

The logo consists of the text '6G SNS' in a bold, sans-serif font. The '6G' is in blue, and 'SNS' is in dark blue. A vertical dark blue line is positioned to the right of the logo.

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The logo consists of the text '6G SNS IA' in a bold, sans-serif font. The '6G' is in blue, 'SNS' is in dark blue, and 'IA' is in blue. A vertical dark blue line is positioned to the right of the logo.

6G SNS IA

Session 2

ISAC/JCAS Research & Innovation, Validation and Challenges

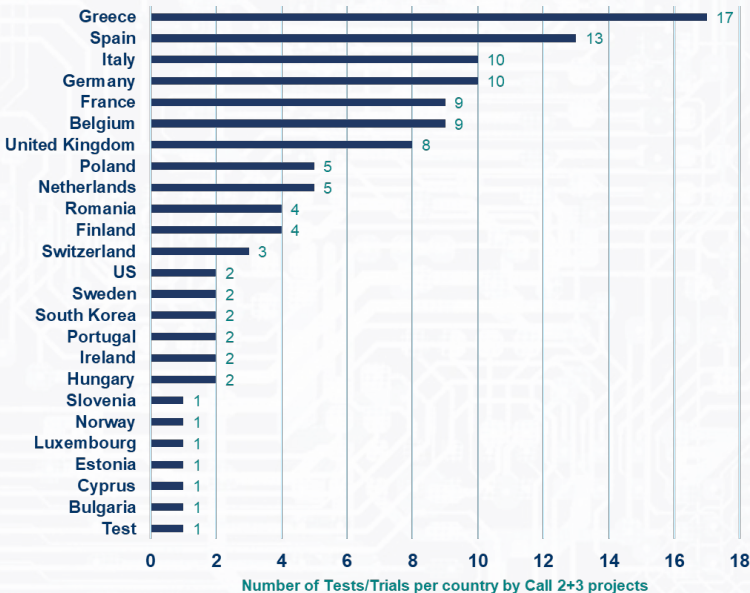
Moderator: Kostas Trichias (6G-IA)
SNS Technology Board Chairman

SNS JU /6G-IA & 5G-ACIA Highlights, Lessons learnt and next steps on ISAC/JCAS
10 October 2025

Validation Efforts & Achievements in SNS JU

- More than 120 Tests / Trials taking place in more than 25 EU countries
- Southern-European countries are leading in terms of tests/trials
- Good spread of test/trial sites across the EU
- 15 recent Key Achievements from 9 SNS Projects concern ISAC/JCAS

Test/Trials per country - Total



15 Key Achievements					9 Unique Projects				
TIMES - Key Achievement 2		Opti-6G - Key Achievement 1		ISEE-6G - Key Achievement 3		Hexa-X-II - Key Achievement 6		Hexa-X-II - Key Achievement 5	
ADVANCED PHY-LAYER DESIGN FOR THZ INTEGRATED SENSING AND COMMUNICATION (ISAC)		5G OWC COMMUNICATION NETWORK ARCHITECTURE		UAV-ASSISTED COMMUNICATIONS: FROM AERIAL CORRIDORS TO ISAC TECHNOLOGY		AI-BASED AIR INTERFACE		ARCHITECTURE FRAMEWORK FOR NOVEL 6G SERVICES	
Hexa-X-II - Key Achievement 3		BeGREEN - Key Achievement 2		6G-SENSES - Key Achievement 3		6G-SENSES - Key Achievement 2		6G-SENSES - Key Achievement 1	
6G END-TO-END ARCHITECTURE BLUEPRINT		BEGREEN ISAC AND RIS INTEROPERABILITY		OPTICAL TRANSPORT NETWORK OPTIMIZATION SUPPORTING INTEGRATED SENSING AND COMMUNICATION SERVICES		6G-SENSES NETWORK ARCHITECTURE		6G-SENSES ECOSYSTEM VIEW	
6G-MUSICAL - Key Achievement 3		6G-EWOC - Key Achievement 1		6G-DISAC - Key Achievement 3		6G-DISAC - Key Achievement 2		6G-DISAC - Key Achievement 1	
DISTRIBUTED BEAMFORMING FRAMEWORK FOR CELL-FREE ISAC SYSTEMS		PIC PLATFORM ENHANCEMENT IN SUPPORT FOR OWC BEAMFORMER WITHOUT MECHANICALLY MOVING PARTS		METHODS FOR DISTRIBUTED ISAC OPERATION		INTELLIGENT MANAGEMENT & ORCHESTRATION FOR SCALABLE ISAC		DISTRIBUTED ISAC ARCHITECTURE	

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ISAC/JCAS Research & Innovation, Validation and Challenges



