Newsletter

Number 12, - August 2025

Newsletter Editor
Lianet Mendez-Monsanto, Universidad Carlos III de Madrid, Spain

COST INTERACT Chairman
Laurent Clavier, IMT Nord Europe, France

COST CA20120 ACTION

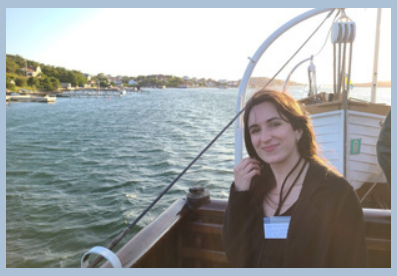
INTERACT

IN THIS ISSUE:

EDITOR'S ADDRESS

Dear reader,

It is a pleasure to share the 12th issue of the INTERACT newsletter, marking the second edition under my editorship.
This time, we present an extended issue, including a special article on the fascinating Grimeton Radio Station, visited during the 11th MC & Technical Meeting held in Gothenburg, Sweden.
In addition, as usual, you will find the highlights of the Gothenburg meeting, including updates from all working groups and vertical teams. We present two very interesting interviews: Prof. Erik Ström from Chalmers University of Technology, host and organizing leader of this meeting, and Mariam Mussbah, young researcher from TU Wien.



Lianet Mendez-Monsanto
Universidad Carlos III de Madrid, Spain

Laura Finarelli, from the University of Applied Sciences of Western Switzerland (HES-SO), shares her STSM testimonial following her visit to Politecnico di Torino, Italy, encouraging other researchers to explore similar opportunities.
This meeting featured engaging presentations and discussions, with sensing/radar as key topics. After a difficult selection process, four of them are highlighted here.

I hope you enjoy this extended issue!

ABOUT COST

This COST Action aims at contributing to the societal transformation, by developing the next generation of radio communication networks, 6G.

The Intelligence-Enabling Radio Communications for Seamless Inclusive Interactions (INTERACT) vision is to go beyond the capabilities of the 5G and to make the radio network itself intelligent, meaning aware, adaptive and parsimonious.
Challenges include:

1) Fundamental research in the fields of antennas and propagation, signal processing and localization, network architectures and protocols, to design intelligent-enabling radio communications;
2) Exploitation of Machine Learning tools for the implementation of many aspects of this network intelligence;
3) Collecting real-world data and making them available to the research community by building the INTERACT datasets.

This COST action started in October 2021 and ends in October 2025.

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY
Funded by the European Union

11th MC & Technical Meeting - Gothenburg 2025

June 18th, 2025, Gothenburg (Sweden) - Newcomers' photo.

Gala dinner on Eriksberg's Shipyard boat - Laurent Clavier, Chiara Buratti and Hamed Ahmadi.

Announcement on next events

Final INTERACT 12th MC & Technical Meeting

We are excited to announce the next, **final** meeting of the action held at Arts et Métiers, **Lille, France**!

Date: 29 September-2 October, 2025.

In addition, don't miss the **one-day workshop** on ***Tuesday 30 September***, a multidisciplinary, forward-looking overview of future wireless technologies featuring great speakers. We really hope to see you there! Find the details here.

INTERACT 8th Training School: Decision Making Systems in Wireless Communications: from Theory to Practice

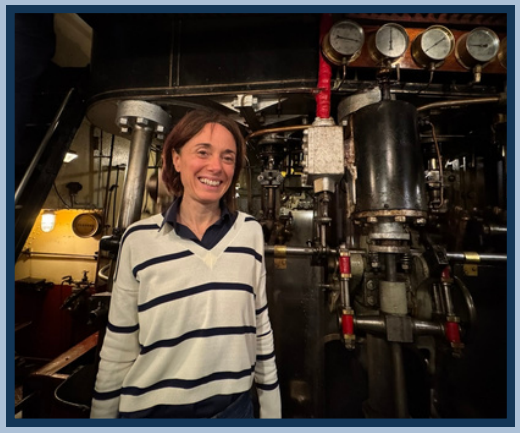
Date: 17-19 September 2025.

Also, we are thrilled to announce the next INTERACT Training School at Instituto Politécnico de Leiria, Portugal! Find more details here.

CHAIRMAN'S ADDRESS

A few months before the Gothenburg meeting, a massive blackout struck Spain and Portugal, cutting power, halting transport, and crippling digital communications for hours. Millions were left without electricity or basic services, and radio networks collapsed, forcing emergency broadcasters offline. In some regions, first responders struggled to maintain contact without functioning radio infrastructure. This event underscored the urgent need to rethink how radio networks are built and maintained. As climate-related disasters intensify and infrastructure vulnerabilities grow, resilient, fail-safe communication systems are no longer optional, but essential. Future radio networks must ensure uninterrupted service, with greater fault tolerance and resilience. One path forward is integrating AI-native systems at the core of network architecture. These systems can continuously monitor performance, predict failures, and proactively optimize operations in real time. Autonomous reconfiguration can maintain service continuity by prioritizing critical traffic and reallocating resources to guarantee a minimum quality of service for all users. Additionally, on-demand base stations mounted on unmanned aerial vehicles can be deployed to reinforce terrestrial networks during crises.

