2021

Annual report

cnit
consorzio nazionale
interuniversitario
per le telecomunicazioni

National Lab
RaSS
Radar and Surveillance Systems

Director's Introduction

Welcome to the 2025 Annual Report of the Radar and Surveillance Systems (RaSS) Laboratory.
This report summarizes the laboratory's key research activities, results, and strategic achievements over the 2025 financial year.
In 2025, RaSS continued to demonstrate strong performance and growth:

- Expansion of the team with one permanent and one fixed-term researcher.
- 40 active research projects.
- Approval of five new projects starting in early 2026
- 46 scientific publications.
- Participation in 15 international conferences and workshops, involving 17 team members.
- Leadership in three NATO initiatives and participation in an additional one.

This document provides a concise overview of our main activities.
For further information, please contact: rass@cnit.it.
Now in my third year as Director, I am proud of the results achieved and the continued commitment of our team, whose professionalism and dedication drive our success.

Director's Short Bio

Prof. Agostino Monorchio received his degree in Electronic Engineering from the University of Pisa in 1991 and his PhD in Remote Sensing and Environmental Monitoring in 1994. After an initial experience as a microwave radioastronomy engineer at the Arcetri Astrophysical Observatory, he joined the University of Pisa in 1996, where he is currently Full Professor of Electromagnetic Fields. He has held international academic appointments, including Adjunct Professor at Pennsylvania State University and at the Italian Naval Academy, and has been Visiting Scientist in Spain and China. He is a member of the Scientific Advisory Board of the Directed Energy Research Center at TII (UAE).
Since 2023, he has been Head of the Radar and Surveillance Systems (RaSS) National Laboratory of CNIT and serves as the Italian representative in the NATO-STO Sensors & Electronics Technology Panel. His research focuses on computational electromagnetics, metamaterials, antennas, and wireless propagation. He has authored over 180 journal publications, more than 300 conference papers, and holds 6 patents. An IEEE Fellow since 2012, he is listed among the Top Italian Scientists.

Agostino Monorchio
Director of RaSS

cnit consorzio nazionale interuniversitario per le telecomunicazioni

National Lab RaSS Radar and Surveillance Systems


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January
February

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THE RADAR AND SURVEILLANCE SYSTEMS LABORATORY AT A GLANCE

The Radar and Surveillance Systems (RaSS) Laboratory is one of the National Laboratories of the National Interuniversity Consortium for Telecommunications (CNIT), a non-profit consortium comprising 50 research units-42 from Italian universities and 8 from CNR institutes-and 8 national laboratories. More information is available at https://www.cnit.it/en/.

Established in 2010, the RaSS Lab was created to bring together a critical mass of expertise in radar systems and applied electromagnetics, addressing the growing challenges of research and innovation in these fields. Today, RaSS is home to a team of 32 people, including researchers, technical personnel, and administrative staff.

Over the years, RaSS has led or contributed to numerous national and international research projects funded by a wide range of institutions: the Italian Ministry of Defence (MoD), European Defence Agency (EDA), Ministry of Education (MIUR), Ministry of Economic Development (MISE), European Commission (EC), European Space Agency (ESA), EOARD (European Office of Aerospace Research and Development), NATO (via SPS and NCIA), the Italian Space Agency (ASI), and the Tuscany Region.

RaSS is committed to maintaining and enhancing the quality and excellence of its research. It continuously works to strengthen its internal structure and to invest in foundational research across emerging domains. Positioned at the intersection of academia and industry, the laboratory plays a key role in bridging the gap between research and practical applications. Several projects developed at RaSS have resulted in integrated demonstrators with Technology Readiness Levels (TRLs) between 5 and 6.

The lab is also highly active in dissemination and knowledge transfer, contributing to scientific literature through journals and books, and engaging in international conferences, workshops, short courses, seminars, and industry-focused training sessions.

RaSS proudly collaborates with over 50 partners worldwide, including universities, research institutions (both governmental and non-governmental), and industrial stakeholders. It maintains a strong presence within NATO and EDA frameworks, with staff members playing leading roles in Panels and CapTechs. The Lab also actively participates in joint research and experimentation at the “Ugo Tiberio” JCC Lab, a collaborative facility between the Italian Navy’s CSSN and CNIT.

RaSS has also fostered successful technology transfer through the creation of two spin-off companies: ECHOES, specializing in radar systems design and development, and FREE SPACE, focused on advanced antenna systems and electromagnetic technologies. Both companies extend the lab’s impact beyond research, enhancing its role in innovation and industry collaboration.

FINANCIAL STATS

The RaSS Laboratory budget is supported by several sources of funding through various research projects. The following figures outline the lab’s projects and financial trends from FY 2020 through FY 2025.

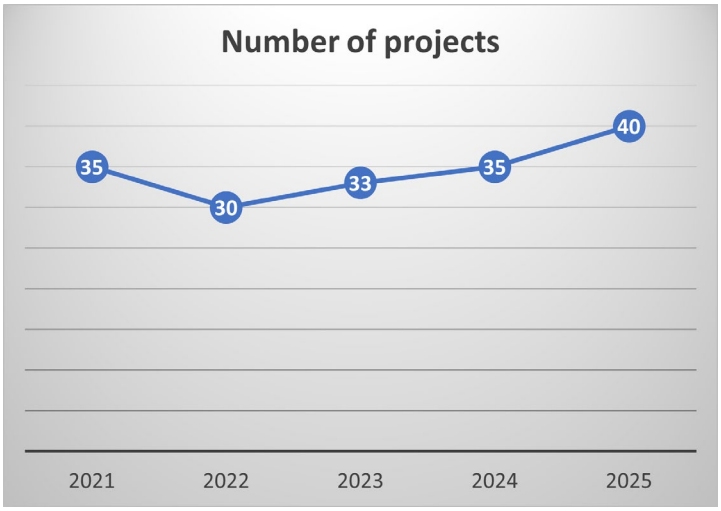


Figure 1 - RaSS Lab number of projects in progress FY 2021 through FY 2025

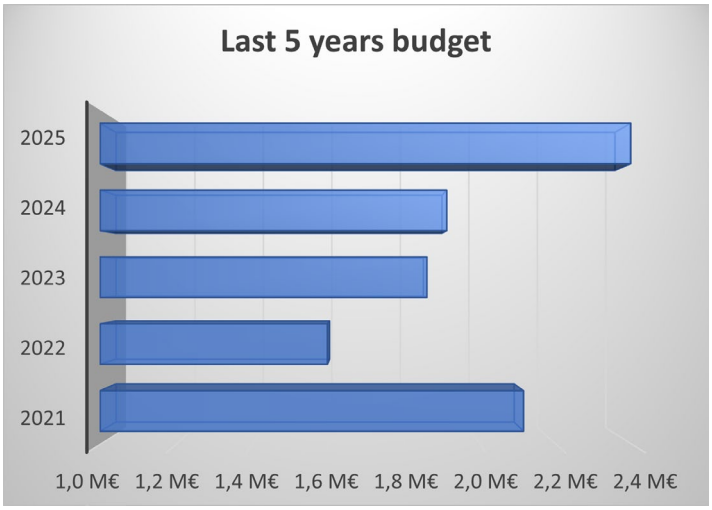


Figure 2 - RaSS Lab financial trend from FY 2021 through FY 2025

ORGANISATION CHART

Figure 3 shows the organisational chart of the RaSS Lab as at the end of 2025. This diagram illustrates the structure of the organisation and the relationships of its governing bodies and positions. The RaSS Lab is organized in five research areas, namely radar systems, radar signal/image processing, remote sensing, antennas, electromagnetic modelling & metamaterials. RaSS also has an explorative research area, where promising basic research is internally funded, and instrumental laboratories. On the administration side, RaSS is composed of a secretariat office, a quality control office and a safety and prevention office. RaSS activities are disseminated by the media & communication board. RaSS governance is directed by the Steering Committee, which is chaired directly by the Director.

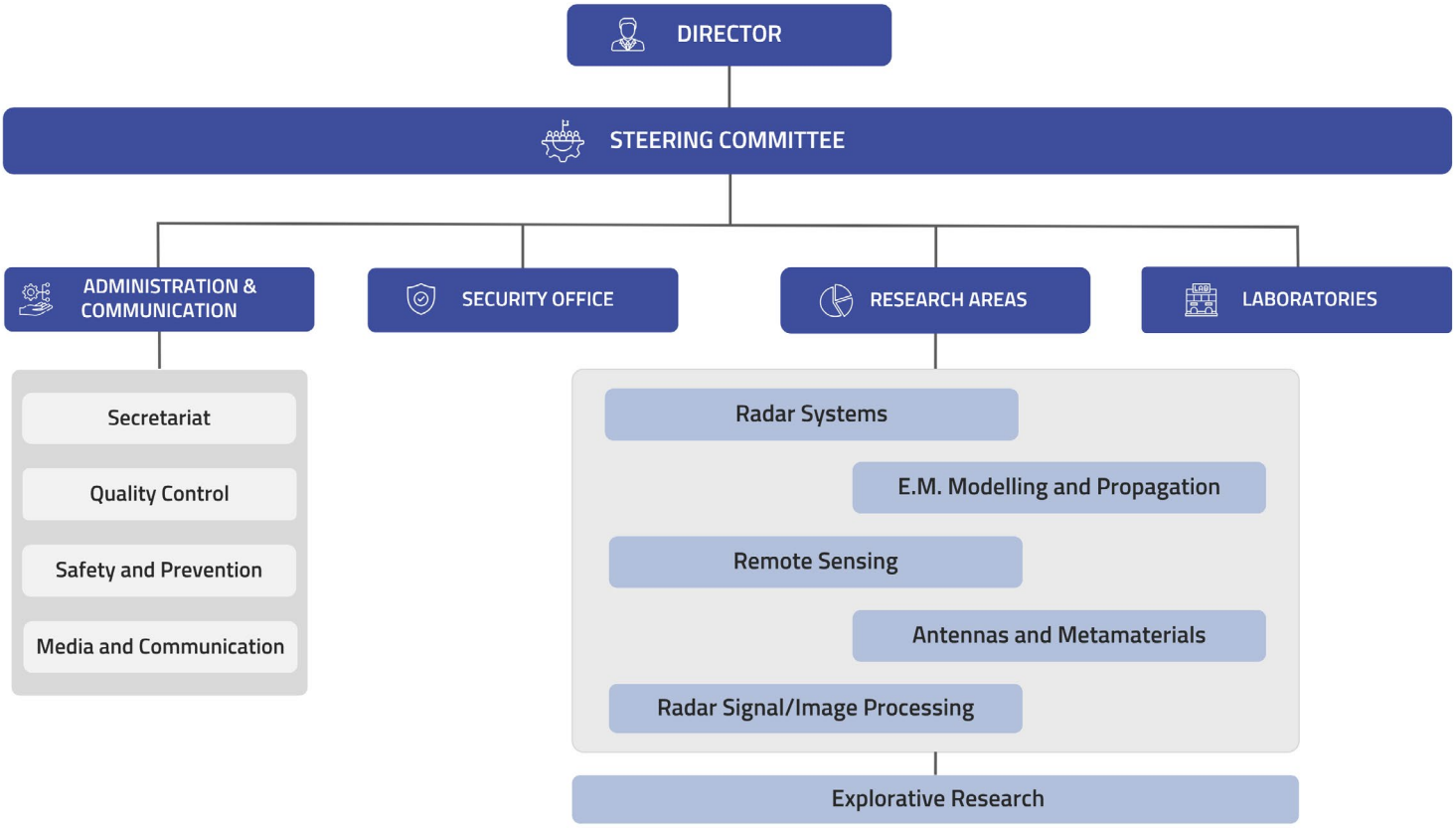


Figure 3 - Organisational Chart.

Active Projects

PROJECT ACCOLADES

(ArtifiCial intelligenCe mOdels for dual bAnD cognitivE Sar)

The project aims to develop advanced Artificial Intelligence (AI) algorithms integrated into a cognitive Synthetic Aperture Radar (SAR) system designed for monitoring and reconnaissance of critical scenarios such as landslides, earthquakes, floods, and civil security events.
The first objective is to create AI models capable of identifying the type of scenario being observed through automated classification and image understanding.
The second objective focuses on enabling the radar to autonomously adjust key acquisition parameters—such as frequency, instantaneous bandwidth, and PRI—according to the detected scenario and the operational functions required.

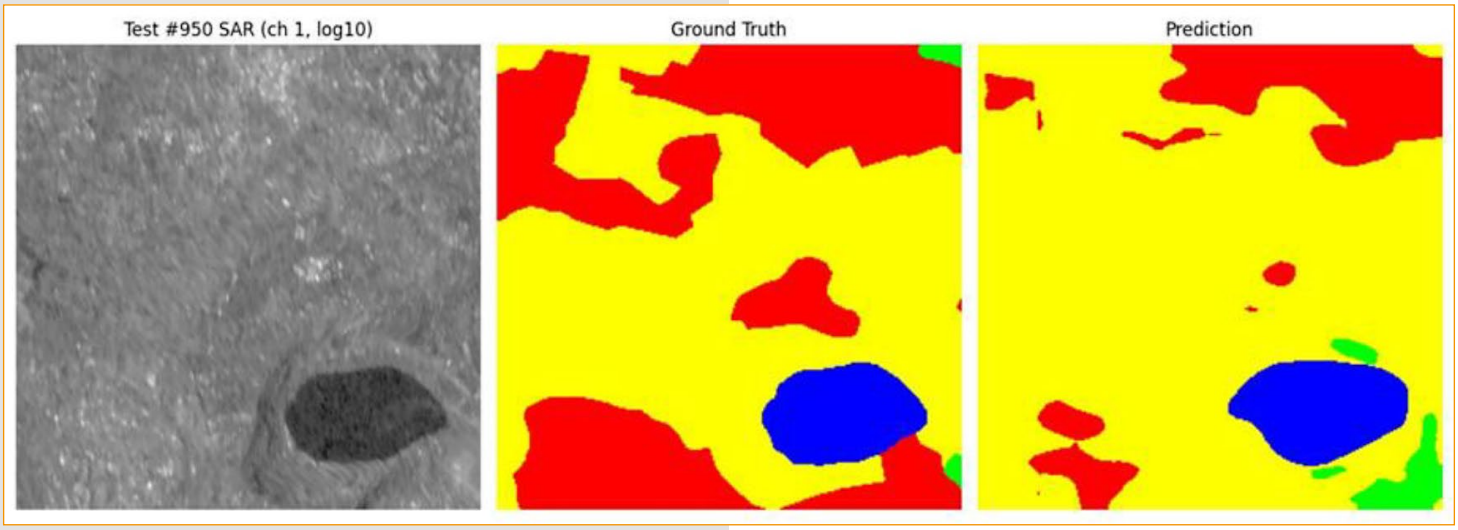
A further key goal is the design and construction of an airborne, multi-frequency SAR demonstrator to validate the technologies and methods developed throughout the project. The initial phase involves defining the relevant use cases and the technical requirements of both the radar system and the AI algorithms. This is followed by data collection and dataset preparation, which includes designing preprocessing methods and implementing AI-based image segmentation techniques to build a comprehensive training dataset representing different scenario classes.

During model training and testing, various AI approaches —including those inspired by other application domains —will be explored to meet mission-specific performance needs, with particular attention to scalability, output quality, and computational efficiency. The project will then define the architecture of a cognitive, multi-band SAR sensor and analyse operational modes that allow the system to adapt dynamically to diverse observation conditions.

The resulting AI models will be embedded in a closed-loop framework capable of simulating a fully autonomous cognitive radar.
The final phase consists of an extensive measurement campaign to acquire additional data, validate the developed algorithms, and demonstrate the effectiveness of the purpose-built cognitive SAR system.

Keywords: Artificial Intelligence (AI), Synthetic Aperture Radar (SAR), Cognitive radar

Technical Sheet
Funding institution:
Italian Space Agency (ASI)
Project partners
RINA Consulting S.p.A., NHAZCA s.r.l., ECHOES s.r.l., CNIT, RINA Consulting - Centro Sviluppo Materiali S.p.A
Project duration
February 2025 - August 2027
Involved countries
Italy



(a) Very preliminary test of one of the AI-based segmentation techniques.

PROJECT AI4CUAV

Innovative AI-framework to enable the detection, classification and tracking of killer- drone

The current AI-based algorithms on detection and classification algorithms based on radar signatures (i.e. signals and images) shown a non-reliable solution for the detection and classification of small UAVs. A combined system with the EO/IR detection and classification based on AI-techniques could improve the required performances. Ai4CUAV intends to improve the Threat Evaluation Subsystem of a counter UAV (C-UAV) through AI-based algorithms. Supposing the anti-drones composed by multiple heterogeneous sensors, such as radars and EO/IR sensors, these algorithms "work" on radar signals and EO/IR images to enable the detection and classification of the killer-drones, as well as on drone trajectories to help to recognize a drone from another object.

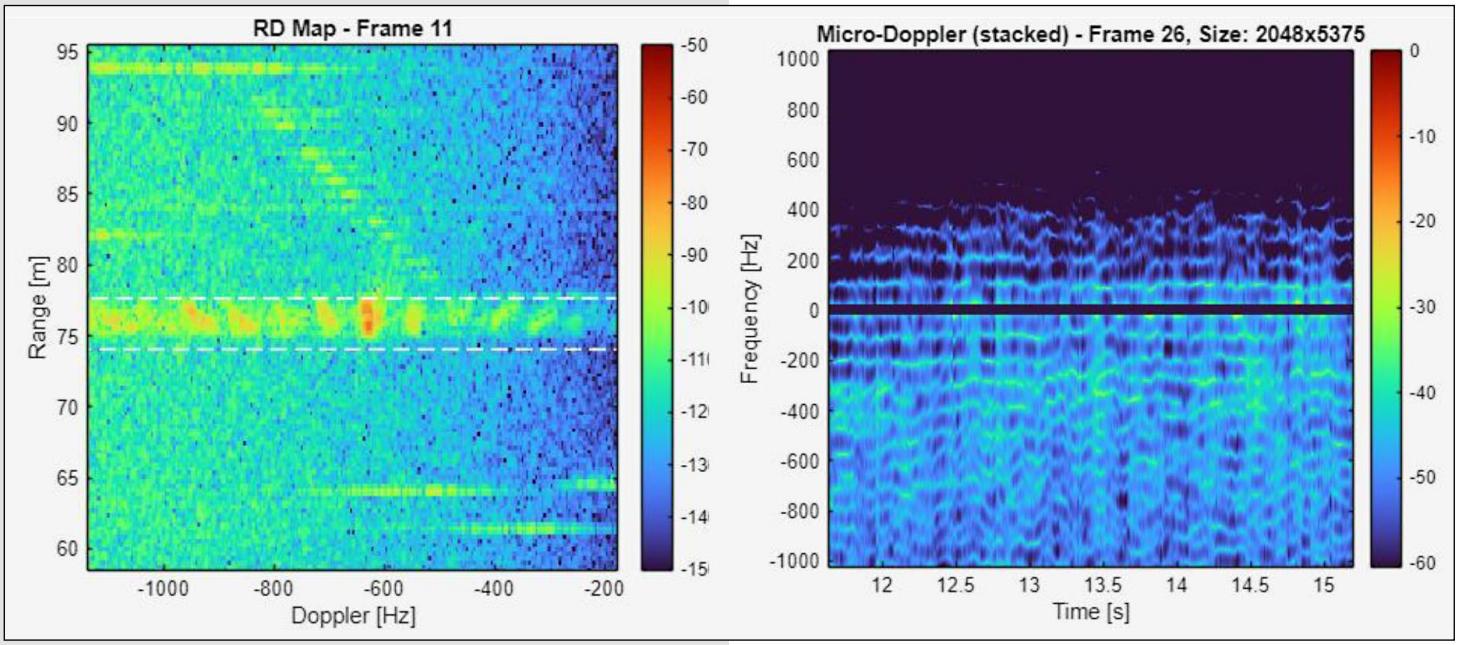
This project will build a shared database of RF and EO/IR signatures of different drones which can be used as training data and test set, which allows to compare different detection and classification techniques. Ai4CUAV will investigate all the key SOTA of AI techniques from multiple sensor sources, including but not limited to, machine learning and deep learning. These techniques will be evaluated against the different use cases and scenarios, in order to assess the most adapted/promising ones. For the most promising techniques, algorithm prototyping and adaptation will be performed to assess preliminary performances through simulations.

This project is a follow-on of the NATO SPS project n. G5633 "ANTI-DRONES – Innovative concept to detect, recognize and track killer-drones", involving the core partners CNIT-RASS (NPD) and MTU (Co-Director), that concluded in September 2022 with good results, focused on the development of a new concept of anti-drone system, based on mini-radar technology and signal processing, able to detect, recognize and track the killer-drones - mini/micro UAS - in order to facilitate the neutralization of them minimizing the risk for people and assets. This AI-framework will be integrated in the ANTI-DRONES prototype, tested and evaluated by the end-user experts. Ai4CUAV project is a research project focused on a breakthrough innovation using AI. As such, it is expected to advance the accuracy of detection algorithms, and set forward AI-based solution of high complexity problems. From a prospect vision, Ai4CUAV would bring into market a novel and innovative AI application enabling intelligent ISR in complex situations.

Keywords: Drone detection, AI (Artificial Intelligence), Target classification, Target Motion Analysis (TMA)

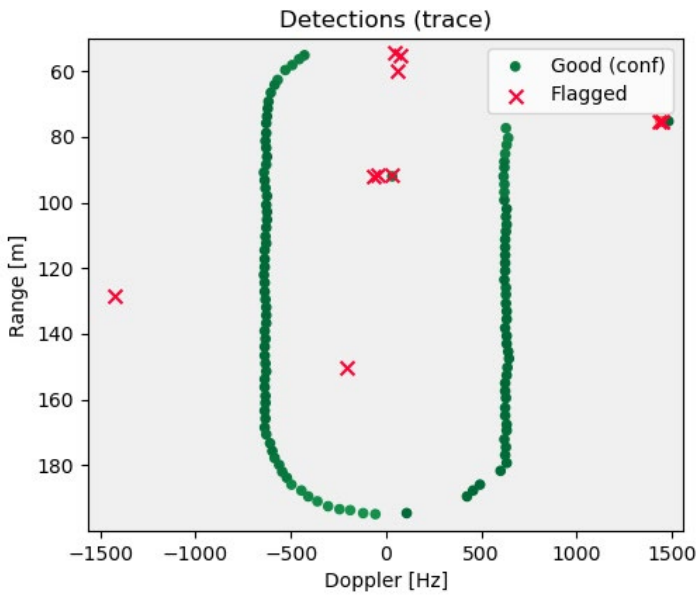
AI4CUAV

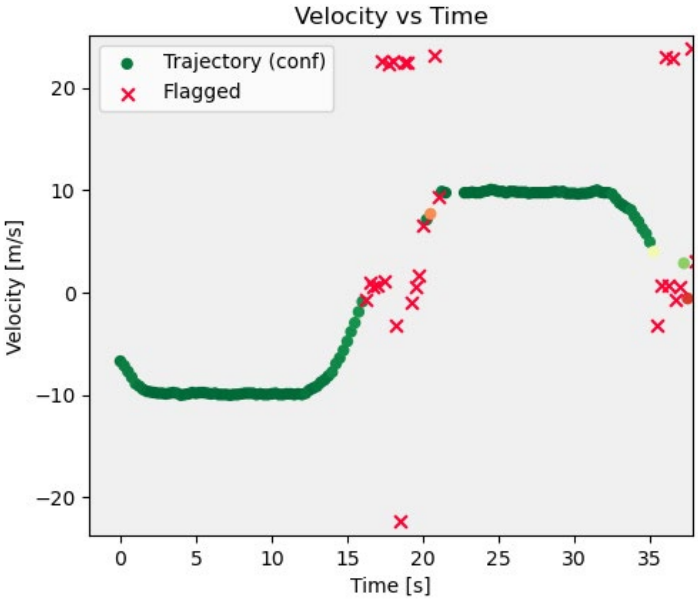
Technical Sheet
Funding institution:
NATO-SPS
Project partners
IUS, MTU, GPI, UniLink, KhNUIA
Project duration
March 2024 – September 2026
Involved countries
Ukraine, Bosnia and Herzegovina, North Macedonia, Germany, Moldova, Italy



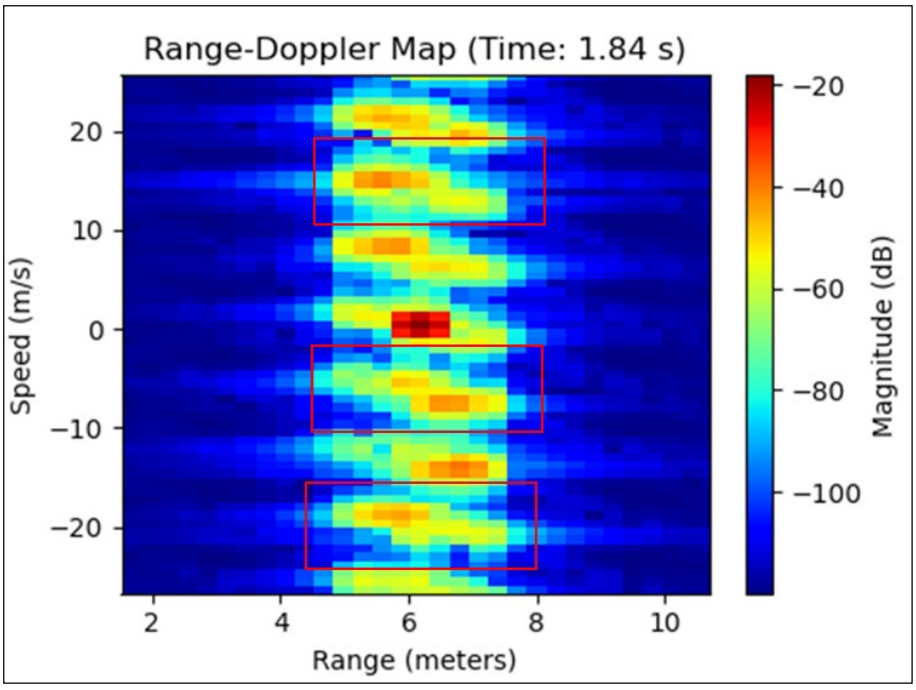
(a) Real Range-Doppler map of DJI Matrix 400 along with the extracted Micro-Doppler

(b) DJI Matrix 400 drone shown in the real Range-Doppler map and site of the acquisition campaign in Rome

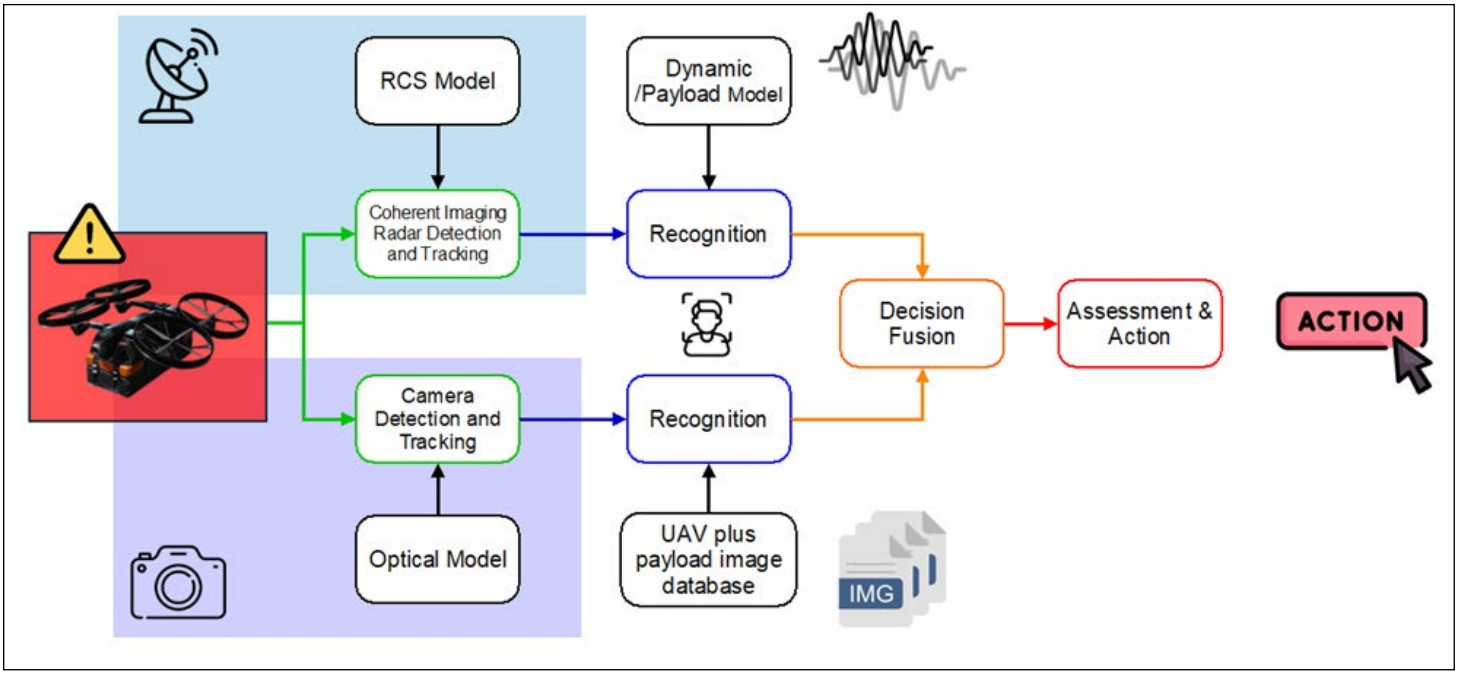




(c) Detection trace of the DJI MATRIX 400 in Range-Doppler map and in Velocity-Time domain



(d) Simulated Range-Doppler signature of a quadcopter using the same RF parameters of the real radar



(f) Final classifier architecture involving the fusion of multi-sensor data. AI-based algorithms will be used to obtain the detection and fuse the data.

PROJECT ARTURO

The ARTURO (Advanced Radar Technologies in eUROpe) project proposes a solution to fulfil future operational needs based on extended use of emerging technologies. The ARTURO research addresses the future defence needs (keeping in mind civil world as well) and proposes a new class of sensors based on feasibility studies and high level specifications. From an architectural point of view, the proposed approached is based on the scalability as a key driver of design, i.e. a modular design for extending the same components on different platforms with a consequent reduction of non-recurring and logistic costs. The design is then based on an elementary and fundamental component for all the new class of radars while the different sensors for different domain applications are formed via aggregation of the elementary component. As a matter of fact, the ARTURO project will analyse and study a wide set of technologies to evaluate the benefits they could bring in new generation of radar systems and to indicate which are relevant depending on the CONOPS. In particular, a roadmap for sensors will be elaborated based on the study results provided by various technological analyses. This roadmap will figure out the most appropriate sensors according to their domain and use cases, their class of performance, their level of maturity, their cost benefit analysis and their complementarity regarding other competing technologies.