Presenter: Dr Sebastian Robitzsch, InterDigital Europe Ltd

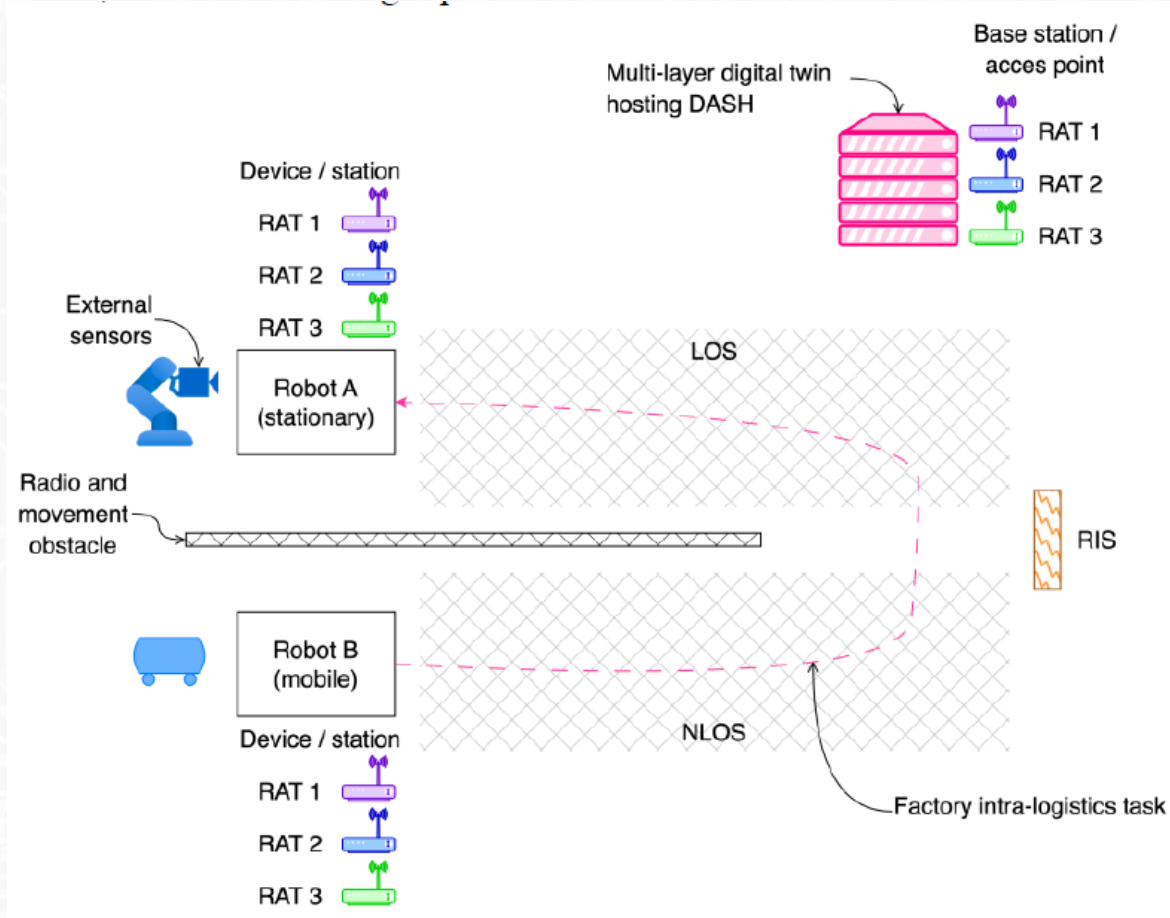
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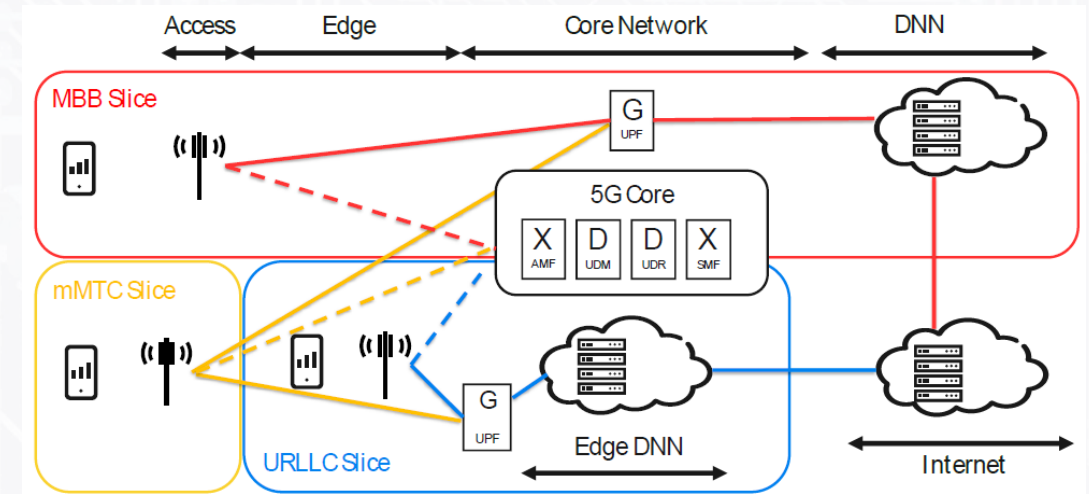
smart-networks.europa.eu

- Research and innovation
 - Aims to revolutionise the 3GPP Radio Access Network (RAN) design and operation by developing a pioneering MultiX fusion Perceptive 6G-RAN system (MP6R)
 - Support an integrated multisensor, multi-static, multi-band, and multi-technology paradigm to enable multi-sensorial perception
 - Address the 6G sustainability goals (where applicable)
 - Explore AI's full potential across all layers of the MP6R and develop an energy efficient AI architecture for adaptive ISAC transmitter/receiver and distributed learning with a novel low power AI engine design.
- Validation
 - MultiX has two proof of concepting sites: Siemens lab, 5TONIC

Siemens Lab



5TONIC



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Integrated Sensing, Energy and Communication for 6G
Networks

Presenter: Prof. Konstantinos Maliatsos, University of the Aegean,
University of Piraeus, GR

