



# UK SAR Workshop

Workshop Report  
Monday 11 April 2022

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# Introduction

## Space Hub Yorkshire presents the UK SAR Workshop

SAR – Synthetic Aperture Radar – is an active imaging process with applications to environment, civil and defence sectors. SAR sensors can be hosted on satellites, drones or in-situ and have the ability to ‘see through clouds’, meaning that SAR imagery of the Earth can be constructed when optical imagery cannot, for example, when it’s cloudy or at night.

With the new [National Space Strategy](#) and [Defence Space Strategy](#), there is a big need for the UK to develop its SAR capability as we seek to expand both our civil and defence use of Space data. The UK has world-renowned expertise in SAR, and this workshop was particularly timely because of the status of the UK involvement in Copernicus and the potential failure of ESA SAR satellite Sentinel-1b.

Space Hub Yorkshire hosted a one-day UK SAR Workshop on Monday 11th April 2022 to stimulate discussions across the academic, commercial, civil, and defence communities. This was held at Nexus, University of Leeds, with the option to join virtually.

This was a great opportunity to bring the whole UK community together, organised by a committee of multiple national stakeholders leading on SAR.

### Organising committee:

- Anna Hogg, University of Leeds
- Cristian Rossi, Satellite Applications Catapult
- David Blacknell, Defence Science and Technology Laboratory (DSTL)
- Harshbir Sangha, UK Space Agency (UKSA)
- Harv Smyth, Ministry of Defence (MoD)
- Jonathan Hicks, Department for Environment, Food and Rural Affairs, (DEFRA)
- Robert Elliott, Science and Technology Facilities Council (STFC)
- Ruth Amey, University of Leeds
- Tim Wright, University of Leeds



The poster is split into two vertical panels. The left panel has a dark blue background with the Space Hub Yorkshire logo at the top, which consists of a green circle with a white outline and the text 'SPACE HUB YORKSHIRE' inside. Below the logo, it says 'Space Hub Yorkshire presents' in white, followed by 'UK SAR Workshop' in large white letters, and 'Bringing together the SAR community' in smaller white letters. A green arrow-shaped box at the bottom left contains the text 'Monday 11 April 2022'. At the very bottom of the left panel are four white icons: Twitter, LinkedIn, a globe, and an envelope. The right panel features a 3D map of the United Kingdom with a blue glow, set against a dark background with vertical blue light beams. A black box in the top left of this panel contains the text 'NovaSAR-1'. At the bottom of the right panel are the logos for the UK Space Agency, Surrey, and Airbus.

# Summary of talks

The workshop was delivered in four sessions:

1. Showcasing academic innovation
2. SAR technology and data
3. Downstream commercial use cases
4. UK SAR strategic direction

Speakers were invited from across the UK and together they represented:

- Three universities (Universities of Leeds, Sheffield and Birmingham)
- Fifteen organisations, including
  - businesses (JBA Consulting, Leonardo, SatSense, Telespazio, Fujitsu, SSTL, Airbus, Satellite Applications Catapult);
  - research council (UKRI STFC);
  - agencies (UKSA, ESA); and
  - ministerial departments (MoD, DEFRA, BEIS, DSTL).