These are among the research areas currently explored and that will be addressed by INTERACT in the near future.



Chiara Buratti, Gothenburg (Sweden) - Eriksberg's Shipyard boat machinery

SPECIAL ARTICLE - INTERACT VISIT
WORLD HERITAGE GRIMETON RADIO STATION

June 17th 2025 - Grimeton Radio Station Visit - Sweden

Within the 11th INTERACT MC & Technical meeting at Gothenburg, Sweden, we had the privilege of visiting one of the most remarkable and historically significant engineering sites in the world: the Grimeton Radio Station, located just outside Varberg. Designated a UNESCO World Heritage Site in 2004, Grimeton is the only remaining long-wave radio station of its kind that still stands with its original equipment fully intact and operational. This visit offered a fascinating look back at the roots of telecommunications and the evolution of wireless technology.

SOLVE THE QUIZ!

During our visit, the hosts challenged us with a fun question.

Guess the transmission **frequency** if it equals the **wavelength**!
Hint: speed of light $c \approx 3 \cdot 10^8$ m/s.
Read the article for the answer!

?

About the history

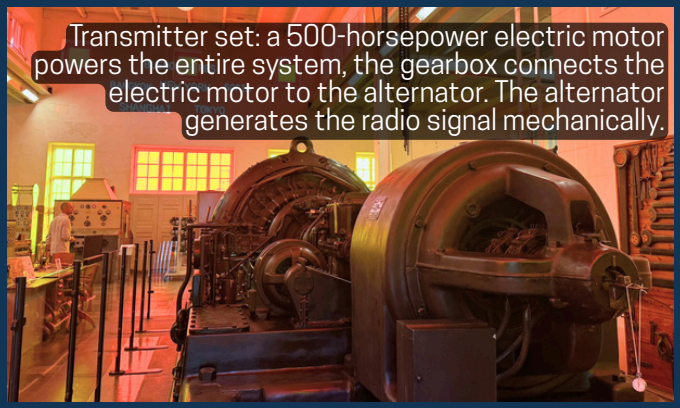
During World War I, Sweden struggled to maintain reliable international communications, relying heavily on vulnerable and costly cables. After the war, the Swedish Royal Telegraph Agency sought to solve this by establishing a direct wireless link with the United States. In 1920, the Swedish Parliament approved the construction of a large transatlantic radio station, selecting the Radio Corporation of America (RCA) system, developed by Swedish-born inventor Ernst Alexanderson, to ensure compatibility and reliability.

The station was strategically located on the west coast of Sweden, in Grimeton, Halland, to allow the signal to travel freely across the Atlantic. Construction began in late 1922 and, by December 1, 1924, the station was operational. It quickly became Sweden's primary link to the U.S., handling 95% of telegram traffic, and achieving average transmission times of just 17 minutes between Sweden and New York.

Although more modern short-wave transmitters gradually took over by the 1940s, the original long-wave Alexanderson transmitters remained as reliable backups. One was eventually dismantled, but the other survives intact and fully functional to this day, housed in the original transmission building, making Grimeton a living monument to early wireless technology, and a unique window into the history of global telecommunications.

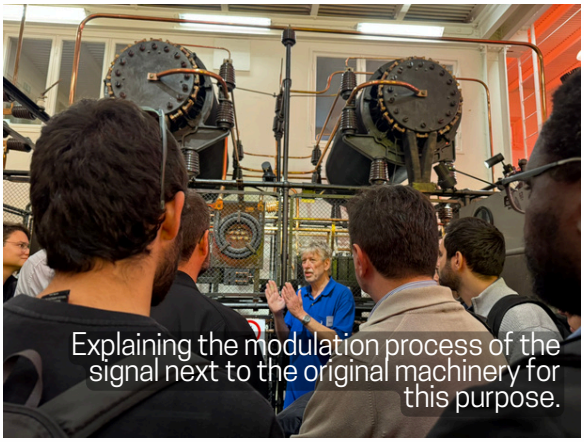
The Alexanderson Transmitter

The centerpiece of Grimeton is its long-wave transmitter, which uses electromechanical generation of radio waves. Unlike modern transmitters, the Alexanderson alternator converts mechanical rotation directly into radio frequency signals. What made this transmitter so special, even at the time of its introduction in the early twentieth century, was its ability to directly generate a continuous radio signal at a specific frequency. This allowed the system to be used for radio telephony as well, even though in Grimeton's case, it only transmitted Morse code. The station is capable of sending 450 Morse code symbols per minute, around 240 letters. Note that Grimeton was exclusively a transmitting station; it had no receiving equipment on-site.