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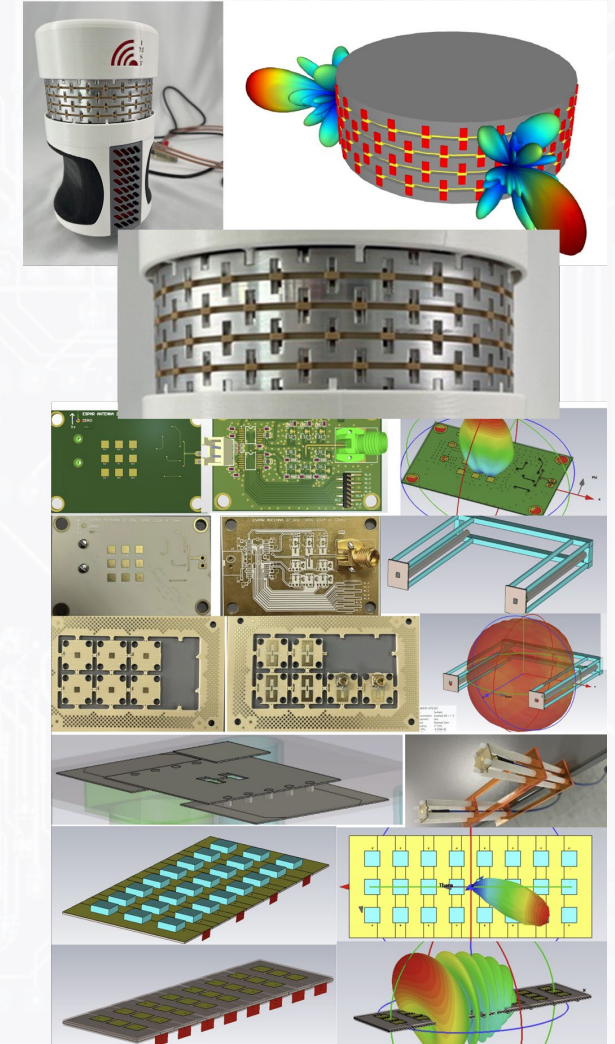
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ISAC/UAV Radio Channel Measurement and Characterization

- Investigation of well-accepted radio channels and extension for ISAC-support
- Development of a RIMAX-based channel sounding and characterization process.
- Development and integration of a channel sounder.
- Performance of measurement campaigns
- ISAC channel modelling

Design and development of

- Antennas for characterization of the UA/ISAC channel.
- Antennas for ISAC operation (for discovery and tracking mode) at FR2 (UAV + ground)
- iSEE-6G Radio Unit with extra beamforming capabilities
- A RIS for FR2 communications and sensing.

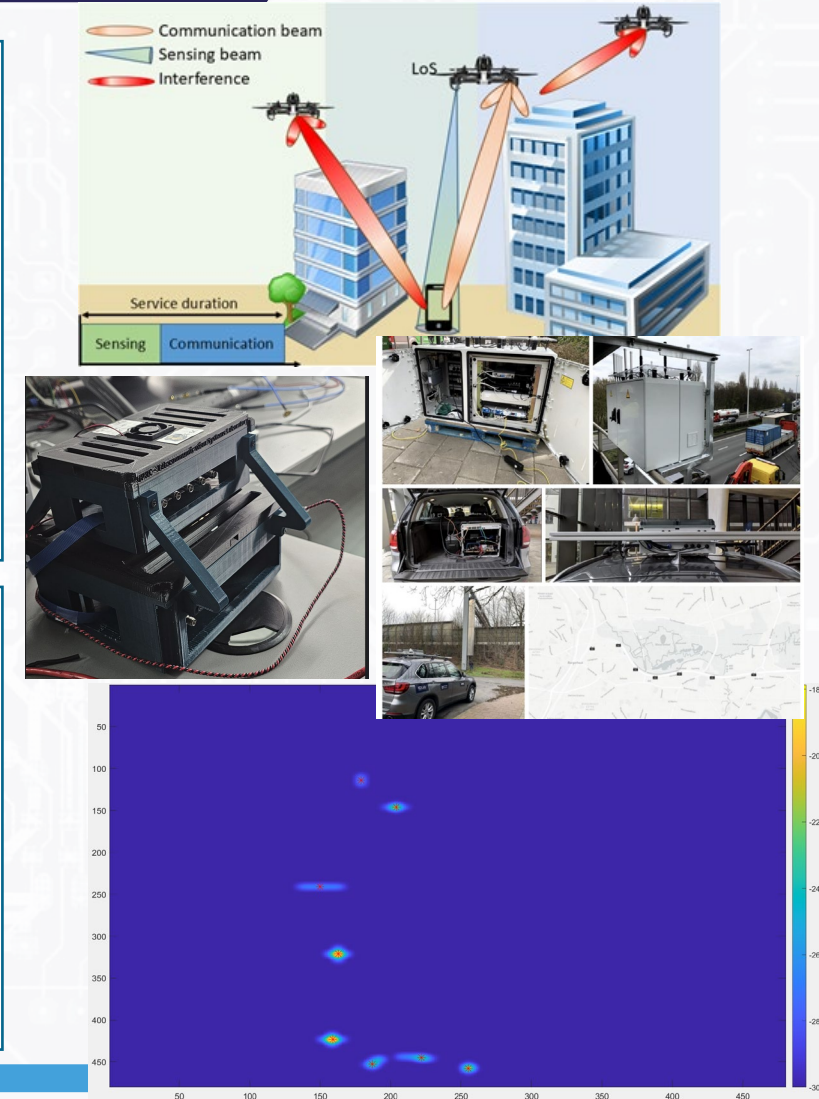


UAV-Assisted Communications: From Aerial Corridors to ISAC Technology

- Performance investigations
- Corridor-assisted UAV-enabled communications
- Joint sensing and communication in UAV-assisted networks.
- Challenges:
 - Increased probability for collisions, air traffic disruption
 - Resource constraints exist in terms of size, weight, and power
 - Spectrum congestion and real-time sensing and fast decision-making.