Figure 1: Speaker organisations

# UK SAR Workshop Timetable

## UK SAR Conference Schedule

Monday 11th April 2022, Nexus, University of Leeds

Time	Session Title	Speaker
09:30 - 10:00	Arrival & Coffee	
10:00 - 10:15	Welcome and Opening Remarks	Dr Anna Hogg, University of Leeds
<b>Session 1 - Showcasing academic innovation</b>		
10:15 - 10:25	Monitoring our hazardous planet with Sentinel-1 InSAR	Prof. Tim Wright, University of Leeds
10:25 - 10:35	Cryosphere	Dr Anna Hogg, University of Leeds
10:35 - 10:45	Measuring forest properties with satellite SAR	Prof. Shaun Quegan, University of Sheffield
10:45 - 10:55	SAR sensing using commercial drones	Dr Michail Antoniou, University of Birmingham
10:55 - 11:30	Coffee	
<b>Session 2 - SAR technology and data</b>		
11:30 - 11:40	Overview of SAR downstream applications	Dr Cristian Rossi, Satellite Applications Catapult
11:40 - 11:50	Low TRL SAR to operational use	Prof. David Blacknell, DSTL
11:50 - 12:00	NovaSAR - UK's SAR constellation	Dr Phil Whittaker, SSTL
12:00 - 12:10	Next generation of SAR sensors	Sam Doody, Airbus
12:10 - 12:20	Sentinel-1 Mission Highlights	Dr Malcolm Davidson, ESA
12:20 - 13:30	Lunch and showcase	
<b>Session 3 - Downstream commercial use cases</b>		
13:30 - 13:40	Downstream Applications of SAR – a consultant's perspective	Dr John Bevington, JBA Consulting
13:40 - 13:50	Surface deformation monitoring with InSAR	Amy Gooding, SatSense
13:50 - 14:00	The Power of Ecosystems	Peter Ridgway, Fujitsu
14:00 - 14:10	Flood Monitoring and Maritime Surveillance	Alex Farman, Telespazio
14:10 - 14:20	Airborne SAR	Dr David Greig, Leonardo
14:20 - 14:50	Coffee	
<b>Session 4 - UK SAR strategic direction</b>		
14:50 - 15:00	Defence SAR priorities	AVM Harvey Smyth, MoD
15:00 - 15:10	UKSA SAR national capability	Harshbir Sangha MBE FRSA, UKSA
15:10 - 15:20	SAR needs for DEFRA over the next 5 years	Jon Hicks, DEFRA
15:20 - 15:30	Overview of Space at UKRI-STFC	Dr Philip Carvil, STFC
15:30 - 15:40	Implementing the NSS	Anisha Maan, BEIS
15:40 - 15:50	Coffee	
15:50 - 16:30	Break-out round table discussions	
16:30 - 17:00	Summary of round table discussions	
	Closing Remarks	
17:00 - 18:30	Networking in the foyer	



# Audience

The SAR workshop was targeted at, and successfully attracted, attendees from across academia, industry and government organisations. The event was of great benefit, not only for all levels of academics, but for SAR post graduate researchers across all institutes.

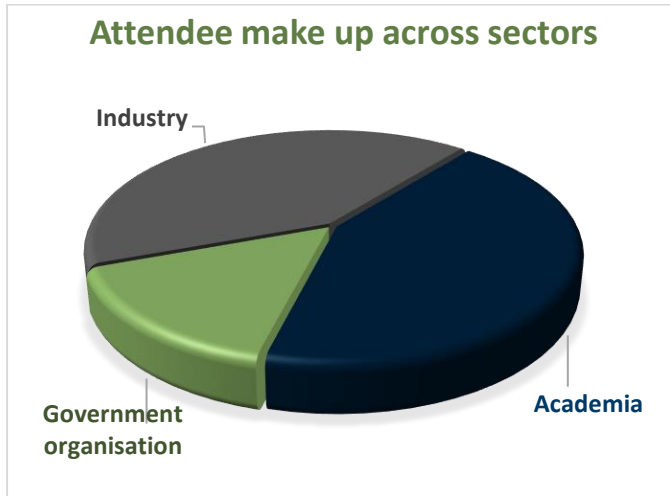


Figure 2: SAR workshop attendees make up across academia, government organisations and industry

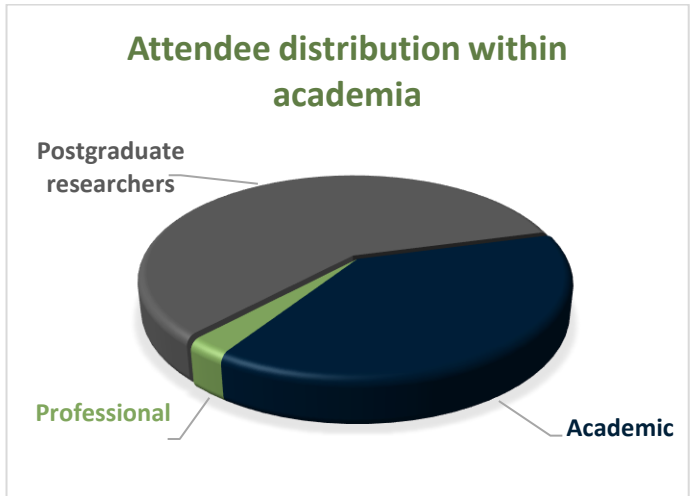


Figure 3: SAR workshop attendees make up within academia

Government organisations included ministerial departments, combined authorities and research councils.