Keywords: Advanced Radar Technology in eUROpe

Technical Sheet

Funding institution:

EU EDF

Funded by the European Union

Project partners

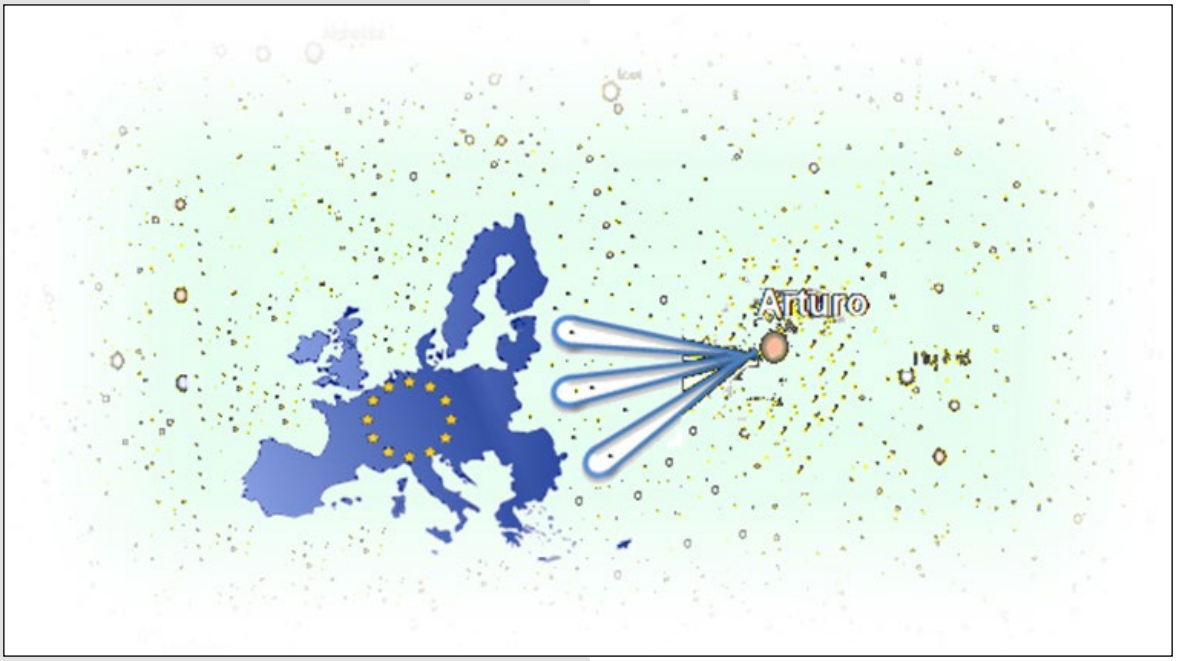
Scalinix, Sentech S.r.l., Thales DMS France SAS, Thales Nederland BV, Totalforsvarets Forskningsinstitut, Universidad de Sevilla, Università degli Studi di Pavia, XY-Sensing, Leonardo SpA, Aalto Korkeakoulusaatio sr, Airbus Defence and Space, Baltijos Pazangiu technologiju Institutas, CoreHW, Echoes S.r.l., Hensoldt, Indra, Marduk Technologies, TNO, Pitradwar, Rheinmetall Italia, SAAB, SATWAYS

Project duration

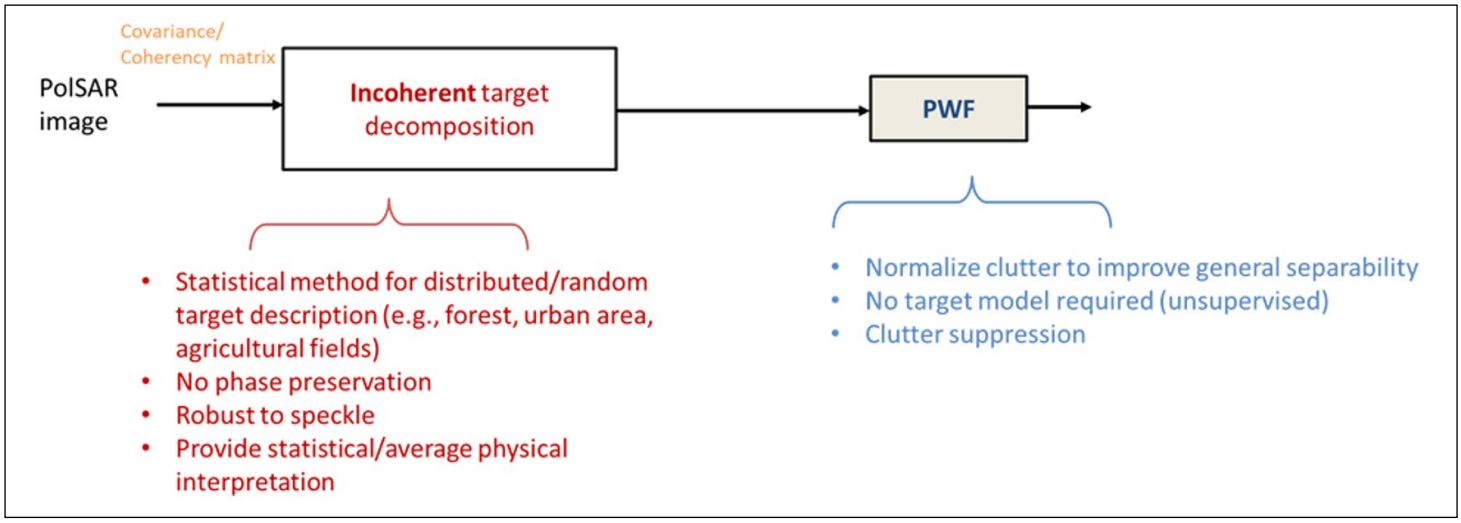
September 2023 - August 2026

Involved countries

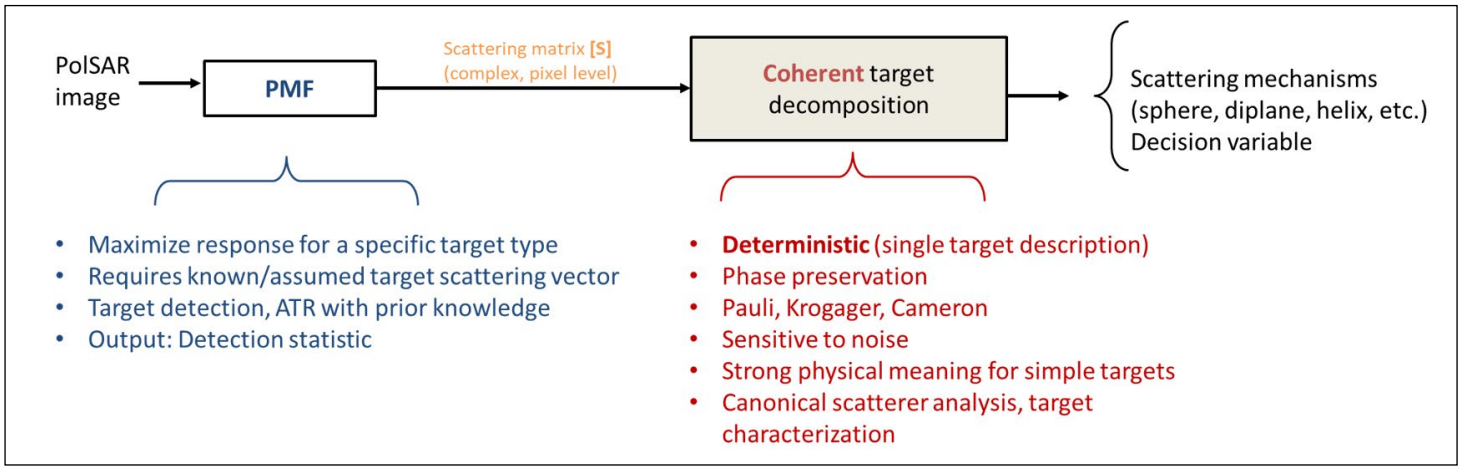
Italy, France, Germany, Netherlands, Sweden, Spain, Poland, Finland, Lithuania, Estonia, Greece



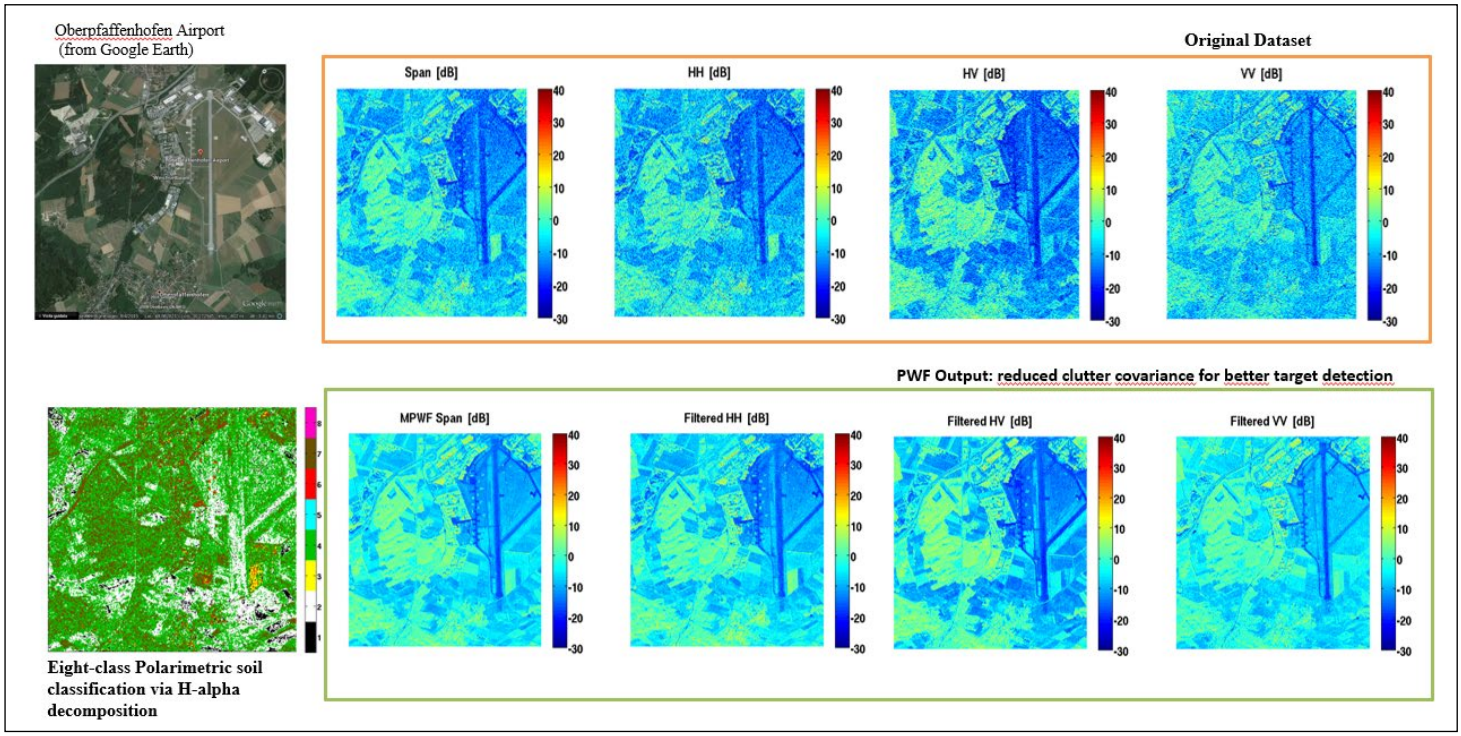
(a) High Level Concept and Logo of ARTURO



(b) Polarimetric Feature Extraction based on PWF (Polarimetric Whitening Filtering)



(c) Polarimetric Feature Extraction based on PMF (Polarimetric Matched Filter)



(d) Feature extraction result applying H-alpha decomposition over 8 classes: reduced clutter variance, allowing for better target detection against clutter.

PROJECT DEEP-TRACE

Deployable performing HF radio goniometer compact system for C-ESM applications

The DEEP-TRACE project aims at realizing a multi-channel system based on an array of compact receiving antennas for receiving, digitizing and analysing HF band signals for C-ESM applications. This configuration is conceived to cope with compactness, easy deployment, modularity, and scalability requirements.
The proposed technological solution allows to estimate the direction of arrival (DoA) of the received signals, to characterize the signal through the use of Artificial Intelligence (AI) techniques, and to localize the source making use of 3D ionospheric propagation models for the signals transmitted in sky-wave mode. This system could be used individually or in a multi-sensor / multi-platform configuration. This last configuration, appropriately dislocated, will allow the geolocation of the HF source, regardless of the type of propagation (sky-wave or surface-wave).
The main innovative aspects of this proposal are:

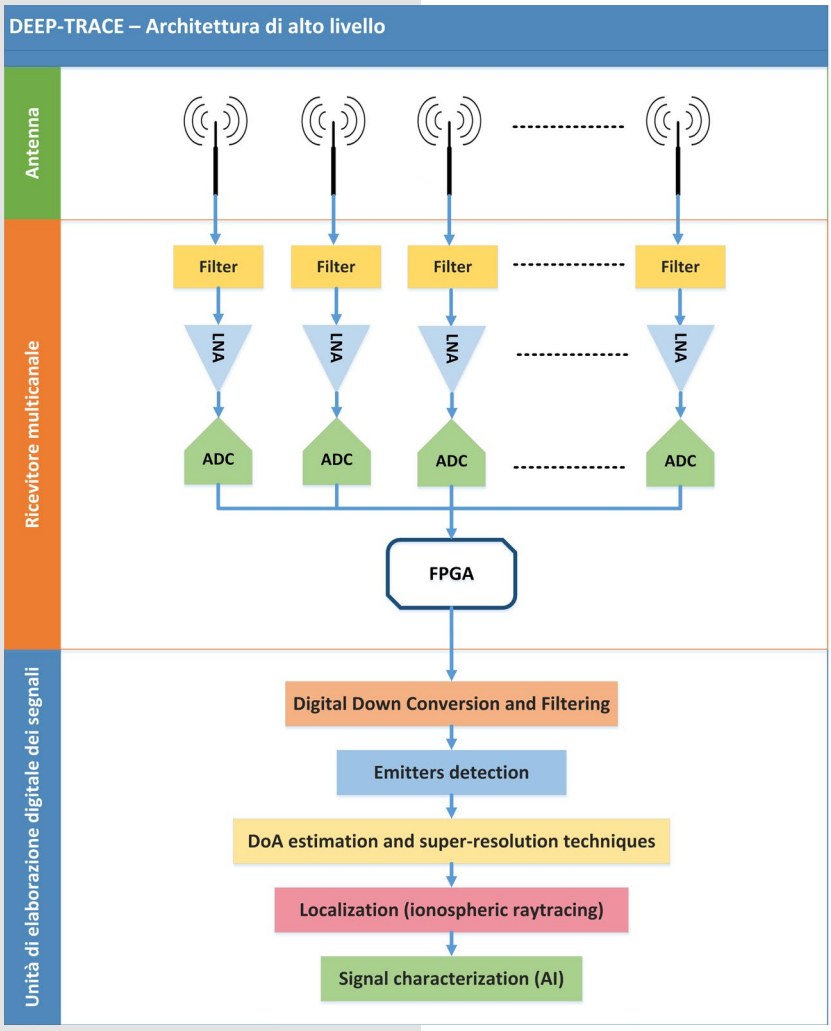
1) An accurate miniaturization of the antennas combined with the use of an active and flexible adaptation, able to use the radiating elements in array configuration to be deployed both in the terrestrial environment (urban or not) and naval;
2) Implementation of different DoA estimation techniques even in the presence of a limited number of sensors, and comparison of their performance in terms of mean square error of estimate and robustness to mismatches between design conditions and actual conditions determined by the ionospheric channel;
3) Positioning techniques of the individual receiving nodes in a sensor network configuration. The techniques adopted will optimize the spatial configuration of the nodes in order to minimize the Cramer-Rao limit on the DoA estimate.
4) Localization based on 3D ionospheric propagation models able to reconstruct the e.m. path from the receiver to the transmitter through the ionospheric channel;
5) Artificial Intelligence (AI) for classifying the detected signal (e.g.: type of propagation, continuous / pulsed wave, modulation, etc.).

The Deep Trace project has completed its second phase during which the subsystems have been tested separately. During the third phase the integration of the overall system and functional tests in operative scenario will be performed.

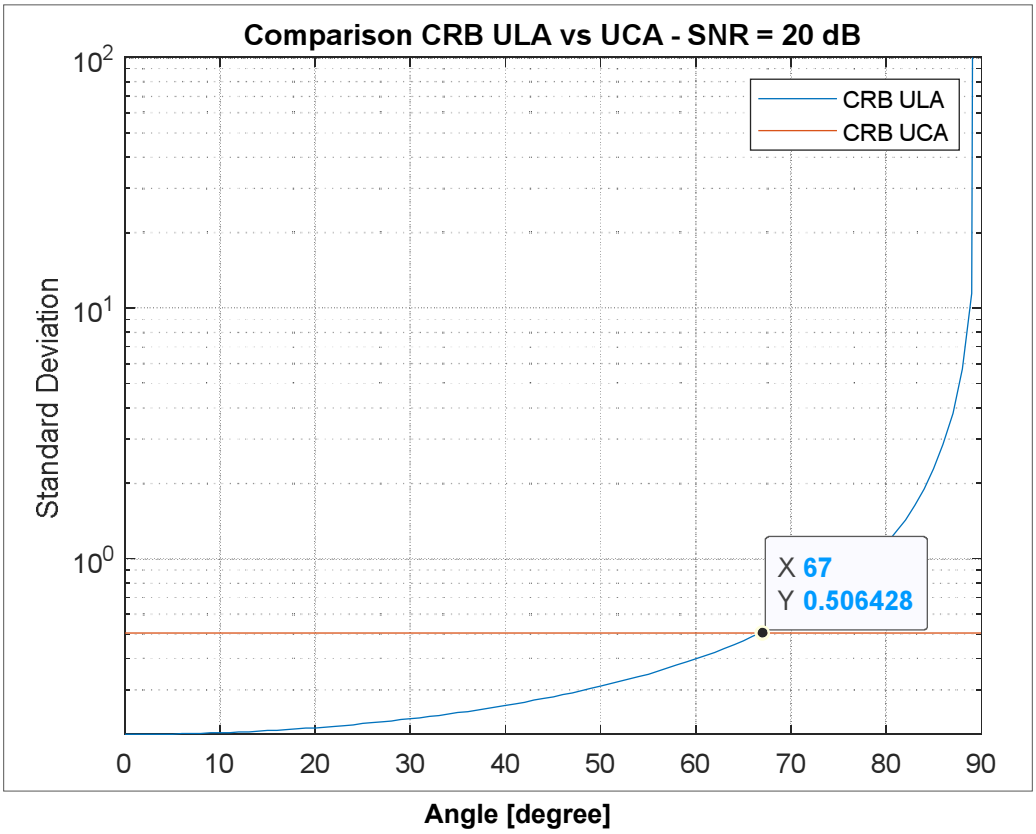
Keywords: HF communication, C-ESM, HF compact Antennas, Ionospheric study, Raytracing 3D, AI, Direction of Arrival (DoA), Single Site Location (SSL)

DEEP TRACE

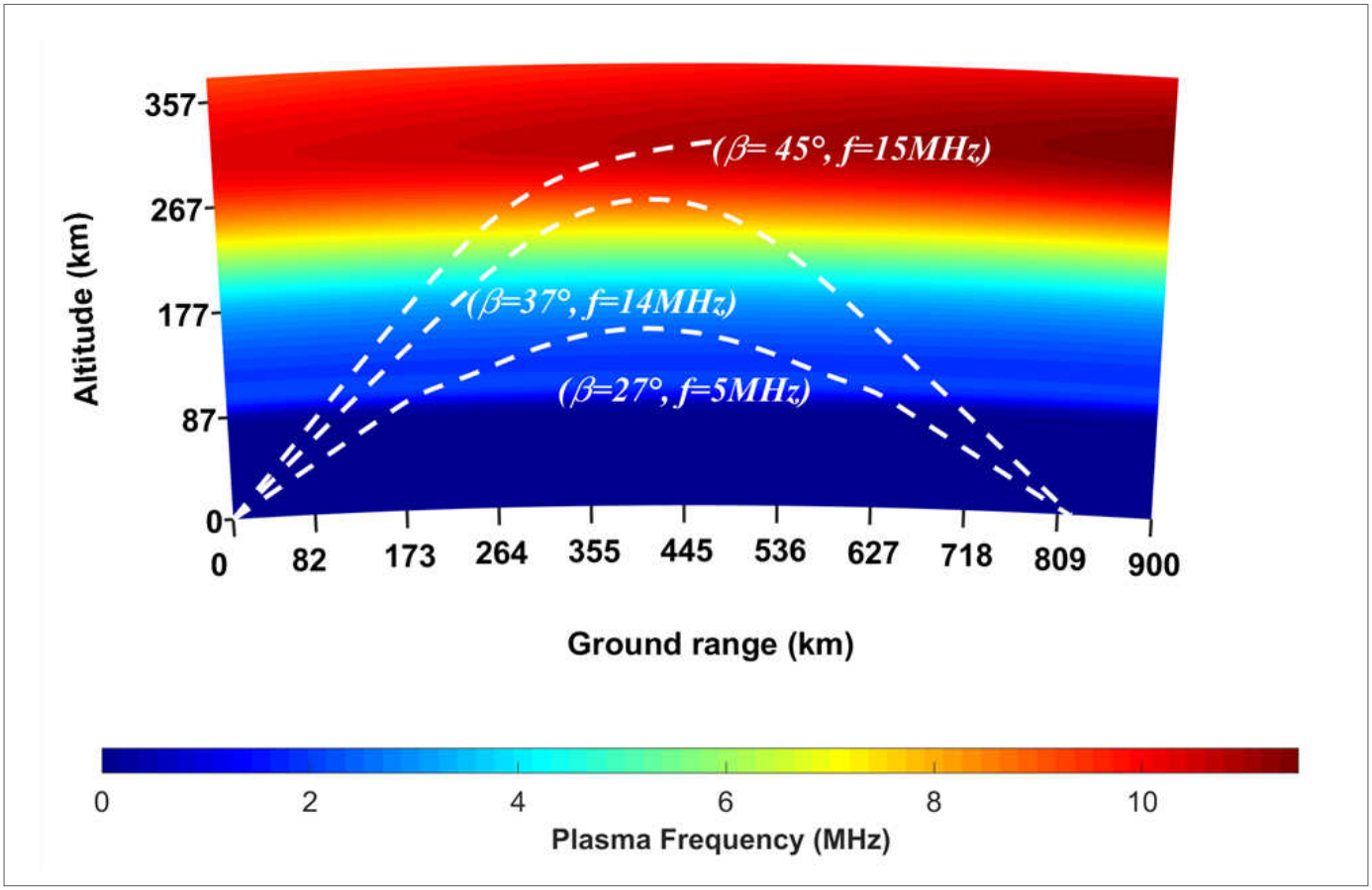
Technical Sheet
Funding institution:
Italian MoD
Project partners
ECHOES s.r.l., FreeSpace s.r.l
Project duration
June 2021 - ongoing
Involved countries
Italy



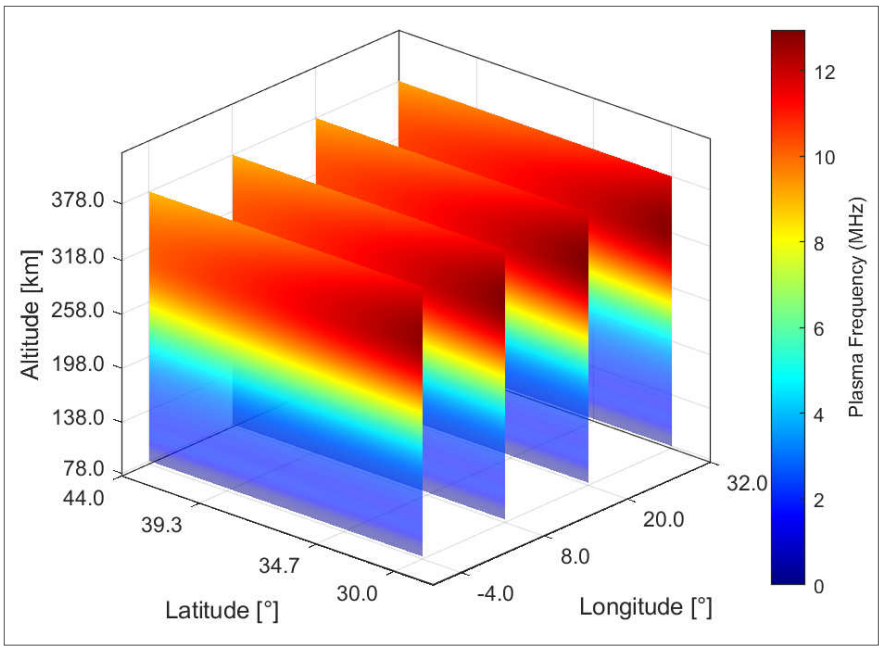
(a) DEEP-TRACE High-level architecture



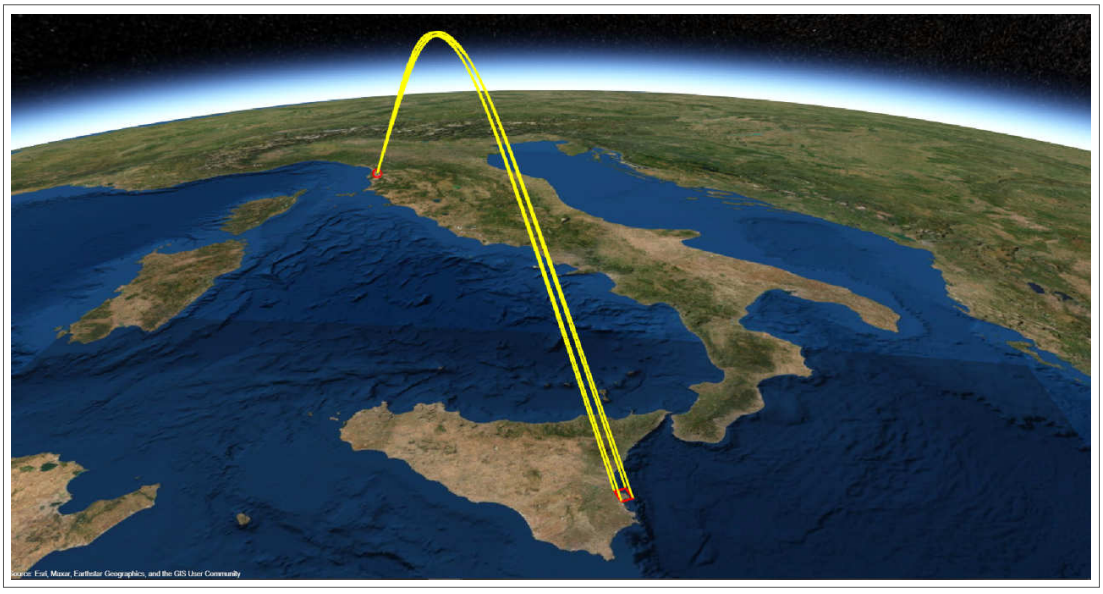
(b) Beamforming performance comparison: Uniform Linear Array (ULA) vs Uniform Circular Array (UCA) (SNR=20 dB)



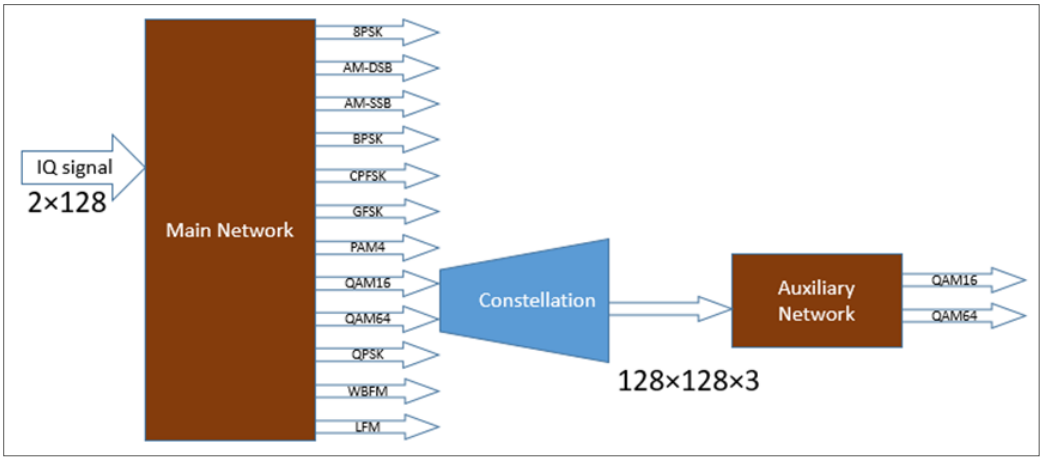
(c) Electron density profile and ray-paths formation related to the reference scenario



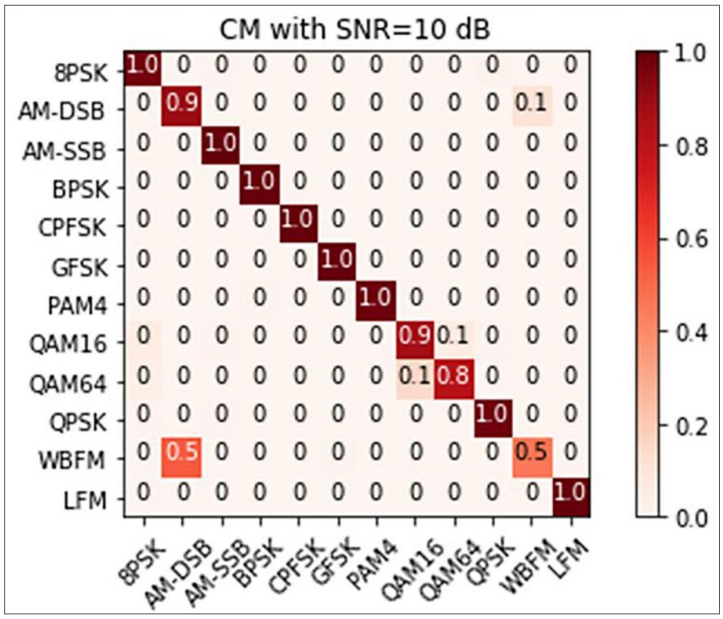
(d) Longitude slices of the 3D Electron density related to the reference scenario



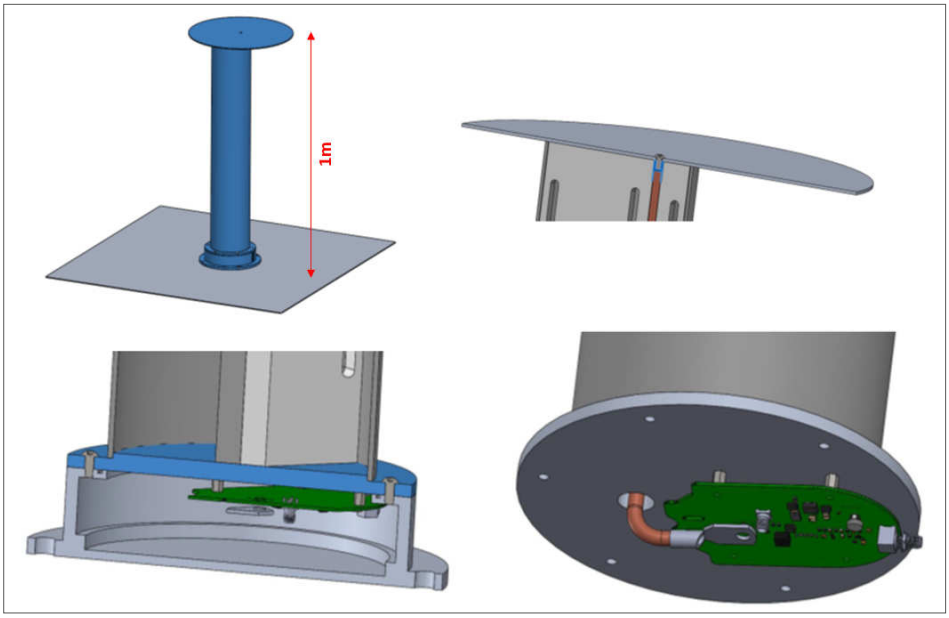
(e) 3D ray tracing outcome for the transmitter localization in the reference scenario



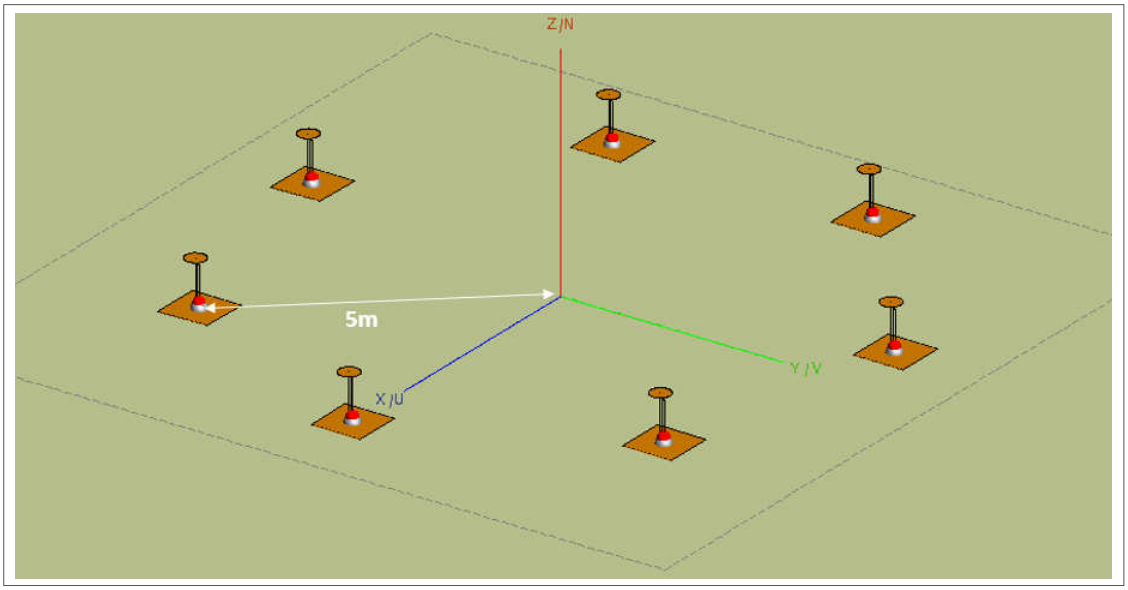
(f) The CNN-based automatic modulation classification architecture. The auxiliary network resolves the ambiguity between the two similar modulations (QAM16, QAM64) to enhance the overall accuracy



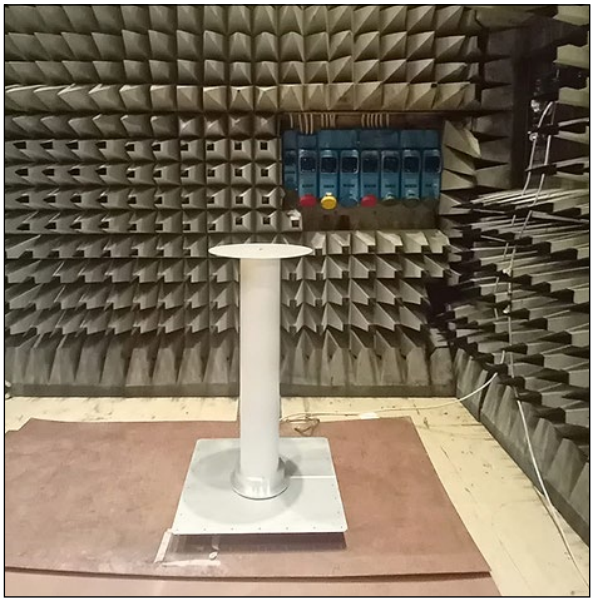
(g) The confusion matrix of the proposed automatic modulation classification architecture at SNR=10dB