PHY Design and Experimentation for JCCSP

- Design of an OFDM-based PHY frame (with 5G backwards compatibility) with JCCSP support.
- Integration of the iSEE-6G antenna achievements.
- Development of ISAC algorithms for the specific setup.
- Integration of the iSEE-6G transceivers towards the project PoCs.



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6G-DISAC: Distributed Intelligent Sensing and Communications for 6G



Physical-layer implications and enablers of ISAC

Presenter: Hui Chen (Chalmers University of Technology, Sweden)

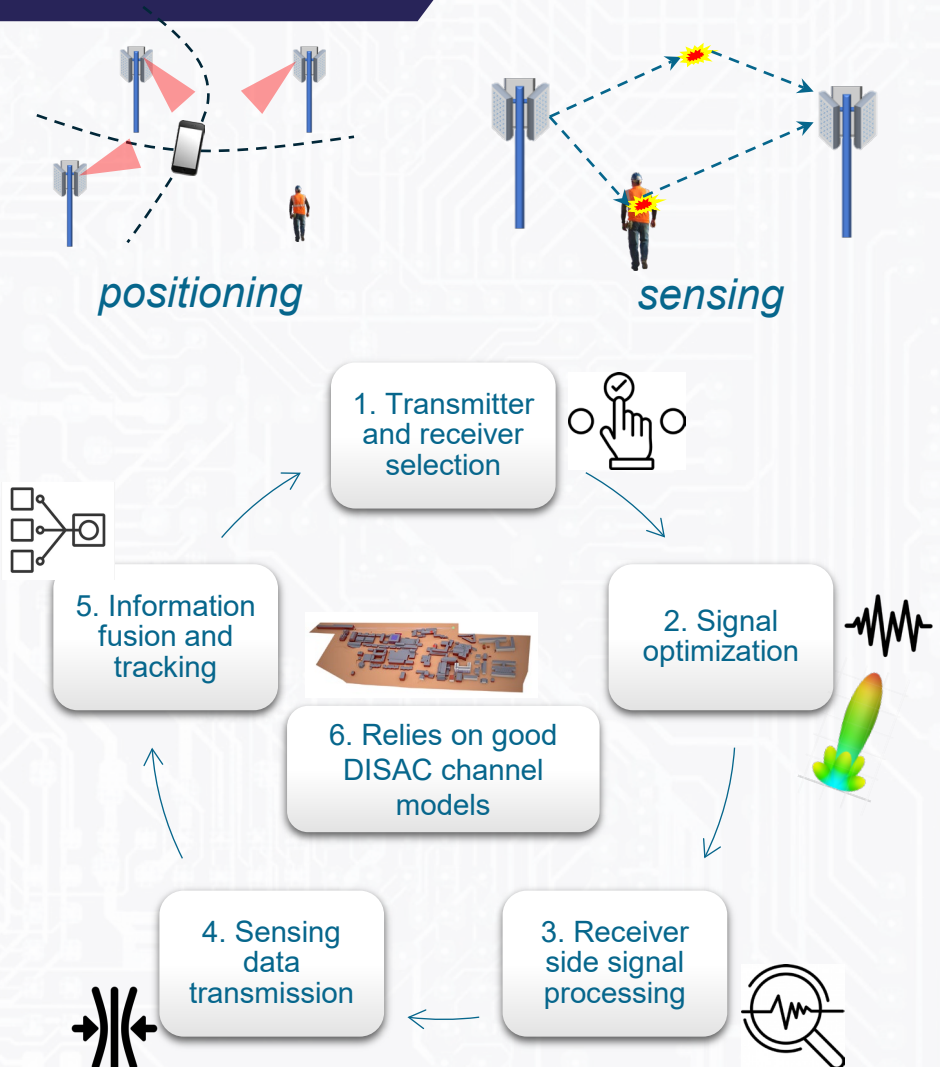
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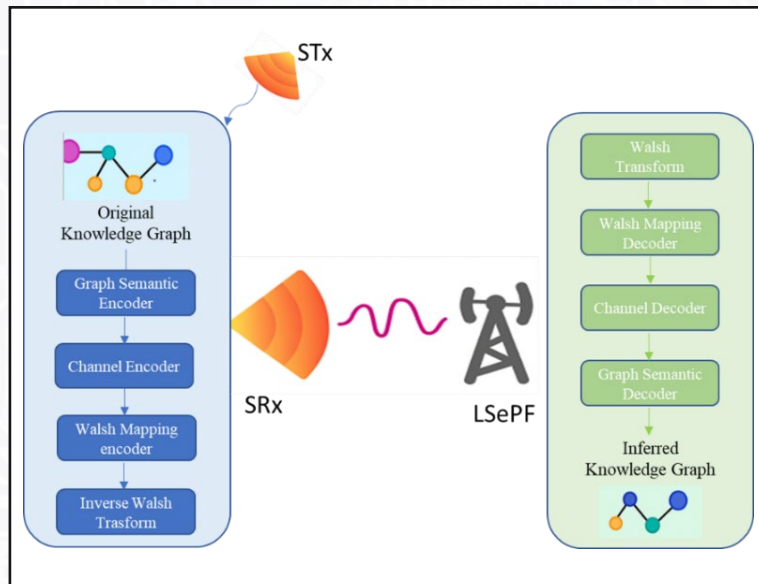
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Physical Layer Solutions

