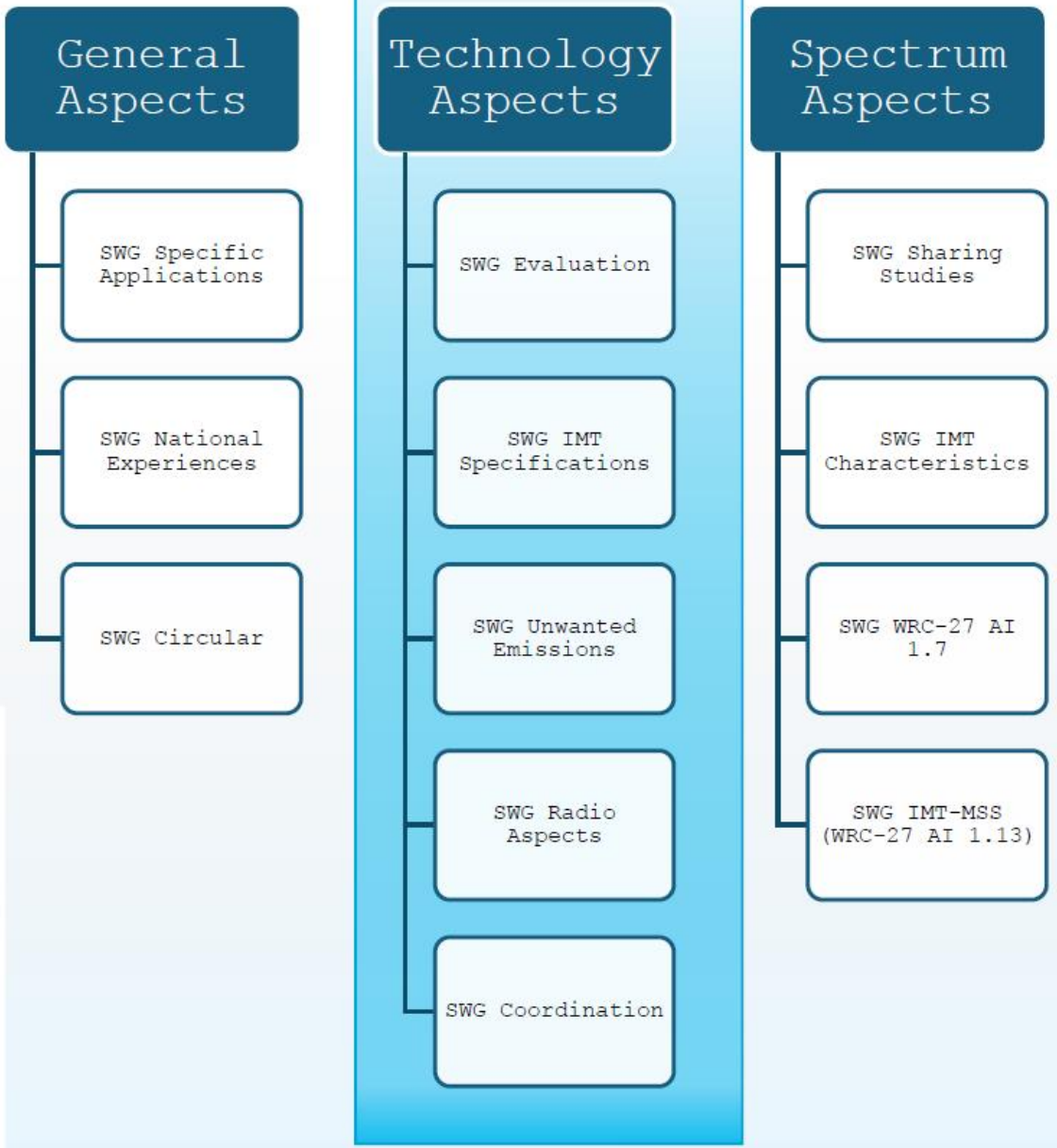
Contents

ITU-R WP 5D structure

The IMT-2030 track

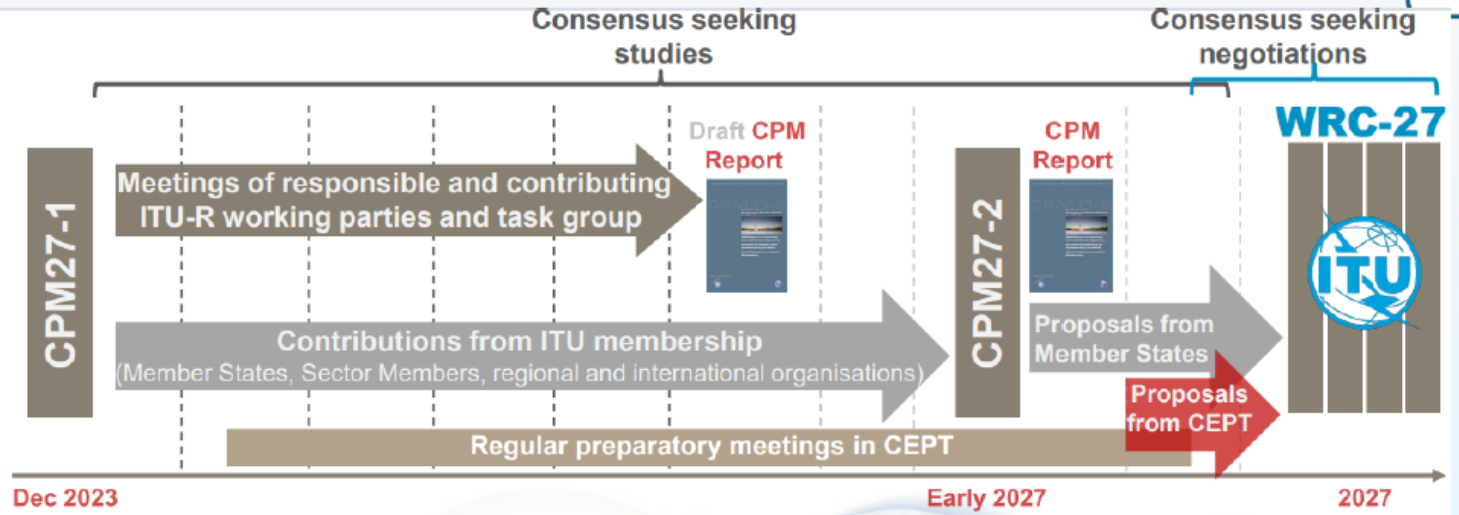
Now the fourth round!
IMT-2000 (WCDMA/HSPA + others)
IMT-Advanced (LTE-A, IEEE 802.16m)
IMT-2020 (NR, DECT-NR+)
IMT-2030 (3GPP Rel-20/21)