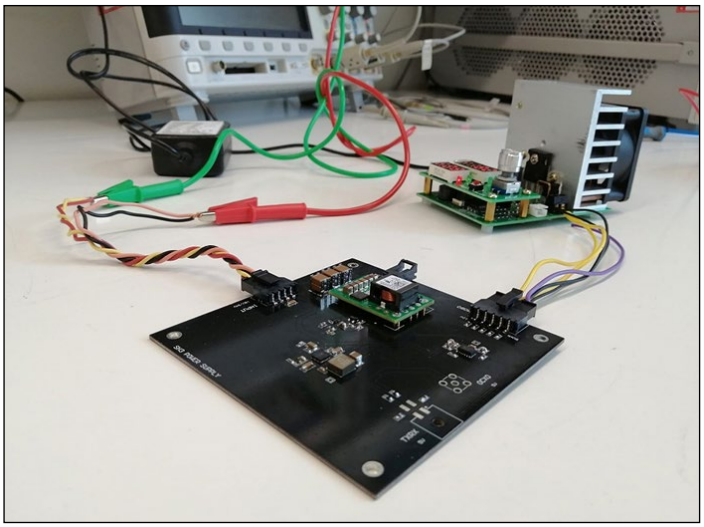
(h) Preliminary mechanical project of the antenna (single element of the array) including, at the bottom, the PCB of the amplifier performing the matching with the front-end of the receiver. The antenna is very compact having an overall dimension of about 1m



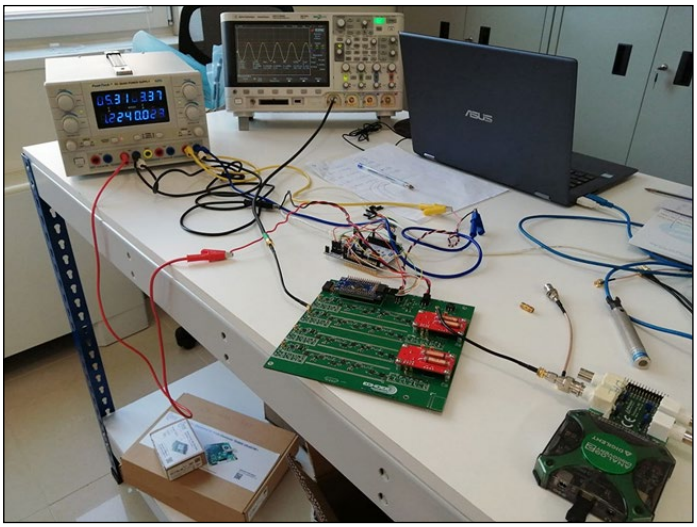
(i) EM model of the circular array for the DOA estimation. The array diameter is about 10m and it can be easily deployed in the operative scenario due to the compact antennas



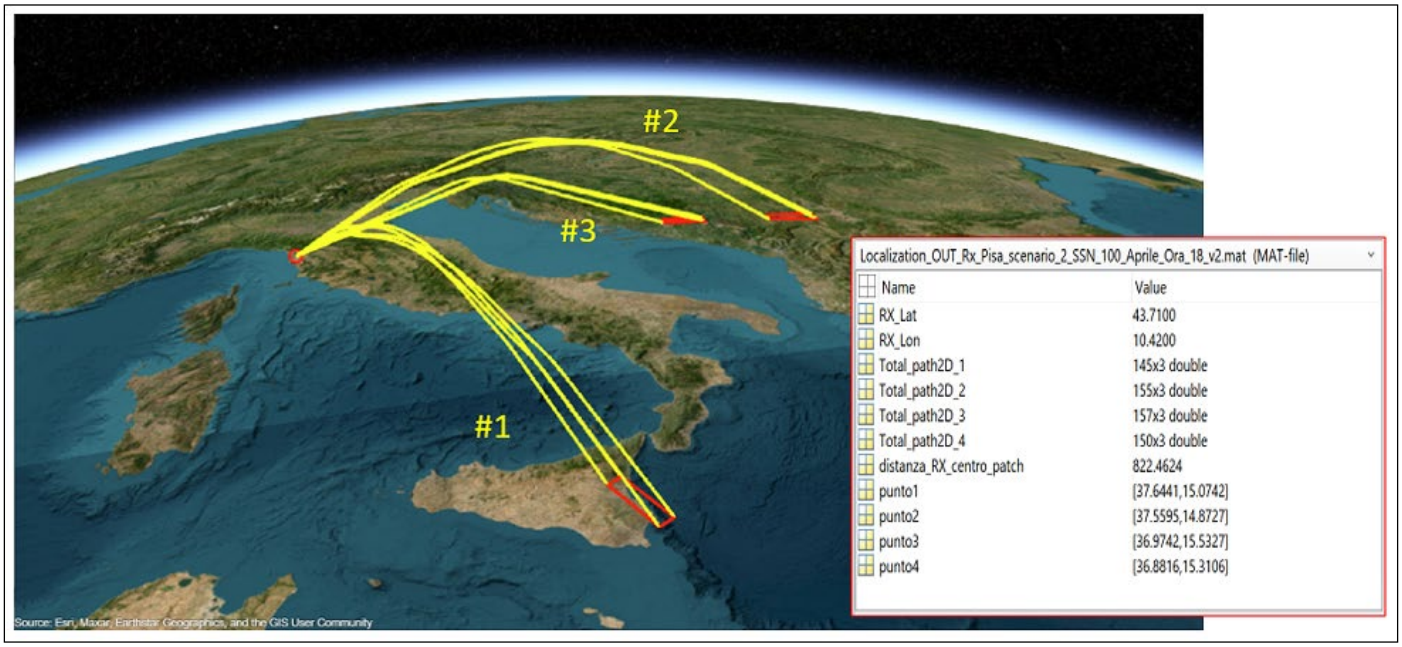
(l) antenna in the anechoic chambers for the test measurements (courtesy of Free Space S.r.l.)



(m) Measurement setup of the Power Supply Unit of the SDR receiver (courtesy of ECHOES S.r.l.)



(n) Setup test amplification chain (courtesy of ECHOES S.r.l.)



(o) Graphical and numerical output related to localization test.

PROJECT DRN

Drone Radar Network

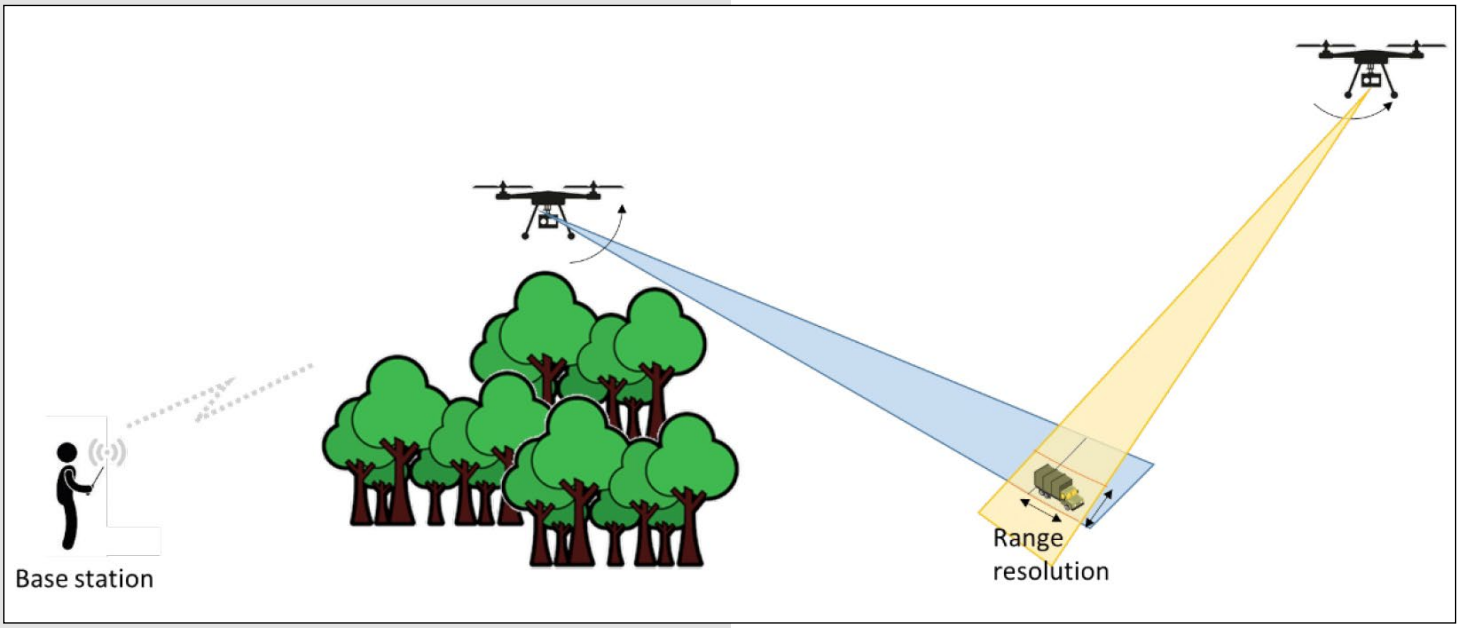
In tactical environments, the need for a swift and adaptable surveillance system is evident for small ground troops and medium-sized coastal vessels. Ground troops on the move and boats navigating coastal waters require real-time updates on their surroundings and timely alerts about potential threats or nearby movements. Existing communication systems often fail to provide comprehensive details or timely updates, leading troops to rely on semi-fixed surveillance tools like portable radars, which are limited by terrain obstacles and lack adaptability in dynamic situations. Similarly, coastal naval operations face challenges due to obscured threats from coastal topography and potentially insufficient command-provided information, increasing associated risks. There is a clear need for an innovative, cost-effective, and versatile surveillance system not currently available in the market.

The proposed solution involves deploying easily launched drones equipped with sensors from various ground points or small boats. These drones offer lightweight, portable systems for continuous perimeter surveillance. Their dynamic surveillance capabilities allow for the detection of threats both in the air and on land, adapting to changing scenarios. Equipped with radar sensors, these drones operate independently of lighting or weather conditions, unlike electro-optical systems. This solution also enhances naval tactical scenarios by transforming shipboard radars into multi-static systems, enabling obstacle scouting and improved target detection, tracking, and recognition.

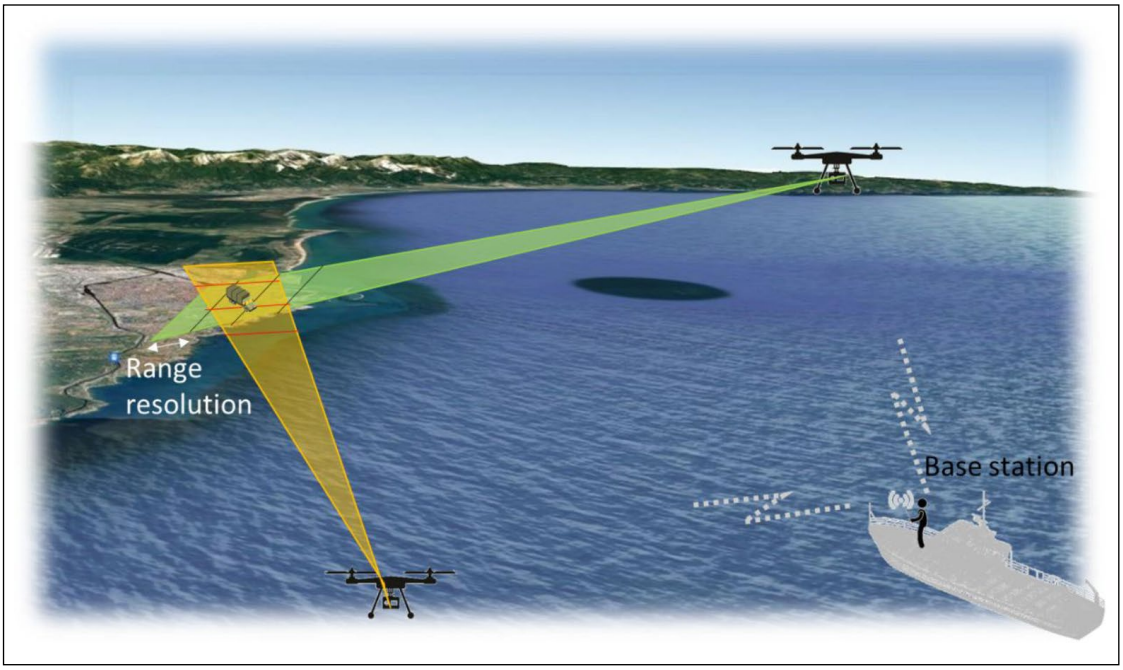
The project's primary goal is to demonstrate drone swarm technology, focusing on developing and integrating surveillance and collision avoidance systems, and creating algorithms for efficient drone-based surveillance in both land and maritime tactical operations. This initiative aims to overcome current surveillance limitations, providing a dynamic and adaptable solution for tactical scenarios on land and at sea.

Keywords: SAR Imaging, Drones, Radar Network

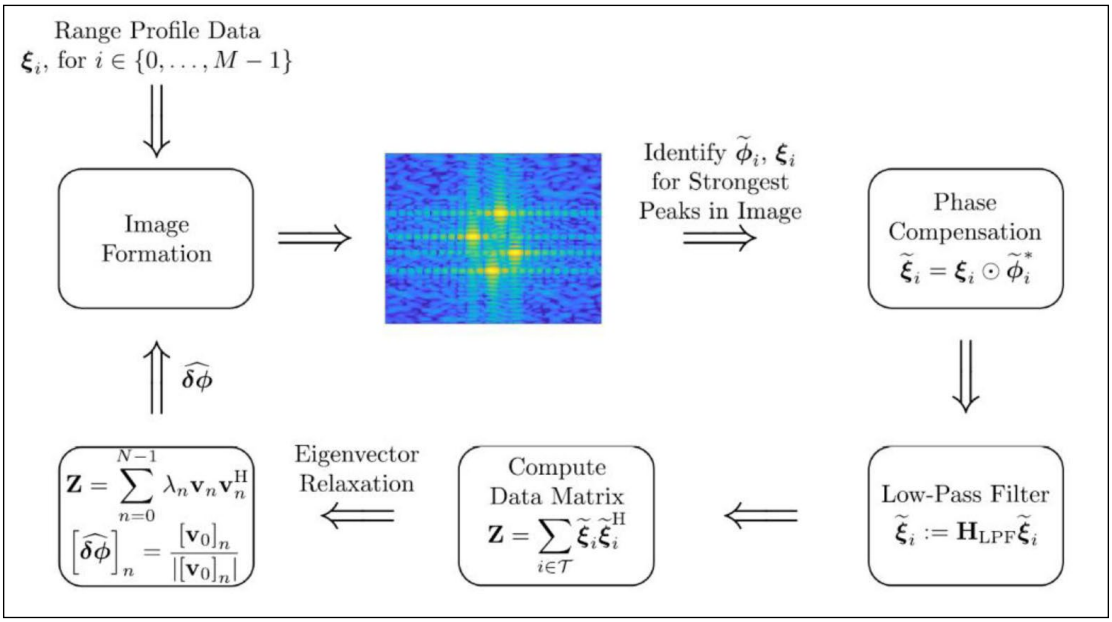
Technical Sheet
Funding institution:
Italian MoD
Project partners
ECHOES S.R.L, ARESYS, SIGMA INGEGNERIA S.R.L.
Project duration
October 2022 - ongoing
Involved countries
Italy



(a) Ground tactical surveillance: detection and localization of moving targets



(b) Maritime tactical surveillance: detection and localization of moving targets



(c) Generalized Phase Gradient Algorithm for SAR imaging.

PROJECT FARADAI

Frugal and Robust AI for Defence Advanced Intelligence

The project "Frugal and Robust AI for Defence Advanced Intelligence" (FaRADAI) focusses on frugal learning, i.e. the ability of a system to adapt and learn from its environment, including from user supervision, for a reasonable cost and without intervention from expert developers. An important cross-cutting need for Artificial Intelligence is to create technologies for reliable, autonomous, and frugal learning, i.e. the ability of a system to adapt and learn from its environment, including from user supervision, at a reasonable cost and without intervention of expert developers nor regression.

Such technologies can be highly disruptive and have a high impact on many capabilities, especially when the information to be managed is highly variable or unpredictable and high adaptability is required.

These technologies can also alleviate the current need to provide data to system developers to achieve improvements depending on that data, which can be critical when the data is sensitive, and is therefore critical for defence. They can improve technological independence more generally. Selected actions should include the organization of technology challenges that address well-defined objectives in order to initiate and drive progress towards addressing identified defence needs, while simultaneously leveraging civilian research and generating spillover effects.

As part of the FaRADAI project, current advances in artificial intelligence technologies will be thoroughly studied in parallel with a detailed study of the main challenges imposed by a defense system. Aiming for significant breakthroughs in artificial intelligence, the models will accelerate their wider application and deployment in defense systems, increasing their impact and overall performance.

Keywords: Target Classification, Artificial Intelligence

Technical Sheet

Funding institution:

EU EDF

FaRADAI has received funding from the European Union's EDF programme under grant agreement No 101103386.

Funded by the European Union

Project partners

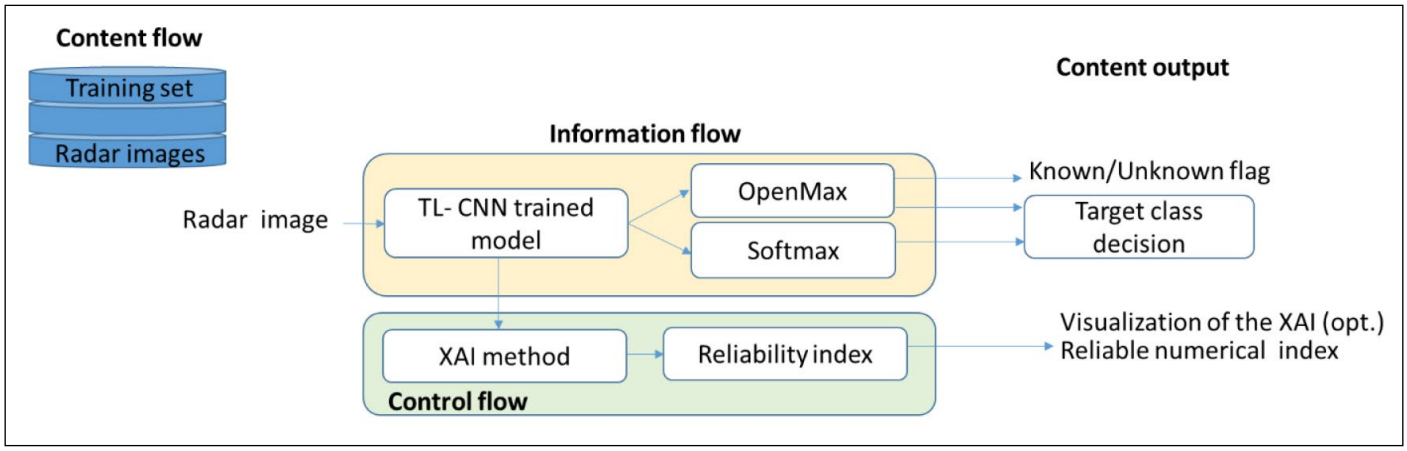
ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS, ANAPTYXIS - CERTH, BALTIJOS PAZANGIU TECHNOLOGIJU INSTITUTAS, BIANOR SERVICES EOOD, C&V CONSULTING, COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES, DEFSECINTEL SOLUTIONS OU, E-GEOS SPA, EXUS SOFTWARE MONOPROSOPI ETAIRIA, PERIORISMENIS EVTHINIS, FLYSIGHT SRL, FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER, ANGEWANDTEN FORSCHUNG E.V., FUNDACION TECNALIA RESEARCH & INNOVATION, HENSOLDT OPTRONICS GMBH, INDRA SISTEMAS SA, INFILI TECHNOLOGIES SOCIETE ANONYME, INSTITUT PO OTBRANA, LEONARDO - S.p.A., LINK CAMPUS UNIVERSITY, MARINTRAFIK OPEREISONS ANONYMI, ETAIREIA PLIROFORIKIS, MBDA ITALIA S.p.A., NATIONAL CENTER FOR SCIENTIFIC, RESEARCH "DEMOKRITOS", NAVAL GROUP, NEDERLANDSE ORGANISATIE VOOR TOEGEPAST, NATUURWETENSCHAPPELIJK ONDERZOEK TNO, OKTAL SYNTHETIC ENVIRONMENT, RHEINMETALL ELECTRONICS GMBH, RIGAS TEHNISKA UNIVERSITATE, SAFRAN ELECTRONICS & DEFENSE, SATWAYS, SKA POLSKA SPOLKA Z OGRANICZONA, ODPOWIEDZIALNO, STAM SRL, SZAMITASTECHNIKAI ES AUTOMATIZALASI KUTATOINTEZET, THALES France, THALES PROGRAMAS DE ELECTRONICA Y COMUNICACIONES SA, THALES SIX GTS FRANCE SAS, UNIVERSIDAD POLITECNICA DE MADRID

Project duration

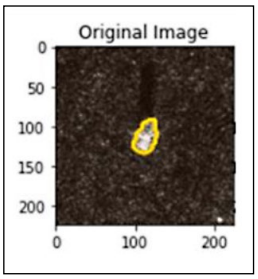
December 2022 - ongoing

Involved countries

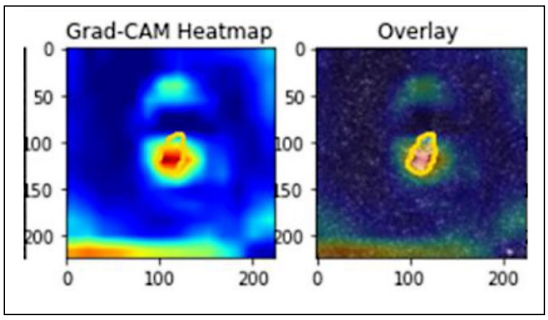
Lithuania, Bulgaria, Belgium, Estonia, Germany, Spain, Greece, France, Netherlands, Latvia, Poland, Italy, Hungary



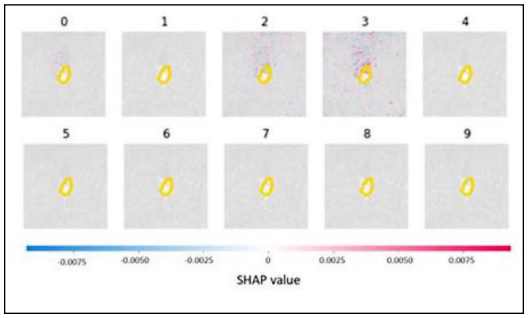
(a) AI-base architecture for NCTR using radar images



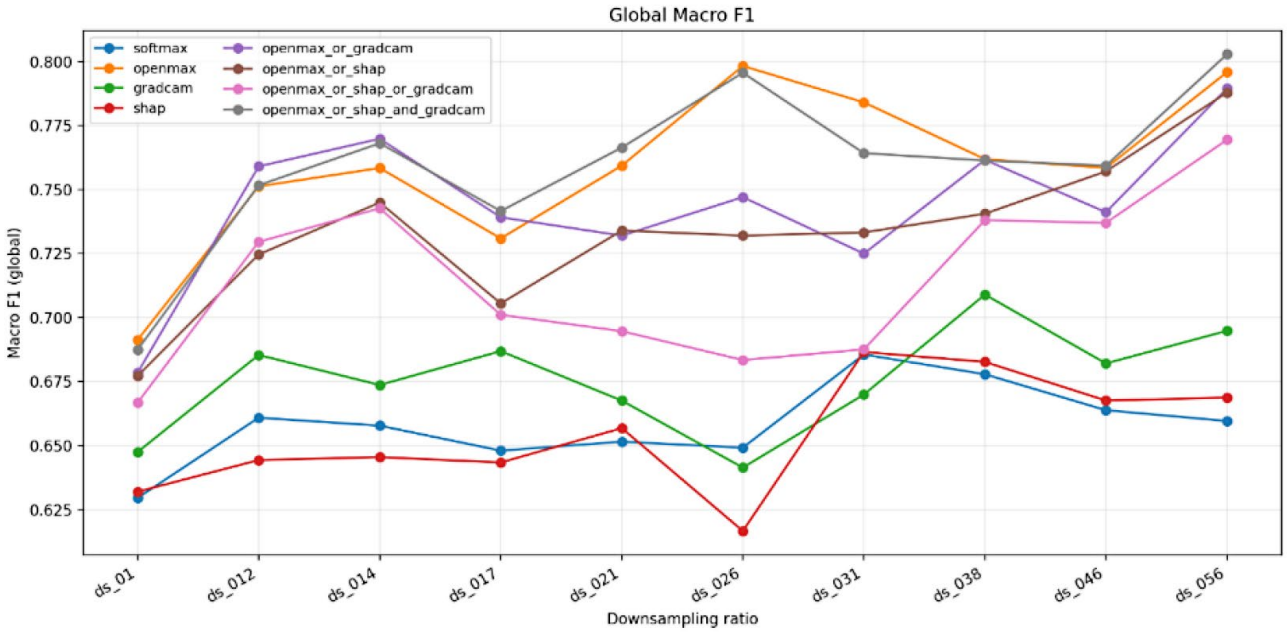
(b) XAI module output: sample test image



(c) XAI module output: Grad-CAM Heatmap



(d) XAI module output: SHAP explanation maps



(e) Global Macro F1 of single and integrated blocks.

PROJECT FESPAN

Forecasting Electromagnetic Signal Propagation Anomalies

FESPAN will improve the future situational awareness capabilities of European defence at tactical and operational levels by contributing to the development of use cases and requirements for the future tactical decision-making support tool. The work carried out within FESPAN will pave the way for the study and development of novel signal analysis and processing capabilities. The study focuses on analysing propagation anomalies to understand their impact on signal propagation. An example is the case of hypersonic threats, where signal propagation occurs through a plasma layer that could deflect or disrupt propagation, with effects on the radar's detection of the object.

Keywords: Propagation Anomalies, RCS estimation, HT tracking, Hypersonic threats, Plasma

Technical Sheet

Funding institution:

EDF Project - European Commission

Funded by the European Union

Project partners

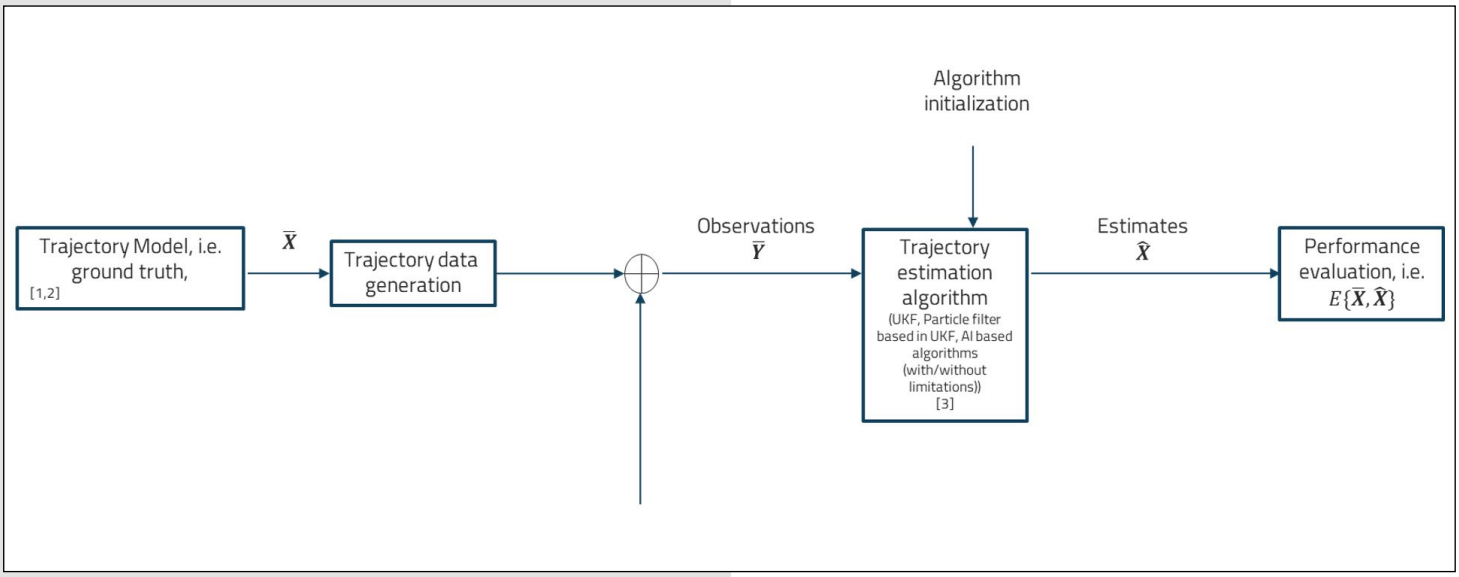
Teknologian Tutkimuskeskus Vtt Oy, Ait Austrian Institute Of Technology Gmbh, Commissariat A L Energie Atomique Et Aux Energies, Alternatives, Elettronica Spa, Fondazione Links, Leading Innovation & Knowledge For Society, Forsvarets Forskninginstitutt, Fraunhofer Gesellschaft Zur Forderung Der, Angewandten Forschung Ev, Free Space Srl, Hensoldt Sensors Gmbh, Ilmatieteen Laitos, Institut Franco, Allemand De Recherches De Saint Louis, Lulea Tekniska Universitet, Naval Group, Nederlandse Organisatie Voor Toegepast, Natuurwetenschappelijk Onderzoek Tno, Office National D'etudes Et De Recherches Aerospatiales, Politechnika Warszawska, Qamcom Research And Technology Ab, Reaktor Innovations Oy, Terma As, Thales Six Gts France Sas, Totalforsvarets Forskningsinstitut, Uppsala Universitet

Project duration

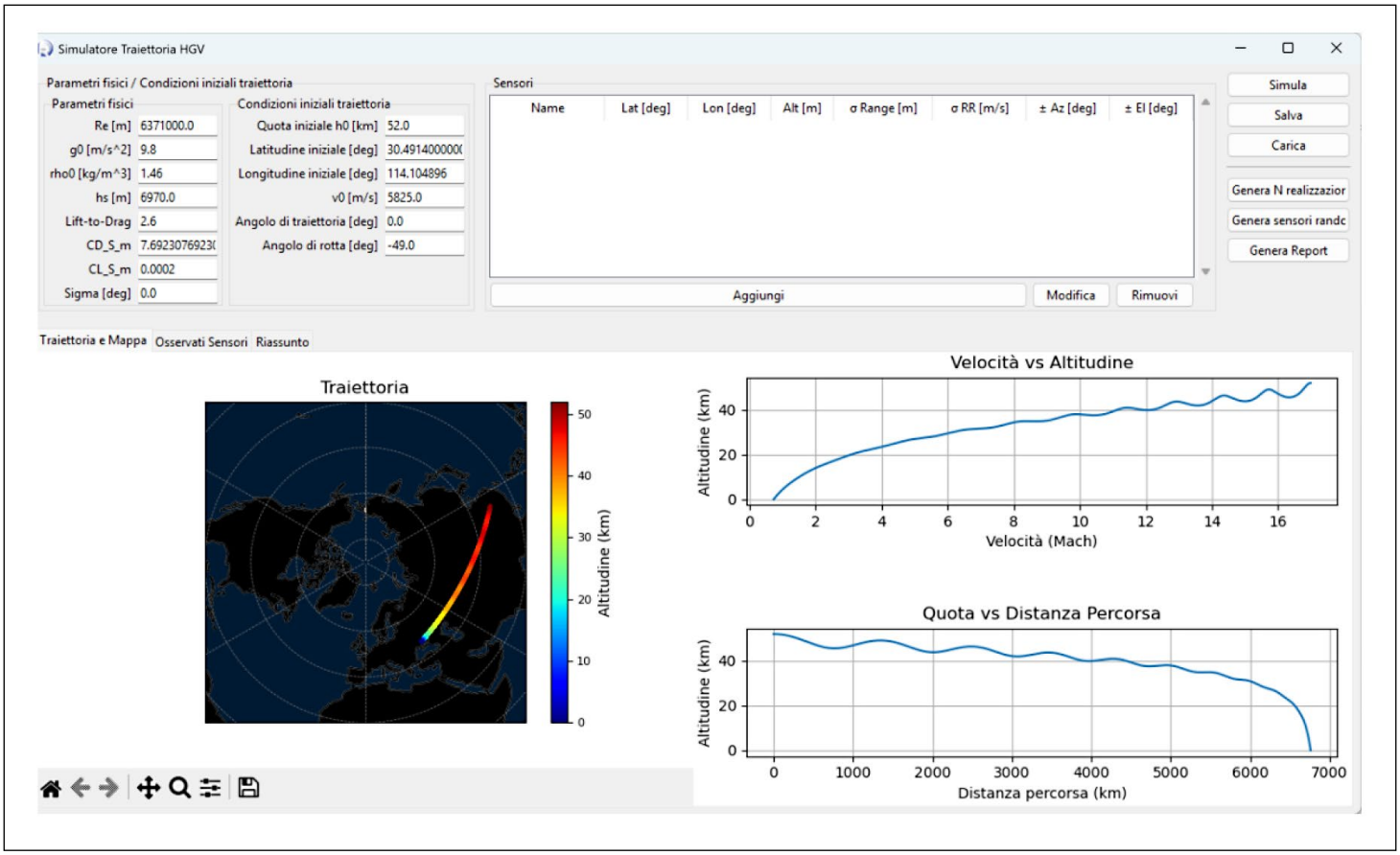
December 2024 -December 2027

Involved countries

Finland, Austria, France, Italy, Norway, Germany, Sweden, The Netherlands, Poland, Denmark



(a) Flow activity chart for trajectory estimation



(b) Preliminary output of trajectory simulator.