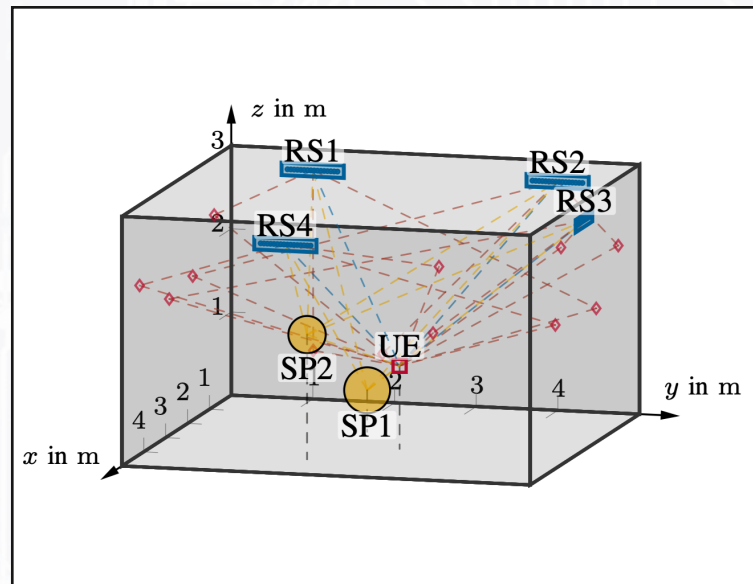
- Transmitter side
 - During sensing: signal design in time, frequency and space
 - After sensing: representation of sensing data
- Receiver side
 - Detection and tracking of objects/targets
 - Positioning and tracking of connected users
- Sensing-aided communication
 - Sensing-aided dynamic handover management
 - Sensing-aided full-duplex communication.
 - Sensing-aided beamforming and beam tracking.



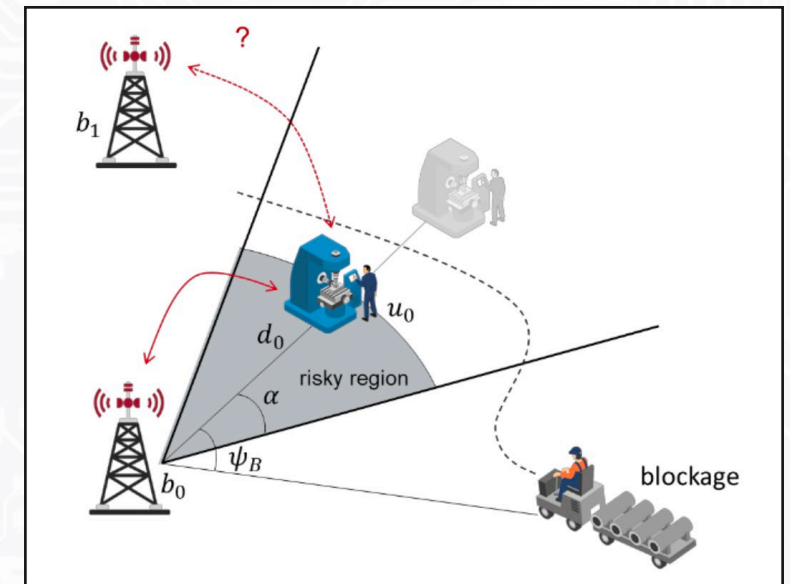
- Task 1: Physical Layer Optimisation and Adaptive Waveform Shaping
- Task 2: Sensing, Localisation, and Tracking of Active and Passive Objects
- Task 3: Sensing-Aided Communications



Case Study 1: Semantic-aware Communication of Sensing Data



Case Study 2: Joint Localization, Synchronization and Mapping via Phase-Coherent Distributed Arrays



Case Study 3: Sensing-/Location-aided Dynamic Handover Management

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Presenter: Izzat Darwazeh-University College London