Figure 4: Government departments attending the UK SAR workshop

40% of the attendees were from diverse industry sectors, identifying as Space-aligned businesses. Figure 5 shows a small representation of these companies.



Figure 5: A fraction of the industry attendees at the UK SAR workshop

The UK SAR workshop was primarily designed to be an in-person event for 100 people, however, to make it more accessible it was delivered as a hybrid event, welcoming almost just as many online participants too. As a result, although the majority of attendees were from the UK, several participants joined from across the globe (including India, Indonesia, Portugal, Taiwan, and the USA).

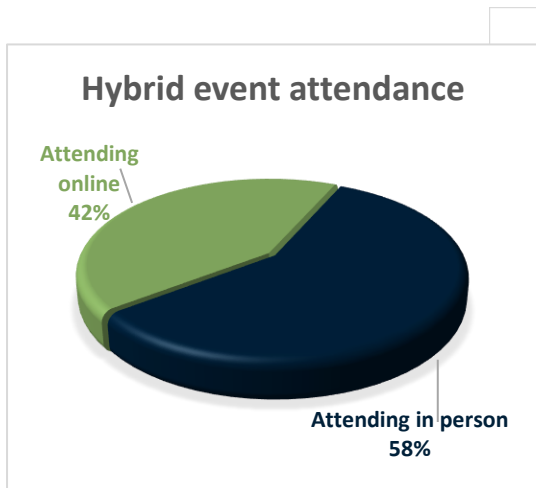


Figure 7: hybrid attendance at the event

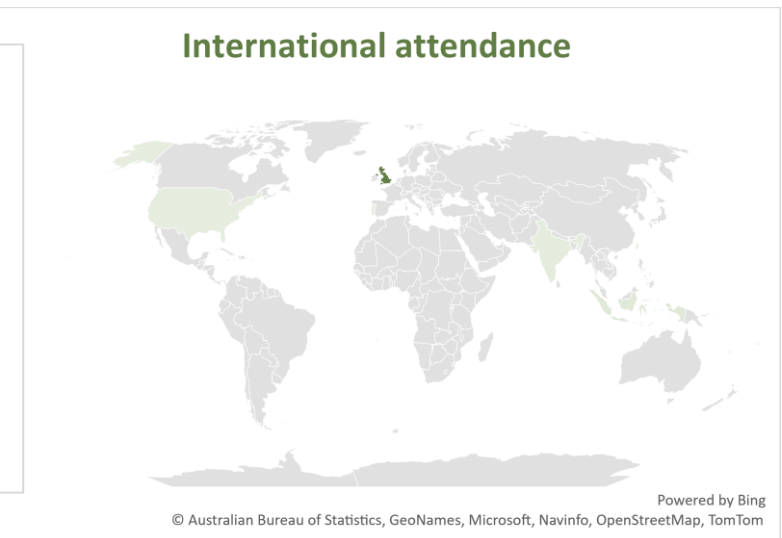
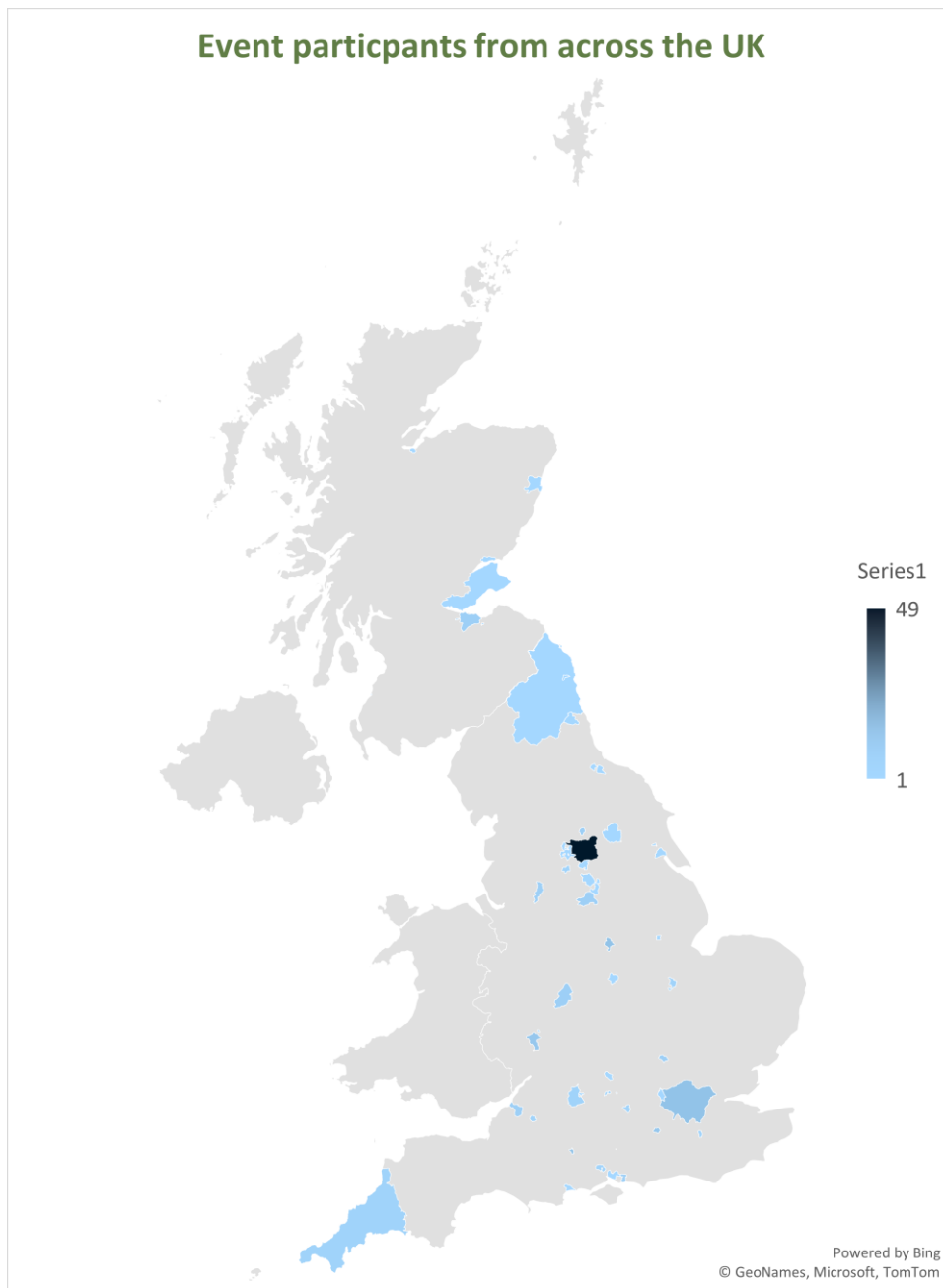