Transmitter set: a 500-horsepower electric motor powers the entire system, the gearbox connects the electric motor to the alternator. The alternator generates the radio signal mechanically.

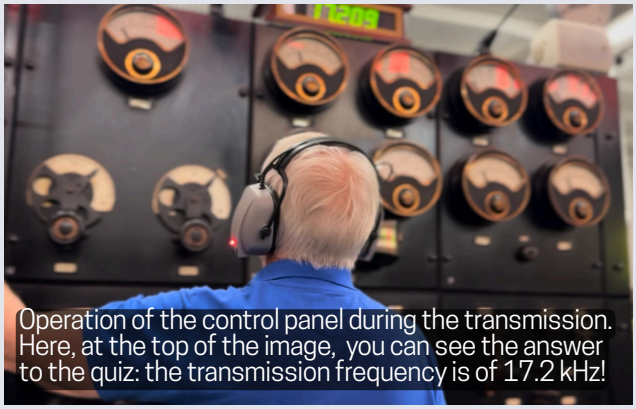
SPECIAL ARTICLE - INTERACT VISIT
WORLD HERITAGE GRIMETON RADIO STATION



Explaining the modulation process of the signal next to the original machinery for this purpose.

GUIDED TOUR - Visit the official website for more details!

All the INTERACT visitors had the unique opportunity to witness a live transmission using the station's original machinery, operated by dedicated volunteers.



Operation of the control panel during the transmission. Here, at the top of the image, you can see the answer to the quiz: the transmission frequency is of 17.2 kHz!

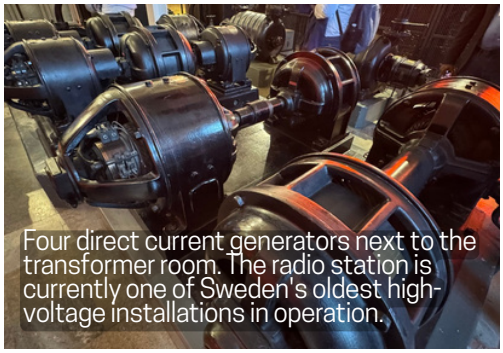
The association has plenty of theoretical and practical knowledge about the Alexanderson transmitter.

A TRANSMISSION: JUST FOR US

Erik Ström, Carles Anton and Laurent Clavier.

Tape Reader, Telex

Punched tape led to more info in a shorter time: the foundation of modern data transmissions!



Four direct current generators next to the transformer room. The radio station is currently one of Sweden's oldest high-voltage installations in operation.

INSIDE THE STATION

SPECIAL ARTICLE - INTERACT VISIT
WORLD HERITAGE GRIMETON RADIO STATION

Grimeton Today: Tradition and Innovation

The daily life at Grimeton Radio Station World Heritage Site is a mix of tradition and modern preservation. The staff and volunteers not only maintain the original Alexanderson transmitter and antennas, but also care for the surrounding landscape, buildings, and visitor facilities. The old formal structure, with roles like chief engineer or machinist, has given way to a smaller, more adaptable team whose dedication keeps the site running smoothly. For many, working at Grimeton is more than a job—*it's a passion*.

The station also serves as a reminder of just how far wireless communications have come. In its day, the Alexanderson transmitter represented cutting-edge technology, capable of transmitting Morse code across the Atlantic. Compared to modern speeds, it was incredibly slow, transmitting the equivalent of 1 GB of data at full speed would take years! Over time, long-wave systems were replaced by smaller, faster, and more efficient short-wave transmitters, eventually making the way for today's mobile networks.

Despite these advances, **Grimeton was never dismantled** like many of its contemporaries. Thanks to preservation efforts, it remains fully intact and operational, an extraordinary example of early wireless infrastructure.

In recognition of its cultural and technological importance, it was inscribed as a **UNESCO World Heritage Site** in 2004. Today, Grimeton not only honors the past but also connects it to the present, showing how the foundations of our wireless world were built.

As engineering students and professionals, stepping into Grimeton was like stepping into a time capsule of communications history. The experience was both technically enriching and inspiring, offering a deeper appreciation for the innovations that enable today's digital world. Special thanks to the **Grimeton staff** for the excellent tour and insightful explanations, and to **Prof. Erik Ström** and the **Chalmers University** team for hosting us.