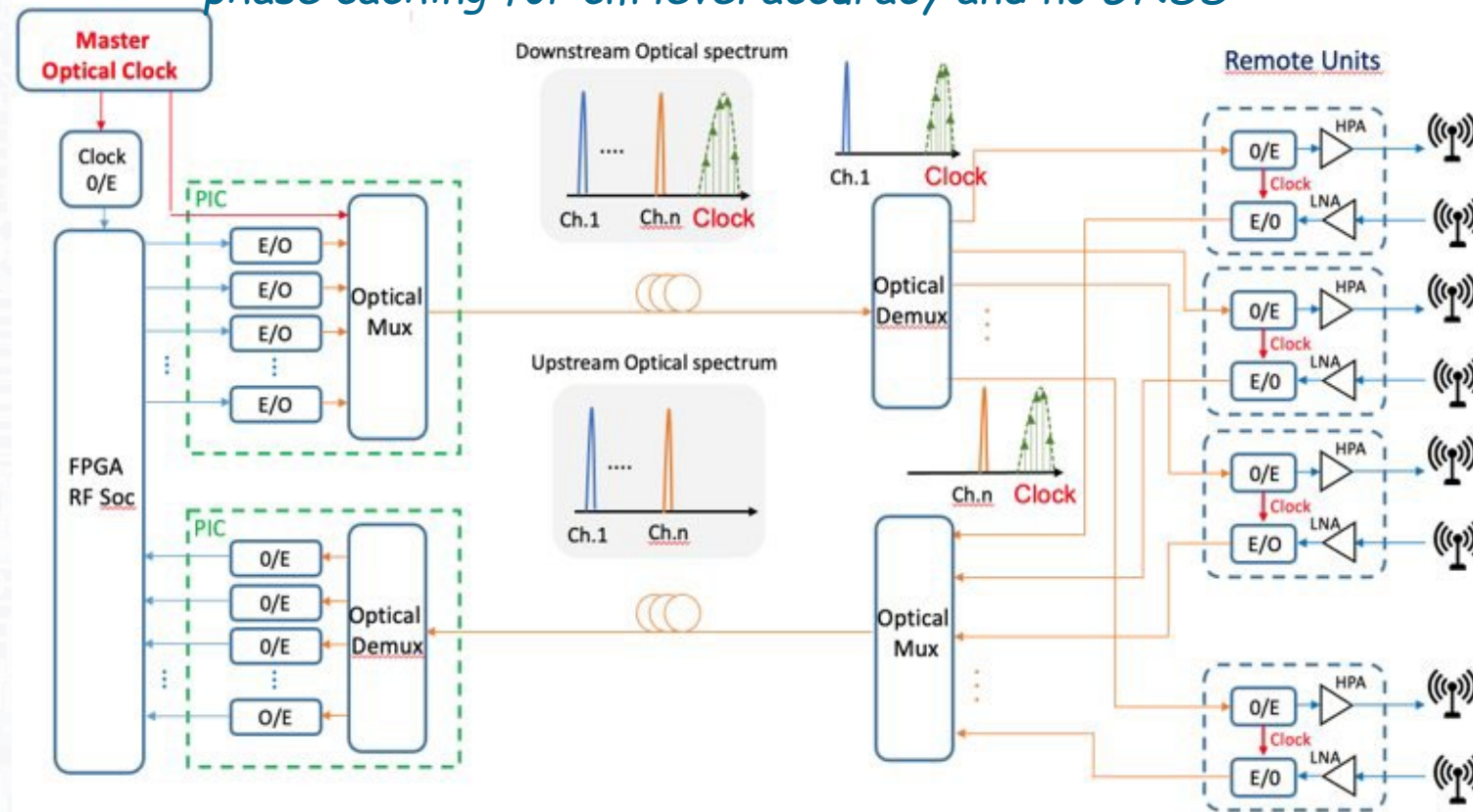
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New Synchronisation architecture

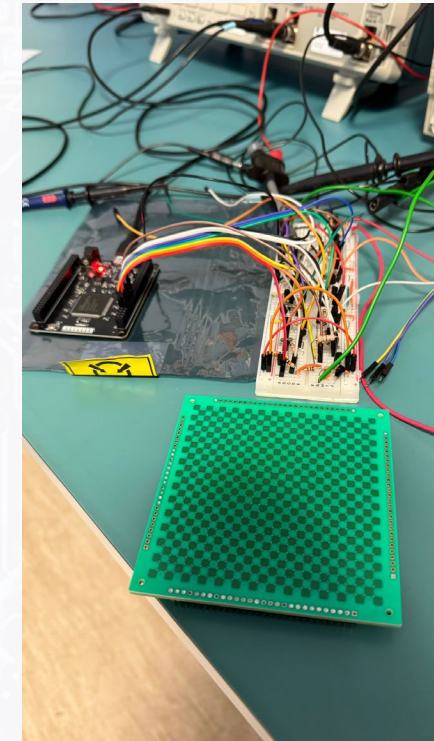
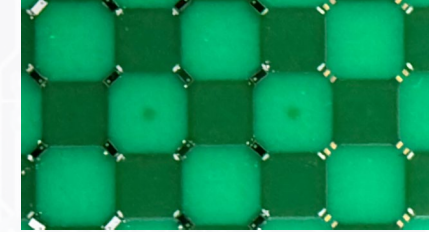