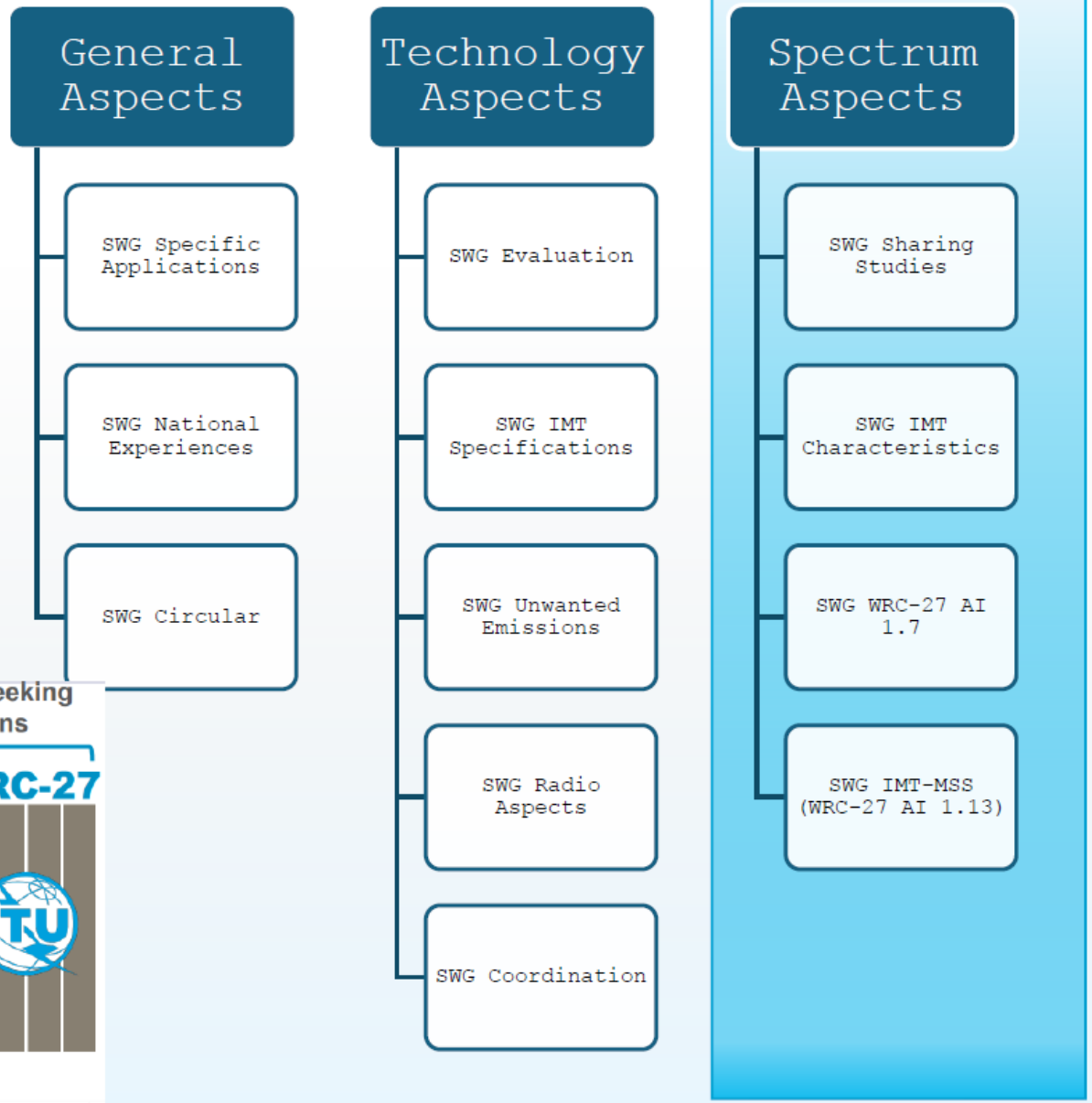




ITU-R WP 5D structure

The WRC-27 track





Technical Performance Requirements

- Current list of minimum technical performance requirements (TPRs) – 18 items
  - Peak data rate, *5th percentile user data rate (User experienced data rate)**, Peak spectral efficiency, Average spectral efficiency, 5th percentile user spectral efficiency, Area traffic capacity, Connection density, User plane latency, Control plane latency, Mobility, Mobility interruption time, Reliability, Bandwidth, Positioning, *Energy efficiency for sustainability**, *Sensing-related requirements**, AI-related capabilities, *Resilience*

  Note) Title of the items have been updated.*
- Outcome of discussions on other candidate TPRs
  - Security: No TPR (To be included in description template)
  - Sustainability: No TPR (Energy efficiency is defined as a representative TPR for sustainability.)
  - [Coverage]: TBD (Concern expressed by *sector members and administrations* on this TPR.)
  - [Composite requirement]: TBD (Concern expressed by *a sector member and administration* on this TPR.)
  - [Interoperability]: TBD (Clarification and discussion on this TPR is needed at the next meeting.)

TPRs	High-level evaluation methodology	Usage scenarios / Test environments
Peak data rate	Analytical	IC
Peak spectral efficiency	Analytical	IC
5th percentile user data rate	DL: Analytical UL: Simulation	Dense Urban – IC [Rural – UC]
5th percentile spectral efficiency / Average spectral efficiency / Mobility	Simulation	Indoor Hotspot – IC Dense Urban – IC Rural – IC [Rural – UC]
Area traffic capacity	Analytical	Indoor Hotspot – IC [Dense Urban – IC]
User plane latency	Analytical	IC & HRLLC
Control plane latency	Analytical	IC & HRLLC
Connection density	Simulation	Urban Macro – MC
Reliability	Simulation	Urban Macro – HRLLC
Mobility interruption time	Analytical	IC & HRLLC
Bandwidth	Inspection	N/A
Energy efficiency for sustainability	Unloaded case: Analytical [Loaded case: Analytical or Simulation]	Unloaded case: IC Loaded case: [Dense Urban – IC], [Rural – IC]
Positioning	Simulation	Indoor Factory – ISAC Urban[Macro] – ISAC
Sensing-related requirements	Simulation [Analytical (only for Resolution)]	Indoor Factory – ISAC Urban[Macro] – ISAC
AI-related capabilities	Inspection	N/A
Resilience	Inspection	N/A
[Composite requirement]	[Simulation]	[Dense Urban – IC] [Indoor Factory – HRLLC]
[Coverage]	[Simulation]	[Rural-UC]
[Interoperability]	[Inspection]	N/A

IC – Immersive Communication, HRLLC –Hyper Reliable and Low Latency Communication,
MC – Massive Communication, UC – Ubiquitous Connectivity
AIC – Artificial Intelligence and Communication, ISAC – Integrated Sensing and Communication

Sharing studies on the IMT candidate bands

DG 4 GHz

- FS, MS, FSS allocated on a primary basis
- AM(R)S, ARNS, FS, MS on adjacent channels on a primary basis
- 13 contributions

DG 7/8 GHz

- FS, MS, SRS, EESS, MetSat, FSS, MMSS, MSS, SOS allocated on a primary basis
- FS, MS, SRS on adjacent channels on a primary basis
- 52 contributions

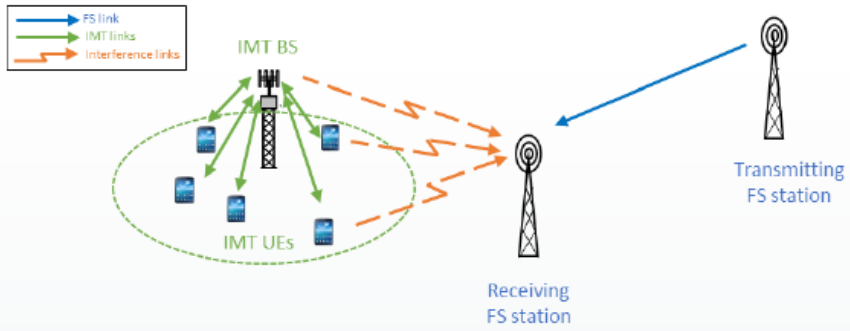
DG 14/15 GHz

- FS, MS, SRS allocated on a primary basis
- FS, MS, FSS, EESS (passive), RAS, SRS (passive) on adjacent bands on a primary basis
- 6 contributions

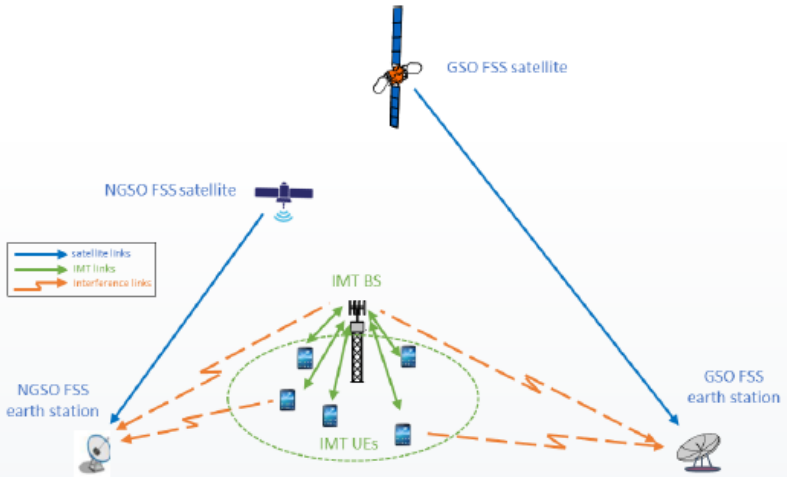
Documents related to studies to assess potential interference from incumbent systems into IMT ("reverse studies") were also introduced.