For those who wish to learn more or plan a visit, further information is available on the station's official website:
https://grimeton.org/en/

INTERVIEW WITH A SENIOR RESEARCHER: ERIK STRÖM

PROFESSOR
CHALMERS UNIVERSITY OF TECHNOLOGY

Erik received his Ph.D. from the University of Florida in 1994. After a stint as Postdoc and Assistant Professor at KTH – Royal Institute of Technology, he joined Chalmers in 1996, where he is now a full Professor and Head of Division. He received the Chalmers Pedagogical Prize in 1998, the Chalmers Ph.D. Supervisor of the Year award in 2009, and the Chalmers Area of Advance Award in 2020. Erik is a Fellow of the IEEE.

What are your favourite areas of interest and research?
My main "problem" is that I am interested in almost everything. With that said, I like to delve into theory to understand things from first principles.

What was your motivation to become a researcher?
I love to learn new things and share my insights, as they may be, with students and colleagues. If my research can be applied in practical systems, this is extra rewarding.

What is the "next big thing" in the wireless communication area?
Ah, such an easy question… We need to rethink how today's wireless systems operate in light of increased threats from cybercrime, sabotage, and military attacks. Moreover, we need to revisit protocols, specifically multiple access, to cater to efficient short packet communications, which I believe will become increasingly important.

Considering the innovations in the scientific world in the last 20 years, which was the most remarkable one, which one didn't get the attention it deserved, and which one finished with a "dead end"?
Limiting ourselves to wireless cellular systems, massive MIMO has had the most significant impact in practice. Not enough attention has been given to short-blocklength information theory and coding, where much use in practice can be found. It is not a complete dead end, but reflective intelligent surfaces seem not to live up to all the initial hype.

What was your motivation to be part of COST INTERACT?
To learn about propagation and channel modelling from the experts. It has been a very stimulating learning experience for me!

My favourite book, movie, TV series are…
I do not read as much as I used to, but I just finished Project Hail Mary by Andy Weir, which I really liked. Otherwise, I enjoy watching sports on TV or live, particularly American college football (Go Gators!) and cross-country skiing.

I'm most passionate about…
Learning and teaching! Hence, I have the dream job (if I could just reduce my admin duties) ☺

My favourite holiday is…
With friends enjoying good food, wine, and conversation.

In few words, I consider myself to be…
An introvert, slightly nerdy person who has learned that interaction can be pretty enjoyable.

What is your country well known for?
The Nobel Prize, popular music, surströmming, meatballs, akvavit, gender equality, sustainability, unpredictable summer weather, and some successful multinational companies (Ericsson, Volvo, IKEA, Spotify, Skype, …).

My favourite or personal quote is …
The road to wisdom?—Well, it's
plain and simple to express:
Err
and err
and err again,
but less
and less
and less.

Piet Hein

Is there anything else you like to share?
I feel truly blessed to have been a part of the COST community for some time now. Thank you all for creating such a friendly environment!

INTERVIEW WITH A YOUNG RESEARCHER: MARIAM MUSSBAH

PROJECT ASSISTANT - TU WIEN

Mariam Mussbah received both her Bachelor's and Master's degrees from TU Wien and is currently a soon-to-graduate PhD student at the Institute of Telecommunications. She has been part of the Christian Doppler Laboratory for Digital Twin-assisted AI for Sustainable Radio Access Networks, where her research over the past five years has focused on sustainable cell-free MIMO systems, with an emphasis on improving energy efficiency and reducing the environmental impact of future wireless networks.

What are your favourite areas of interest and research?

My main area of interest is signal processing at the physical layer, particularly in the context of wireless communications. I enjoy working on problems that involve optimizing how signals are transmitted, received, and processed—especially when it contributes to making communication systems more efficient and sustainable.

What was your motivation to become a researcher?

What motivated me to become a researcher is a deep curiosity to understand how things work and a genuine enjoyment of solving complex problems. I find it rewarding to break down technical challenges and develop solutions that can have a meaningful impact.

What is the "next big thing" in the wireless communication area?

I believe the next big thing in wireless communications is the development of sustainable solutions that prioritize both energy and cost efficiency. As networks become denser and more complex to meet growing data demands, it's crucial to rethink how we design and operate them to minimize environmental impact and operational costs.

Considering the innovations in the scientific world in the last 20 years, which one didn't get the attention it deserved, and which one finished with a "dead end"?

One of the most remarkable innovations has been global wireless connectivity—it's changed how we stay close to others, no matter the distance.

As for dead ends, it's hard to say—some ideas just arrive before their time and may prove valuable years later.

How did you became involved in COST INTERACT (or any of the previous Actions)?

A colleague told me about the great networking opportunities at INTERACT, and it seemed like a great way to connect with others in my field—so I joined.

My favourite book, movie, TV series are...

Book: Le Petit Prince.

Music: My favorite music really depends on my mood. I don't stick to one genre; I enjoy anything from calm, instrumental pieces to more upbeat and energetic tracks.

TV series: Dark.

I'm most passionate about...

Spending time with family, biking, skiing, and baking.