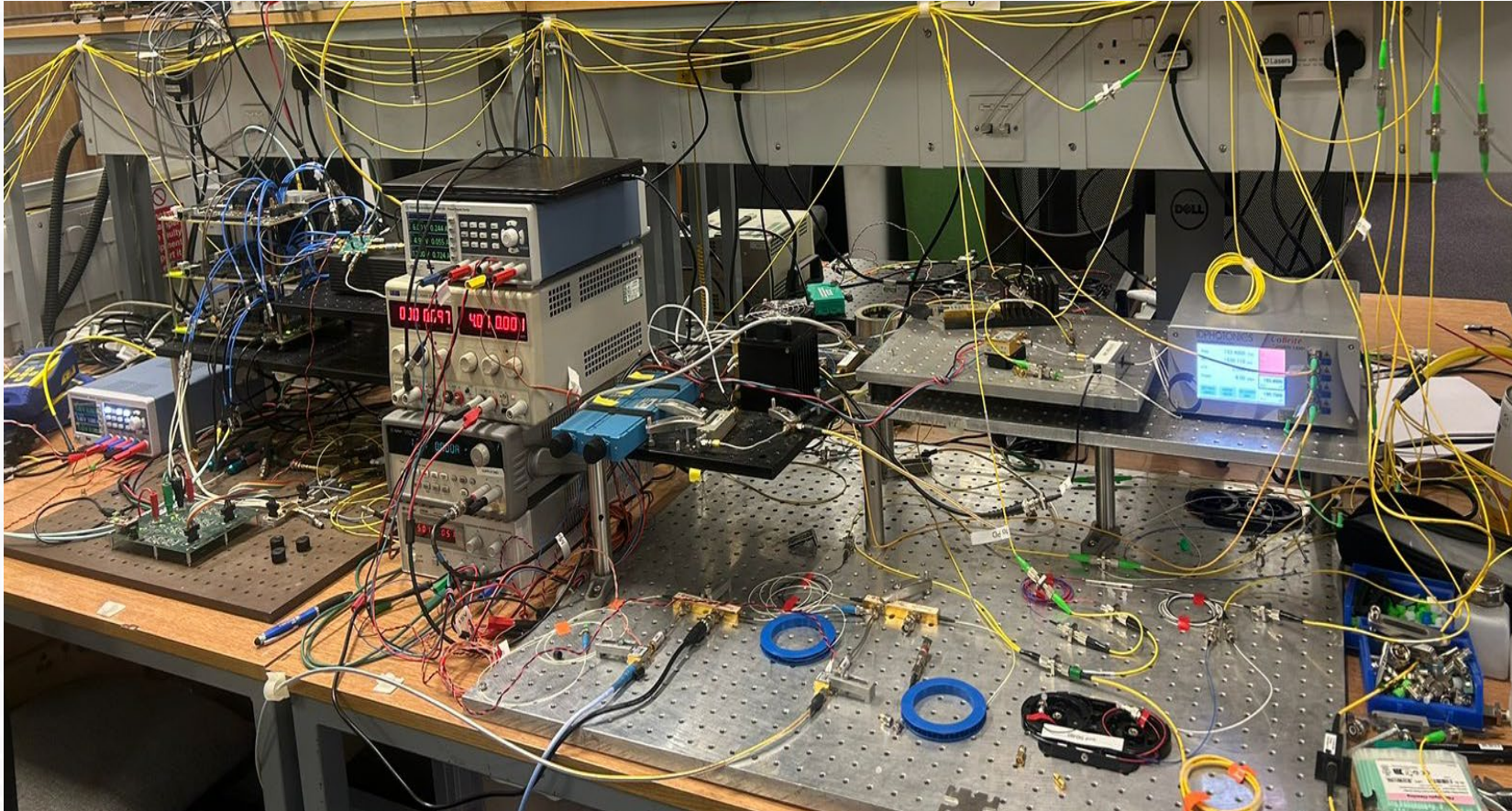
*Requires for cm level accuracy and no GNSS
Stable sources,
optical and wireless,
phase caching for cm level accuracy and no GNSS*