Figure 6: Attendance from across the globe

**32%** of UK attendees were from Leeds, **61%** from the rest of England and **7%** from Scotland.



*Figure 8: Engaging members of the SAR community from across the UK*



# Speaker Biographies

## Session 1: Showcasing academic innovation

### Professor Tim Wright, University of Leeds



Tim Wright is Professor of Satellite Geodesy at the University of Leeds. He is director of the NERC Centre for the Observation and Modelling of Earthquakes, Volcanoes and Tectonics (COMET), and co-founder and director of SATSENSE Ltd.

### Associate Professor Anna Hogg, University of Leeds

Dr Anna E. Hogg is an Associate Professor in the School of Earth and Environment at the University of Leeds, in the Institute for Atmospheric and Climate Science (ICAS). She is the co-director of the NERC SENSE Earth Observation Centre for Doctoral Training (CDT) which has a focus on Earth observation and advanced computer techniques. Anna is the founder of Space Hub Yorkshire, coordinating Space activity across the Yorkshire region, advocating for Space research, innovation, teaching and industry opportunities. Anna is also a member of various leading scientific committees across the globe.



### Professor Shaun Quegan, University of Sheffield



Shaun Quegan is a Professor in the School of Mathematics & Statistics at the University of Sheffield and a member of the National Centre for Earth Observation. His research over the last 25 years has been mainly concerned with using satellite data and ecosystem models to clarify the role of the land surface, and especially forests, in the Earth's carbon cycle and climate. He is the proposer and Lead Scientist of the European Space Agency BIOMASS mission, launching in 2023, which will measure forest biomass, height and disturbance worldwide, and he has served on numerous national and international committees advising on climate and Earth Observation by satellites. He has written two books on radar and SAR, and 150 journal articles.