Some potential interference scenarios

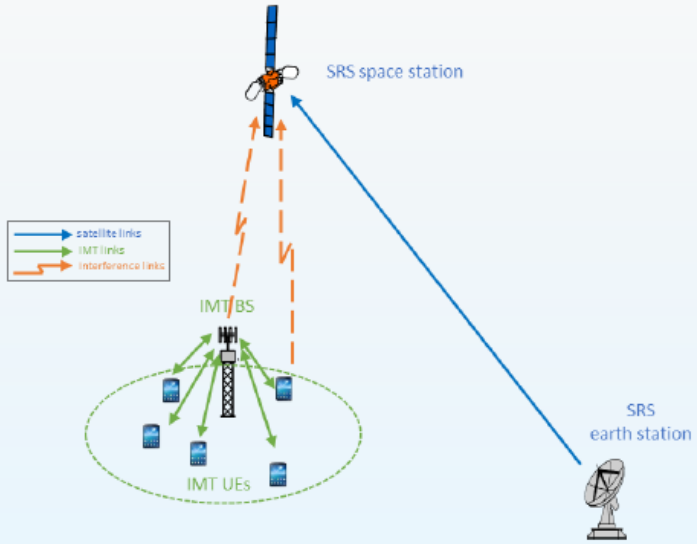
IMT transmitters → FS receivers



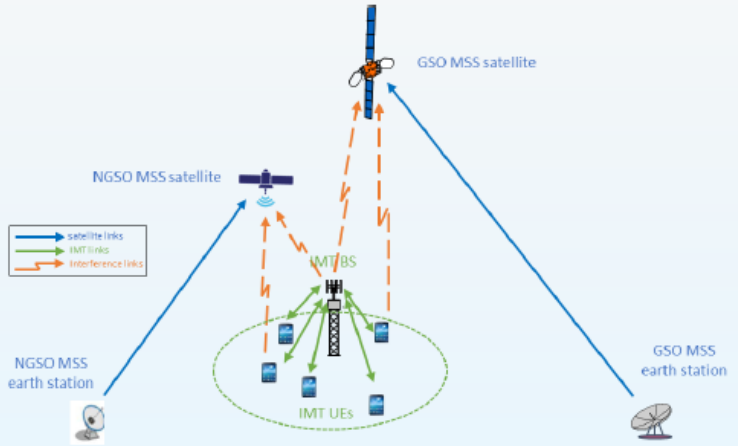
IMT transmitters → FSS earth stations



IMT transmitters → SRS space stations



IMT transmitters → MSS space stations



Other AIs where IMT is the victim: IMT Characteristics, chapter 4

The working document is largely stabilized and the content agreed, except for text intended to address cases beyond the baseline characteristics for parameters such as UE antenna gain and body loss (including protection of wall-mounted CPEs)

One very thorny open item is section 7 on the protection criterion for IMT, which remains unresolved

- IMT protection criteria is has been -6dB during previous study periods
- One approach is to use I/N CDF as measure to evaluate exceedance probability, whilst keeping IMT protection criterion fixed without reference to time percentage
- Another approach is to have non-exceedance probability as a range of values. The non-exceedance probability of X% in the CDF of I/N indicates that X% of the simulation snapshots satisfies this I/N value
- Yet another approach is C/(N+I) and a throughput criterion

[Editor's Note for Section 7:
The whole Section 7 is inside [...] and not agreed as a whole yet. However, in SWG, texts highlighted in GREEN were agreed, texts in YELLOW are not agreed and need more consultations and text in CYAN have not been reviewed.]

Table 25 contains the *I/N* value for assessing the protection of IMT (irrespective of the number of interferers) in sharing and compatibility studies [+footnote]

TABLE 25

***I/N* value for protection of IMT**

I/N	−6 dB

For the Monte-Carlo simulation analysis:

Results of Monte-Carlo studies can be assessed by analysing the CDF of I/N, which could vary depending on the scenario being studied.

For the assessment of the protection of IMT, non-exceedance probability values for I/N in Table 25 can be set at 98% for IMT user equipment and 99.5% for IMT base stations. In some particularly specific cases, higher non-exceedance probability values could be used (e.g., up to 99.99 or 100%).

To enable comparison across studies, the non-exceedance probability used in the assessment should be presented alongside the results of studies. [It is to be noted that complementary approach is to examine C/(I+N) statistics and/or throughput loss metrics.]

For the MCL analysis:

The evaluation of the IMT protection can be performed using the value in Table 25.
To enable comparison across studies, the time percentage value set in the propagation model should be presented alongside the results of studies.

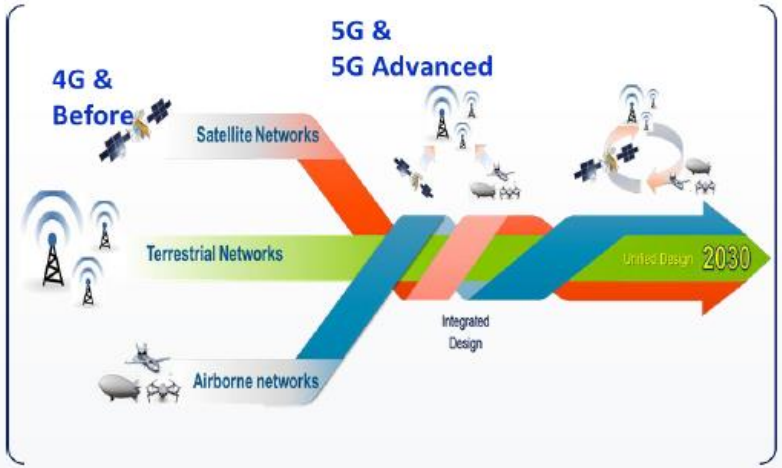
Other AIs where IMT is the victim: IMT Characteristics, chapter 4

Some MNOs and four southern African countries raised the topic of CPEs used in IMT-based Fixed Wireless Access.
Question on whether the same body loss and antenna gains should be considered for CPEs as IMT UEs, since it can be argued that deployment is different for IMT CPE devices.
Typically CPE devices are wall mounted/vehicle mounted and therefore body loss is not applicable

Current un-agreed text in the working document:

[Beyond the baseline characteristics provided in the referenced material, [sensitivity] studies may be performed with clear justification for different values used (e.g. Tx Power, antenna pattern, antenna gain (0 - 5 dBi), body loss (0 dB) and noise figure).]

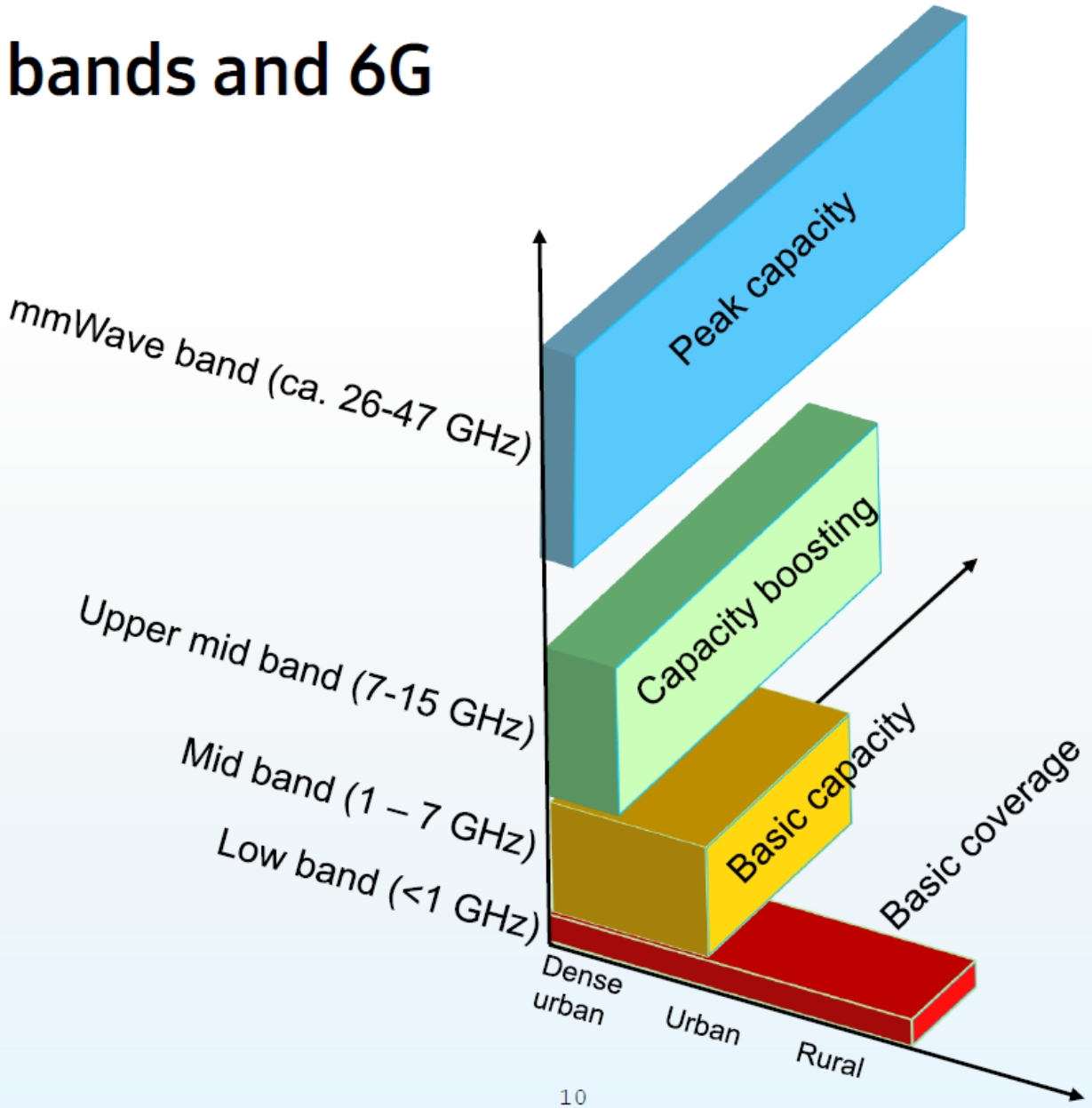
Integration of TN and NTN in 6G?