My favourite holiday is...

Skiing in the mountains on a sunny day - nothing beats the fresh air, snow, and sunshine.

In few words, I consider myself to be...

I had a hard time answering, so I asked someone who knows me well, who gave me the following answer:

"Organized, detail-oriented, reliable, and always ready to support others."

What is your country well known for?

Libya is known for its vast desert landscapes, beautiful Mediterranean beaches, and warm hospitality. Austria, on the other hand, is famous for its alpine scenery, winter sports, schnitzel, traditional pastries, coffee culture, and the rich cultural heritage of Vienna.

My favourite or personal quote is ...

"Curiosity will conquer fear even more than bravery will." James Stephens.

HIGHLIGHTS FROM THE LAST MEETING

WG1 - Radio Channels

A total of three pure WG1 sessions took place, three joint WG1/WG2 sessions, one sub WG1.2 (RIS) session and a WG1 discussion session on the book.

Concerning "pure" WG1 sessions, one session dealt with updates from ETSI ISG THz on channel models, extensions for the near field for 3GPP channel model, 3GPP summary of the work done in the evaluation study item for 7-24 GHz bands, and new hydrophobic antenna design. In another session MIMO channel characterization was discussed, with contributions on object-enabled clustering for distributed massive MIMO, GPU-parallelized multipath channel parameter estimation, and characterization of in-car and in-train penetration channels. One last WG1 session presented interesting contributions on novel antennas for channel sensing, novel frequency-diverse array transmission techniques and integral electromagnetic techniques for scattering from heterogeneous building facades. WG1 discussed the final modifications needed for the book chapter, including he classification of the TDs of the Gothenburg meeting , along with the time plan.

WG2 - Signal Processing and Localization & SWG2 ISAC

At this meeting, ISAC was the most significant topic at WG2, highlighting a session about ETSI ISG ISAC overview given by Javier Lorca, specially interesting for both WG2 and WG1. Another pure WG2 session was held about interference management in 6G X-like subnetworks and sub-band full duplex, as well as an interesting work about goal-oriented wireless sensor networks: error exponent and outage analyses with distributed hypothesis testing (DHT).

As mentioned above, three joint WG1/WG2 took place, including works about MIMO performance, ranging, localization, spectrum sharing, beam management, and artificial intelligence applied to channel estimation and other solutions.

Regarding the sub-WG2 (ISAC), in total 11 TDs were presented, including a wide range of topics: resource allocation, waveform design, channel modeling, ray tracing, detection and tracking, prototypes, and one TD on channel modeling for ISAC. Discussions about the WG2 book section took place, as well as coordinating efforts across all subsections for a cohesive outcome.

WG3 - Network Architectures and Protocols

No dedicated WG3 sessions were held during this meeting. A TD submission was redirected to VT4, resulting in no WG3-relevant topics to report at this time. However, it is worth noting that parallel efforts within WG3 have remained active, and discussions related to the upcoming WG3 book have been made. While no new TDs were presented, members continue to engage in collaborative exchanges and planning activities that reflect the group's long-term objectives.

VT1 - Health and Well-Being

VT1 held one joint session with SWG on Electro-Magnetic Field (EMF) with 15 attendees and one TD. This work discussed vital signs monitoring using mmWave OFDM radar, whose details can be found in the *selected scientific topic section* of this newsletter! The meeting of the SWG EMF consisted of two TDs focused both on measured power density values on different environments and technologies. One focused on 5G exposure values during a mass event in Spain, and the other done encompassing 2G/4G/5G in Lisbon comparing values with those obtained several years before. There were interesting discussions about joint initiatives of the group about the measurement recording time as well as exclusion zones including European operator's data. Finally, the group discussed about the progress of the book chapter, which is within the required timeline.

VT2 - Transportation

VT2 held two productive sessions featuring four TDs centered on UAV and LEO satellite communications. The presentations addressed a range of topics including: detection of UAV radio signals, characterization of micro-Doppler radar signatures, monitoring of link quality for UAVs, and modeling of optical links for LEO satellites. In parallel, we're pleased to report progress on the white paper covering V2V, T2T, UAV, and airplane-to-airplane communication. Thanks to the contributions of 25 authors, a first draft of the white paper has been completed, along with an initial version of the associated book chapter. While some refinements and updates are still pending, the work is progressing well and remains on track.

VT3 - Industrial Automation

VT3 conducted a focused session featuring three presentations on MIMO-related topics, which included: localization using MIMO signals, calibration methods for digital twins and measurement campaigns on distributed MIMO in industrial environments. In addition, they reviewed the structure and content of the corresponding book chapter, going through the assigned papers for each section. Those belonging to the current event were also evaluated and incorporated into the draft content to ensure comprehensive coverage.