PROJECT iFURTHER

High FreqUency oveR The Horizon sensors' cognitivE networRk

iFURTHER

The iFURTHER project aims to address wide area air and sea covert surveillance, by developing new concepts of Over-The-Horizon radar to be integrated into a collaborative network of high-frequency sensors. This project will therefore focus on a cognitive network of high-frequency radars as a disruptive future defence capability to protect the EU. The main objectives of this project are:

- Detect and track air and sea targets at long range (over the horizon), far beyond currently existing systems, by using the reflections of skywave and surface-wave propagated signals.
- Fill gaps and extend the current EU air and sea radar coverage by introducing a multistatic sensor configuration supported by ad-hoc network protocols and an appropriate infrastructure for synchronisation and coordination of sensors (e.g., C2).
- Implement cognitive radar management systems to optimise operational parameters in real time and as a function of environmental conditions (e.g., the state of the ionosphere), based on robust ionospheric models and sounding protocols (not excluding the development of ionospheric sensors).
- Implement advanced signal processing techniques to improve over-the-horizon detection and track performance as well as target localisation capabilities.
- Utilize available non cooperative illumination and apply cognitive features at network level to develop new techniques for optimized use of the electromagnetic spectrum and passive processing.

Keywords: HF-OTH (Over-The-Horizon) radar, Cognitive Radar, HF communications, 3D ionospheric raytracing, Digital array processing.

Technical Sheet

Funding institution:

iFURTHER is a research project funded by the European Defence Fund under EDF-2021-DIS-RDIS-OTHR-2 "Research for disruptive technologies for defence applications" - Grant Agreement No. 101103607

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Project partners

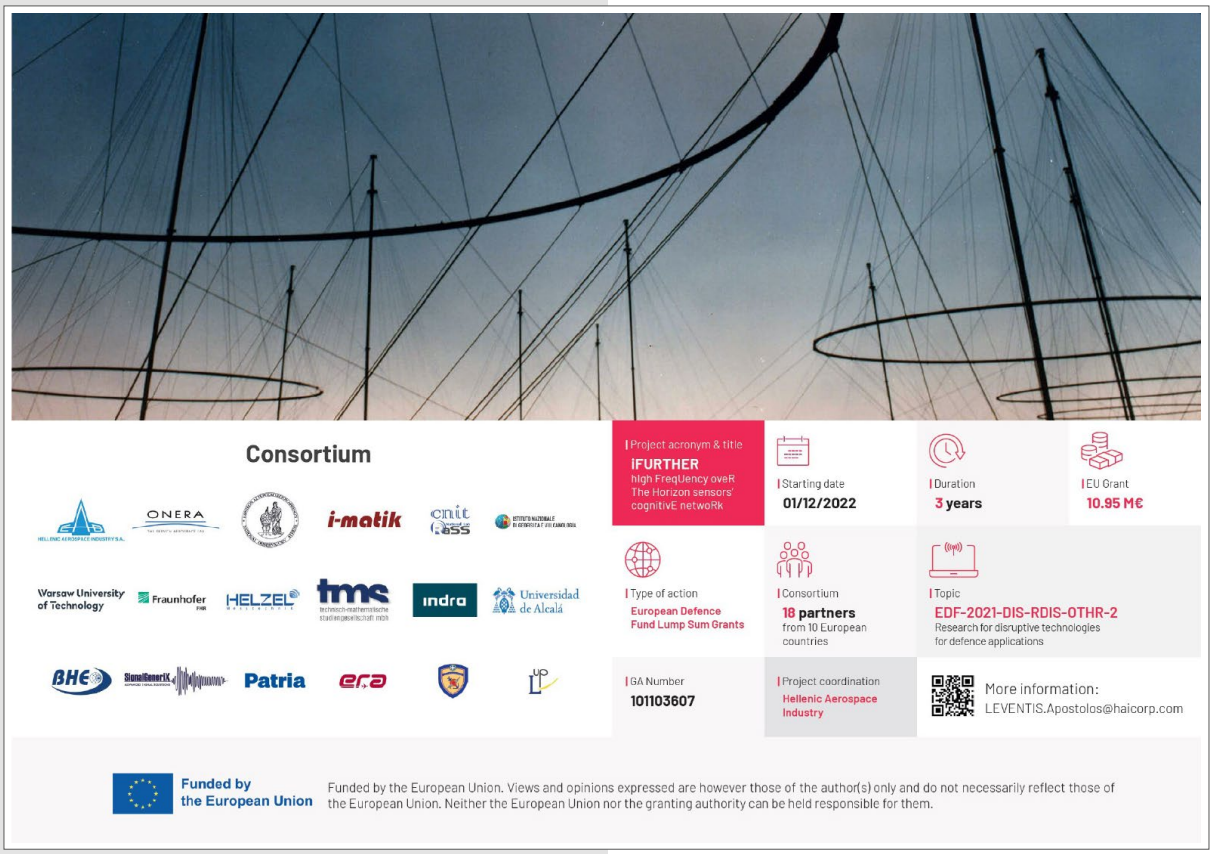
Hellenic Aerospace Industry SA, Office National D'etudes Et De Recherches Aerospatiales, Ethniko Asteroskopeio Athinon, Imatik - Efarmoges Ypsilis Texnologias Etaireia Periorismenis Efthinis, Consorzio Nazionale Interuniversitario per le Telecomunicazioni, Istituto Nazionale di Geofisica e Vulcanologia, Politechnika Warszawska, Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.V., Helzel Messtechnik GmbH, Technisch-Mathematische Studiengesellschaft Mit Beschrankter Haftung, Indra Sistemas SA, Universidad De Alcala, SignalGenerix Limited, Patria Aviation Oy, Era AS, Ministry Of National Defence, Greece, L - up SAS

Project duration

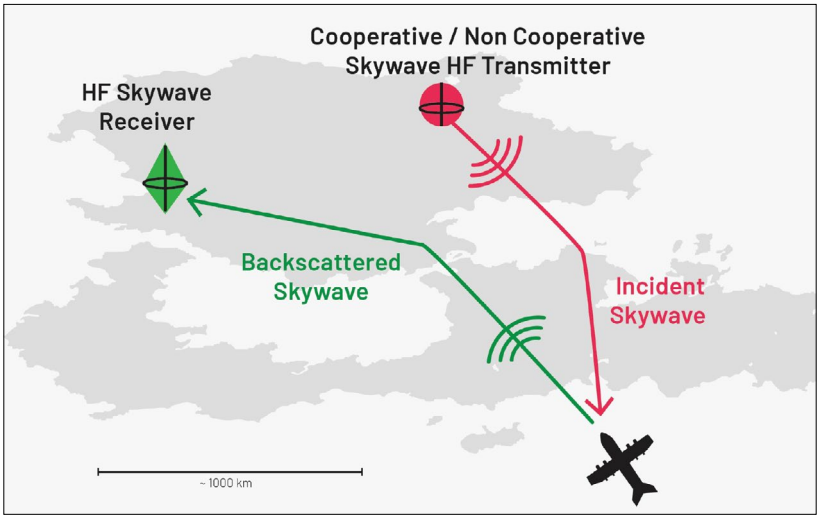
December 2022 - November 2025

Involved countries

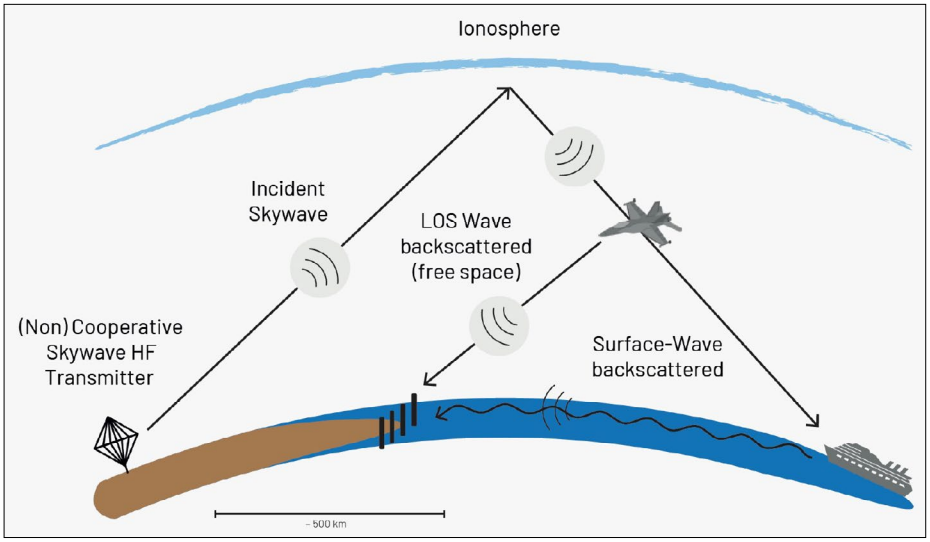
Italy, Greece, Germany, Czech Republic, Spain, France, Finland, Poland, Cyprus



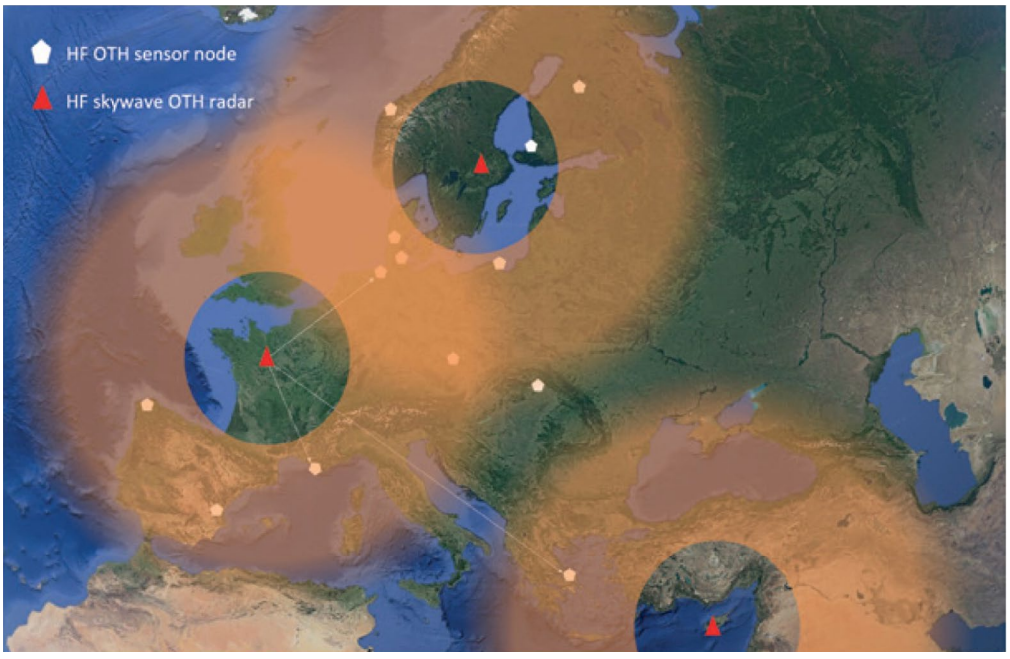
(a) iFURTHER overview



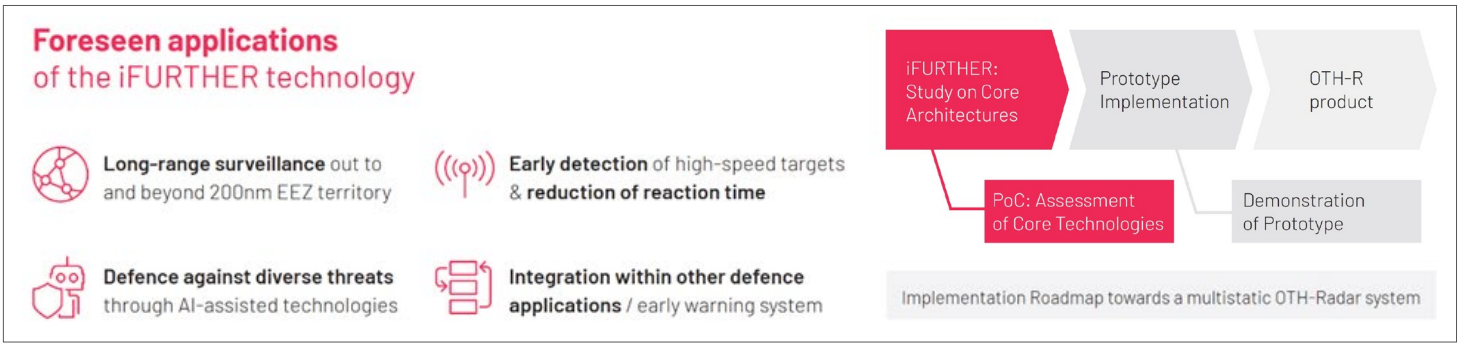
(b) Multistatic Skywave OTH-R system with long baseline: Concept



(c) Multistatic Hybrid (Skywave -LOS/Surface-wave) OTH-R system: Concept



(d) Envisioned EU-wide surveillance



(e) Foreseen applications and implementation Roadmap towards an OTH Radar product

(f) Consortium Members in the Final Review Meeting.

PROJECT ISS

The aim of this project is to analyse the technological and algorithmic solutions for a Target Motion Analysis (TMA) system for submarines.
Particularly, a software-defined architecture is proposed to host a wide spectrum of software applications dedicated to the management of on-board systems. Using a distributed shared server architecture, data can be available from multiple users at the same time, without the need of execution on dedicated consoles. The proposed architectural approach allows to limit the space required for the HW, for which an architecture has been proposed, introducing energy saving factors and minimizing the need for heat dissipation. The modularity of the architecture makes it easy to integrate possible updates both HW (to increase system computational capabilities) and SW (to update automatic information analysis capabilities) and ensure interoperability with solutions from any future developments.
Given the software-defined nature of the system, a particular focus has been the cybersecurity aspects, adopting a security-by-design strategy, which provides the integration of special security systems in each element of the developed system. In addition, advanced artificial intelligence algorithms were taken into account to allow the identification and mitigation of any cyber attacks.
Finally, TMA and data fusion algorithms have been analysed, focusing on the integration of different type of sensors in the system without the need to modify the software.

Keywords: Submarine Tracking, Target Motion Analysis (TMA), Cyber Security, Passive Sonar.

Technical Sheet
Funding institution:
DRASS
Project partners
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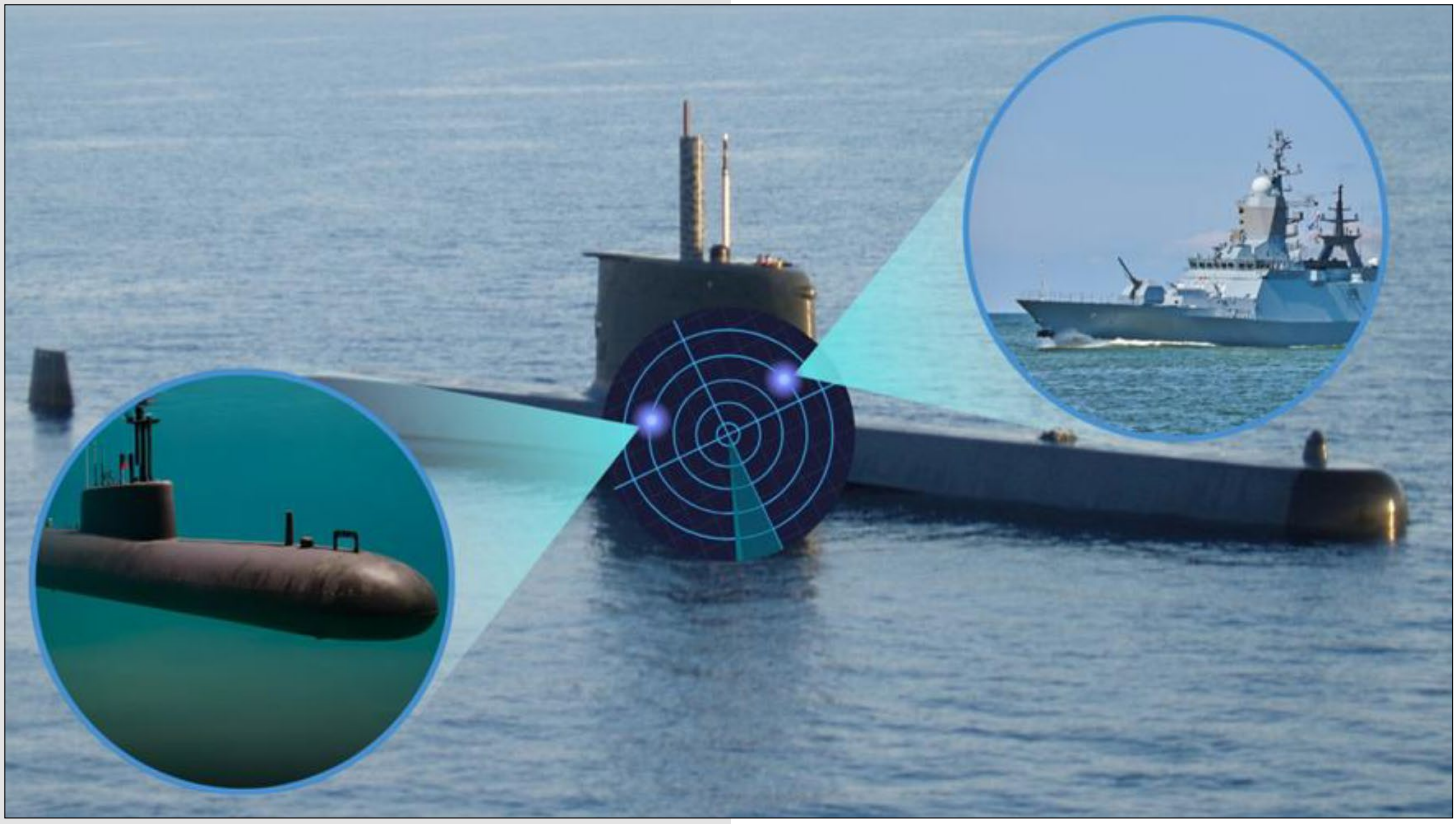
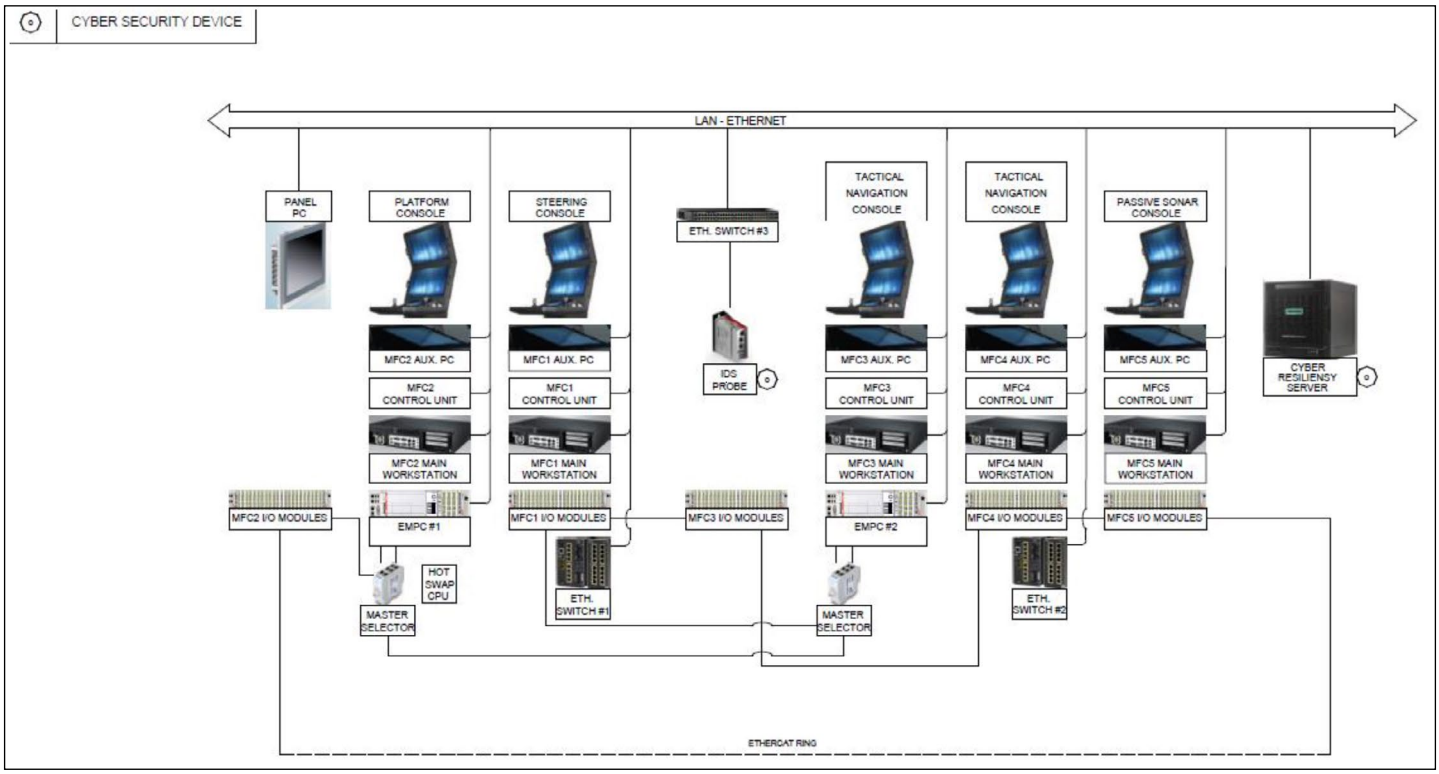
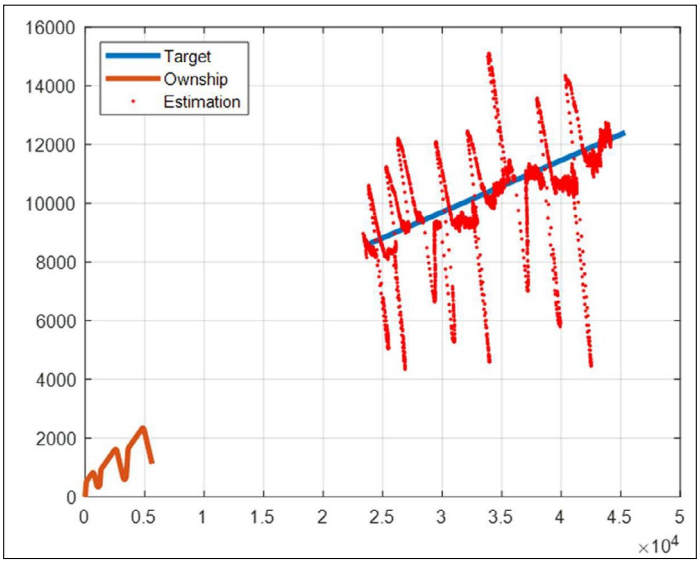
Project duration
JJanuary 2021 - July 2025
Involved countries
Italy



(a) The system will track both surface and underwater target



(b) Possible hardware configuration of a command and control system



(c) TMA simulation results

(d) Final Demonstrator.

PROJECT LEO-TO-VLEO

Mission driven LEO to VLEO satellites for defence operations

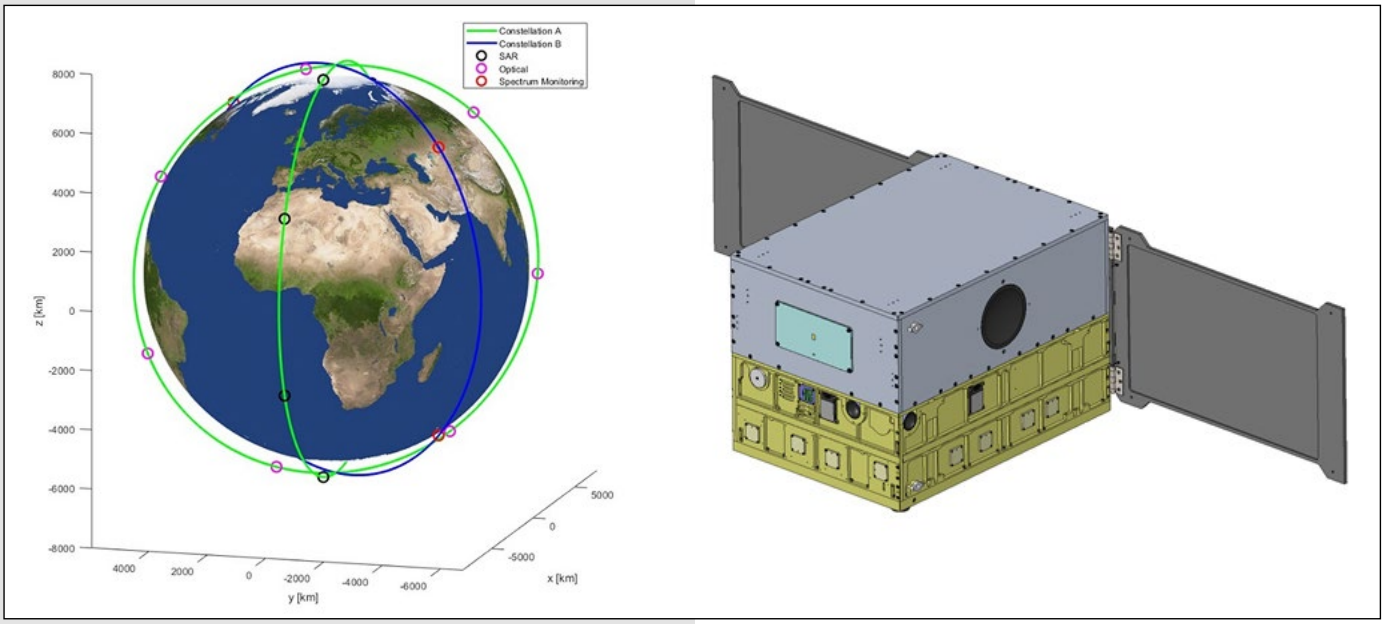
The main objectives of this project focus on developing a comprehensive business case for the use of Low Earth Orbit (LEO) to Very Low Earth Orbit (VLEO) satellites in military applications, emphasizing their feasibility, benefits, and challenges. The LEO-to-VLEO system operates in a dual-mode configuration: satellites maintain functionality in a low-altitude parking orbit within LEO for routine operations and descend to VLEO under conditions demanding enhanced performance. This transition allows for superior resolution and improved sensor capabilities in critical scenarios.

The project seeks to define precise technical requirements for satellite design, covering aspects such as spatial and temporal coverage, sensor capabilities, communication quality, security, and interoperability to ensure alignment with military needs.

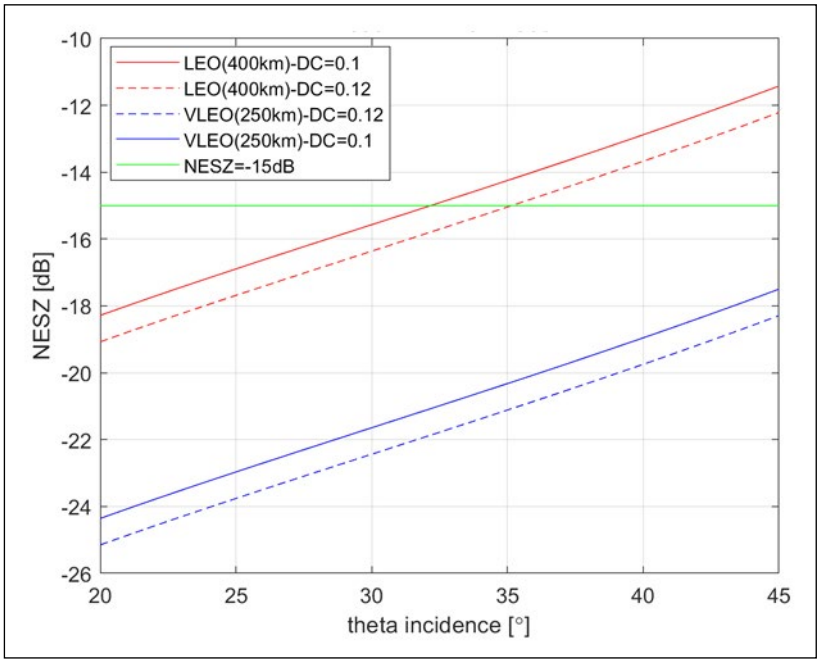
A preliminary design phase is also included, involving the creation of preliminary architectural specifications, 3D models, and full-scale mock-ups to validate design feasibility and optimize system efficiency. Additionally, the project prioritizes European non-dependence on critical components and technologies, addressing risks associated with external dependencies and fostering strategic autonomy. Beyond technical milestones, this initiative aims to enhance European leadership in space technology, contributing to its defense capabilities, resilience, and sovereignty in a competitive global landscape.

Keywords: Satellite and payload design, CONOPS, propulsion system.

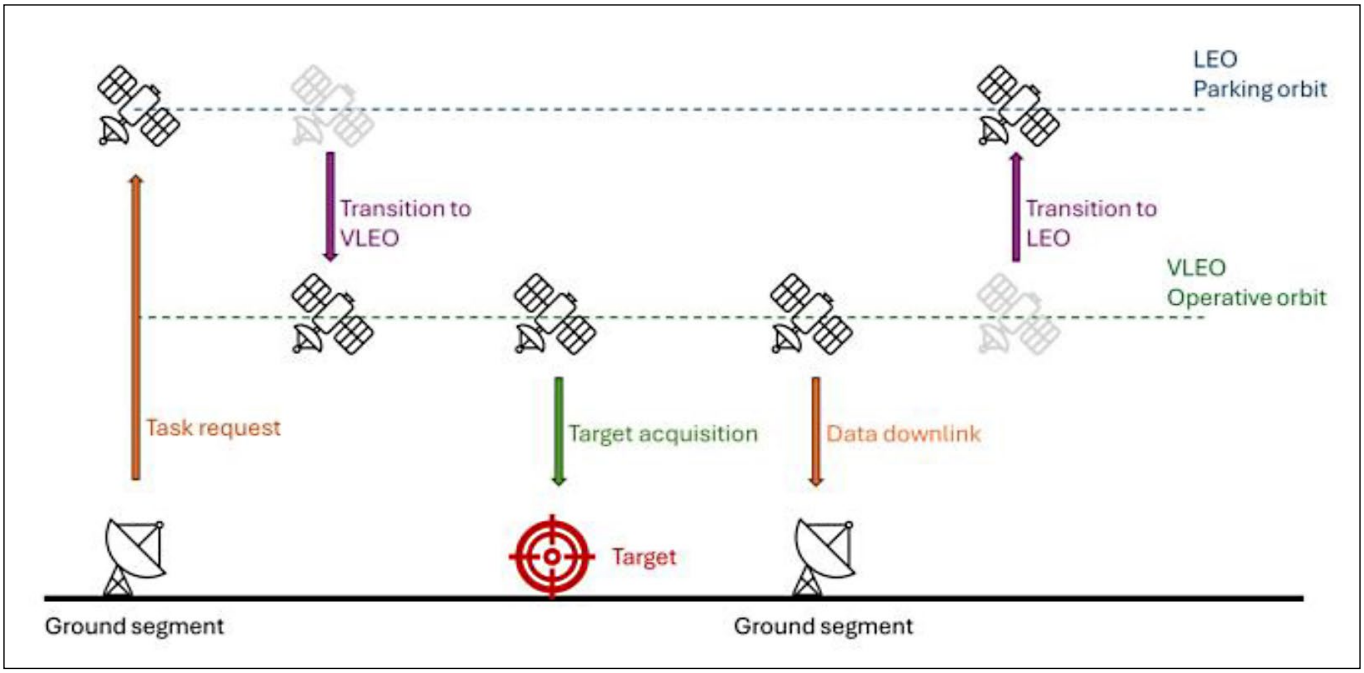
Technical Sheet
Funding institution:
EDA
Project partners
TYVAK International, Politecnico di Milano, FlySight
Project duration
March 2024 - March 2025
Involved countries
Italy



(a) Satellite constellation (from PoliMi) satellite bus (NEBULA from Tyvak)



(b) SAR payload preliminary - performance (NESZ) comparing VLEO and LEO orbits



(c) System Concept of Operations.

PROJECT MAELSTROM

Modern approaches to enhanced electromagnetic sensing through Orbital Angular Momentum radar

MAELSTROM project addresses the exploratory assessment of vortex (orbital angular momentum, OAM) radar concepts for defence-oriented sensing applications. The project aims to evaluate whether structured electromagnetic wavefronts carrying angular momentum can provide measurable advantages over conventional beamforming techniques in selected operational contexts, without assuming their replacement of established radar architectures. The focus is placed on realistic radar use cases relevant to ISTAR, seeker-like tracking, and target discrimination, where angular information, robustness at low signal-to-noise ratio, or additional motion features may be beneficial.