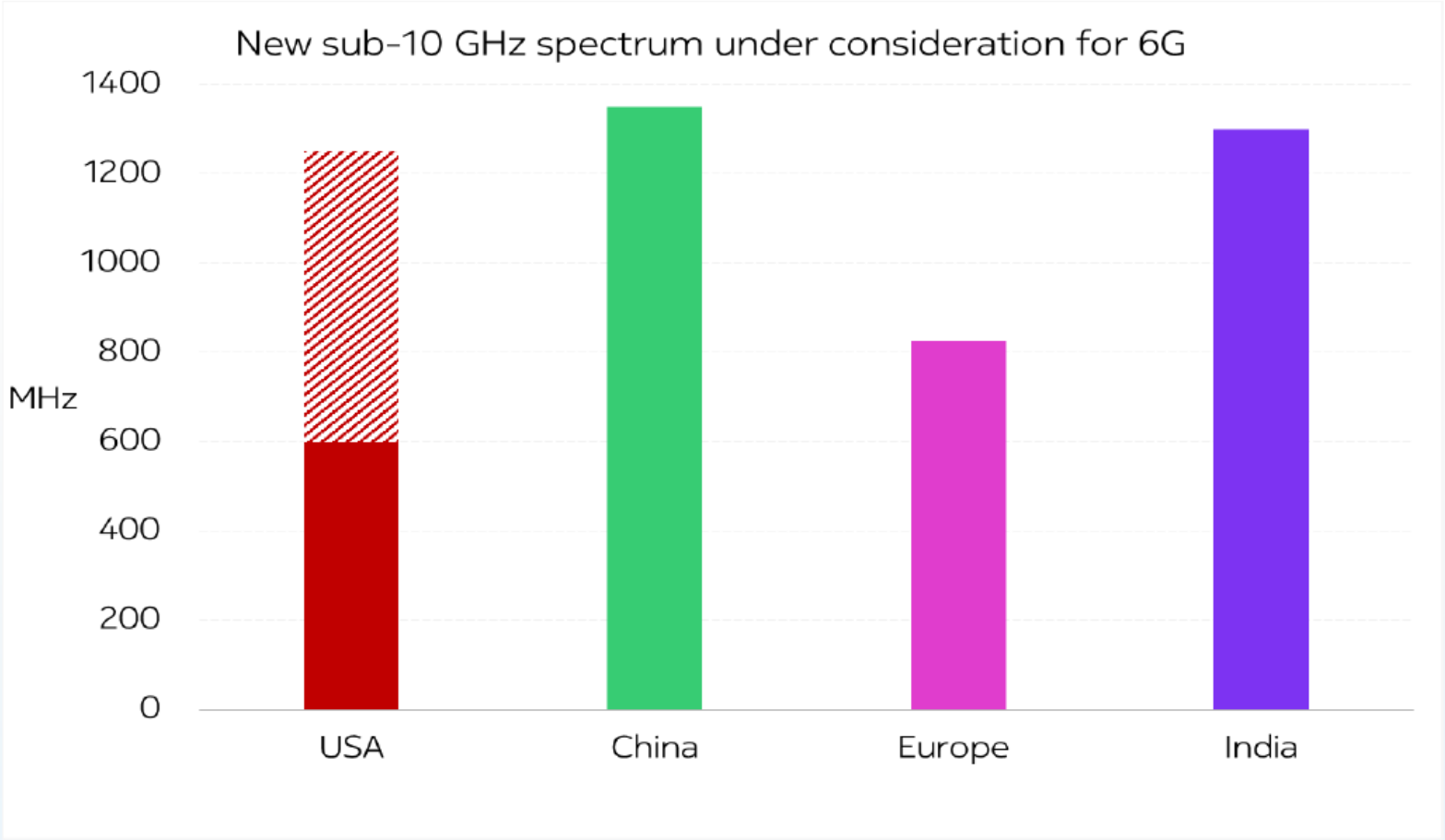
But…
IMT-2030 terrestrial and satellite components are under the purview of totally separate Study Groups. Terrestrial component is addressed by WP 5D whereas non-terrestrial component is addressed by WP 4B.

The TPRs at WP 5D do not address TN-NTN integration. The TPR for interoperability relates to completely different aspects.

IMT Spectrum bands and 6G



Europe is falling behind in 6G assignments?



Source: Global Mobile Suppliers Association

Samsung Research

Thank you

Engineering and Physical Sciences Research Council

Department for Science, Innovation & Technology

Federated Telecoms Hubs

JOINER National Spectrum Facility

Engineering and Physical Sciences Research Council

Department for Science, Innovation & Technology

IP Pool

Technical Standards

Thought Leadership

Academic Excellence

Skills & Training

Translation & Commercialisation

Federated Telecoms Hubs

CHEDDAR
Communications **H**ub for Empowering **D**istributed clou**D** computing **A**pplications and **R**esearch

TITAN
NETWORK OF NETWORKS HUB
PLATFORM DRIVING THE ULTIMATE CONNECTIVITY

HASC
HUB IN ALL-SPECTRUM CONNECTIVITY

JOINER
An experimentation platform for future connectivity.

One of Europe's Largest Research Consortia

- **27** leading UK universities
- **100+** researchers focused on advanced communications technologies
- **£12M+** awarded in 2025 for research in advanced communications technologies across the research hubs

UKRI Engineering and Physical Sciences Research Council

Federated Telecoms Hubs

The FTH Directors & Leadership Team

TITAN
NETWORK OF NETWORKS HUB
PLATFORM DRIVING THE ULTIMATE CONNECTIVITY

Led by
Prof Harald Haas,
University of Cambridge

Focusing on emerging seamless, intelligent and resilient Network of Networks (NoN) solutions and technologies

CHEDDAR
Communications **H**ub for Empowering **D**istributed clou**D** computing **A**pplications and **R**esearch

Led by
Prof Julie McCann,
Imperial College London

Researching 6G technologies that support edge-fog-cloud continuum of computation.

HASC
HUB IN ALL-SPECTRUM CONNECTIVITY

Led by
Professor Dominic O'Brien,
University of Oxford

Focusing on how to combine wired and wireless internet technologies to achieve end-to-end connectivity