VT4 - Smart Building and Cities

In the VT4 session, there were four TD presentations. The main topics included investigating the effects of external actors, such as non-stationary objects and interfering signals, on transmitted signals, as well as network management to improve QoS of heterogeneous services and energy efficiency. There was an additional session focused on the book chapter. They plan to add two TDs presented at the current meeting, along with plots.

SELECTED SCIENTIFIC TOPIC:

VITAL SIGNS MONITORING USING MMWAVE OFDM RADAR

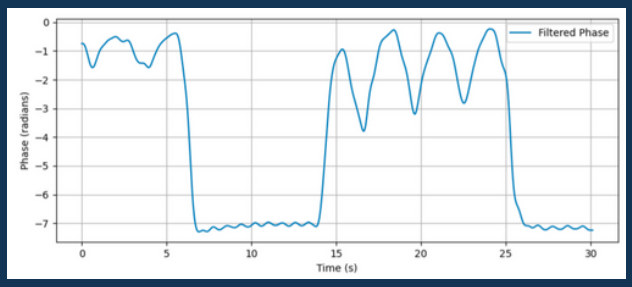
Contactless and light-independent monitoring of human vital signs, such as heart and breathing rates, can be achieved via radar techniques, which can even make use of existing communications signals. This offers an efficient solution with applications in a wide range of medical tasks, elderly care, sports, and even the military.

In this work, the authors present experimental results obtained in the Fraunhofer Institute for Integrated Circuits in Ilmenau that show the suitability of vital sign monitoring via an indoor mmWave OFDM radar system.

The radar setup is based on a bistatic configuration at a frequency of 26.5 GHz with a 1 GHz bandwidth. Measurements were taken under several scenarios, including a subject lying down, sitting, or walking, in both line-of-sight and non-line-of-sight conditions, and with one or two subjects present simultaneously, as well as considering the presence of different clothing types and blankets.

The results demonstrate the feasibility of vital sign detection. In addition, the authors highlight important factors that must be considered, such as the activity, distance and angle relative to the radar device; signal processing challenges related to the presence of breathing harmonics that might interfere with heart rate measurements; patient's mobility; and high path loss in non-line-of-sight conditions, all of which remain open areas for research and improvement. Overall, the experiment confirms mmWave OFDM radar as a leading solution for contactless measurement of vital signs.

Measurement taken for a sitting person facing the radar.



Person periodically holding their breath.

JAKUB DOBOSZ, MAXIMILIAN ENGELHARDT, DIEGO DUPLEICH, MACIEJ STAPOR, AND PAWEL KULAKOWSKI

Contact person kulakowski@agh.edu.pl

SELECTED SCIENTIFIC TOPIC:

A MEASUREMENT-BASED SPATIALLY CONSISTENT CHANNEL MODEL FOR DISTRIBUTED MIMO IN INDUSTRIAL ENVIRONMENTS

Ultra-reliable and low-latency communications (URLLC) will enable a wide range of new applications, such as remote driving and industrial automation. Distributed multiple-input multiple-output (D-MIMO) is a promising technology for URLLC, and, for its development, accurate channel models are of utmost importance.

This work derives a channel model from a D-MIMO unique measurement campaign carried out at a frequency of 3.75 GHz with a bandwidth of 35 MHz and using twelve fully coherent distributed dipole antennas in a rich scattering and heavily shadowed industrial environment at Lund University.

The authors present a new approach to classify obstruction in D-MIMO systems derived from lidar data and approximated from the first Fresnel zone. Furthermore, they thoroughly investigate statistical measures such as small-scale fading, large-scale fading, delay spread, and transition rates between line-of-sight and obstructed line-of-sight conditions for the different antenna elements, laying the foundations for an accurate channel model for D-MIMO systems in industrial environments.

Industrial D-MIMO measurement environment. The red circles mark the approximate locations of the antennas.

In order to ensure spatially consistent simulation results, the correlations of large-scale fading between antennas are modeled. Additionally, tail distributions are included to enable proper evaluation of reliability and rare events. Based on the results, a channel model for D-MIMO in industrial environments is provided and validated, along with a recipe for its implementation.

CHRISTIAN NELSON, SARA WILLHAMMAR, AND FREDRIK TUFVESSON

Contact person christian.nelson@eit.lth.se

SELECTED SCIENTIFIC TOPIC:

5G VEHICLE POSITIONING IN TUNNELS WITH SINGLE ANCHOR TDOA EXPLOITING MULTIPATH REFLECTORS

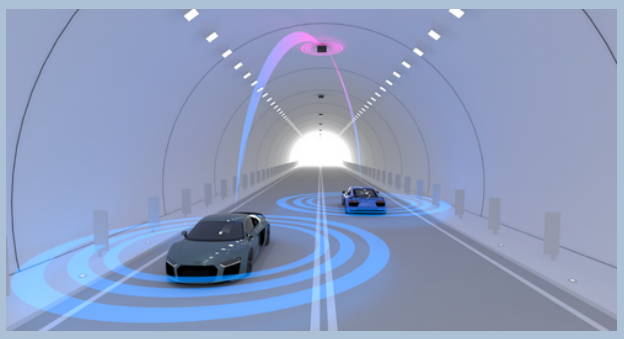
High-accuracy positioning is challenging in confined environments, such as indoor spaces or tunnels, which are affected by non-line-of sight (NLOS) conditions and multipath. In this work, the authors propose a positioning methodology aligned with the 3GPP Release 17 standard for cellular communications to estimate the position of a moving vehicle inside a tunnel.