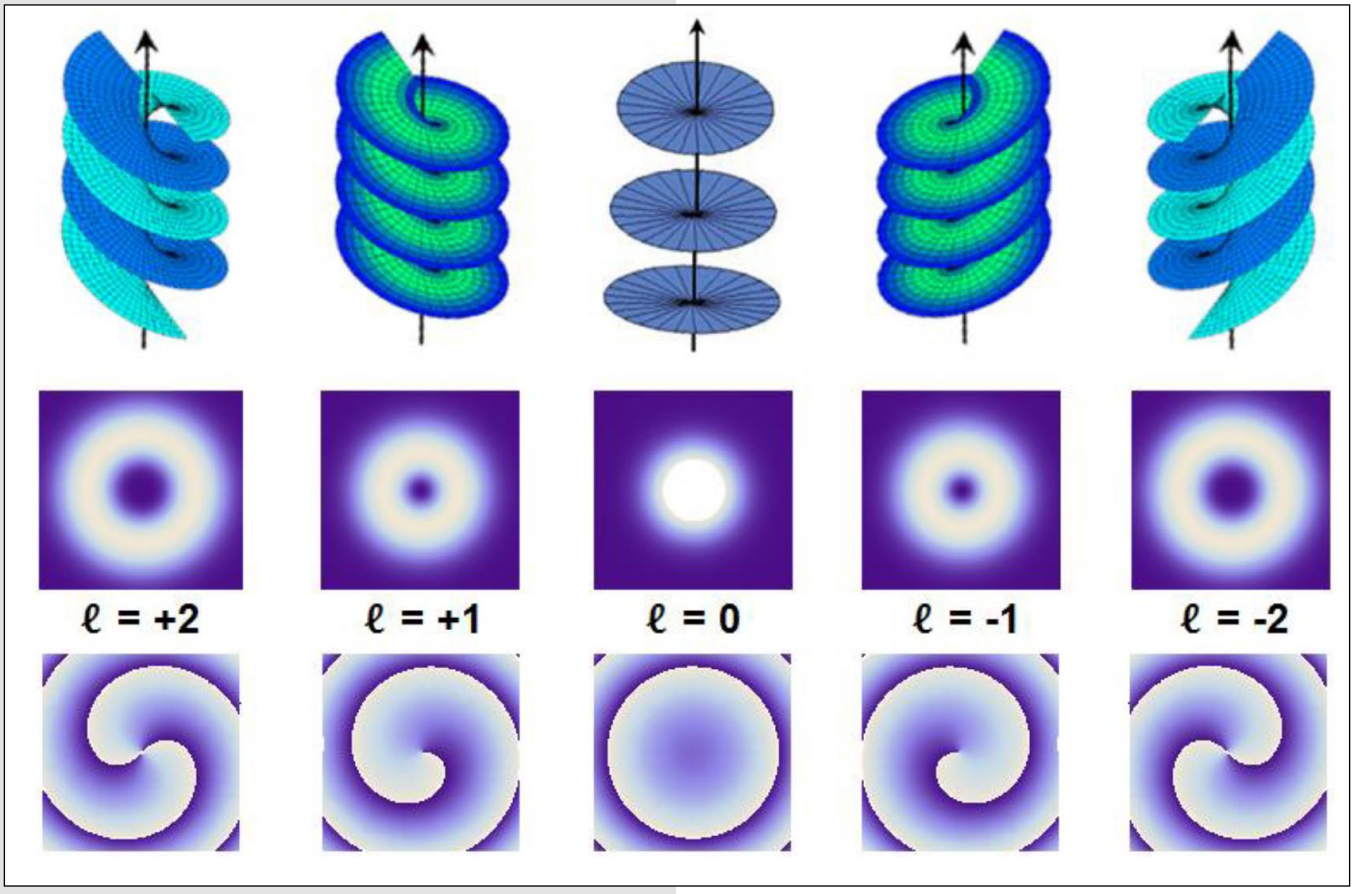
Within MAELSTROM, an extensive analysis of the international state of the art is combined with a structured consultation of stakeholders and end users from the defence community. This process supports the identification of operational scenarios, user needs, and technical constraints that are critical for the practical adoption of vortex radar concepts. The project investigates detection and tracking in challenging geometries, angular separation of closely spaced targets, and the exploitation of rotational motion signatures, with particular attention to the limits imposed by array geometry, calibration, and mode purity.

The outcome of the study is a consolidated set of user requirements, system-level considerations, and technology gaps, together with a realistic assessment of the current technological readiness level. MAELSTROM provides guidance on where vortex radar techniques may complement conventional solutions, clarifies their limitations, and outlines research directions necessary to progress towards operationally relevant demonstrations.

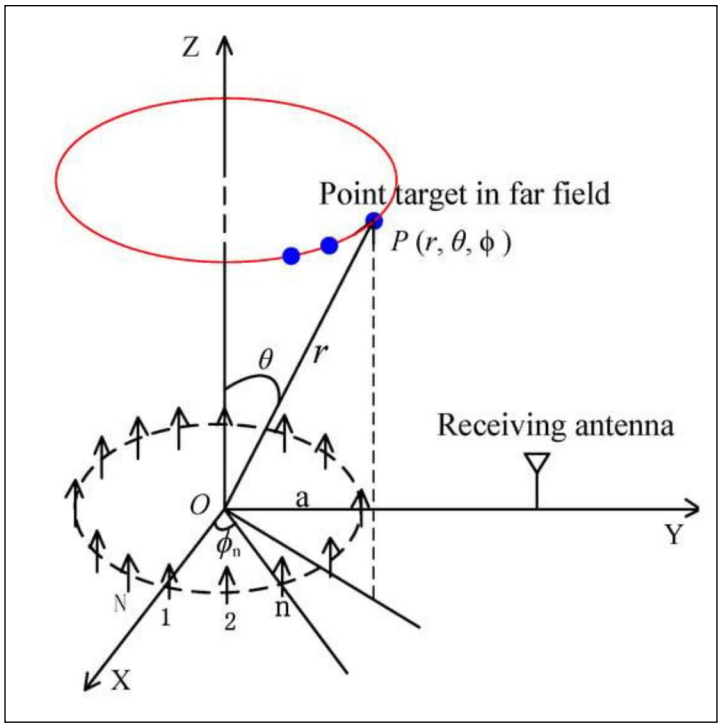
Keywords: Vortex radar, orbital angular momentum, beamforming.

MAELSTROM

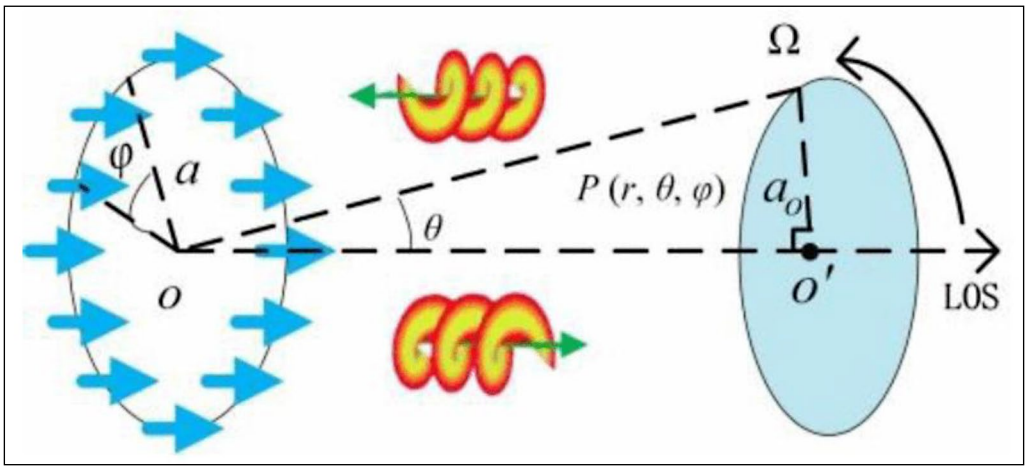
Technical Sheet
Funding institution:
EDA
Project partners
Fondazione Links, Warsaw University of Technology (WUT)
Project duration
March 2025 - ongoing
Involved countries
Italy, Poland



(a) Wavefront, amplitude and phase diagrams of a vortex wave depending on mode (RAI - Centro Ricerche e Innovazione Tecnologica (CRIT), "Progetti di ricerca e innovazione", available online at http://www.crit.rai.it/)



(b) UCA (Uniform circular Array) for OAM beamforming
(from Yuan, T.; Wang, H.; Cheng, Y.; Qin, Y. Electromagnetic Vortex-Based Radar Imaging Using a Single Receiving Antenna: Theory and Experimental Results. Sensors 2017, 17)



(c) Vortex radar for rotational Doppler detection (from Z. Zhou, Y. Cheng, K. Liu, H. Wang and Y. Qin, "Rotational Doppler Resolution of Spinning Target Detection Based on OAM Beams," in IEEE Sensors Letters, vol. 3, no. 3, pp. 1-4, March 2019.

PROJECT MARTINA

Multi-source satellite imagery artificial Intelligence Analysis challenge

Defence intelligence organisations across the EU face an overwhelming growth in areas of interest and in the volume of available satellite imagery. Artificial Intelligence offers a way to accelerate image analysis by automating processing, feature extraction, and other labour-intensive tasks. Yet, the effectiveness of AI in this domain depends on rigorous validation, as models can suffer from bias, overfitting, and sensitivity to the complex conditions typical of satellite data, such as atmospheric variability or sensor differences. Ensuring reliability therefore requires diverse datasets, robust metrics, and systematic evaluation.

MARTINA addresses this need by establishing the necessary hardware infrastructure, a collaborative testing platform, curated and annotated datasets, and comprehensive test and evaluation plans. The project will organise a multi-year technological challenge in which at least three Participant Consortia will develop and validate AI solutions for analysing multi-source, multi-modal satellite imagery for defence use. Four progressive campaigns will test AI systems across a wide set of operational scenarios and increasing levels of complexity.

A consortium of 17 partners – including research organisations, industry, SMEs, and satellite data providers – has joined forces to define requirements, provide high-quality data, and ensure meaningful validation procedures. Use cases are grouped into major functional areas such as site analysis and monitoring, damage assessment, and mapping and tracking, progressively integrated into higher-level information products throughout the challenge.

By the end of the project, MARTINA will have created a reusable environment, validated datasets, and standardised procedures to support future challenges and the transition of innovative AI-based solutions into operational and commercial products for EU Member States.

Keywords: AI, Radar, Elettro-optical, Satellite, Multimodal, GEOINT.

MARTINA

Technical Sheet

Funding institution:

EU EDF

Funded by the European Union

Project partners

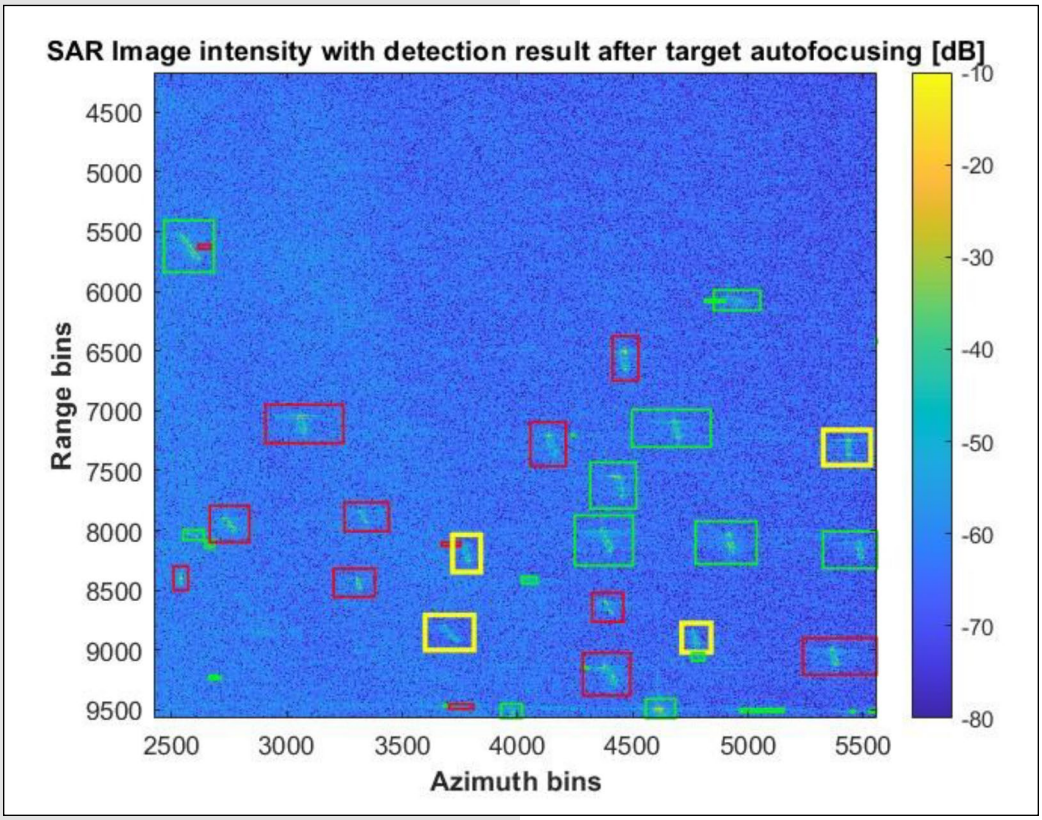
SATCEN, OPT/NET, Bullet Prove, Flysight, Wiser Technology, ONERA, LIST, CEIIA, GEOSAT, ICEYE, DLR, SATLANTIS, CNIT, HAA, Fraunhofer, NLR, Hisdesat

Project duration

November 2025 - November 2029

Involved countries

Netherlands, Poland, Portugal, Italy, Bulgaria, Germany, Greece, Spain, Finland, Luxembourg, France.



(a) Example image of the output of a detection algorithm applied to a SAR image obtained with the COSMO-SkyMed constellation.

PROJECT PESCO

PErvaSive Communications - RESTART Spoke 1 on Pervasive and Photonic Network Technologies and Infrastructures

The Future Pervasive Internet will be an extremely complex environment, where communication and sensing functions will be integrated exploiting a multitude of complementary enabling technologies, and where functionalities will also be embedded into (beyond-edge) users and IoT devices, which will become an integral part of the pervasive network. Addressing this vision, PESCO sets itself at one of the strategic crossroads for the development of beyond-5G and 6G networks, also integrating future generation sensing components in a holistic way. PESCO addresses the complexity of the research challenges posed by this scenario in a comprehensive way, involving a multiplicity of key expertises. Based on a comprehensive architecture, PESCO will deliver the critical components in the fundamental areas of: (i) novel user-centric pervasive Internet paradigms including IoT and users' devices; (ii) integrated sensing and communication technologies; (iii) edge intelligence supporting pervasive environments; (iv) novel sensing paradigms exploiting diverse communication technologies; (v) holistic sensing and communication cognitive approaches taking into account broader environmental aspects, like, for instance, energy efficiency. PESCO implements a multi-faceted performance evaluation approach, composed of a blend of analytical modelling, large-scale simulation and prototyping, to deliver key results in the aforementioned areas. CNIT RaSS Lab activity is focused on the study of the synchronization requirements for radar MIMO system on drone swarm, on the synchronization technique integration and on the experimental test/validation.Detect and track air and sea targets at long range (over the horizon), far beyond currently existing systems, by using the reflections of skywave and surface-wave propagated signals..

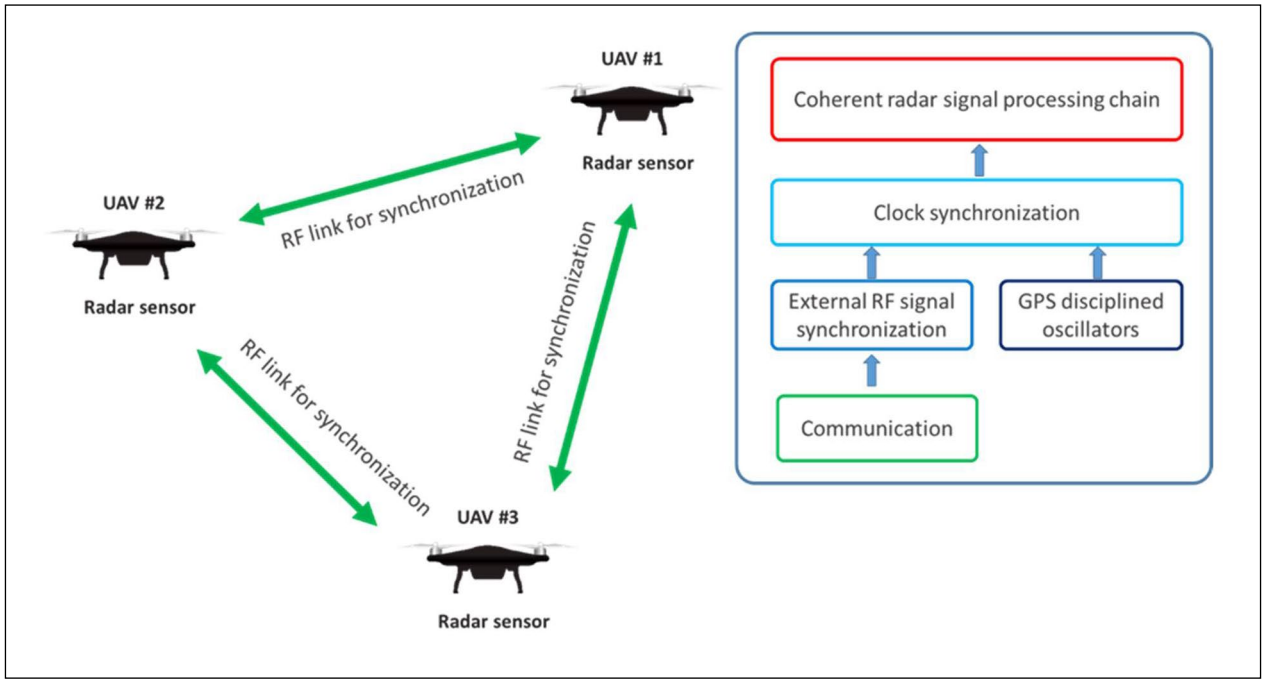
Keywords: Radar systems, Radar signal processing.

RESTART PESCO

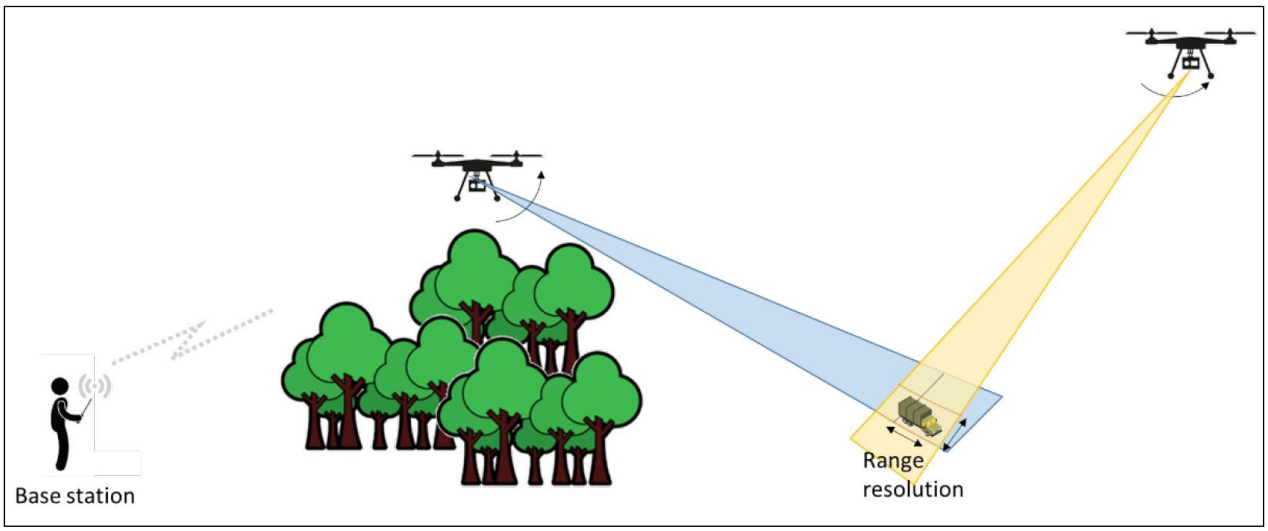
Funded by the European Union NextGenerationEU | Ministero dell'Università e della Ricerca | Italiadomani

Technical Sheet
Funding institution:
European Union under the Italian National Recovery and Resilience Plan (NRRP) of NextGenerationEU
Project partners
CNR IIT, CNR IEIIT, CNR IREA, UniFI, UniPI, IniPD, UniBO, CNIT PNT Lab, OpenFiber
Project duration
January 2023 - December 2025
Involved countries
Italy

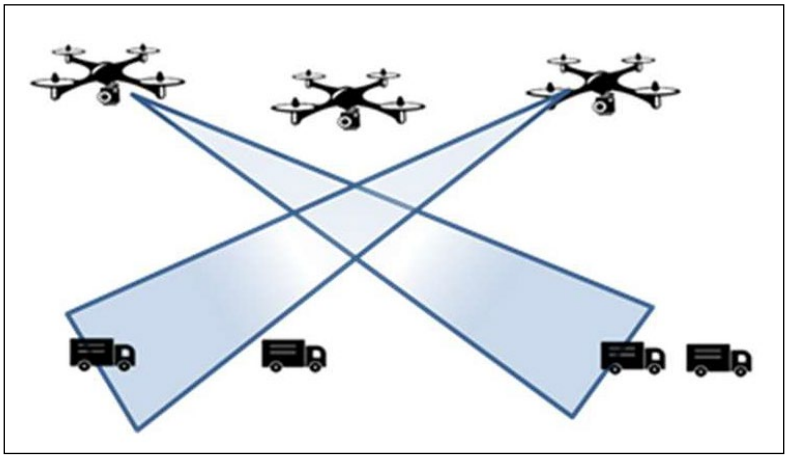
(a) Swarm of drones synchronization conceptual image



(b) Logical architecture of the use case related to the swarm of drones synchronization



(c) Swarm of drones reference scenarios: scenario 1: detection and localization of moving targets



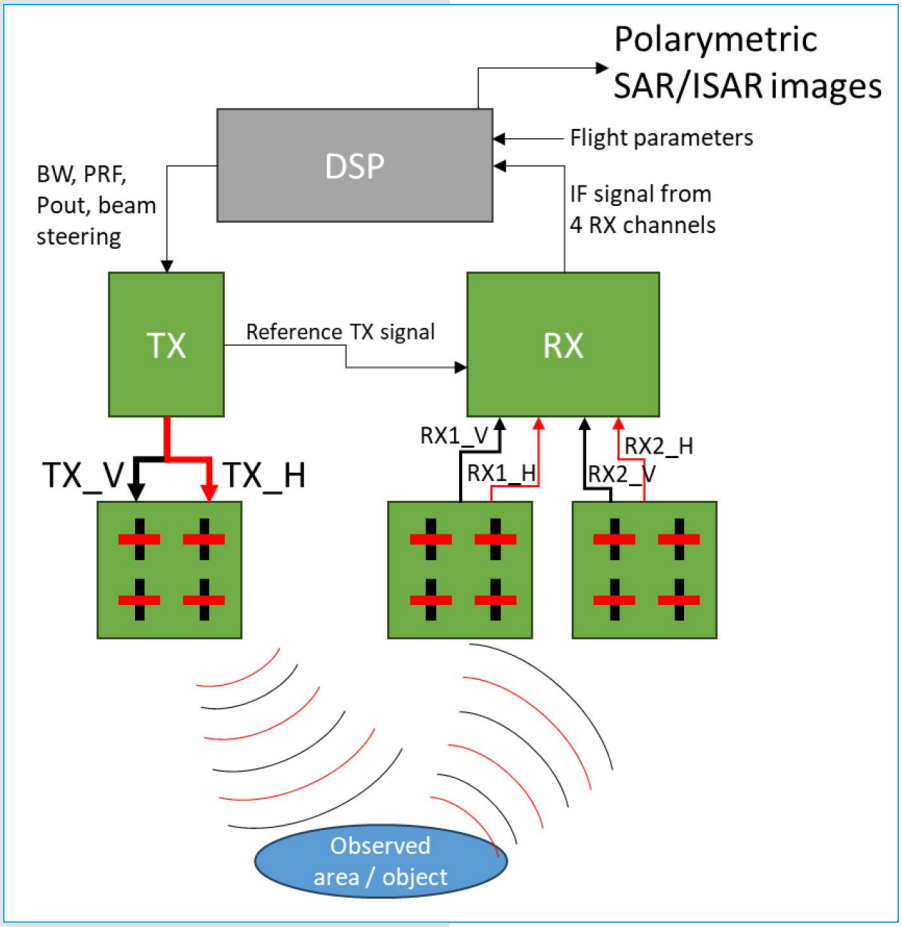
(d) Swarm of drones reference scenarios: multistatic radar imaging.

SDR-Based Fully Polarimetric AESA Radar

PORTAL is a European Defence Agency (EDA) research and technology project focused on advancing radar-based ISTAR capabilities through an integrated, multi-platform and polarimetric approach. The project develops a system-of-systems concept combining a system of three drone-borne SAR sensors with complementary airborne SAR and ground-based ISAR assets. By exploiting full polarimetry, multi-channel processing and cooperative sensing, PORTAL aims to improve target detectability and discrimination in challenging maritime and land.
environments, where sea clutter, heterogeneous terrain and complex traffic can severely degrade conventional solutions. The technical work spans scenario and user-needs definition, the review and development of state-of-the-art algorithms for polarimetric clutter mitigation, adaptive processing and detection, and the extraction of robust features for non-cooperative target recognition. These algorithmic building blocks will be integrated into demonstrators and validated through dedicated trial campaigns in representative coastal and ground scenarios, producing radar products and performance evidence relevant for defence end users. Ultimately, PORTAL targets a scalable and upgradeable radar capability that supports persistent surveillance, rapid cueing of high-resolution imaging sensors, and improved situational awareness for European maritime security, border/perimeter surveillance and protection of critical infrastructure.

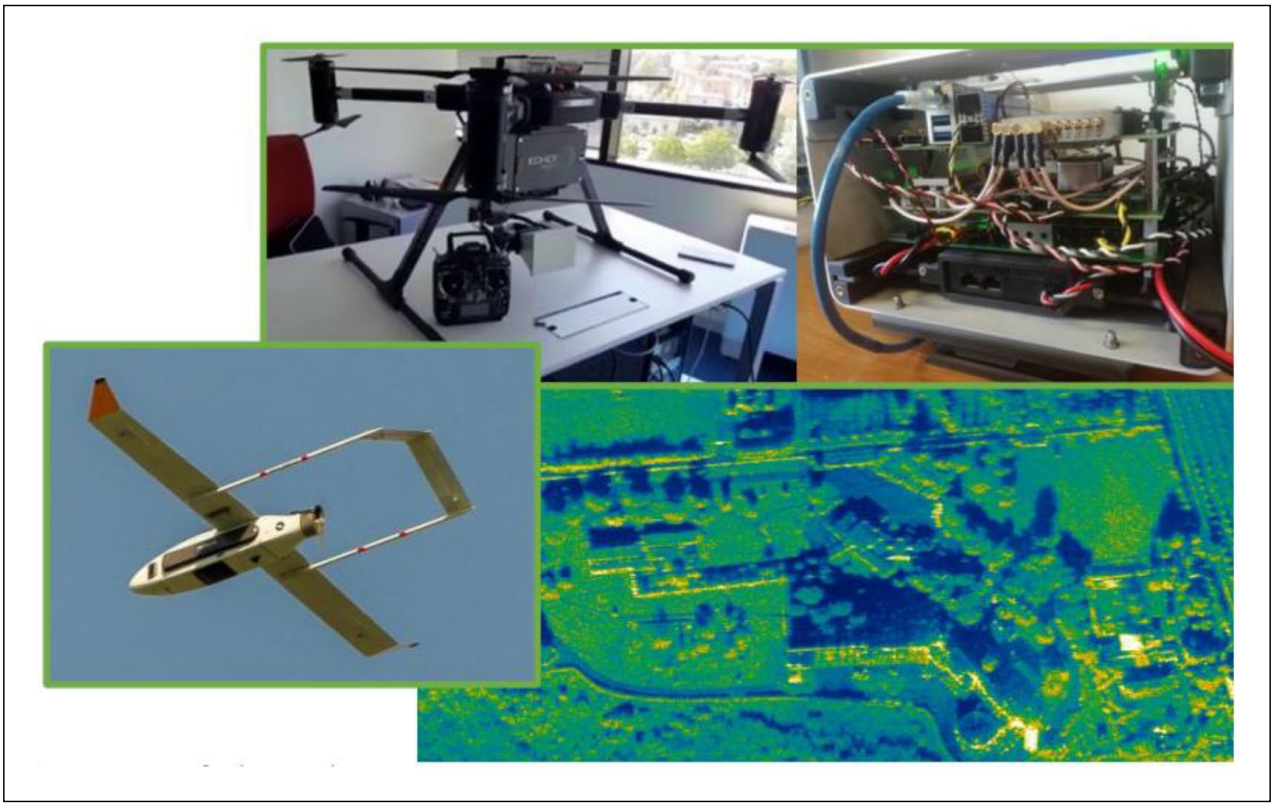
Keywords: Radar-based ISTAR, Drone-borne SAR, Polarimetric radar, Synthetic Aperture Radar (SAR), Inverse Synthetic Aperture Radar (ISAR).

Technical Sheet
Funding institution:
EDA
Project partners
ELDES s.r.l., Warsaw University of Technology (WUT), ECHOES Technologies s.r.l., XY Sensing, SpaceForest, WB Electronics, ITWL Air Force Institute of Technology
Project duration
September 2025 - ongoing
Involved countries
Italy, Poland



(a) Rx-Tx for polarimetric system

(b) Radar on swarm of drones setup



(c) Airborne SAR imaging from drones (courtesy of Echoes s.r.l).

PROJECT REACT II

Responsive Electronic Attack for Cooperation Tasks II

In the context of the fast-changing electromagnetic warfare environment and given the rapid advance in sensors and long-range weapons to counter air threats, it arises the urgent need to address the current military capabilities shortcomings of the EU MS in the area of Airborne Electronic Attack (AEA).
In order to deal with current and future contested EW environments, where the use of air power may be seriously compromised, it is required to boost a joint effort of the EU industry in the defence sector to fill in the gaps in the existing EU AEA capabilities.
REACT II (awarded proposal for EDF-2022-DA-AIR-AEW) will bring all the progress made and the lessons learned from REACT I (awarded proposal for EDIDP-ACC-AEAC-2019). All this experience gathered is an invaluable asset to build on for the new project to be undertaken.
The REACT II consortium consists of 21 partners from 10 Countries, covering the whole value chain from applied research to high technology product development and supply.
The REACT II solution to cover the future challenges for AEA capability will be comprised by a modular architecture based system whose core building blocks will allow to reconfigure the system to better adapt to the needs of the mission to be performed. From a strategic point of view, REACT II will encourage the cooperation among European Union member states, stimulating the production of doctrine and CONOPS at EU level, strengthening the EU defence own capabilities, promoting EU technologies and improving the competitiveness of EU defence industrial base to develop new EW systems to be offered as in-kind contribution to NATO defence.

Keywords: AESA, ECM, AI, Cognitive Radar.

REACT II
Project

Technical Sheet

Funding institution:

Co-funded by the European Union

Project partners

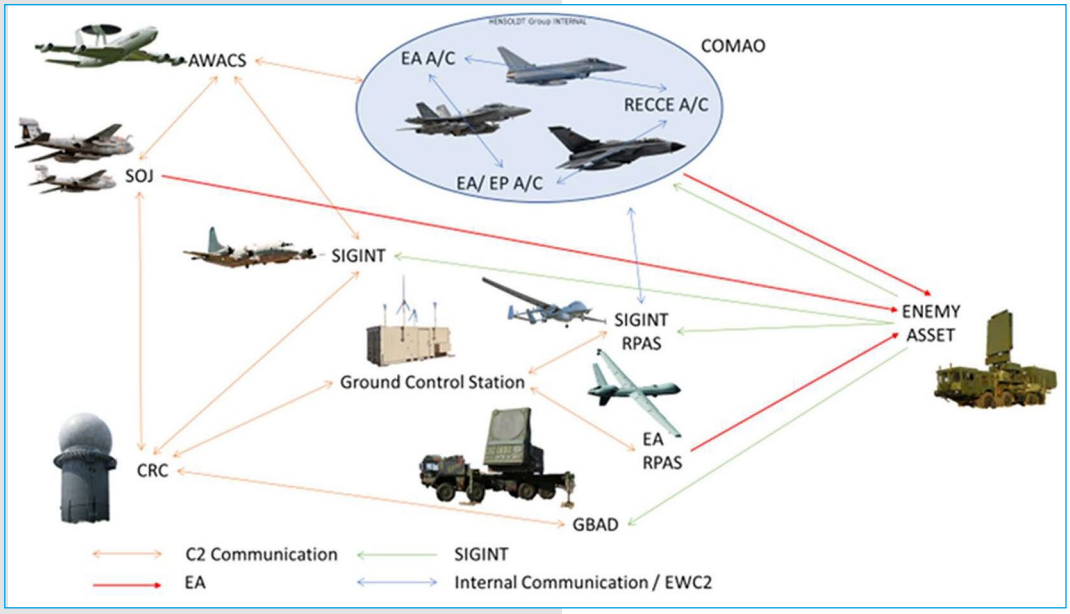
Indra (Coordinator, Spain), Elettronica (ELT, Italy), Hensoldt (HEN, Germany), Saab (SAAB, Sweden), Thales (TSA, France), CAFA Tech (CAFA, Estonia), BPTI (Lithuania), Rantelon (RAN, Estonia), Bianor Services (BIA, Bulgaria), XY Sensing (XYS, Poland), Axter Aerospace (AXT, Spain), Spikatech (SPT, Spain), Sentech (SEN, Italy), D&P Development (D&P, Italy), Warsaw University of Technology (WUT, Poland), Universidad Politécnica de Madrid (UPM, Spain), Royal Netherland Aerospace Center (NLR, Netherlands), Royal Institute of Technology in Stockholm (KTH, Sweden).

Project duration

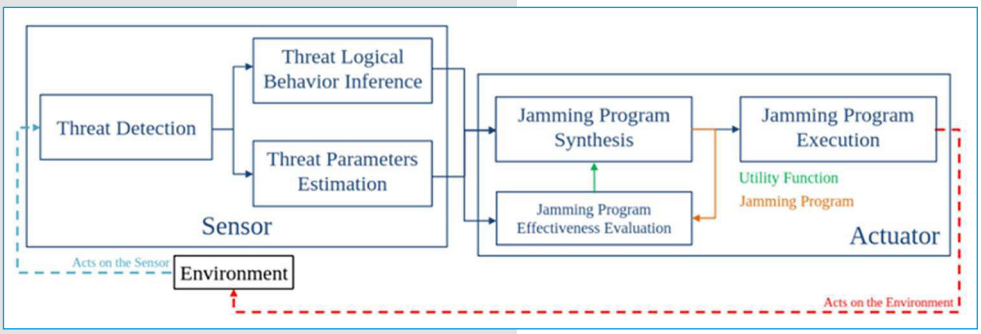
December 2023 - March 2029

Involved countries

Spain, Italy, Germany, Sweden, France, Lithuania, Netherlands, Poland, Estonia, Bulgaria



(a) AEA network



(b) Cognitive EW system, block scheme.