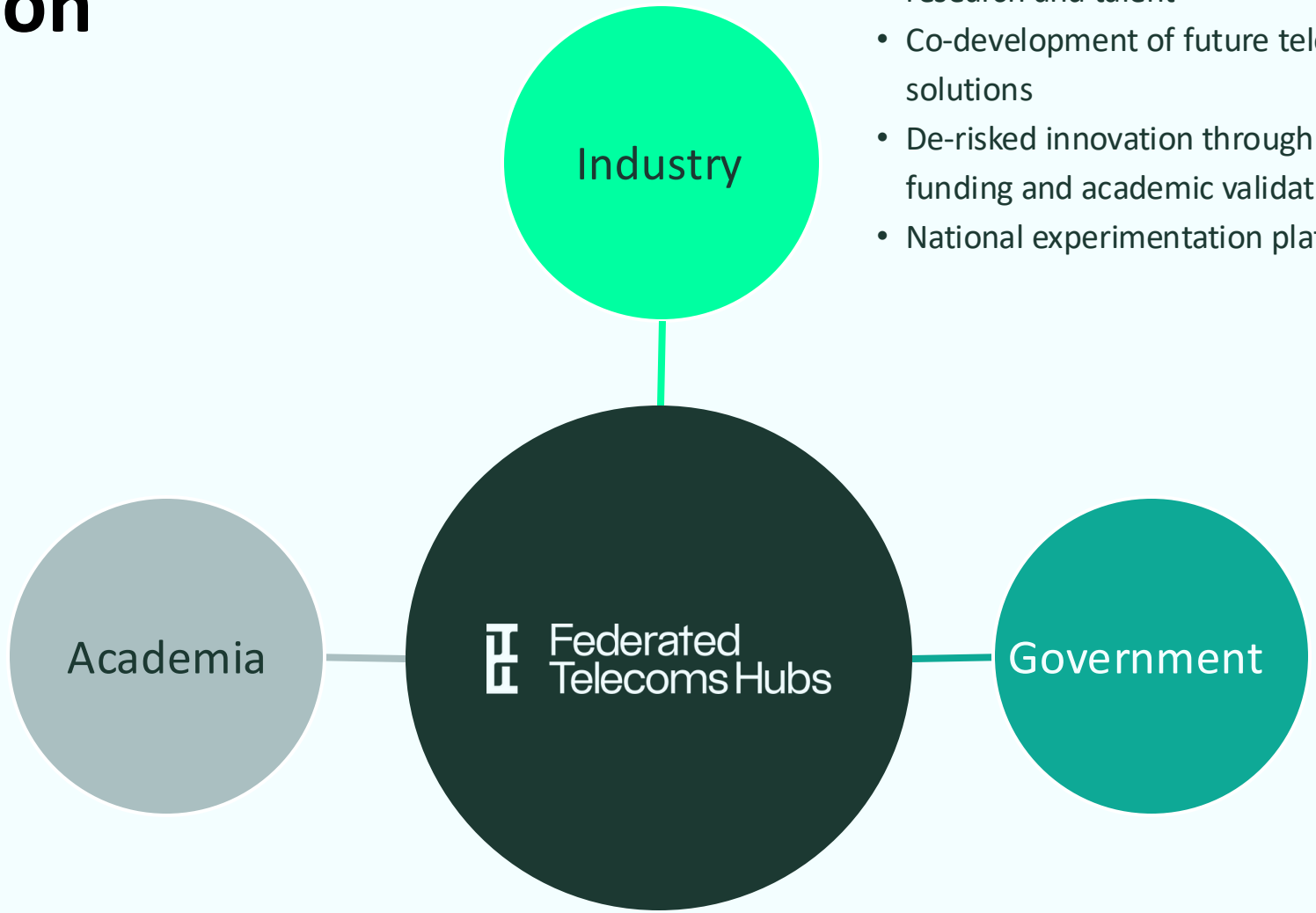
JOINER
An experimentation platform for future connectivity.

Led by
Prof Dimitra Simeonidou,
University of Bristol

A national experimentation platform to accelerate 6G and future network research

Collaboration

- Accelerated access to cutting-edge research and talent
- Co-development of future telecoms solutions
- De-risked innovation through public funding and academic validation
- National experimentation platform



- National platform to apply and test research at scale
- Industry and policy relevance for impact case studies
- Access to commercial and policy partners for knowledge exchange

- Evidence-based policy insights from technical experts
- Enablement of national R&D goals through public-private-academic collaboration

About
JOINER National Spectrum Facility

JOINER

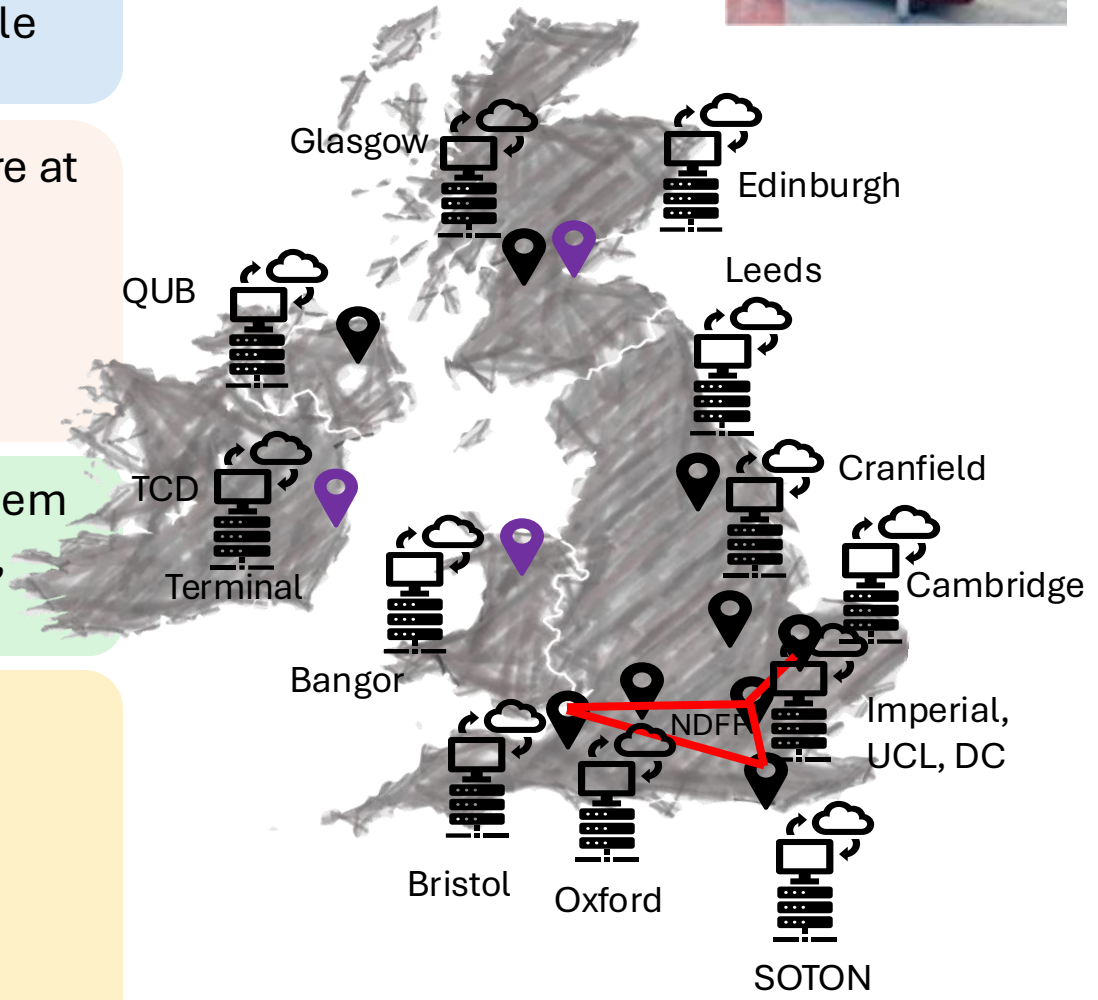
JOINER is a national-scale experimentation platform aiming to support future networks research, collaboration and experimentation at scale

It is delivering an open, programmable and feature rich infrastructure at scale interconnecting 14 labs (including SONIC Labs) + a nomadic terminal, offering connectivity, cloud, RIC & mobile packet cores, monitoring, management, orchestration, spectrum measurement, ORAN, NTN emulation platforms

It is already developing capability to support the wider telco ecosystem including international (US/FABRIC, EU/SNS, Ireland, etc.), industry, SMEs and regions.

Key attributes include:
Large scale host for Future Network Experimentation:

- Collaborative by design
- Heterogeneous platform
- Led by world-class research labs
- Enabler of system-level research addressing end-to-end challenges



Key Areas of Technical Development

Onboarding New Hardware
Radio, OWC,
HW programmable platforms, ultrafast switches, new fibres, etc.