### Dr Michail Antoniou, University of Birmingham

Dr. Mike Antoniou is a Reader in RF Sensing Systems at the University of Birmingham, where he leads a team of 15 researchers on radar systems and signal processing. He has nearly 20 years of research experience on SAR systems, and is the co-chair of the SAR Focus Group at EMSIG- the UK Radar society.



## Session 2: SAR technology and data

### Dr Cristian Rossi, Satellite Applications Catapult



Dr Cristian Rossi is the Geospatial Science Lead at the Satellite Applications Catapult, where he is coordinating with research and academic communities to ensure pull through of science to support the space sector; and he is Visiting Lecturer at the School of Geography of the Environment at the University of Oxford.

### Professor David Blacknell, DSTL

Professor David Blacknell holds a B.A. (Hons.) in Mathematics from Cambridge University, an M.Sc. from University College London, a Ph.D. from Sheffield University and is a Fellow of the Institute of Physics. He worked at the GEC-Marconi Research Centre from 1984 to 1991 and at QinetiQ (formerly DERA) from 1991 to 2007 where he became a QinetiQ Fellow in 2002. He held the Chair in Radar Systems at Cranfield University from 2007 to 2008. He currently works at DSTL as Chief and Fellow of Radar Sensing. In addition, from 2019 to 2020 he was Chair of the NATO Sensors and Electronics Technology Panel and he has been a visiting Professor at University College London since 2010.



### Dr Phil Whittaker, SSTL



Phil is RF Payloads Manager at SSTL where he is responsible for definition and implementation of RF payload solutions in support of SSTL missions. Phil has worked at SSTL for twenty years on communications, navigation and radar projects.

### Sam Doody, Airbus

Sam Doody is the Head of Microwave Instruments UK within Airbus Defence and Space, covering the design, build, test and operation of spaceborne active and passive microwave sensing instruments. Sam started his career as a radar systems engineer involved in the implementation of Sentinel-1 before supporting a number of other spaceborne missions such as NovaSAR. Most recently Sam has been involved in the development of novel SAR concept studies and product development. He is an active member in both the UK and EU active and passive microwave communities.



## Dr Malcolm Davidson, ESA



Malcolm Davidson was born in Canberra, Australia in 1968. He received his Honours B.Sc. in physics from the University of Toronto, Canada, in 1990, his M.Sc. in image processing and remote sensing from the University of Edinburgh, Scotland, in 1992, and his Ph.D. degree in physics from the Rheinische Friedrich-Wilhelms-Universität Bonn, Germany, in 1997. From 1997 to 2001 he worked at the Centre D'Etudes de la Biosphere (CESBIO) in Toulouse, France, as a research associate.

Since 2001 he is staff member of the European Space Agency ESA within the Mission Science Division of the European Space Research and Technology Centre (ESA-ESTEC). At ESA, he holds the role of Mission Scientist for the Copernicus SENTINEL-1 and ROSE-L missions. His main responsibilities concern the formulation of mission requirements for this mission and chairing mission advisory groups. He has also been appointed Head of the Campaigns section in 2009 and is responsible for managing the scientific campaign activity programme, which includes ground, tower and airborne campaigns in support of Earth Observation (EO) missions and mission science.

## Session 3: Downstream commercial use cases

### Dr John Bevington BSc MSc PhD DAS CGeog FRGS, JBA

John is a Chartered Geographer and Technical Director of Earth Observation and Disaster Risk Management at JBA Consulting, UK. He has 14 years' experience working in sectors including insurance and international development - developing geospatial analytics tools to help understand and communicate disaster risk. His clients include utilities companies, local authorities, humanitarian organisations, World Bank and UN agencies. John helps direct JBA's activities in the International Development sector and advance the use of Earth Observation technologies across the JBA Group.



### Amy Gooding, SatSense



Amy graduated from the University of Exeter in 2017 with an undergraduate degree in Engineering Geology and Geotechnics and began working in the mining industry as a geological technician. From there she moved onto Asset Management on the strategic highways as a graduate geotechnical engineer within Kier. This involved the identification and remediation of geotechnical defects on behalf of the client Highways England. Amy pursued a Masters at Imperial College London in Soil Mechanics and upon completion she worked as an Assistant Engineer on HS2, designing earthworks. Amy joined SatSense in 2021 where she is working as a geotechnical engineer.