LNAV/VNAV
FMC SPD
LNAV
H 063
VNAV PTH
CMD
2.2
99
.79
33000
GS
435
277 NM
0.00
-50 VS
STD
.791
HDG 062
FMC L
CRS 164
RNP
ANP
2.00
0.02
400
MAIN PANEL DUs
LOWER DU
NORM
OUTBD PFD
ENG PRI
PFD
INBD
MFD
ND
LIGHTS
TEST
NOSE WHEEL STEERING
ISFD HEADING FR
LEFT IRS ONLY
TRK
075
MAG
TERR

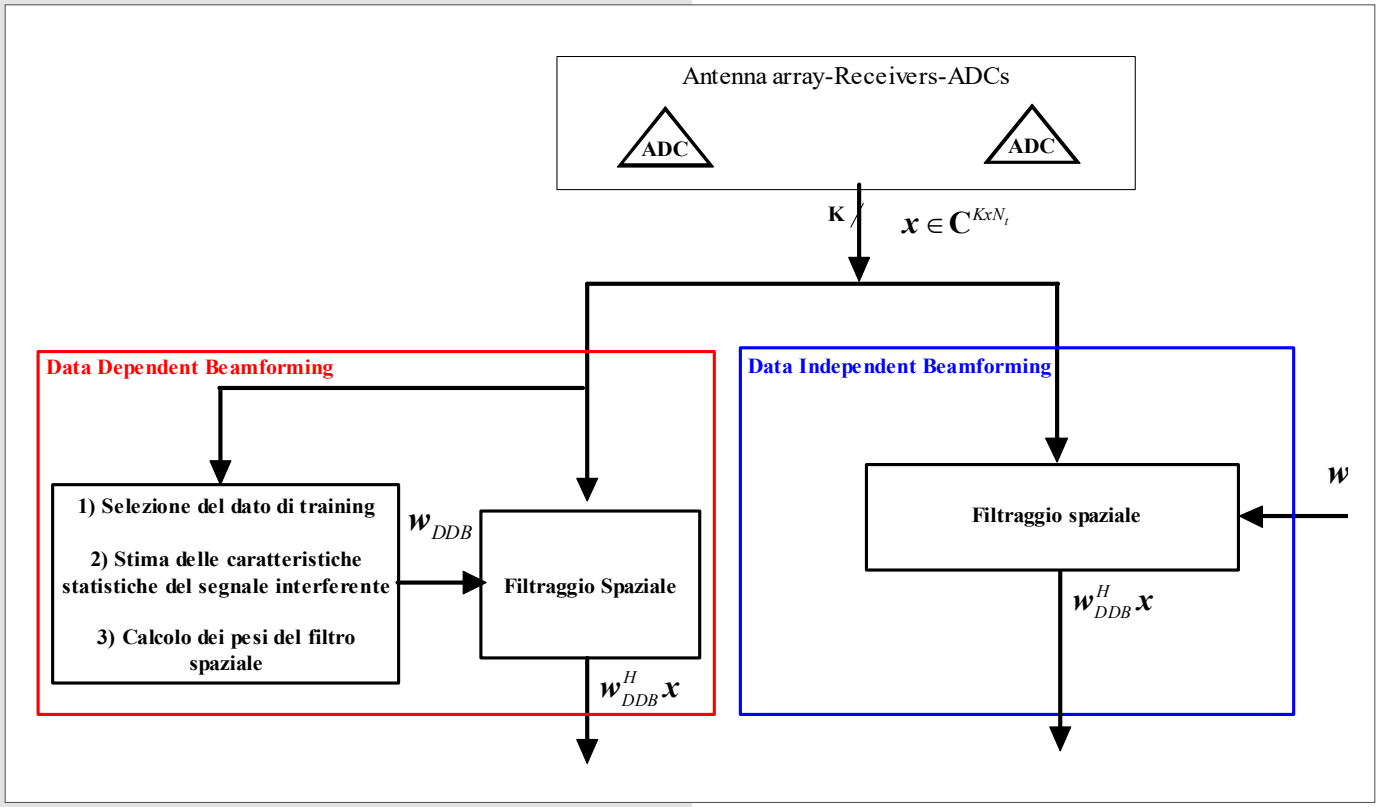
PROJECT SAMBA-X

Seeker AESA multiruolo a basso costo in banda X per applicazioni navali

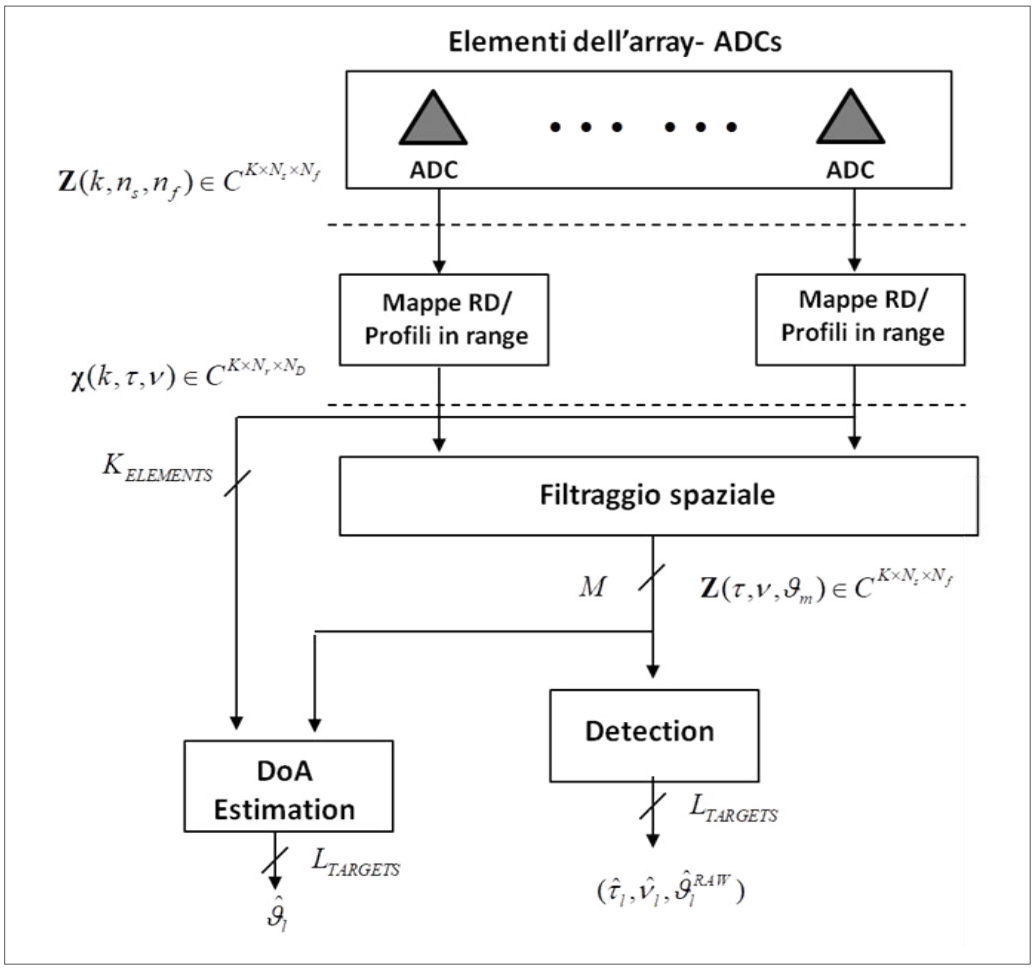
Traditional seekers use a mechanical scanning antenna, which limits the overall system performance. With the improvement of the latest microwave device technologies, Active Electronic Scanned Array (AESA) has become implementable in seekers. This allows for substantial performance improvements, which result in a significant increase of seeker's operational capabilities. In particular, SAMBA-X aims to improve seeker's performances with regard to increased target discrimination, resistance to ECM (ECCM), and greater longevity, thanks to the improved Mean Time Between Failures (MTBF) obtainable with this technology.
In summary, this project focuses on the study and development, for the first time in Italy, of a low-cost seeker demonstrator equipped with an ITAR-free AESA X-band antenna. The seeker under consideration has multirole capabilities, that is, it could also be used as a fire direction system on smaller ships. As part of this project, a demonstrator based on AESA technology will be built and validated in laboratory. Such demonstrator will implement a digital version of the classic "monopulse".
The demonstrator will also be able to record "raw" data and make it available for offline verification of newly developed algorithms. Once validated, these algorithms will be available for future implementations (upgrades) either on the same demonstrator or on a possible, higher TRL, prototype. During 2024 CNIT contributed also in user requirement definition and project validation.

Keywords: Seeker, Digital Beamforming, Jammer, Monopulse, AESA

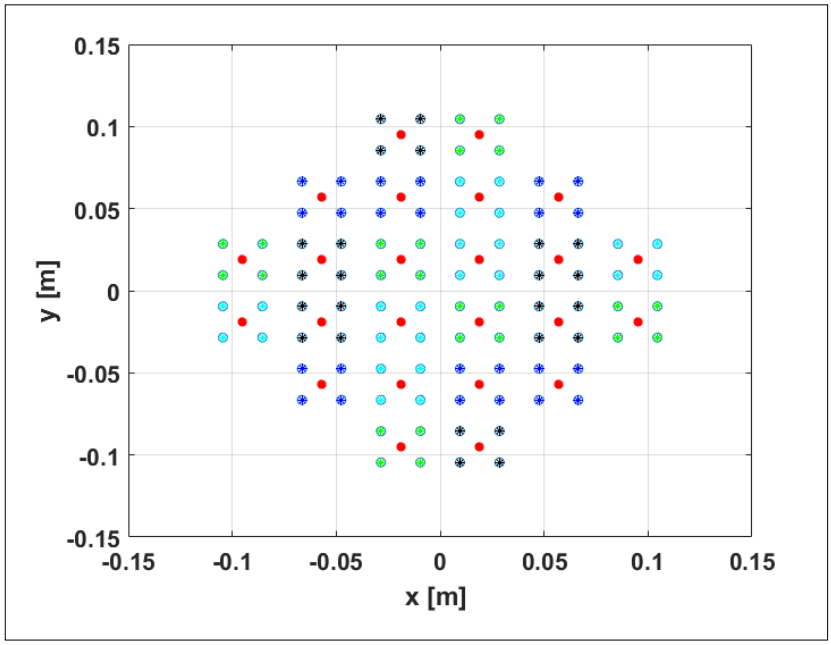
Technical Sheet
Funding institution:
Italian MoD
Project partners
ELDES S.r.l
Project duration
February 2020 - Ongoing
Involved countries
Italy



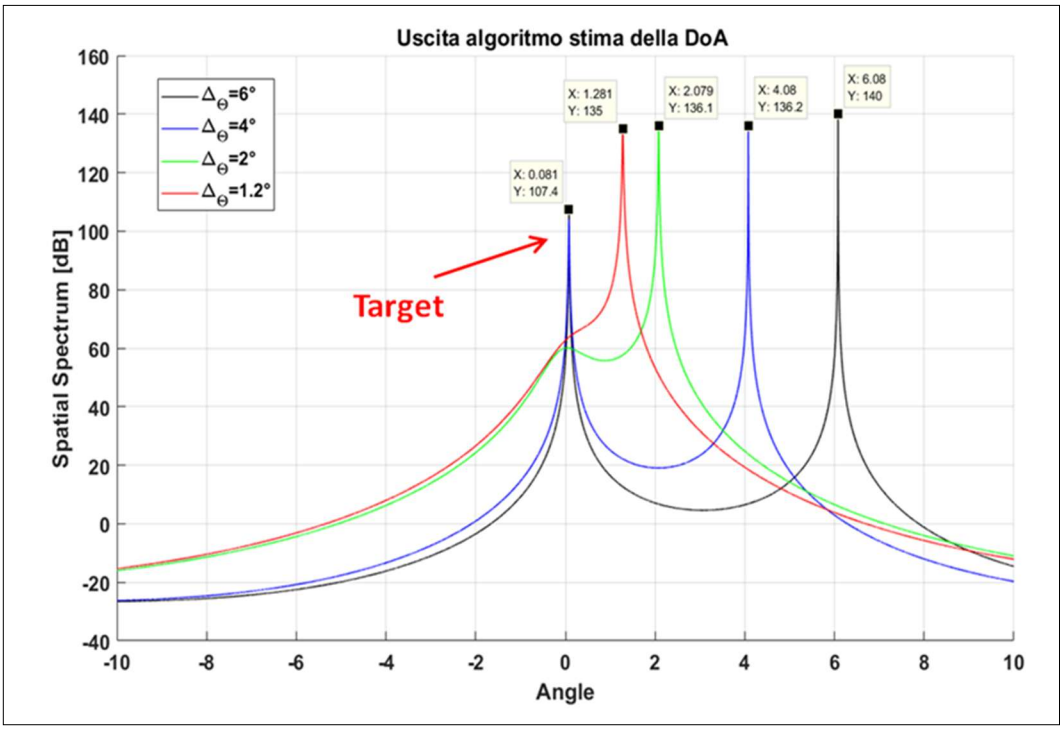
(a) Difference between data dependent beamforming and data independent beamforming



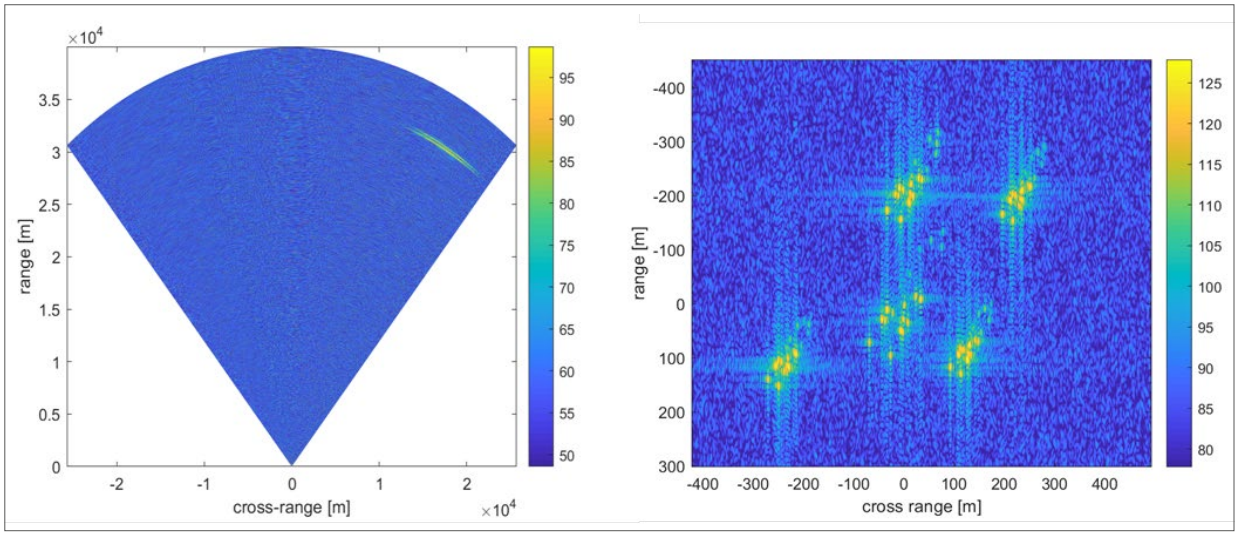
(b) DBF architecture



(c) AESA antenna of 96 patches grouped into 24 QTRM modules of 4 patches each



(d) Output of the MUSIC algorithm in the case of the presence of a target and a jammer source with variable DoA



(e) Preliminary results on the radar imaging technique application.

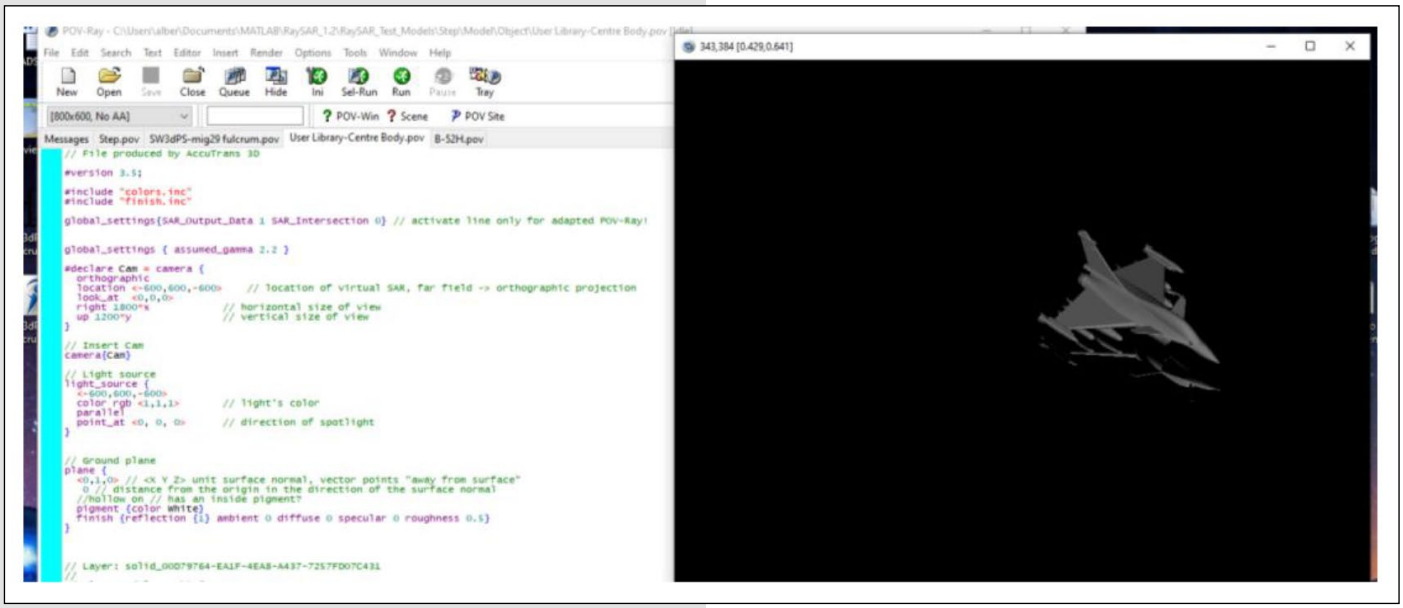
PROJECT SARAI

SAR signature simulation of targets

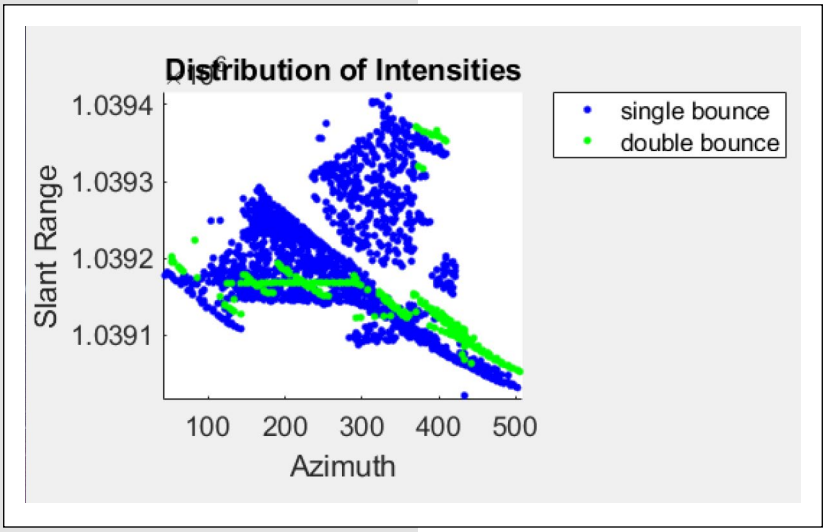
The SARAI project was developed to design, implement, and validate a flexible simulation framework for the generation of realistic Synthetic Aperture Radar (SAR) imagery, with specific focus on target representation, clutter modelling, and suitability for algorithm development and ATR-oriented studies.
During Phase 1, the project established the core simulation architecture based on an integrated pipeline combining POV-Ray and RaySAR. This phase focused on defining the end-to-end workflow, from CAD-based scene description to coherent SAR image formation. Key outcomes included the capability to model complex targets, ground interactions, and multipath effects through deterministic ray tracing, as well as the generation of repeatable and fully parameterized synthetic SAR images. Phase 1 demonstrated the feasibility of controlling geometry, materials, bounce levels, and system resolution within a unified framework. Phase 2 extended the simulator toward increased physical realism and operational relevance. In particular, advanced clutter modelling was introduced, including asphalt, bare soil, and vegetation surfaces, calibrated using statistical distributions such as Weibull and extreme-value models. System response effects were incorporated via configurable point spread functions, enabling realistic sidelobes and resolution control. Phase 2 also addressed dataset generation at scale, producing structured synthetic datasets with associated metadata suitable for algorithm testing and training.

Keywords: Seeker, SAR, simulation, ray-tracing

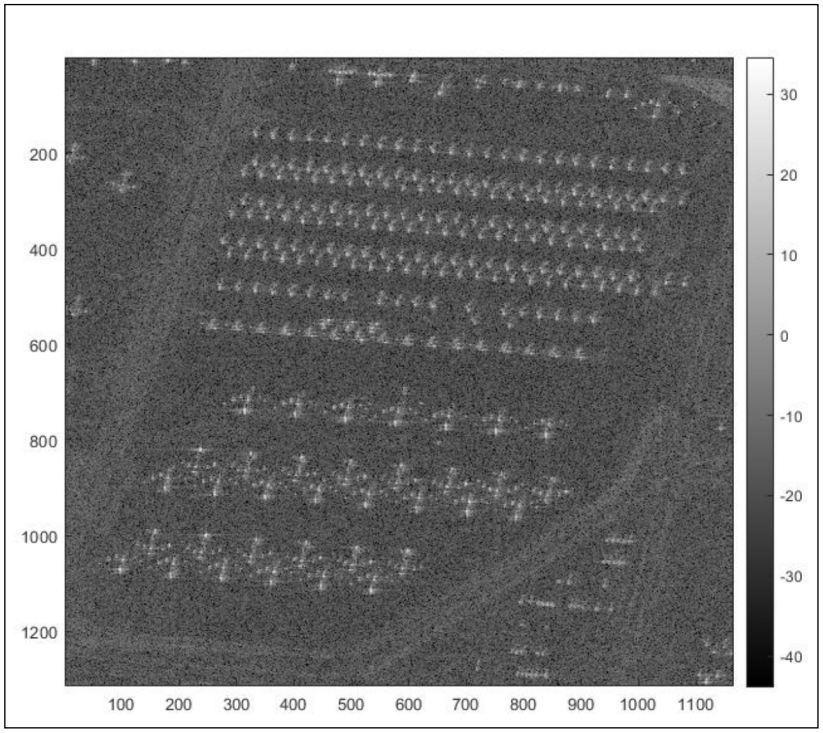
Technical Sheet
Funding institution:
E-GEOS S.p.a
Project partners
E-GEOS S.p.a
Project duration
February 2021 - May 2025
Involved countries
Italy



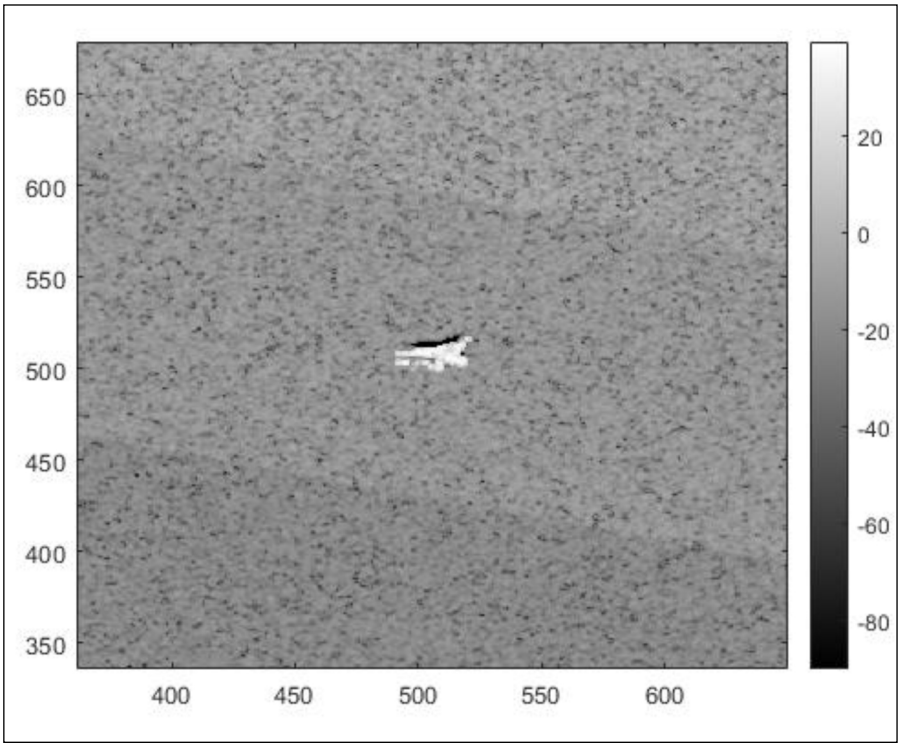
(a) Ray-SAR raytracing simulation environment



(b) Reflection behaviour after SAR image simulation



(c) Sample of real SAR CSK image of airplanes with background



(d) Simulation of SAR image in presence of clutter.

PROJECT SPIA

Sistema Radar Passivo per la rivelazione di oggetti in orbita terrestre bassa - Passive radar system for the detection of low-Earth orbit objects

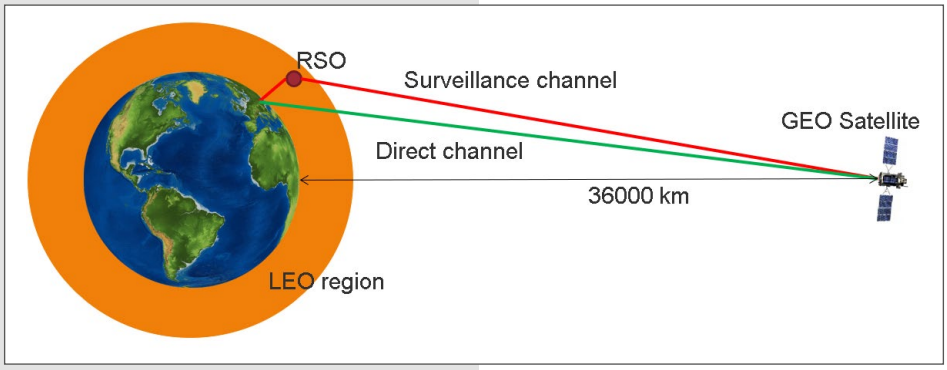
The proposed technological solution is focused on the use of a passive radar based on an array antenna that uses signals transmitted from satellite platforms (e.g.: DVB-S/DVB-S2) as illuminators of opportunity. This approach represents an opportunity of particular interest for the detection of space debris, thanks to the very wide coverage that transmitters in geostationary orbit can guarantee. The passive radar architecture allows for continuous surveillance (24 hours on 7 days), without the use of any own transmitters, minimizing costs and energy consumption. In order to improve the radar detection performance, we propose the adoption of an array antenna formed by a high number of receive-only elements, therefore limiting the realization costs. Moreover, a single receiving element will be equipped with a flexible reception system capable of digitizing high-bandwidth signals. The ability to acquire broadband signals will allow the system to exploit a large part of the energy radiated by the satellite in order to improve the level of SNR. The use of an array of antennas and digital beamforming techniques can enable the achievement of a sufficient gain and the possibility to scan electronically the volume under surveillance.

The main objectives of the Phase 1 (first year) of the project are:

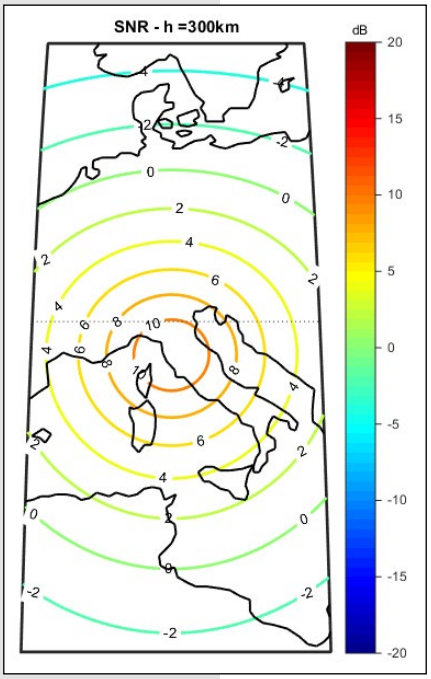
- Definition of system requirements;
- Study and definition of the receiver antenna array geometry configuration;
- Study and definition of digital beamforming techniques;
- Study and definition of the signal processing system.

Keywords: Passive radar, Digital beamforming (DBF), Space Surveillance & Tracking (SST), sparse array, DBB-S2, International Space Station (ISS)

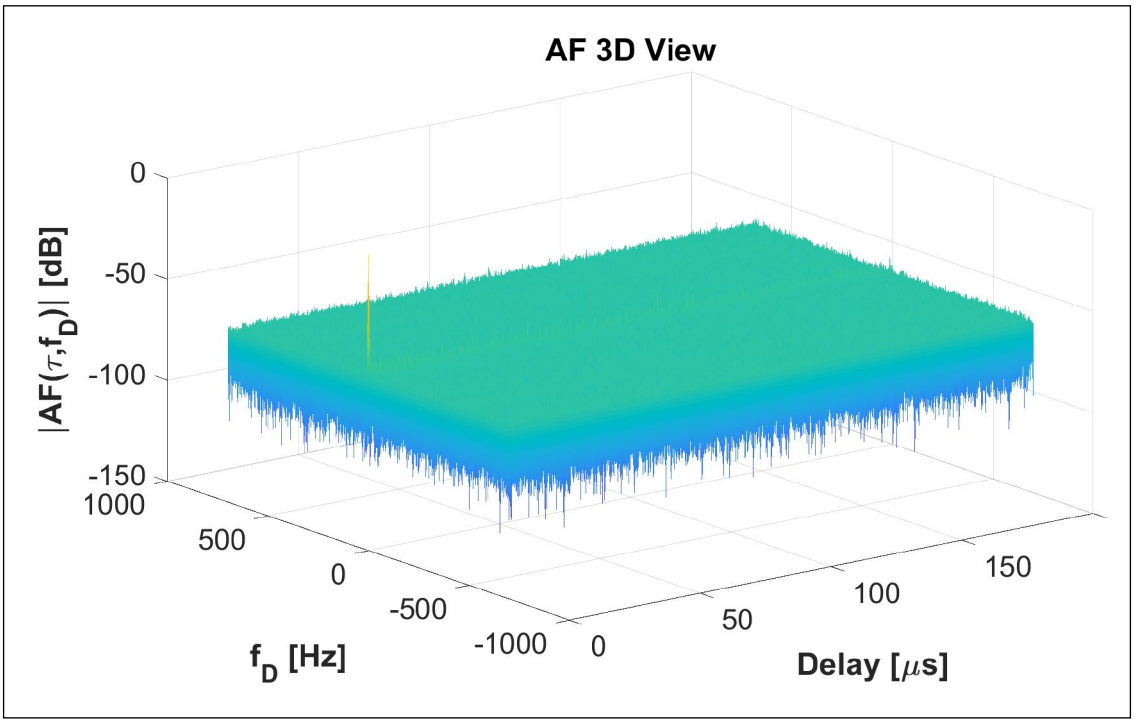
Technical Sheet
Funding institution:
Italian MoD
Project partners
ECHOES S.r.l.
Project duration
February 2020 - ongoing
Involved countries
Italy



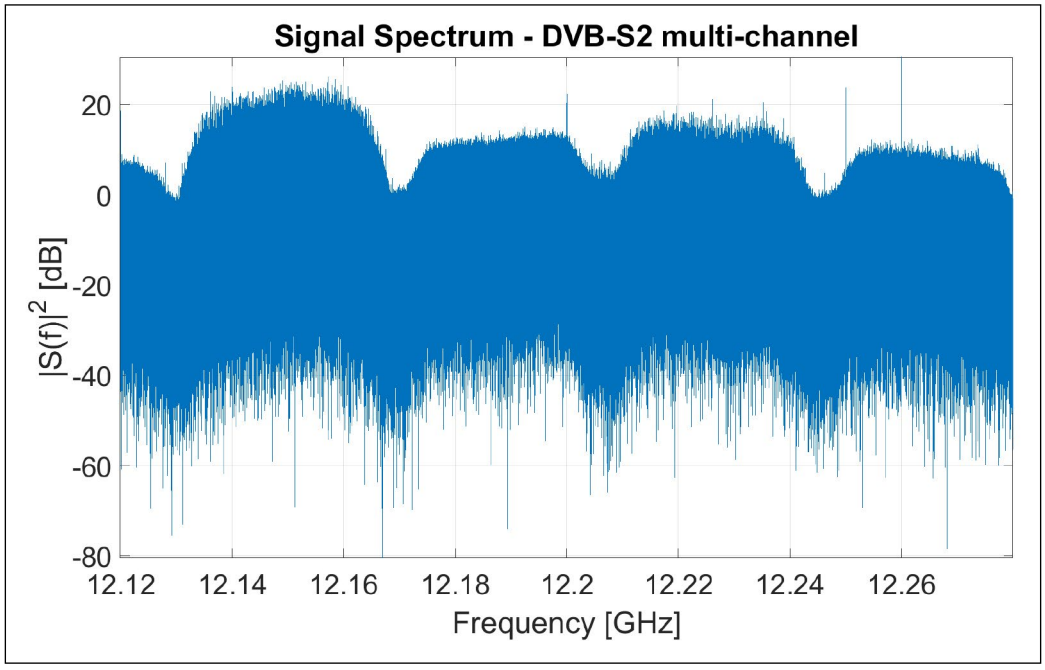
(a) Geometry of a satellite-based passive bistatic radar © [2020] IEEE. Reprinted, with permission, from [L. Gentile, A. Capria, A. L. Saverino, Z. Hajdaraj and M. Martorella, "DVB-S2 Passive Bistatic Radar for Resident Space Object detection: preliminary results," 2020 IEEE International Radar Conference (RADAR), 2020]



b) Expected SNR map obtained for a target with RCS=20 dBsm at an height=300 km



(c) Measured signal spectrum containing four transponders (Eutelsat Hotbird 13B real data)



(d) Four transponders DVB-S/DVB-S2 AF as a function of time delay and Doppler frequency (Eutelsat Hotbird 13B real data);

PROJECT SR4IS

Super Risoluzione spaziale per immagini Iperspettrali Satellitari-FASE II

A critical element of satellite hyperspectral (HS) technology (HS-SAT) is the limitation on spatial resolution. The SR4IS project defines processing strategies capable of extracting spectral information at a lower spatial scale by analyzing the hyperspectral image itself and/or jointly analyzing data acquired with other sensors (broadband or multispectral) characterized by higher spatial resolution.