Infrastructure Evolution
Convergence (wireless, optical, satellite, computing, sensing),
Distributed & disaggregated

Native Security
Cyber
Physical layer & Quantum
QKD security as a service for 6G, integration of QKD and post-quantum cryptography

AIaaS
For network and AI applications

Open software/platforms/interfaces
Higher reliance on open infrastructure, platforms and interfaces

Cloud & Edgification
Continued cloudification
Federated and Split Edge computing

Spectrum
RF, THz and optical (infrared and visible light)

JOINER Brain: Measurement & Analytics, Orchestration & Management, User Management, Policies

User Equipment

Access Network

mmWave /THz

WIFI

B5G/6G

LiFi

Fibre Broadband

Sensing

Spectrum

Local Experimenters

JOINER Terminal

- User Portal
- mATRIC (multi-access control)
- On-Premisses Hybrid Cloud
- Private Cloud
- SDN Control
- Storage and Computational Resources — CPU/GPU/RAM AI Nvidia Platform
- Hosting for equipment, platforms and users-terminals
- ASIC/FPGA — Programmable ICs
- L3 Routing — Service Router, SD-WAN
- L2 Switching — Programmable Packet Switches
- L1 Switching — Optical Switches

JOINER Fabric

Hybrid Cloud

- VI Monitoring and Data Collection Platform
- Virtual Infrastructure Management Platform

Virtual Infrastructure

AI models	Open-Source Platforms	RICs
Monitoring Data	Storage	Spectrum Data
Serverless Compute	Mobile Packet Core	

Physical Infrastructure

- Infra Monitoring and Data Collection Platform
- Infrastructure Management Platform
- L 2/3 Hybrid Cloud Connectivity [e.g., AWS VPN/Private Link]
- Satellite links (GEO, LEO) at specific locations, e.g., Cranfield
- 10-40Gbps Layer2 Transport Network Connectivity at all 14 locations [JISC, Heanet for Ireland]
- Layer 1 Optical Connectivity [existing NDFF infrastructure across Bristol, Cambridge, Southampton, UCL]

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:

Table 1 - Ofcom's Spectrum Management Strategy illustrated on a page

Key spectrum duty	To secure optimal use of spectrum in the UK i.e. the use that delivers the greatest value to UK citizens and consumers		
The context for future spectrum management	Requirements for wireless service are likely to increase for many spectrum uses. This will lead to **growing competing demands** for key spectrum resources	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
Our strategy	We will continue to **combine the use of market mechanisms possible and effective and regulatory action where necessary**. When we do take action we seek to retain flexibility in order to create options, rather than dictate solutions 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 associated with changes in spectrum use • Promoting improvements in radio performance standards to reduce future coexistence issues • Increasing the quantity and quality of information on spectrum use we make available We will also **continue to play a leading role in international spectrum debates** where this is most relevant to good outcomes in the UK		

Ofcom's new Growth Duty (2024) needs both spectrum for innovation but also innovation for spectrum management

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. "

Spectrum research questions and needs

Spectrum research questions

How to support **continued growth** in spectrum usage:

- Growth in data consumption
- Wider diversity of uses : Public, private, NTN
- Increased societal reliance on critical national infrastructure – security and resilience needs
- New and higher spectrum bands

Enable **denser spectrum sharing** between adjacent networks and heterogeneous services, including sharing by frequency, time, location and power

How to ensure **spectrum usage more closely reflects actual usage**, ensuring efficient assignment while delivering the necessary protections against harmful interference and investment certainty

To address these questions researchers need

Real-world spectrum interactions

Open data on the characteristics of spectrum usage

Operation *at scale* for credibility:

- Geographical
- Temporal
- Computing (inc. AI) infrastructure
- Connectivity
- Traffic

To emulate and test advanced system concepts in realistic – and preferably real - environments

We are seeking to galvanise and support the UK research and innovation community to better meet these needs via JOINER and the Future Telecoms Hubs

Introducing JOINER NSF

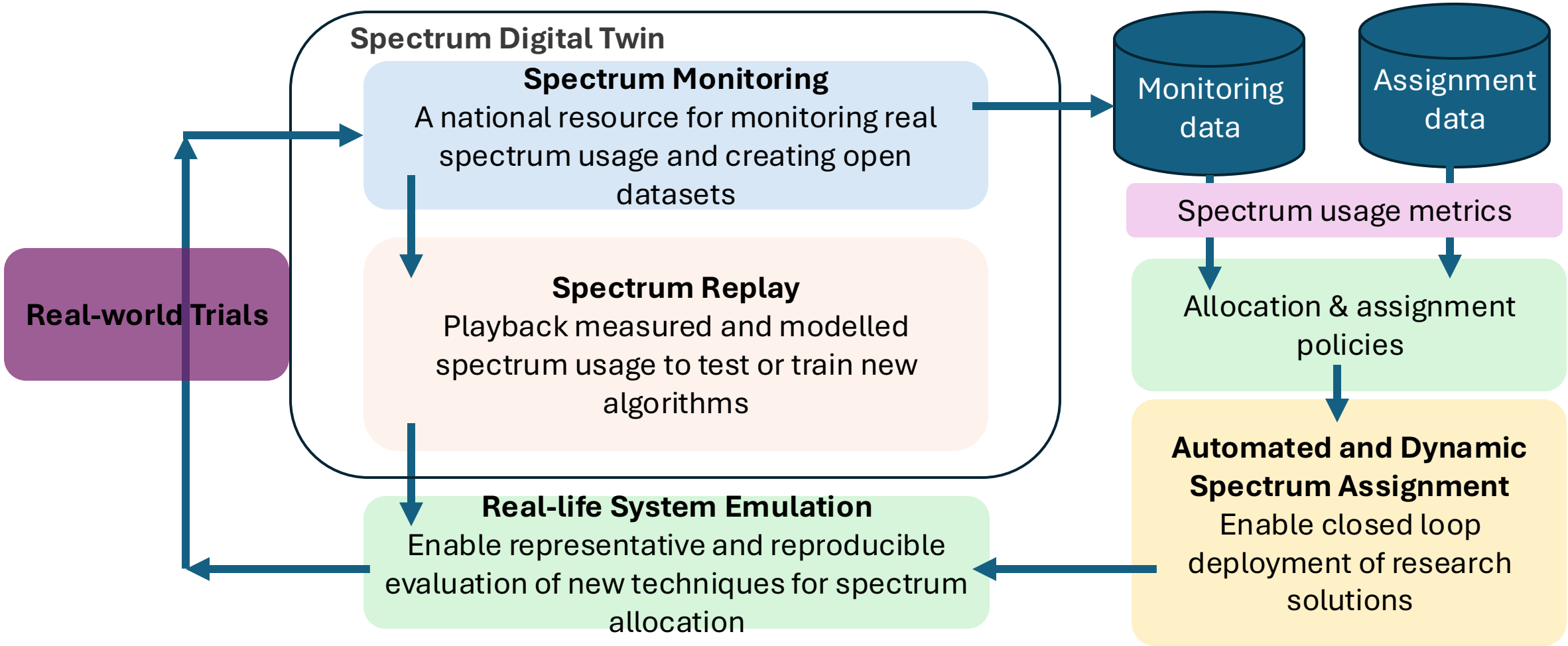
JOINER-National Spectrum Facility (JOINER-NSF) is a facility hosted by JOINER to meet the needs of spectrum access innovation researchers and developers.

Spectrum access innovation here includes specifically:

- Spectrum management solutions to enable more efficient use of the radio spectrum and deliver spectrum abundance for diverse future radio spectrum users, ensuring that spectrum access is not a limiting factor on the UK's economic and societal potential
- Approaches to spectrum sharing amongst heterogeneous spectrum-using services
- Multidisciplinary spectrum innovation spanning engineering, economics, policy and regulation
- Increased interference resilience for spectrum-using services, particularly from dissimilar services.
- Automated techniques for monitoring, managing and assigning spectrum for challenging spectrum scenarios
- Providing low-friction access to spectrum for UK researchers across all research domains (not limited to spectrum-related research)

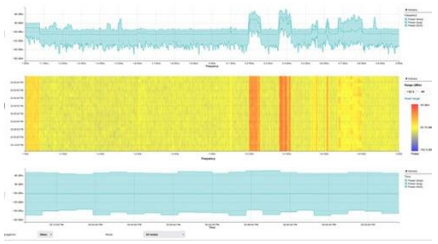
While there is a large body of research and other facilities and testbeds aimed at spectrum efficient solutions for individual systems, JOINER-NSF focuses particularly on what might be called 'spectrum science', i.e. the overarching role of radio spectrum management to better allocate and assign spectrum amongst diverse services.