### Peter Ridgway, Fujitsu

Peter has worked in the UK and Australia with government, private and academic sectors as a business and ICT mediator. From Business and Operating Models, Risk & Security, to Information and Technology; the identification of value and objectives, building strategy, and delivering outcomes is his primary focus.



## Alex Farman, Telespazio UK



A Senior Consultant with over 20 years of experience working in the Space Industry. Currently at Telespazio UK in the Geo-Information department, Alex undertakes technical management for projects that utilise both SAR and Optical Satellite imagery in downstream applications.

## Dr David Greig, Leonardo

On graduating from The University of Edinburgh with a PhD in Computational Physics in 1995, David Greig joined GEC-Marconi (now Leonardo UK) as a Systems Engineer. He is now a Technical Specialist in radar systems having been involved the development of simulations of the radars currently operational on the RAF Typhoon and Royal Navy Wildcat as well as various research and development projects. His current role involves close collaboration with both the MoD and various universities including acting as industrial supervisor for several current PhD projects.



## Session 4: UK SAR strategic direction

### Air Vice Marshall Harvey Smyth, MoD



Air Vice-Marshall Harv Smyth is UK's Director Space, leading the Space Directorate in the Ministry of Defence (MOD), responsible for defence space strategy, policy, capability planning and cross-Government & International coherency.

He has extensive combat experience having flown hundreds of operational missions from both land bases and aircraft carriers over. He has been awarded the Distinguished Flying Cross (DFC), was appointed Officer of the Order of the British Empire (OBE) and Companion of The Most Honourable Order of the Bath (CB), Smyth also had the honour of being an Aide de Camp to Her Majesty the Queen.

### Harshbir Sangha MBE FRSA - Director Growth, UK Space Agency

Harshbir joined the UK Space Agency in December 2018 to lead the Copernicus (EU Earth Observation) Programme. Through the UK-EU Trade Negotiations, Harshbir negotiated an agreement in principle for the UK to continue its participation in the programme.

As Director of Growth, Harshbir and his team are responsible for the UK Space Agency's work to deliver the innovation and business environment which will grow and sustain the national capabilities required to meet the UK's space ambitions. This includes enabling the development of regional / local space clusters along with UK's capabilities in satellite Earth observation, space technology, telecommunications and space applications working through ESA, nationally and internationally.



**Jon Hicks, DEFRA**



Jon Hicks is a Senior Earth Observation Policy Advisor in Defra's Chief Scientific Advisor's Office. Jon is part of Defra's EO Centre of Excellence, where he is the R&D Lead and manager of the centre's secretariat. With Defra as policy lead, Jon has represented the UK Government at both Copernicus Committee and Copernicus User Forums.

**Dr Philip Carvil, STFC**

Phil has worked in the Health & Life Science and Space Sectors for >10 years, where he currently leads the North West of England's HealthTech Cluster, co-leads the strategic development of the North West of England's Space Cluster and is the interim manager for the Harwell Space Cluster. Holding appointments nationally and internationally, he is the elected coordinator of the UK Space Life and Biomedical Science Association (UK Space LABS) and President for the European Low Gravity Research Association (ELGRA).



**Anisha Maan, BEIS**



Anisha is the Regional Growth lead, within the new BEIS Space Directorate's Sector team. Anisha joined the team January this year, and she has previously worked on the National Space Strategy which was published September last year.



Figure 9: A full day of varied SAR talks drawing and holding a large audience

# Exhibition Stands

The atrium was populated by a variety of stands and exhibitions of research posters and was the centre of networking for the attendees of the workshop.

## SAR Research Posters

Post graduate research posters showcased the breadth of SAR research at the University of Leeds.

## Andel

*Andel* is a global market leader in the design, development and application of specialist leak detection, flood defence and environmental protection systems.

## SatSense

*SatSense's* algorithms convert satellite data from Sentinel-1 and other satellites into datasets that provide accurate data on ground movements

## Appleyard Lees

*Appleyard Lees* is a leading team of experienced attorneys specialising in all aspects of intellectual property law and patent law

## WRIPA

*White Rose Industrial Physics Academy*, whose mission is to bring students and businesses together to foster innovation and retain talent within Yorkshire, Humberside and the East Midlands.