Specifically, the SR4IS project refers to the hyperspectral sensor of Italian Space Agency's (ASI) Earth observation mission named PRISMA (Hyperspectral Precursor of the Application Mission).

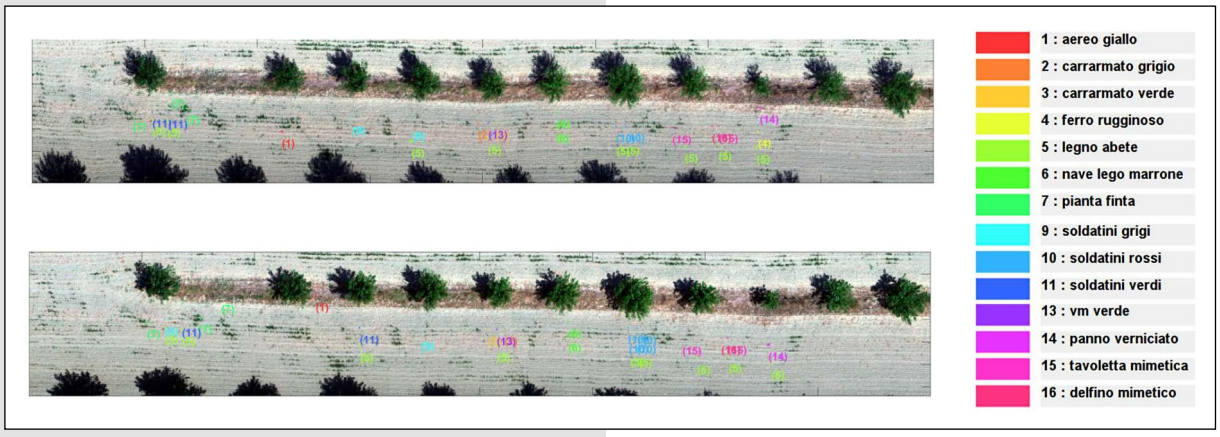
During Phase II, the project focused on validating and operationally assessing the hyperspectral super-resolution (SR) and sub-pixel detection (SPD) methodologies on real data and realistic scenarios relevant to Defence applications.

For hyperspectral super-resolution, the PRISMA-SR processing chain was upgraded by replacing the Sentinel-2 (S2) data fusion module adopted in Phase I with a Deep Learning–based algorithm, DSEN2. The network was trained on real S2 imagery using Wald's Protocol and residual learning, enabling the super-resolution of the 20 m S2 bands to 10 m by exploiting spatial details from the native 10 m bands. The resulting high-resolution multispectral product was then fused with PRISMA hyperspectral data through robust SFIM-HP-based techniques (RSFIM-Hard and RSFIM-Soft), specifically designed to mitigate residual co-registration errors and uncertainties in the sensor MTF. Validation was carried out on two near-simultaneous PRISMA/S2 image pairs acquired over urban and mixed environments, using both qualitative analysis and no-reference quantitative indices. Results demonstrated a clear improvement over bilinear interpolation, with reduced spatial and spectral distortions.

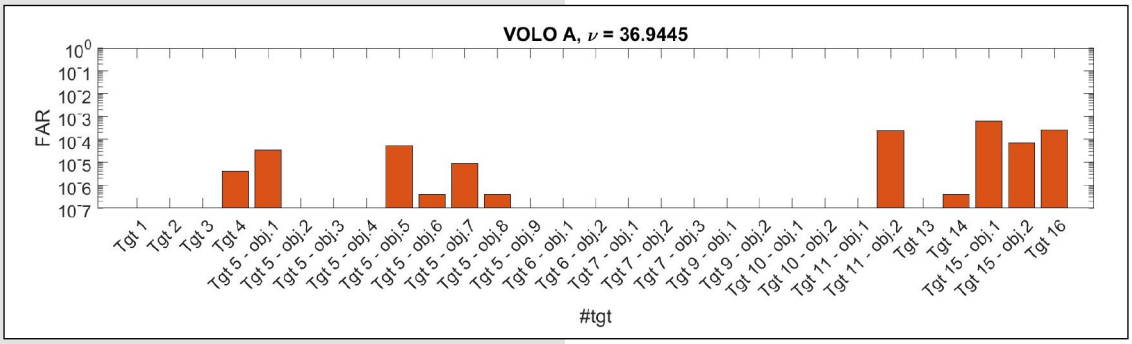
For SPD, the EC-FTMF algorithm was applied to real data acquired in controlled measurement campaigns using a remotely piloted aircraft system equipped with a hyperspectral sensor, as well as to archived PRISMA satellite images covering heterogeneous scenarios. The methodology proved effective in detecting sub-pixel targets with different spectral characteristics, achieving very low false alarm rates and robust performance even in complex backgrounds. Overall, Phase II confirmed the operational viability of the proposed SR and SPD processing chains and validated their effectiveness on real hyperspectral data.

Keywords: Super resolution, hyperspectral satellite images, Sub-pixel target detection.

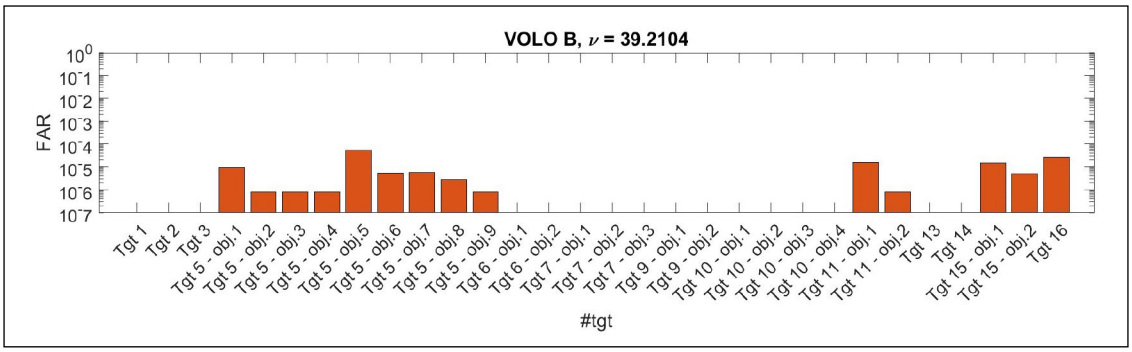
Technical Sheet
Funding institution:
Italian MoD
Project partners
University of Pisa, National Research Council
Project duration
June 2024 - June 2025
Involved countries
Italy



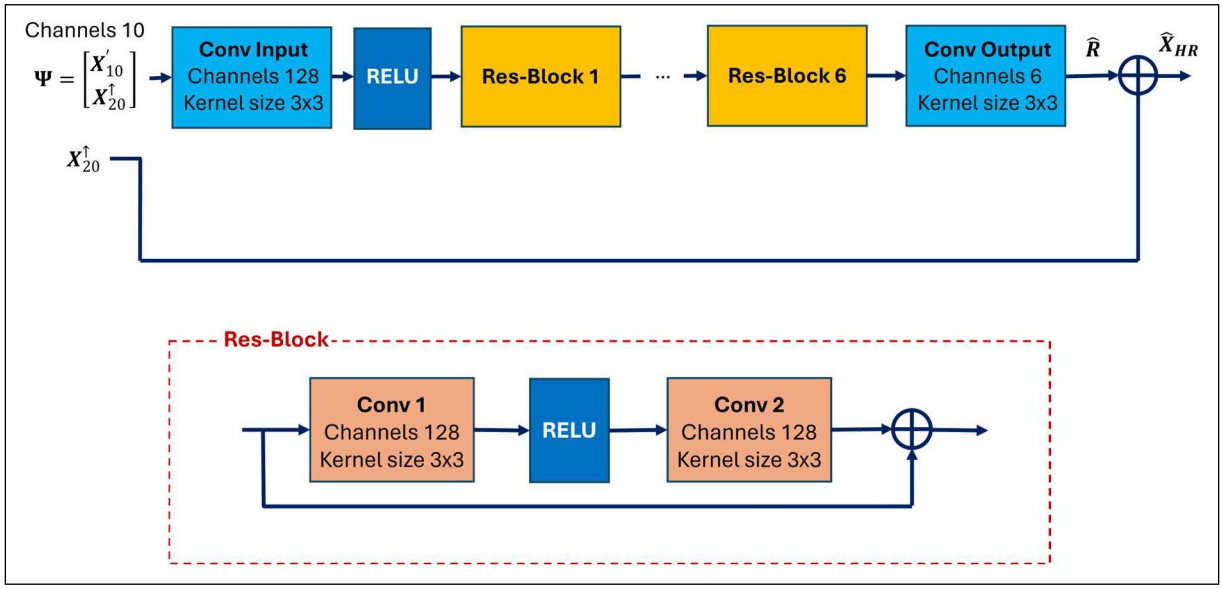
(a) Drone based experimental campaign: measurement field and targets deployed



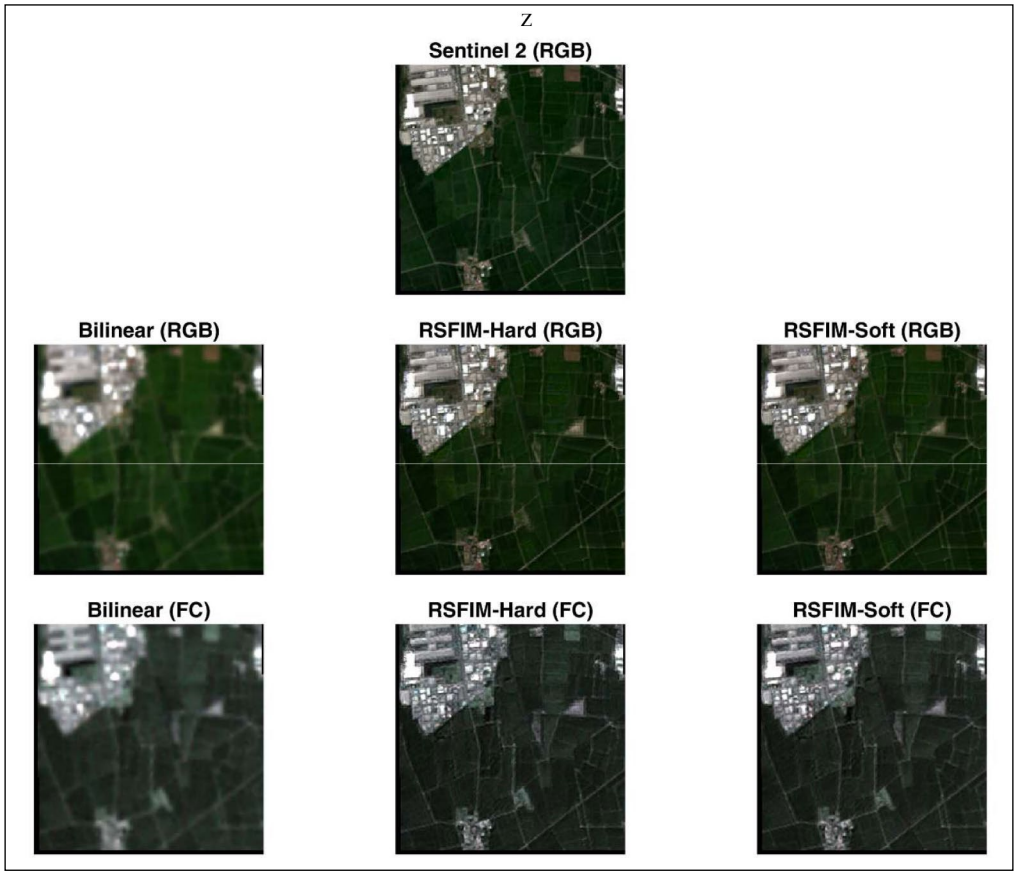
(b) FAR@1stD – bar graph for dataset A



(c) FAR@1stD – bar graph for dataset B



(d) Block diagram of the network DSEN2



(e) Example Super Resolution results obtained by applying the SR algorithm based on the fusion strategy to a real PRISMA-Sentinel 2 image pair.

PROJECT SYNC-MRN

Synchronization of Multistatic Radar Networks (SYNC-MRN)

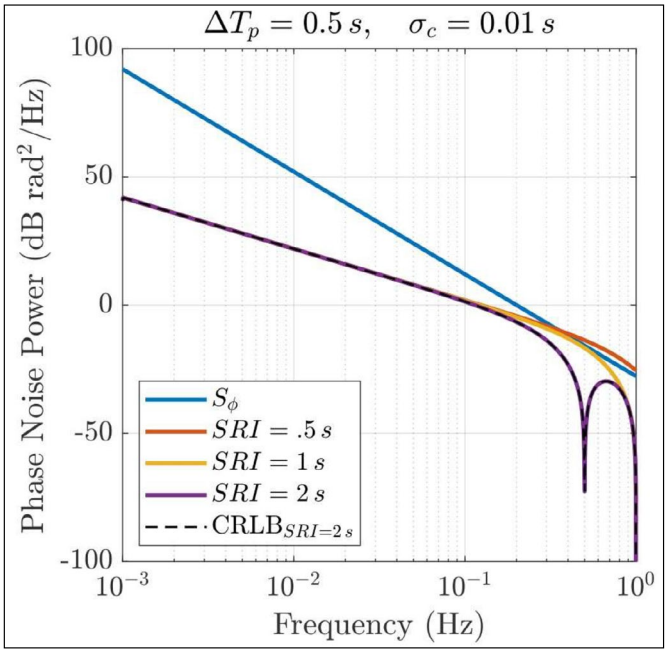
Modern warfare is increasingly relying on autonomous Unmanned Ground Vehicles (UGVs) and Unmanned Aerial Vehicles (UAVs). As a result, enhancing Situational Awareness capabilities has become crucial for executing effective military operations. The SYNC-MRN project aims to tackle this problem by studying and developing a Mobile Multistatic Radar Network for surveillance applications in urban environments to provide support to military operations. The key feature of this system is its adaptive nature, which is needed to deal with the highly dynamical battle scenarios. The network, being mobile, will have its radar nodes installed on Unmanned Ground Vehicles (UGVs). This mobility brings forth significant challenges in terms of the system's size and power requirements. The network's mobile nature and the unique characteristics of operational environments also affect the quality of the wireless channel, hence appropriate modulation techniques must be adopted to address these challenges. Furthermore, as the system is multistatic, it requires stringent synchronization across the network to enable coherent processing and maintain a certain standard of performance.

Our laboratory's research is focused on the task of synchronization, which in radar applications often imposes very precise timing. This is typically accomplished using optical fibres. However, for this particular and demanding application, only wireless synchronization protocols have been investigated. Initial simulations indicate that combining these protocols with highly stable oscillators could deliver the necessary performance. During this first year of the project, the research has been focused on a comparative analysis of the results achieved by using the proposed approach with different oscillator models.

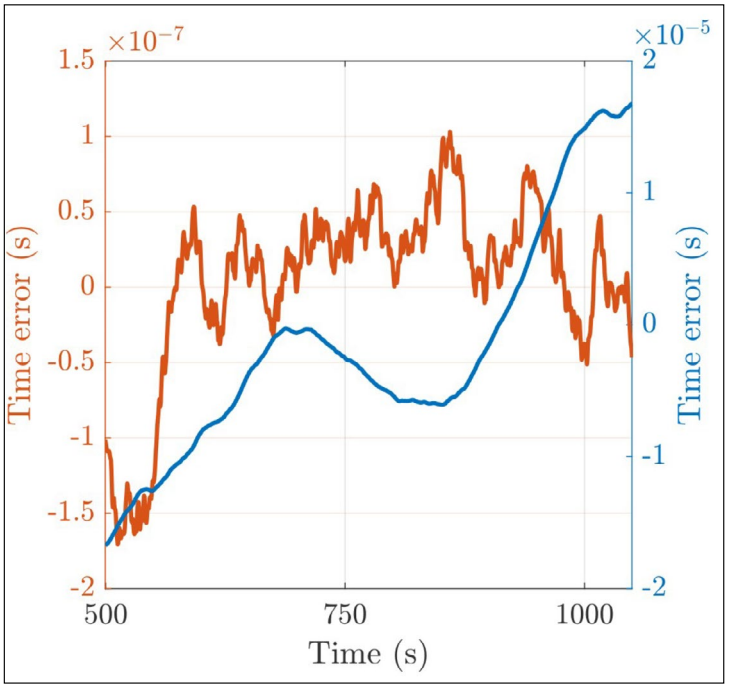
Keywords: Multistatic Radar Network, Radar synchronization, GNSS Denied

Technical Sheet
Funding institution:
Rheinmetall S.p.A.
Project partners
Rheinmetall S.p.A.
Project duration
November 2022 - ongoing
Involved countries
Italy

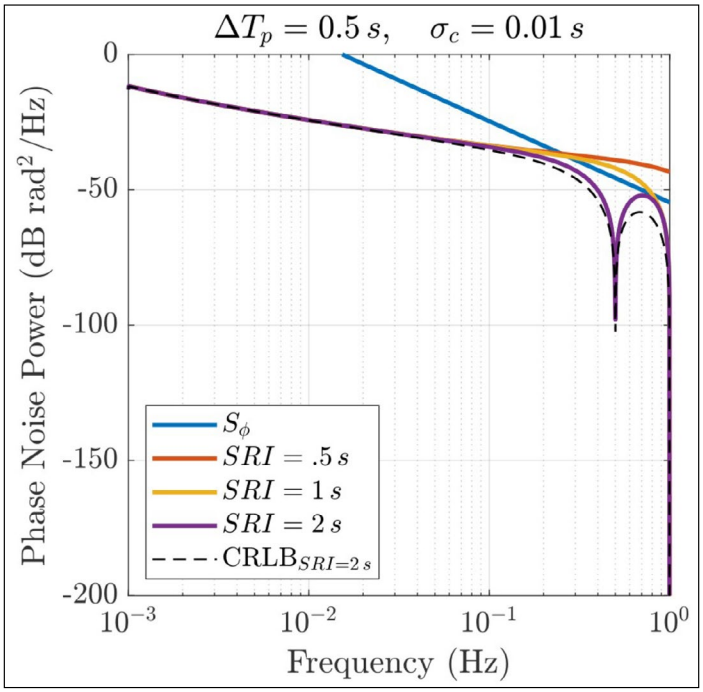
a) Scenario pictorial view



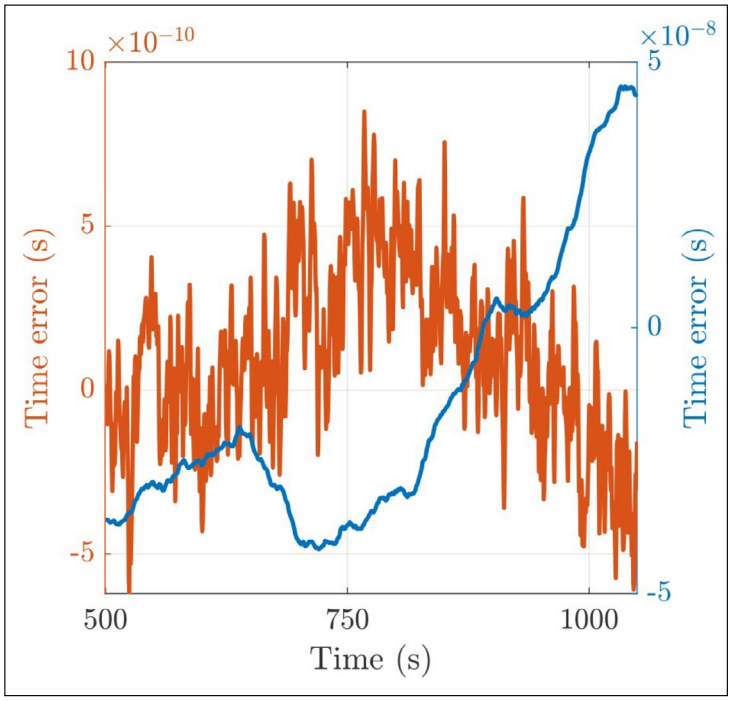
(b) Phase Noise Power Spectral Density (PSD) of the USRP E312 oscillator (blue curve) compared to the Phase Noise PSD post-synchronization by adopting the proposed approach. The Synchronization Repetition Interval (SRI) indicates the time between two consecutive synchronization epochs.



(c) Timing error realizations obtained by using the USRP E312 oscillator model (blue curve) and the same model post-synchronization (orange curve)



(d) Phase Noise Power Spectral Density (PSD) of the ULN-8R oscillator (blue curve) compared to the Phase Noise PSD post-synchronization by adopting the proposed approach. The Synchronization Repetition Interval (SRI) indicates the time between two consecutive synchronization epochs



(e) Timing error realizations obtained by using the ULN-8R oscillator model (bluecurve) and the same model post-synchronization (orange curve).

PROJECT TAN TOM

The TAN-TOM project, funded under the Fund for Sustainable Growth of the Ministry of Enterprise and Made in Italy (MISE), focuses on non-invasive analysis techniques for leather processed in the tanning sector. It employs new multispectral optical and electromagnetic tomographic acquisition systems, utilizing artificial intelligence-based processing.
The project involves five partners, including three key companies operating in diverse industrial sectors:

- Barnini srl: Lead Company, specialized in automated systems
- SIRIO Lavorazione Conciaria srl: Expertise in tanning processes for third parties.
- TECNOCREO Engineering: Operates across various national industrial sectors.

Additionally, two Research Organizations contribute:

- National Inter-university Consortium for Telecommunications (CNIT): An ICT-focused non-profit research body.
- Experimental Station for the Leather and Tanning Materials Industry srl (SSIP): A National Research Body for the leather supply chain, serving as the Scientific Coordinator of the Project.

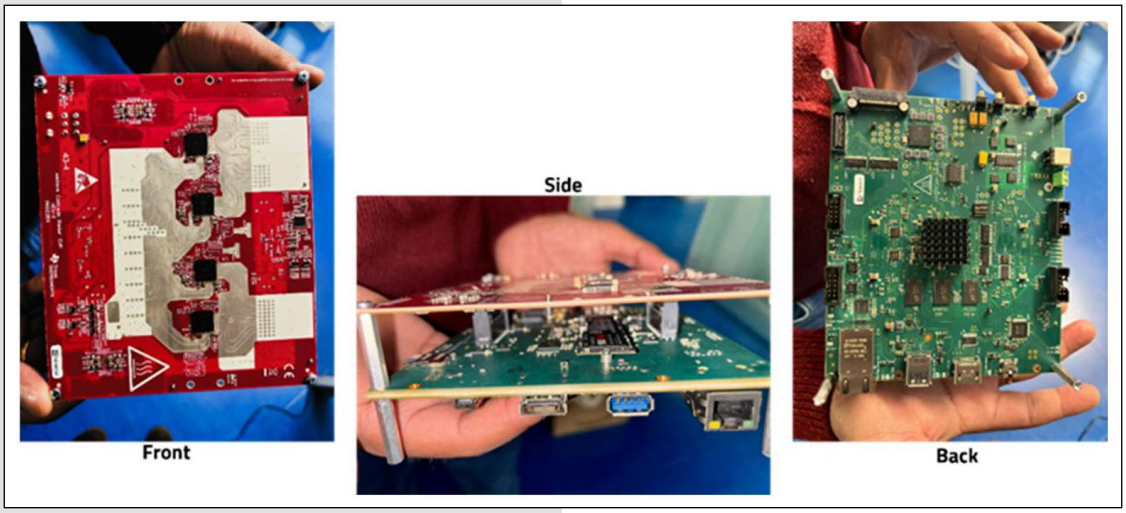
Furthermore, four high-profile companies contribute as consultants:

- COMPOLAB: An engineering firm skilled in multidisciplinary development of advanced solutions, from ideation to industrialization.
- FREE SPACE: An innovative startup dedicated to researching, designing, and producing systems and devices for electromagnetic signal generation, control, and transfer.
- BCN: A tanning company with over 80 years of experience, specializing in managingìcomplex R&D projects, combining craftsmanship, technological innovation, and eco-sustainability in its third generation.
- FLYSIGHT: An SME operating in the defense, aerospace, and infrastructure sectors, producing decision-support software solutions based on artificial intelligence and augmented reality.

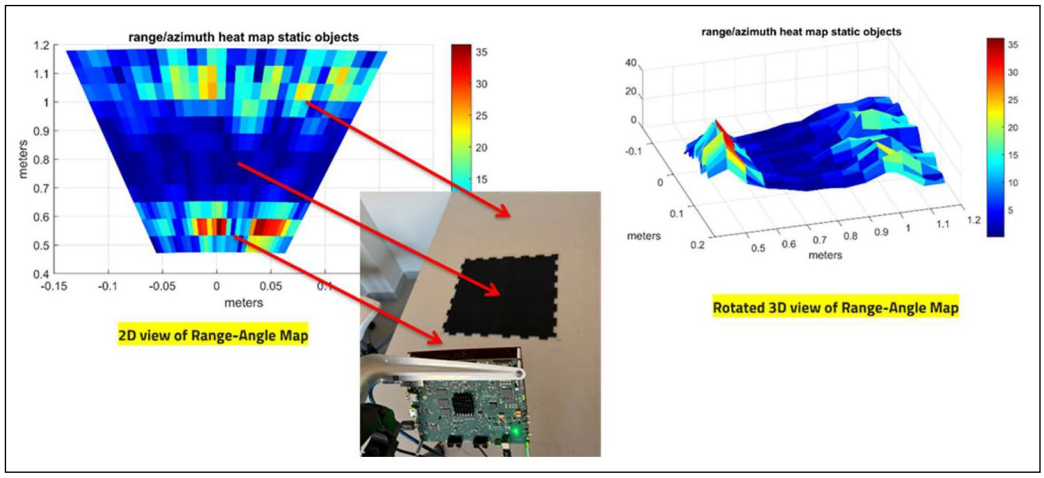
The project aims to create a “tomographic” leather inspection system (TAN-TOM) with high strategic potential for the development of the leather supply chain. This system will enable the analysis of leather quality during manufacturing processes, ensuring continuous monitoring and the development of advanced technological diagnostic systems for quality assurance. Within the project, RaSS studied the interaction of the electromagnetic waves with the leather and then identified a radar system to perform experiments with leather samples. The experiments demonstrated the ability of the radar to see and reveal the leather sample and metallic objects hidden behind.

Keywords: Leather analysis, FMCW radar, AI, tomographic analysis

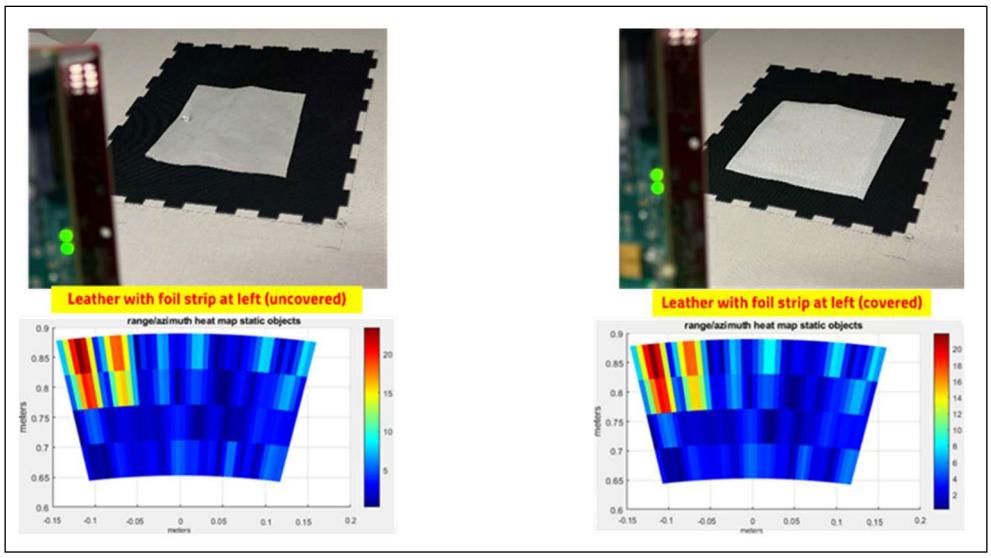
Technical Sheet
Funding institution:
Ministero delle Imprese e del Made in Italy (MISE)
Project partners
Barnini srl, TECNOCREO srl., S.I.R.I.O S.r.l., Stazione Sperimentale per l'Industria delle Pelli e delle materie concianti (SSIP)
Project duration
April 2023 - June 2026
Involved countries
Italy



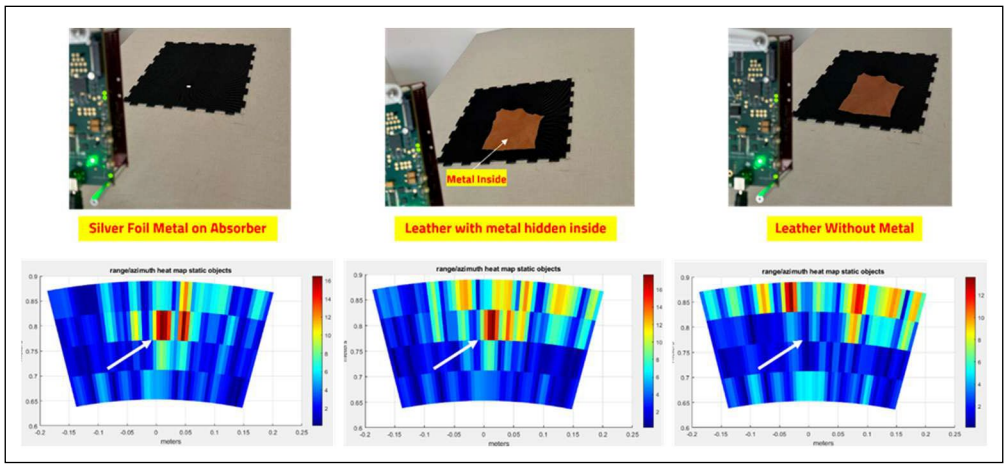
(a) Close-up view of the EHF radar (78 GHz): the left image shows the front of the radar board, where the four RF chips indicate four cascaded TI AWR2243 radar devices. The middle image (side view) illustrates the mechanical stacking and electrical connection between the radar board and the DCA (Data Capture Adapter) board. The right image shows the back of the DCA board, which handles synchronization, power distribution, and high-speed data acquisition and processing.



(b) Range-angle maps showing the benefits of the radar absorber: reflections from the wooden-table are strong while reflections from the absorber area are minimal, confirming background suppression



(c) Detection of a metallic foil strip hidden under a paper sheet on the left side of the leather sample: (top) experimental setup showing uncovered and covered conditions with no optical visibility, (bottom) range-azimuth heatmaps demonstrating the radar's ability to detect objects invisible to optical sensors



(d) Detection of a metallic foil strip hidden under leather.
(Top) Experimental setup showing three conditions: uncovered metal foil on the absorber (left), leather with metal hidden inside (middle), and leather without metal (right).
(Bottom) Corresponding range–azimuth heatmaps demonstrating the radar's ability to detect metallic objects concealed under leather and invisible to optical sensors.