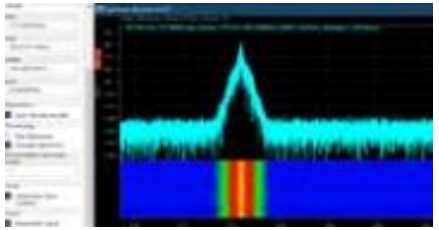
JOINER NSF Functions

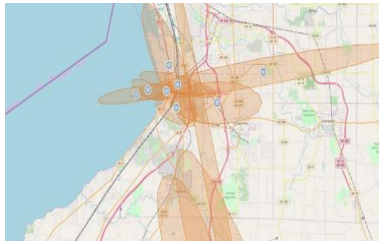


Monitoring Solution – by CRFS

- **RFeye 100-8 Node Plus**
  - 10 MHz to 8 GHz frequency range
  - 100 MHz RF bandwidth
  - Sweep rate 27 - 378 GHz per second (for RBW 3.8 kHz – 15.6 MHz)
  - IQ data and **spectrum occupancy data**
  - Local storage of 4 TBytes SSD on the Node Plus can store 100MHz IQ data for up to 2 hours
- **Rfeye Site Real time Spectrum and Geolocation Software**
- **Rfeye Deepview Forensic signal analysis**
- **Rfeye Mission Manager –** at NOC
  - Job schedule management
  - Intuitive visualization
  - Automated reporting
  - Automated geolocation







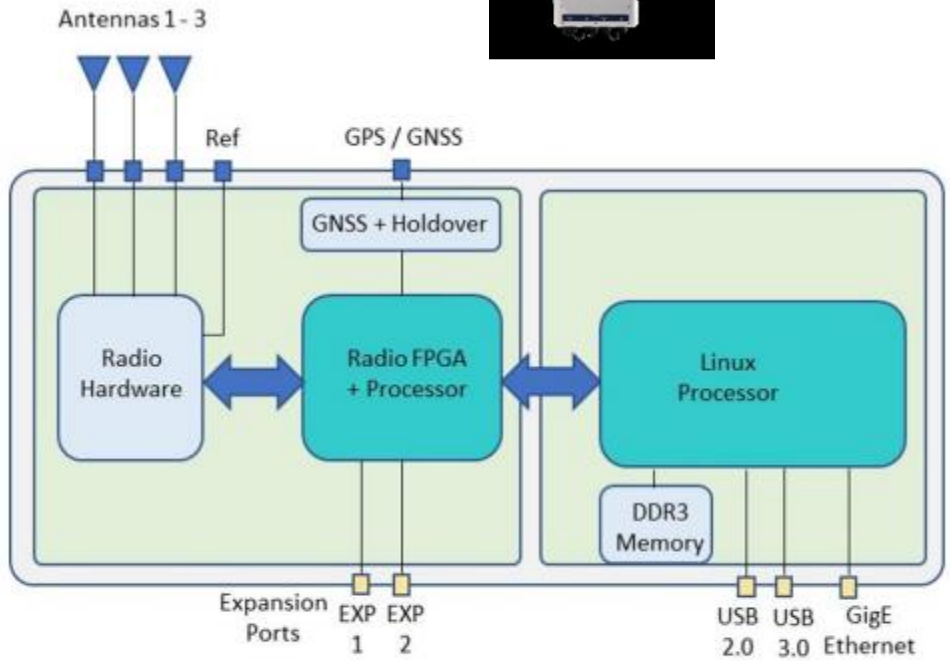
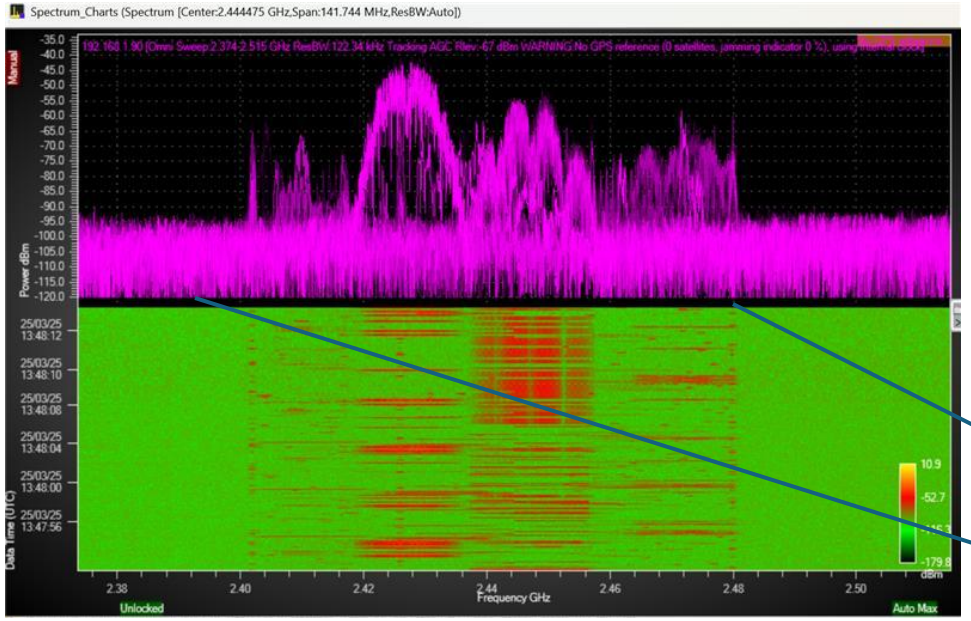
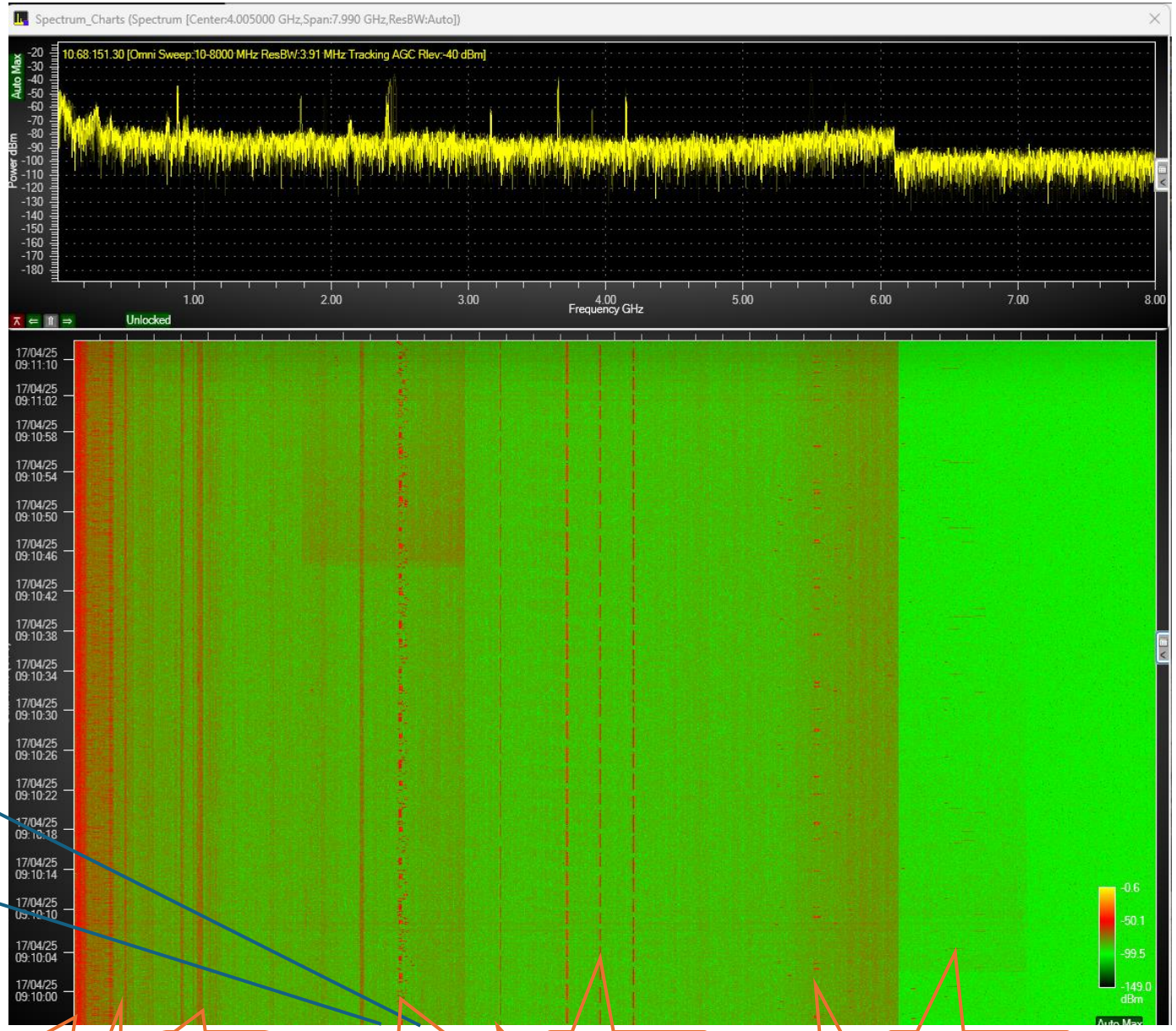