World first: Optical RF test bed with highly stable clock and synchronization and Antennas/RIS

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6G-REFERENCE: OFDM Radar waveform with improved angular resolution



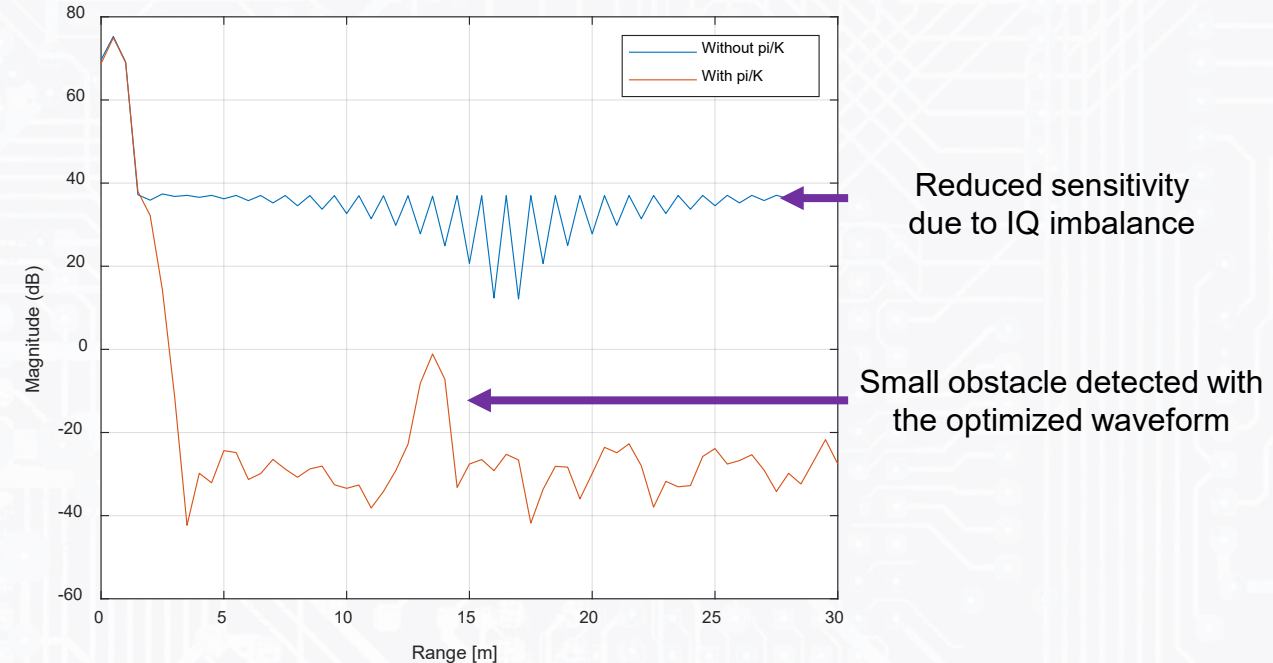
Presenter: Marc Bauduin

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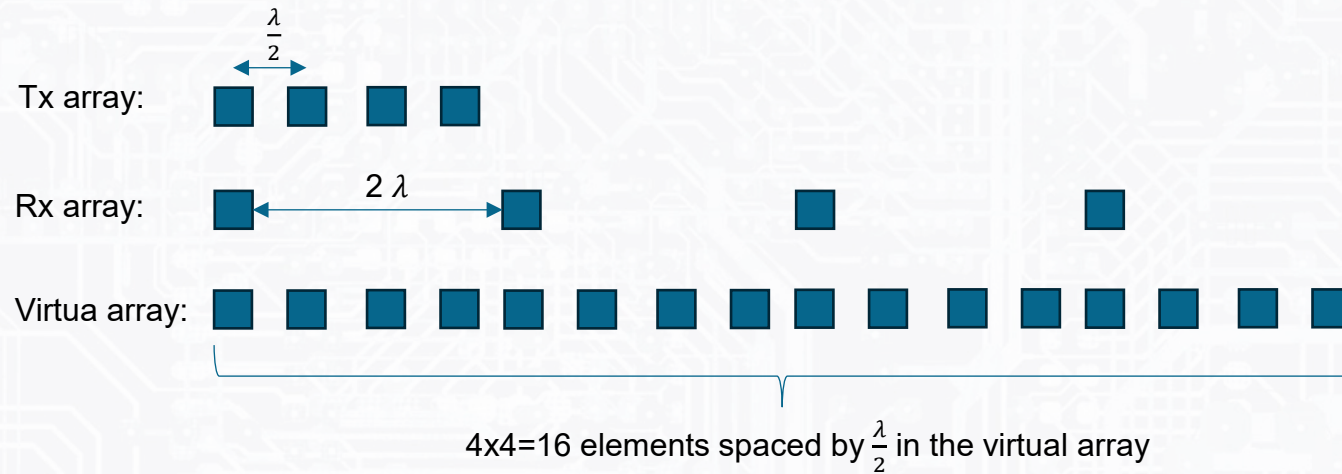
Radar waveform is optimized to improve sensitivity

- Proposed ICAS system:
 - Same front-end for communication and sensing
 - Sensing and communication are done in different time slots
- OFDM waveforms are compatible with sensing
 - $\frac{\pi}{K}$ phase rotation technique can be used to remove artifacts due to IQ imbalance
 - OFDM radar waveform can achieve low PAPR (<2dB)

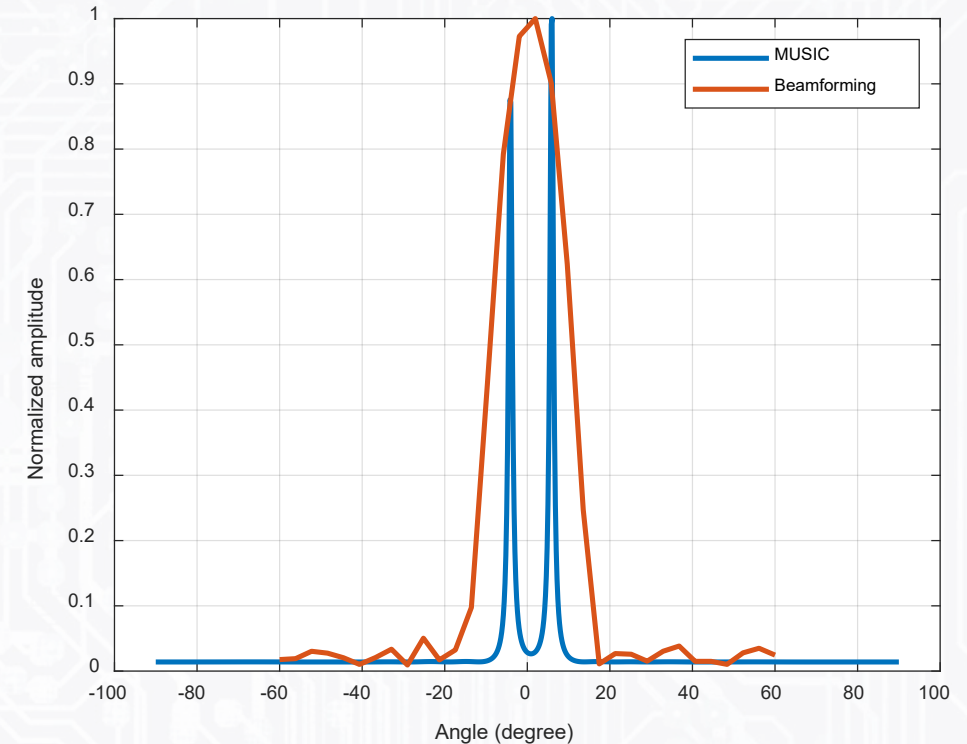


Bauduin M. and Bourdoux A., (2022), "Pi/K Phase Modulation for MIMO Digitally Modulated Radars", IEEE Radar Conference.

Angular resolution limited by aperture size



- Targeted angular resolution is 6°
- Required virtual array aperture size $>20\text{cm}$ (Rayleigh criterion)
- Super resolution algorithm combined with spatial smoothing techniques needed to improve angular separation with smaller antennas array



Pillai S.U. and Kwon B.H. (1989), "Forward/backward spatial smoothing techniques for coherent signal identification", IEEE Transactions on Acoustics, Speech, and Signal Processing.

Roy R., Paulraj A. and Kailath T. (1987), "Comparative performance of ESPRIT and MUSIC for direction-of-arrival estimation", IEEE ICASSP

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6TH GENERATION SMART
NETWORKS & SERVICES

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