The authors exploit the multipath component (MPC) identification of received signal echoes to enhance vehicle positioning, leveraging the MPC characterization introduced in 3GPP Release 17, which labels each signal arrival as line-of-sight (LOS) or NLOS. Moreover, future base stations (BSs) and roadside units (RSUs) are expected to access high-definition (HD) maps, whose knowledge is also embedded with MPC data in this work to dynamically identify signal reflectors and convert the environment into a network of auxiliary positioning anchors.

As shown in the figure, the proposed framework uses a single BS mounted in the tunnel, which receives multiple signals transmitted by an on-board unit (OBU) from the vehicle and measures angle of arrival (AOA) and time difference of arrival (TDOA) to localize it.

LORENZO ITALIANO, MATTIA BRAMBILLA AND MONICA NICOLI

Contact person lorenzo.italiano@polimi.it



Tunnel localization scenario with two connected vehicles exploiting a 5G BSs for positioning.

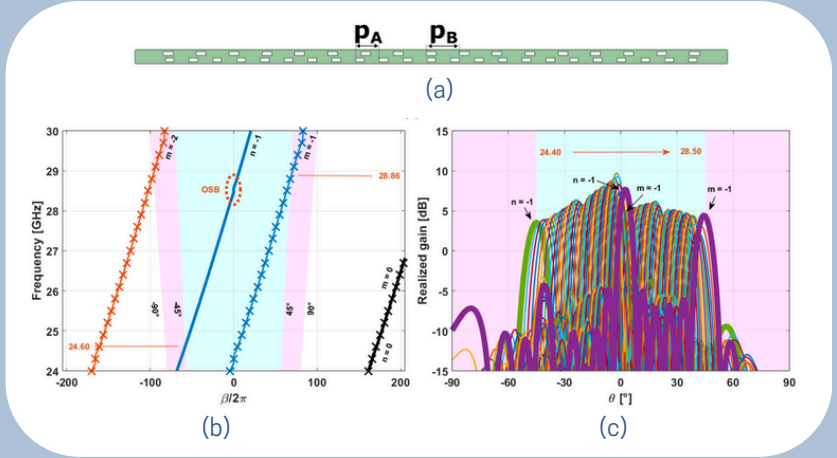
The proposed method exploits single anchor TDOA (SA-TDOA) and AOA measurements; the former is a type of measurement that is not affected by synchronization issues, while the latter is estimated through a sequential zero-forcing (ZF) multiple signal classification (MUSIC) algorithm. An extended Kalman filter is then used to jointly track the reflectors and the vehicle.

Simulation results demonstrate the augmentation capability of the method, which exhibits high accuracy and robustness in both LOS and NLOS scenarios, proving to be a reliable solution for tunnels and other GNSS-denied environments.

SELECTED SCIENTIFIC TOPIC:

DUAL-BEAM LEAKY-WAVE ANTENNA FOR ANGLE-OF-ARRIVAL ESTIMATION AT MMW FREQUENCIES

In the pursuit of simpler and more efficient alternatives to phased arrays for mmWave base stations, this work presents a relatively fast-scanning hybrid dual-beam leaky-wave antenna (LWA) designed to support angle-of-arrival (AoA) estimation in next-generation mobile networks. Unlike traditional phased arrays that rely on complex beam steering, this antenna leverages the frequency-scanning property of LWAs, where the beam direction is naturally controlled by the signal frequency. The proposed design uses a single waveguide structure with two sets of radiating slots, each generating an independent beam, shown in the figure (a).



This allows for dual-beam operation, enabling coverage of a −45° to 45° angular sector by sweeping across a frequency range from 24.4 to 28.5 GHz. While the system requires a relatively wide frequency sweep to achieve full scanning, the approach is well-suited to the limited angular coverage needed in sectorized mmWave base station deployments, typically 90° or less.