Figure1: Node 50-8 / 100-8 architecture

Example spectrum capture

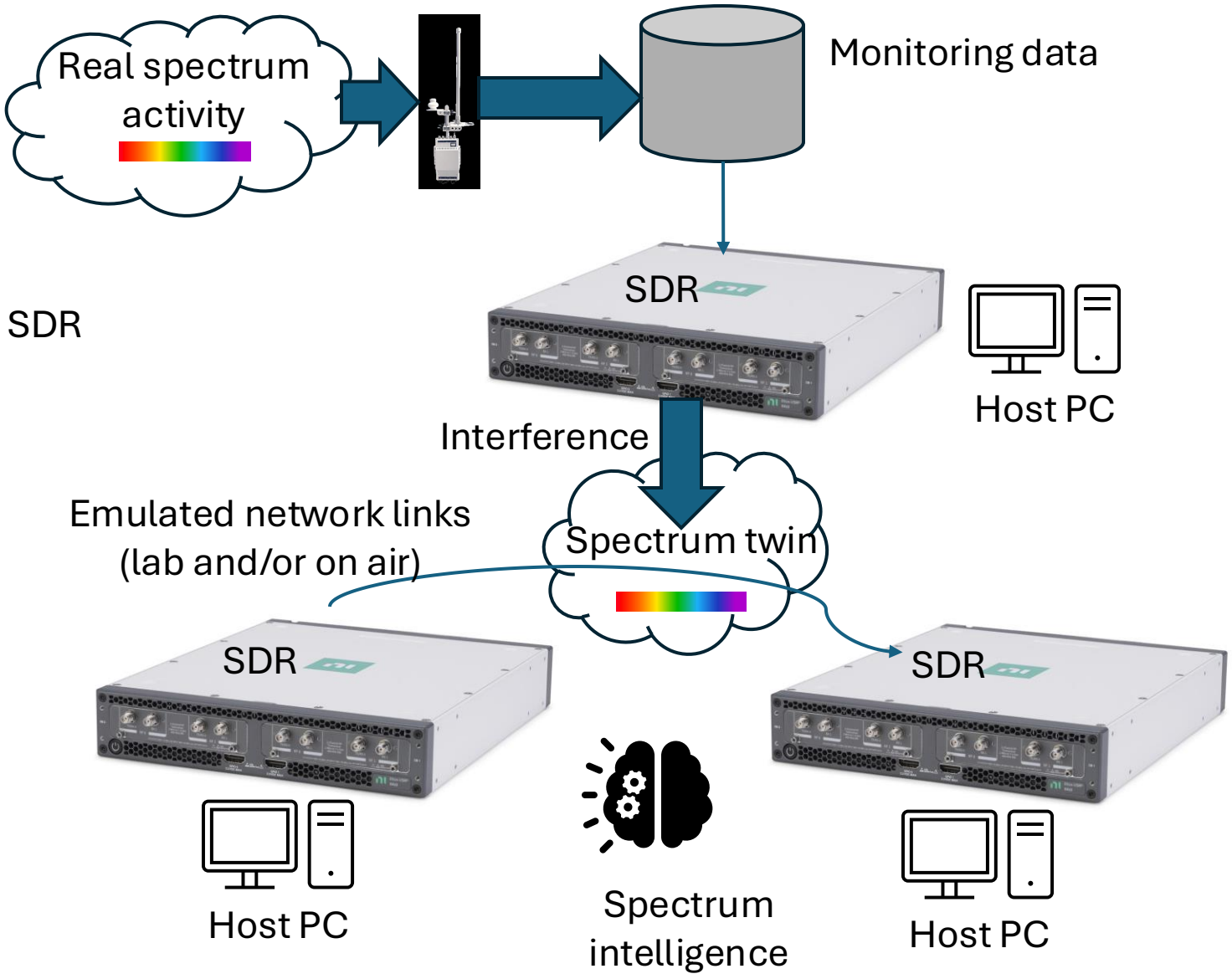




Spectrum Playback and System Emulation

Emulation and replay hardware

- Emerson (National Instruments) X410 USRP SDR
- Frequency range is 1 MHz – 8.0 GHz
- Simultaneous 4 channels TX and 4 channels RX
- Instantaneous 400MHz bandwidth
- FPGA support



Example spectrum research topics enabled by JOINER NSF

Interference Resilience
- Interference and noise resilient receivers, waveforms and protocols
- Coexistence Mechanisms for Heterogeneous Networks

Interference Management and Mitigation
- Anomaly Detection
- Predictive Interference Avoidance

Sharing techniques
- Spectrum Monitoring and Compliance
- Harmonised Spectrum Sharing Frameworks

Radio wave propagation prediction and channel modelling for spectrum management
- New bands
- New coexistence scenarios
- Higher precision and automation
- Enhancing models via ML and measured data

Automated and Dynamic Spectrum Allocation and Optimisation
- Acting on network and usage data without comprising security
- Flexible spectrum assignment while maintaining incentives to invest
- Open standard interfaces

Regulatory and Policy Research
- Incentivising Efficient Spectrum Use
- Working within international spectrum allocation policies while not being limited by them
- Frameworks for AI Regulation in Spectrum Management

Non-exhaustive examples only: additional topics welcome

UK SPF Steering Board update

Dr Abhaya Sumanasena, Real Wireless & UK SPF Chair

UK SPF Steering Board update

- Update on research projects
  - Commissioning study on Sharing between satellites and terrestrial systems in the future
  - Suggestions for possible research projects
  - Currently on file:
    - 1. Sharing between satellites and terrestrial systems in the future
    - 2. International developments in spectrum for 6G
    - 3. The rise of satellite systems non-geostationary orbit (NGSO) and Co-channel operations in MSS bands
    - 4. Lunar communications
- Become a UK SPF Member
  - New large members joining the Steering Board will be able to take advantage of the one-off reduced member's fee of £7,500 p.a.
  - The annual membership fee for SMEs is £3,000 p.a.

Update from Cluster 1

Manuel Rascado-Marti, UK SPF Cluster 1 and LS telcom

Past workshops:

- Demand for indoor connectivity (May 25)

Upcoming events:

- Future demand for Public Sector spectrum (Sep/Oct 2025)
- Demand for shared spectrum (Nov/Dec 2025)
- Utilities and spectrum demand (TBC)
- Other?

Update from Cluster 2

Bob Stewart, UK SPF Cluster 2 & University of Strathclyde

Update from Cluster 3

Tony Lavender, UK SPF Cluster 3 and Plum Consulting

SPF Plenary Cluster 3 update July 2025

- Cluster 3 – Spectrum value and efficiency
  - Contribution of spectrum to economic and social welfare.
  - Efficient use of spectrum (including sharing approaches).
  - Cluster 3 also hosts the Shared Access Licensing (SAL) Forum.
- Recent events
  - 3rd June 2025 – Workshop on spectrum sharing – combined event comprising:
    - SAL Forum on experience with Ofcom changes announced last December
    - Follow up session on Spectrum Sandboxes looking at results and outcomes
- Cluster 3 activity for 2025/26:
  - Continue with work on aspects of spectrum sharing (including SAL).
  - Workshop on economics of spectrum and impact on the UK.
  - Collaborate with other clusters on modernisation of spectrum management.
  - Policy and regulatory approach for spectrum for utilities and public safety.
  - Dates for above activities to be set.

Update from Cluster 4

Kumar Singarajah, UK SPF Cluster 4 and Euroma

Cluster 4 Update (July 24, 2025)

Kumar Singarajah

ITU-R, CEPT / EU and other RTO activities 'picking up speed in 2025 for ITU-WRC-2027. Industry interest / engagement increasing as result !

Envisaged scope of Cluster 4 workshops in 2025 / 2026 / 2027 as below.

I. A June 9, 2025 am workshop event on WRC-2027 space / satellite related agenda items above 3 GHz (viz AI 1.2 and AI 1.1).
II. A September 26, 2025 workshop on WRC-2027 EESS topics under AI 1.19 and AI 1.18.
III. A November 2025 workshop on WRC-2027 AI 1.17 space weather topics.
IV. [A December 2025 workshop with 2-3 non European NRA or RTO representatives to provide perspectives on key topics for ITU WRC- 2027.
V. A Q1 2026 workshop on WRC-2027 AI 1.15 on cislunar / lunar exploration items.
VI. A Q2 2026 workshop on WRC-2027 AI 1.7 (IMT-2030 etc and 5G/6G including NTN).
VII. Two further Workshops in H2 2026 – with focus on some WRC-2027 topics.
VIII. In 2027, at least 3 Workshops on high priority ITU WRC-2027 topics prior to WRC_2027 and 4th Workshop after WRC-2027.

SPF members encouraged to offer presentations re II / III / IV / V / VI / VII above.

AOB & Close

Dr Abhaya Sumanasena, Real Wireless & UK SPF Chair