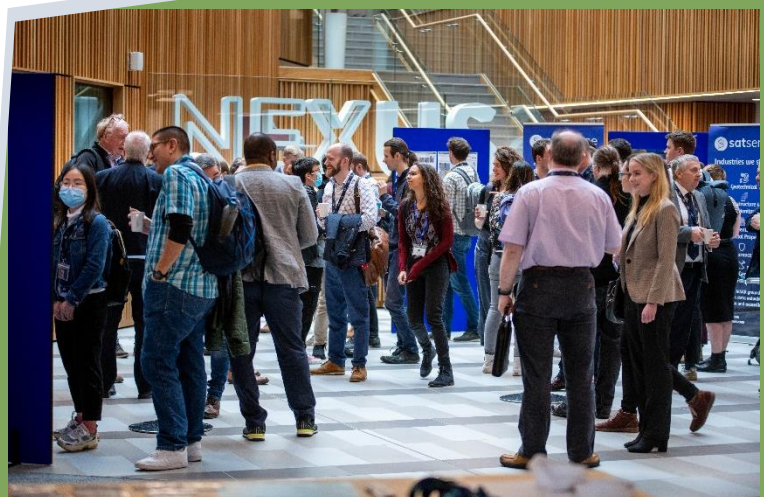


Figure 10: Networking across the UK SAR community was a key event at the workshop

# SAR Workshop – Round Table Discussion Notes

## Discussion format

Round table discussions were split across two breakout rooms: Commercial and R&D.

### UK SAR Workshop – breakout seed questions:

The following were prepared as seed questions.

1. What are the UK's SAR strengths? – success stories, capability, impact
2. What are the future short and long term opportunities for SAR?
  - Instrumentation and Ground Infrastructure
  - Downstream Applications
3. What are the gaps in UK SAR national capability - upstream and downstream, civil and defence?
4. Are there any barriers for commercial exploitation of SAR datasets?
5. What are the major skills gaps in SAR capability? Career level, CPD, upstream vs downstream
6. Where could there be collaboration between the UK's civil and defence SAR communities?
  - How can this be achieved?
7. What is the need for international collaboration on SAR capability? Priority countries?



Figure 11: Round table discussions in the Commercial room

## Commercial room

These notes are from the Commercial room chaired by Cristian Rossi and Tom Hutchinson. Most participants either had an industrial background, or had an interest in the commercial applications of SAR. The key points were agreed and subsequently summarised by Tom Hutchinson.

### Summarised Recommendations:

- CR1. On funding TRI – industry and academia rely on government. Government needs to lead on funding to take the risk and the cost – such as the MOD's £6.5 billion, mentioned during the sessions.
- CR2. On SAR commercial development, the initial customer would need to be government – through this uptake of INSAR would be higher.
- CR3. Industry needs to have a voice in academia – organisations like the Catapult can support on this.
- CR4. It is difficult to access current data from SAR in a timely manner – how can you commercialise if the data is old.
- CR5. Ensuring continuity of the same data sets is important – it is difficult to commercialise a regular service for customers.
- CR6. On skills – there are skills gaps in SAR – it would be important to build some knowledge within geography courses in university for SAR. This may lead to greater uptake of SAR in industry.
- CR7. There is a need to provide low cost training through a provider to develop RF skills and ensure the industry has enough.
- CR8. Recognised lack of skills in RF engineering.

## R&D room

These notes are from the R&D room chaired by Dr Anna Hogg and were taken and summarised by Siddeequah Azmi. Most participants had a background in SAR R&D, or keen interest in it.

### Summarised Recommendations:

- RD1. UK has strengths in all areas of SAR, however the country has no central organisation or research centre and hence it is fragmented, even more so in England than Wales and Scotland.
- RD2. UK SAR is still very academic, and there is a need to raise awareness and engage the industry and the public.
- RD3. Case studies and data need to be made more readily available and accessible for all levels.
- RD4. There is a lack of funding for SAR in the UK and where there is funding available, the application process is onerous and has low success rates. This barrier is even greater for businesses and the public, than it is for academia.
- RD5. Despite being part of the public sector, ministerial departments and local authorities do not have access to or the skills sets required to utilise SAR data.
- RD6. Academic collaboration is needed with government and the industry to create a SAR network, which should be used to channel valuable input from the ground through to decision and policy makers.
- RD7. Outcomes of strategies should be published, so there is transparency and a visible route of progression.





*Figure 12: Round table discussions in the R&D room*





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