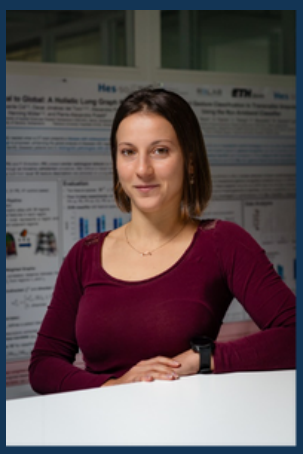
For practical use in AoA estimation, the study points to the use of high-resolution techniques like the MUSIC algorithm to resolve ambiguities and distinguish between the two possible beam directions. Overall, this approach offers a promising and efficient path toward fast beam scanning.

(a) Dual-beam leaky-wave antenna model, with bottom set of slots labelled A and top set of slots labelled B.
(b) Simulated dispersion curves from the dispersive analysis of the unit cell of the two sets of slots, with set A associated to harmonics n and set B associated to harmonics m.
(c) Simulated realized gain in E-plane for the proposed dual-beam leaky-wave antenna, from a frequency sweep over [24.4, 28.5] GHz.

TANGUY LOPEZ, JULIEN SARRAZIN

Contact person
tanguy.lopez@sorbonne-universite.fr

AVAILABLE GRANTS IN THE INTERACT ACTION



STSM TESTIMONY

Balancing Performance and Energy Efficiency: Optimizing Landing Spots for Moving gNBs in 6G Networks

Laura Finarelli
(University of Applied Sciences of Western Switzerland (HES-SO), Switzerland)

Host institution:
Politecnico of Turin, Italy

I am a PhD student affiliated with both the University of Applied Sciences of Western Switzerland (HES-SO) and the Technical University of Berlin (TUB) under the supervision of Professor Falko Dressler and Gianluca Rizzo. In April 2025, I had the opportunity to undertake a **Short-Term Scientific Mission (STSM) at Politecnico of Turin**, under the guidance of Professor Michela Meo.

This collaboration started during the **INTERACT 10th MC and 10th Technical Meeting** in Dublin. Here I met Greta Vallero, a postdoctoral student of Professor Michela Meo, and **we discovered some common interests** related to energy-efficient and green networks. As anticipated, the main focus of my visit was to gain insights into my research topic from a fresh and diverse perspective. Before the start of the STSM, I had discussions with Professor Michela Meo and my supervisors to identify a common and compelling research direction. Given my involvement in the European project Dynamic Mobile Networks (DyMoNet) and my enthusiasm for green and sustainable networks, we decided to focus on energy-efficient UAV-enabled networks, where mobile antennas are dynamically deployed in the scenario.

My primary role was to develop the analytical framework for studying this problem and to adopt intelligent methods to derive meaningful results and insights. Being physically present in Turin was crucial for having in-depth discussions with Professor Meo and for accessing valuable network data available at her institution. I strongly believe that immersing oneself in different research environments is incredibly enriching. This experience allowed me to develop new ideas and gain a more empirical viewpoint, complementing my typically more abstract approach. Applying my theoretical models to real-world data and tools was both challenging and rewarding.

During the STSM, I began drafting a joint paper based on our model and preliminary results. This work will be presented as a Technical Document (TD) at the upcoming INTERACT meeting in Lille, with the goal of eventually submitting it to a conference. Additionally, I connected with another PhD student from Professor Meo's group who expressed interest in my previous analytical models. This led to a collaborative project on network sharing strategies, which has resulted in a conference paper currently under submission.

I am truly grateful for this experience, which has significantly enriched my career from both a technical and social standpoint. I had the opportunity to meet new researchers and fellow PhD students, exchange knowledge and experiences, and enjoy some relaxing moments outside the office—an equally important part of the journey.

I highly recommend this kind of experience to anyone who is curious, open-minded, and ready to embrace new challenges.

WOMEN IN INTERACT

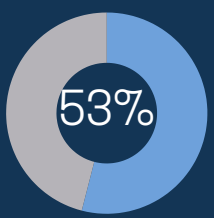
We would like to remember INTERACT's commitment to bridging the gender gap, which is still high considering the figures below. For this reason, we keep supporting ideas like podcasts about female researchers' achievements, and our Mentorship Program, which remains open to all young researchers. Also targeted for young researchers, and regardless of gender, we keep encouraging them to co-chair sessions at our meetings. Remember we still have open opportunity for VBG and ITC grants.

We invite you to share your ideas on how we can further improve gender equality within our community.

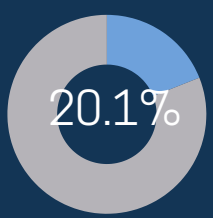
FACTS & FIGURES

Signatory Countries:	**46**
COST Cooperating Members:	**1**
COST Partner Members:	**1**
International Partners:	**5**
Institutions (University/ Industry/ Research Infrastructures/Enterprises) currently participating:	**228**

Young Researchers



Women



Presented TDs in Gothenburg

Meetings per year

INTERACT Action's Members

Participating last meeting

98

Training School/Day completed