PROJECT TIRESYAS

Technology Innovation for Radar
European SYstem ApplicationS

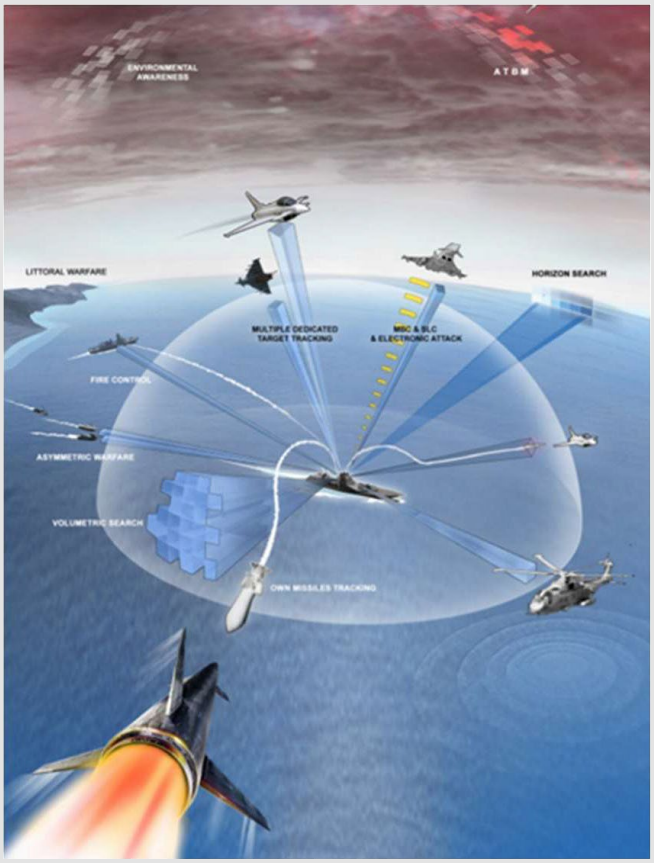
The project TIRESYAS aims at countering emerging threats with increasing sensor resilience. Boosting the cooperation launched under the EDF ARTURO project (Advanced Radar Technologies in eUROpe, funded under EDF2021), TIRESYAS will pursue new research activities including new approaches to radar surveillance and target tracking through innovative algorithms able to combine different radar architectures and will further advance towards a fully digital and disruptive multi-function/multidomain/multi-platform radar system.
The TIRESYAS project will be focusing on:

1 Dual-band / multi-band and multi-functional aperture Radar operating with different radar frequencies.

2 Multi-domain high-end sensors mainly devoted to the defence against new generation of innovative threats such as hypersonic missiles.

The TIRESYAS consortium consists of partners from 11 Countries, covering the whole value chain from applied research to high technology product development and supply. The analysis and development of innovative concepts and technologies in the framework of the TIRESYAS project will generate a technological advantage for EU by recovering existing gaps and figuring out the most comprehensive and disruptive design for the next generation European radar capability at system and sub-system level. At operational level, TIRESYAS will realize a project for a new class of multidomain radar. The TIRESYAS project aims to offer solutions in different environments and scenarios and make them interoperable with existing air defence and force protection systems, employing various degrees of interconnection and integration according to the scenario, environment, and type of protection.

Keywords: AESA, Polarimetric Radar, Hypersonic target detection, Cognitive Radar, AI, Digital array processing, Cybersecure radars



(a) Dual Band / Multi Band Radar concept (image courtesy of Leonardo).

Technical Sheet

Funding institution:

EU EDF

Funded by the European Union

Project partners

Leonardo S.p.A. (LDO, Coordinator) Italy, AALTO KORKEAKOULUSAATIO (AALTO) Finland, AIRBUS DEFENCE AND SPACE GMBH (AIR) Germany, BALTIJOS PAZANGIU TECHNOLOGIJU INSTITUTAS (BPTI) Lithuania, CONSORZIO NAZIONALE INTERUNIVERSITARIO PER LE TELECOMUNICAZIONI (CNIT) Italy, CoreHW Semiconductor Oy (CHV) Finland, ECHOES SRL (ECH) Italy, ELETTRONICA (ELT) S.p.A. Italy, FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV (FHR) Germany, HENSOLDT SENSORS GMBH (HEN) Germany, INDRA SISTEMAS SA (INDRA) Spain, MARDUK TECHNOLOGIES OU (MAR) Estonia, MBDA ITALIA SPA (MBDA) Italy, NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK (TNO) Netherlands, PIT RADWAR SA (PIT) Poland, Rheinmetall Italia S.p.A.(RHI) Italy, SAAB AKTIEBOLAG (SAAB) Sweden, SAS UPMEM (UPMEM) France, SATWAYS-OLOKLIROMENES LYSEIS ASFALEIAS KAI AMYNASIDIOTIKI EPICHEIRISI PAROCHIS YPIRESION ASFALEIAS (IEPYA)-ETAIREIA PERIORISMENIS EFTHYNIS (STWS) Greece, SenTech Srl (Sentech) Italy, THALES DMS FRANCE SAS (THA) France, THALES NEDERLAND BV (TNL) Netherlands, TOTALFORSVARETS FORSKNINGSINSTITUT (FOI) Sweden, UNIVERSITAT POLITECNICA DE VALENCIA (UPV) Spain, XY-Sensing sp. z o. o. (XY-Sensing) Poland

Project duration

September 2024 - August 2027

Involved countries

Italy, France, Spain, Germany, Sweden, Finland, Netherlands, Poland, Lithuania, Estonia, Greece

PROJECT WATCHEDGE

Wide-area Agile and flying neTwork arCHitecture for AI-surveillance processing at the EDGE - RESTART

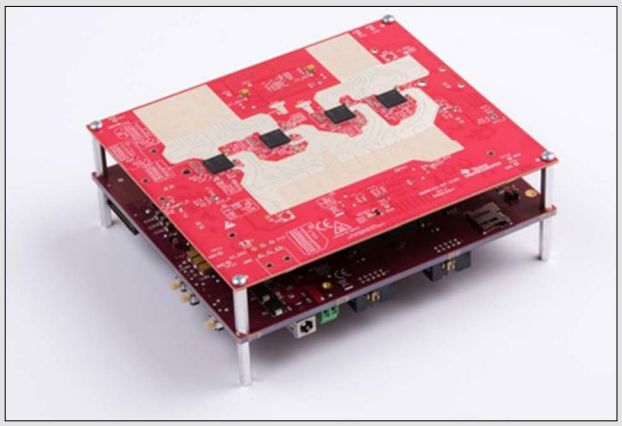
The WatchEDGE project aims to establish a geographically distributed infrastructure to enhance surveillance in rural environments, addressing threats such as wild animals, wildfires, and invasive species. Recognizing that rural areas often comprise fragmented properties owned by different stakeholders, WatchEDGE proposes a shared monitoring system that benefits the entire community. Individual efforts, while effective locally, fail to account for regionalscale threats, such as roaming wildlife crossing property boundaries.

Keywords: Digital array processing, Radar for agriculture, Animal Detection, Wild-Area Surveillance.

The project envisions leveraging existing technological resources (e. a. trail cameras, UAV-mounted cameras, radar, local networks, and servers) already available to individual property owners. By integrating these into a unified system, WatchEDGE aims to deliver advanced monitoring capabilities at a sustainable cost. Central to the initiative is the application of Artificial Intelligence (AI) and Vision Computing (VC) for real-time identification and classification, providing essential situational awareness.

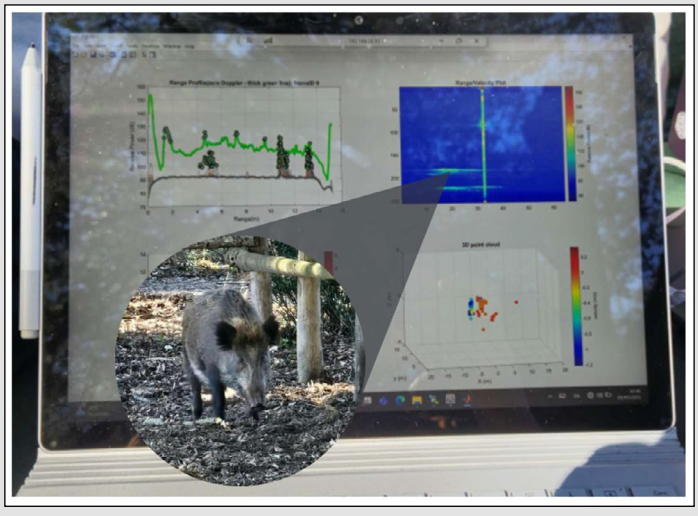
Over the last year, the RaSS Laboratory conducted several measurement campaigns at Parco San Rossore using the TI MMWCAS-DSP-EVM radar. These activities aimed to collect data in a representative outdoor scenario in the presence of wild animals. Measurements involving wild boars and horses were obtained, and processing techniqueswere tested on the collected data.

Technical Sheet
Funding institution:
European Union under the Italian National Recovery and Resilience Plan (NRRP) of NextGenerationEU
Project partners
POLIMI, UNICT, Italtel, UNIPI, Università di Milano Bicocca, Nextworks, Sensor-ID
Project duration
January 2023 - January 2026
Involved countries
Italy



(a) TI MMWCAS-DSP-EVM Evaluation Board used during the measurement campaign

(b) Planning of measurement areas within Parco San Rossore



(c) Detection map of wild boars

(d) Measurement setup.

PUBLICATIONS

2024

[1] Bazzi A, Miccoli F, Wu Z, Cuccoli F and Martinez V (2024), *"A Tool for the Statistical Investigation of the Automotive Radar Interference"*, 2024 4th URSI Atlantic Radio Science Meeting, AT-RASC 2024. [DOI] [URL]

[2] Bazzi A, Miccoli F, Wu Z, Cuccoli F and Martinez V (2024), *"Forecasting Automotive Radar Interference: Is Current Spectrum Enough?"*, 2024 21st European Radar Conference, EuRAD 2024. , pp. 340 – 343. [DOI] [URL]

[3] Biondi A, Facheris L, Argenti F, Cuccoli F, Antonini A and Melani S (2024), *"Assessing Quantitative Precipitation Estimation Methods Based on the Fusion of Weather Radar and Rain-Gauge Data"*, IEEE Geoscience and Remote Sensing Letters. Vol. 21. [DOI] [URL]

[4] Biondi A, Cuccoli F, Facheris L, Argenti F and Baldini L (2024), *"A Novel Space-Time Adaptive Method for Rainfall Estimation by means of Weather Radar and Rain Gauges"*, 2024 4th URSI Atlantic Radio Science Meeting, AT-RASC 2024. [DOI] [URL]

[5] Biondi A, Facheris L, Argenti F and Cuccoli F (2024), *"Comparison of Different Quantitative Precipitation Estimation Methods Based on a Severe Rainfall Event in Tuscany, Italy, November 2023"*, Remote Sensing. Vol. 16(21). [DOI] [URL]

[6] Canicatti E, Nenna G, Novellis G and Monorchio A (2024), *"Non-Destructive Dielectric Characterization of Sample Leather via a Custom-Designed Open-Endend Coaxial Probe"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 917 – 918. [DOI] [URL]

[7] Cantelli-Forti A, Longo G and Russo E (2024), *"Work-In-Progress: Consistent and Tamper-Proof Acquisition of Automatically Verifiable Forensic Web Evidence"*, Proceedings - 9th IEEE European Symposium on Security and Privacy Workshops, Euro S and PW 2024. , pp. 726-730. [DOI] [URL]

[8] Cheraghy M, Soltanpour M, Abdalla HB and Oveis AH (2024), *"SVM-Based Factor Graph Design for Max-SR Problem of SCMA Networks"*, IEEE Communications Letters. Vol. 28(4), pp. 877 – 881. [DOI] [URL]

[9] Cuccoli F, Passeri M, Facheris L, Argenti F, Bazzi A and Martinez V (2024), *"FMCW and OFDM radar receiver SW tool for performance analysis in automotive applications"*, 2024 32nd Telecommunications Forum, TELFOR 2024 - Proceedings of Papers. [DOI] [URL]

[10] Dellabate A, Lazzoni V, Monorchio A and Brizi D (2024), *"Arbitrarily Conformal Metasurfaces for Enhanced Wireless Power Transfer Systems"*, IEEE Access. Vol. 12, pp. 64376-64384. [DOI] [URL]

[11] Facheris L, Cuccoli F, Cortesi U, del Bianco S, Gai M, Macelloni G and Montomoli F (2024), *"A New NDSA (Normalized Differential Spectral Attenuation) Measurement Campaign for Estimating Water Vapor along a Radio Link"*, Remote Sensing. Vol. 16(19) [DOI] [URL]

[12] Facheris L, Argenti F, Cuccoli F, Montomoli F, Gai M, MacElloni G, Cortesi U and Del Bianco S (2024), *"Results of a New Campaign for Ground-to-Ground Measurements of Water Vapor through the Normalized Differential Spectral Attenuation (NDSA) Technique"*, International Geoscience and Remote Sensing Symposium (IGARSS). , pp. 5760-5764. [DOI] [URL]

[13] Falchi M, Usai P, Brizi D and Monorchio A (2024), *"Design of a Low-Frequency Magnetic Metasurface for Extremely Focused and Long Range Wireless Power Transfer Applications"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[14] Falchi M, Masi A, Brizi D, Usai P and Monorchio A (2024), *"An Electronically Reconfigurable Magnetic Metasurface for Low-Frequency RF Applications"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1173 – 1174. [DOI] [URL]

[15] Fontana N, Villani C, Simonazzi M, Sandrolini L, Monorchio A and Barmada S (2024), *"Fabrication and Measurement of a Metasurface for Automotive Applications"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1601 – 1602. [DOI] [URL]

[16] Giusti E, Brizi D and Monorchio A (2024), *"Fabry-Perot Antenna with High-Permittivity Grounded Walls for Side Lobe Level Reduction"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[17] Giusti E, Brizi D and Monorchio A (2024), *"A Beam-Steerable Fabry-Perot Cavity by Mechanically Adjustable Partially Reflective Surface"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1895 – 1896. [DOI] [URL]

[18] Giusti E, Usai P, Monorchio A and Brizi D (2024), *"Fast Ray-Launching Approach to Estimate Fabry-Perot Cavity Radiation Patterns"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1089 – 1090. [DOI] [URL]

[19] Giusti E, Pui CY, Kumar A, Ghio S, Ng B, Rosenberg L, Martorella M and Cao T-T (2024), *"Polarimetric three-dimensional inverse synthetic aperture radar"*, Multidimensional Radar Imaging. Vol. 2, pp. 159 – 184. [DOI] [URL]

[20] Kang H, Xu L, Shen T, Li J and Martorella M (2024), *"Autofocus-Coupled UTAMP for Sparse Aperture ISAR Imaging"*, International Geoscience and Remote Sensing Symposium (IGARSS). , pp. 2048-2051. [DOI] [URL]

[21] Kumar A, Panigrahi R and Martorella M (2024), *"Closed-Form Solution For Accurate Estimation of |SHV|2 In Hybrid-Polarimetry SAR For Oil Spill Monitoring"*, 2024 4th URSI Atlantic Radio Science Meeting, AT-RASC 2024. [DOI] [URL]

[22] Kumar A, Panigrahi RK and Martorella M (2024), *"Accurate Estimation of $\langle |SHV|2 \rangle$ in Hybrid-polarimetry SAR: A closed-form solution"*, International Geoscience and Remote Sensing Symposium (IGARSS). , pp. 10786 – 10789. [DOI] [URL]

[23] Lazzoni V, Dellabate A, Brizi D and Monorchio A (2024), *"Design of a Conformal and Low-Frequency Metasurface for Magnetic Field Shielding in Wireless Power Transfer Systems"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[24] Lazzoni V, Brizi D, Rossi R, Argenti G, Staglianò N, Bindi M and Monorchio A (2024), *"Advances in Microwave Sensors for Non-Destructive Monitoring of Plant Water Status"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 2291 – 2292. [DOI] [URL]

2024

[25] Lupidi A, Giusti E, Tomei S, Ghio S and Martorella M (2024), *"Target Recognition by Means of 3D ISAR Images"*, Proceedings of the IEEE Radar Conference. [DOI] [URL]

[26] Lupidi A, Passafiume M, Costa E, Cuccoli F, Zanforlin U and Dispenza M (2024), *"Performance Estimation of Quantum Radar Systems in Practical Scenarios"*, Proceedings International Radar Symposium. , pp. 298-302. [URL]

[27] Maier G, Albanese A, Ciavotta M, Ciulli N, Giordano S, Giusti E, Salvatore A and Schembra G (2024), *"WatchEDGE: Smart networking for distributed AI-based environmental control"*, Computer Networks. Vol. 243 [DOI] [URL]

[28] Martorella M, Heald G, Lyons A and Antoniou M (2024), *"Guest Editorial: Synthetic aperture in sonar and radar"*, IET Radar, Sonar and Navigation. [DOI] [URL]

[29] Masi A, Brizi D, Canicattì E, Nenna G and Monorchio A (2024), *"Preliminary Investigation of an Innovative RF Sensor for Deformation and Failure Evaluation in Composite Materials"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[30] Masi A, Falchi M, Brizi D, Canicattì E, Nenna G and Monorchio A (2024), *"Inductive Frequency-Coded Sensor for Non-Destructive Structural Strain Monitoring of Composite Materials"*, Sensors. Vol. 24(20). [DOI] [URL]

[31] Masi A, Brizi D and Monorchio A (2024), *"Conformal Metasurface for Enhancing and Shaping Magnetic Field in 0.5T Magnetic Resonance"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 623 – 624. [DOI] [URL]

[32] Masi A, Brizi D, Aldhaheri S, Yahi I, Leye PO, Vega F, Kasmi C and Monorchio A (2024), *"An Electronically Switchable Metasurface for Multifunctional Electromagnetic Applications"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1175 – 1176. [DOI] [URL]

[33] Mishra V and Monorchio A (2024), *"Analysis and Design of Microwave Absorbers Combining Surface Wave Attenuation and Reflection Bandwidth Properties"*, IEEE Transactions on Electromagnetic Compatibility. Vol. 66(1), pp. 70-79. [DOI] [URL]

[34] Mishra V and Monorchio A (2024), *"Systematic Approach to Analyze the Surface Wave Propagation in Absorbing Structure"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 2143 – 2144. [DOI] [URL]

[35] Müller J, Falchi M, Stoja E, Konstandin S, Günther M, Brizi D, Usai P, Monorchio A and Philipp D (2024), *"Deep-Learning Optimized Reconfigurable Metasurface for Magnetic Resonance Imaging"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[36] Osso A, Corucci A, Diana S, Monorchio A, Ghelardi S and Angeloni A (2024), *"On the use of metamaterials aboard complex naval platforms for an effective integration of sensors and subsystems"*, 2024 IEEE INC-USNC-URSI Radio Science Meeting (Joint with AP-S Symposium), INC-USNC-URSI 2024 - Proceedings. , pp. 48. [DOI] [URL]

[37] Oveis AH, Meucci G, Mancuso F and Cantelli-Forti A (2024), *"Advancing Radar Cybersecurity: Defending Against Adversarial Attacks in SAR Ship Recognition Using Explainable AI and Ensemble Learning"*, Proceedings - Conference on Local Computer Networks, LCN. [DOI] [URL]

[38] Oveis AH, Meucci G, Mancuso F, Berizzi F and Cantelli-Forti A (2024), *"Generative AI Threats to Maritime Navigation Using Deceptive ISAR Images"*, IEEE Access. Vol. 12, pp. 173800 – 173809. [DOI] [URL]

[39] Pascarella F, Brizi D and Monorchio A (2024), *"Design of an L-S-Band Frequency Selective Rasorber for Dual-Band Absorption and In-Band Transmission"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[40] Pascarella F, Brizi D and Monorchio A (2024), *"Design of a Frequency Selective Surface Band-Pass Filter Covering Multi-octave L-S Bands"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1825 – 1826. [DOI] [URL]

[41] Rosamilia M, Aubry A, Balleri A, De Maio A and Martorella M (2024), *"A Cognitive-Based ISAR System for Spectral Compatibility Applications"*, 2024 IEEE International Workshop on Technologies for Defense and Security, TechDefense 2024 - Proceedings. , pp. 74 – 79. [DOI] [URL]

[42] Rosenberg L, Giusti E, Pui CY, Ghio S, Ng B, Martorella M and Cao T-T (2024), *"Advances in three-dimensional inverse synthetic aperture radar"*, Multidimensional Radar Imaging. Vol. 2, pp. 87 – 125. [DOI] [URL]

[43] Scarselli C, Giusti E, Brizi D and Monorchio A (2024), *"A Compact Fabry-Perot Cavity Antenna with Circular Polarization"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[44] Scarselli C, Pascarella F, Nenna G and Monorchio A (2024), *"Design and Simulation of a Dual Circularly Polarized Receiving Antenna Array for UHF Band"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 2739 – 2740. [DOI] [URL]

[45] Scarselli C, Giusti E, Brizi D and Monorchio A (2024), *"Gain Enhancement of a Dual Circularly Polarized Patch Antenna based on Electromagnetic Metasurfaces"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 315 – 316. [DOI] [URL]

[46] Semenyuk V, Kurmashev I, Alyoshin D, Kurmasheva L, Serbin V and Cantelli-Forti A (2024), *"Study of the Possibility to Combine Deep Learning Neural Networks for Recognition of Unmanned Aerial Vehicles in Optoelectronic Surveillance Channels"*, Modelling. Vol. 5(4), pp. 1773 – 1788. [DOI] [URL]

[47] Violi V, Usai P, Brizi D, Singh G, Fisichella M, Isernia T and Monorchio A (2024), *"Target Classification through ISAR for Autonomous Vehicles based on Federated Learning"*, 18th European Conference on Antennas and Propagation, EuCAP 2024. [DOI] [URL]

[48] Violi V, Brizi D, Isernia T and Monorchio A (2024), *"A High Roll-Off, Wide Rejection FSS-Based Bandpass Filter for L-S Bands"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 2029 – 2030. [DOI] [URL]

[49] Violi V, Brizi D and Monorchio A (2024), *"Ultra-Thin Wide-Band Multilayer FSS-Based Magnetic Absorber"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). , pp. 1817 – 1818. [DOI] [URL]

PUBLICATIONS

2025

[1] Bonicoli D, Giusti E and Martorella M (2023), *"Compressed Sensing: OMP2D Based Algorithm for Fully Polarimetric ISAR"*, Proceedings International Radar Symposium. Vol. 2023-May [DOI] [URL]

[2] Brizi D, Conte M and Monorchio A (2023), *"A Performance-Enhanced Antenna for Microwave Biomedical Applications by Using Metasurfaces"*, IEEE Transactions on Antennas and Propagation. Vol. 71(4), pp. 3314-3323. [DOI] [URL]

[3] Canicatti E, Ghavami N, Tiberi G and Monorchio A (2023), *"Accuracy Improvement of the Huygens' Principle-based Method for UWB Microwave Imaging"*, 17th European Conference on Antennas and Propagation, EuCAP 2023. [DOI] [URL]

[4] Canicattì E, Sánchez-Bayuela D, Romero Castellano C, Aguilar Angulo P, Giovanetti González R, Cruz Hernández L, Ruiz Martín J, Tiberi G and Monorchio A (2023), *"Dielectric Characterization of Breast Biopsied Tissues as Pre-Pathological Aid in Early Cancer Detection: A Blinded Feasibility Study"*, Diagnostics. Vol. 13(18) [DOI] [URL]

[5] Cantelli-Forti A, Colajanni M and Russo S (2023), *"Penetrating the Silence: Data Exfiltration in Maritime and Underwater Scenarios"*, Proceedings - Conference on Local Computer Networks, LCN. [DOI] [URL]

[6] Capria A, Saverino A, Giusti E and Martorella M (2023), *"SDR-based passive radar technology"*, Passive Radars on Moving Platforms. , pp. 265-289. [URL]

[7] Corucci A, Canicatti E, Flamini R, Usai P, Mazzucco C and Monorchio A (2023), *"An Efficient Ray-Tracing Approach for the Isolation Assessment of Co-Located Base Station Antennas at mmWave"*, IEEE Transactions on Electromagnetic Compatibility. , pp. 1-10. [DOI] [URL]

[8] Cuccoli F, Facheris L, Cortesi U, Del Bianco S, Gai M, MacElloni G, Barbara F, Baldi M, Montomoli F, Antonini A and Ortolani A (2023), *"Integrated Water Vapor Estimation Through Microwave Propagation Measurements: Second Experiment on A Ground-to-Ground Radio Link"*, International Geoscience and Remote Sensing Symposium (IGARSS). Vol. 2023-July, pp. 3788-3791. [DOI] [URL]

[9] Eliana C, Violi V, Brizi D, Flora F, Acerra F and Monorchio A (2023), *"On the Accuracy of Dielectric Characterization of Solid Materials by Open-Ended Coaxial Cable"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 1673-1674. [DOI] [URL]

[10] Facheris L, Antonini A, Argenti F, Barbara F, Cortesi U, Cuccoli F, Del Bianco S, Dogo F, Feta A, Gai M, Gregorio A, Macelloni G, Mazzinghi A, Melani S, Montomoli F, Ortolani A, Rovai L, Severin L and Scopa T (2023), *"Towards Space Deployment of the NDSA Concept for Tropospheric Water Vapour Measurements"*, Atmosphere. Vol. 14(3) [DOI] [URL]

[11] Falchi M, Brizi D and Monorchio A (2023), *"A Preliminary Study of a Conformal Electromagnetic Metasurface for Brain Tumor Detection"*, 17th European Conference on Antennas and Propagation, EuCAP 2023. [DOI] [URL]

[12] Falchi M, Rotundo S, Brizi D and Monorchio A (2023), *"Analysis and design of holographic magnetic metasurfaces in the very near field for sensing applications at quasi-static regime"*, Scientific Reports. Vol. 13(1) [DOI] [URL]

[13] Giusti E, Capria A, Saverino AL, Gelli S, Munoz J, Dosil R, Naya J and Menendez J (2023), *"A Drone-Based Multisensory Payload for Maritime Pollutants Detections"*, IEEE Aerospace and Electronic Systems Magazine. Vol. 38(3), pp. 4 – 18. [DOI] [URL]

[14] Giusti E, Ghio S and Martorella M (2023), *"Drone-based 3DInISAR: Experimental Results"*, Proceedings of the IEEE Radar Conference. Vol. 2023-May [DOI] [URL]

[15] Kang H, Li J, Guo Q, Martorella M, Giusti E and Cai J (2023), *"Robust Interferometric ISAR Imaging With UAMP-Based Joint Sparse Signal Recovery"*, IEEE Transactions on Aerospace and Electronic Systems. , pp. 1-19. [DOI] [URL]

[16] Kumar A, Mishra V, Panigrahi R and Martorella M (2023), *"Application of Hybrid-Pol SAR in Oil-Spill Detection"*, IEEE Geoscience and Remote Sensing Letters. Vol. 20 [DOI] [URL]

[17] Kumar A, Giusti E, Mancuso F, Ghio S, Lupidi A and Martorella M (2023), *"Three-Dimensional Polarimetric InISAR Imaging of Non-Cooperative Targets"*, IEEE Transactions on Computational Imaging. Vol. 9, pp. 210-223. [DOI] [URL]

[18] Kumar A, Giusti E and Martorella M (2023), *"Hybrid Polarimetry Inverse SAR"*, Proceedings of the IEEE Radar Conference. [DOI] [URL]

[19] Lazzoni V, Rossi R, Brizi D, Ugolini F, Baronti S, Moriondo M, Bindi M and Monorchio A (2023), *"Implementation of a microwave sensor for the non-destructive detection of plant water stress"*, 17th European Conference on Antennas and Propagation, EuCAP 2023. [DOI] [URL]

[20] Lazzoni V, Brizi D and Monorchio A (2023), *"Spatial filtering magnetic metasurface for misalignment robustness enhancement in wireless power transfer applications"*, Scientific Reports. Vol. 13(1) [DOI] [URL]

[21] Li H, Feng Y, Zhao M, Wang X, Brizi D, Fang X, Hu J, Sima B, Zong Z, Wu W and Monorchio A (2023), *"A Dual-Polarized and Wideband Switchable Absorption/Transmission Frequency Selective Surface With Multispectral Functionality"*, IEEE Open Journal of Antennas and Propagation. , pp. 1-1. [DOI] [URL]

[22] Masi A, Brizi D and Monorchio A (2023), *"Millimetric Inclusion Detection Through a Contactless Microwave Spiral Sensor for Biomedical Applications"*, IEEE Sensors Journal. , pp. 1-1. [DOI] [URL]

[23] Masi A, Brizi D and Monorchio A (2023), *"Wearable Radiofrequency Metasurface for Inflammatory Process Monitoring"*, 17th European Conference on Antennas and Propagation, EuCAP 2023. [DOI] [URL]

[24] Masi A, Brizi D and Monorchio A (2023), *"Wearable Radiofrequency Metasurface for Smart-Bandages"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 1119-1120. [DOI] [URL]

[25] Meucci G, Mancuso F, Giusti E, Kumar A, Ghio S and Martorella M (2023), *"Point Cloud Transformer (PCT) for 3D-InISAR Automatic Target Recognition"*, Proceedings of the IEEE Radar Conference. Vol. 2023-May [DOI] [URL]

[26] Meucci G, Karahoda B, Oveis A, Mancuso F, Jajaga E and Cantelli-Forti A (2023), *"Naval Cybersecurity in the Age of AI: deceptive ISAR Images Generation with GANs"*, Proceedings - Conference on Local Computer Networks, LCN. [DOI] [URL]

[27] Oveis A, Giusti E, Ghio S, Meucci G and Martorella M (2023), *"Incremental Learning in Synthetic Aperture Radar Images Using Openmax Algorithm"*, Proceedings of the IEEE Radar Conference. Vol. 2023-May [DOI] [URL]

[28] Oveis A, Giusti E, Ghio S, Meucci G and Martorella M (2023), *"LIME-Assisted Automatic Target Recognition with SAR Images: Toward Incremental Learning and Explainability"*, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. Vol. 16, pp. 9175-9192. [DOI] [URL]

[29] Oveis A, Capria A, Saverino A and Martorella M (2023), *"Convolutional Neural Network for Joint Communication and Radar Signals Classification"*, Proceedings International Radar Symposium. Vol. 2023-May [DOI] [URL]

[30] Oveis A, Giusti E, Meucci G, Ghio S and Martorella M (2023), *"Explainability In Hyperspectral Image Classification: A Study of Xai Through the Shap Algorithm"*, Workshop on Hyperspectral Image and Signal Processing, Evolution in Remote Sensing. [DOI] [URL]

[31] Oveis A, Giusti E, Ghio S, Meucci G and Martorella M (2023), *"Credible Recognition of Radar Images: Interpretability Metric and Classification Score"*, International Geoscience and Remote Sensing Symposium (IGARSS). Vol. 2023-July, pp. 1084-1087. [DOI] [URL]

[32] Pascarella F, Scarselli C, Novellis G, Nenna G and Monorchio A (2023), *"Genetic Algorithm Based Optimization for Concentric Circular Antenna Array Design"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 1365-1366. [DOI] [URL]

[33] Pui CY, Ghio S, Ng B, Giusti E and Rosenberg L (2023), *"Robust 3D ISAR Ship Classification"*, Proceedings of the IEEE Radar Conference. Vol. 2023-May [DOI] [URL]

[34] Qi X, Zhang Y, Jiang Y, Giusti E and Martorella M (2023), *"Optimized Nonlinear PRI Variation Strategy Using Knowledge-Guided Genetic Algorithm for Staggered SAR Imaging"*, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. Vol. 16, pp. 2624-2643. [DOI] [URL]

[35] Rotundo S, Lazzoni V, Brizi D and Monorchio A (2023), *"A Radio-frequency High-Q System for Biomedical Sensing Applications"*, 17th European Conference on Antennas and Propagation, EuCAP 2023. [DOI] [URL]

[36] Rotundo S, Falchi M, Brizi D and Monorchio A (2023), *"Non-Invasive Target Detection Enhanced Through a Low-Frequency Passive Metasurface for Biomedical Applications"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 1103-1104. [DOI] [URL]

[37] Rotundo S, Brizi D and Monorchio A (2023), *"On the Feasibility of a High-Sensitivity Imaging System for Biomedical Applications Based on Low-Frequency Magnetic Field"*, IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology. , pp. 1-8. [DOI] [URL]

[38] Rotundo S, Brizi D, Carluccio G, Lakshmanan K, Collins C, Lattanzi R and Monorchio A (2023), *"A Passive and Conformal Magnetic Metasurface for 3T MRI Birdcage Coil"*, 2023 International Conference on Electromagnetics in Advanced Applications, ICEAA 2023. , pp. 222-224. [DOI] [URL]

[39] Saillant S, Bok D, Molinie J-P, Leventis A, Samczynski P, Brouard P, Saverino A, Capria A and Paichard Y (2023), *"iFURTHER Project - A Cognitive Network of HF Radars for Europe Defence"*, Proceedings of the IEEE Radar Conference. [DOI] [URL]

[40] Sánchez-Bayuela D, Canicattì E, Badia M, Sani L, Papini L, Castellano C, Angulo P, González R, Hernández L, Martín J, Ghavami N, Tiberi G and Monorchio A (2023), *"Automated Breast Tissue Classification through Machine Learning using Dielectric Data"*, 17th European Conference on Antennas and Propagation, EuCAP 2023. [DOI] [URL]

[41] Scarselli C, Pascarella F, Ciampalini C, Nenna G and Monorchio A (2023), "Compact Slot-Patch Antenna with Dual Circular Polarization", IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 907-908. [DOI] [URL]

[42] Semenyuk V, Kurmashev I, Lupidi A and Cantelli-Forti A (2023), *"Developing the GoogleNet neural network for the detection and recognition of unmanned aerial vehicles in the data Fusion System"*, Eastern-European Journal of Enterprise Technologies. Vol. 2(9-122), pp. 16-25. [DOI] [URL]

[43] Serrano A, Kobsa A, Uysal F, Cerutti-Maori D, Ghio S, Kintz A, Morrison R.L. J, Welch S, van Dorp P, Hogan G, Garrington S, Bassa C, Saunders C, Martorella M, Caro Cuenca M and Lowe I (2023), *"Long baseline bistatic radar imaging of tumbling space objects for enhancing space domain awareness"*, IET Radar, Sonar and Navigation. [DOI] [URL]

[44] Usai P, Brizi D and Monorchio A (2023), *"Low Frequency Magnetic Metasurface for Wireless Power Transfer Applications: Reducing Losses Effect and Optimizing Loading Condition"*, IEEE Access. Vol. 11, pp. 66579-66586. [DOI] [URL]

[45] Uysal F, Dorp P, Serrano A, Kobsa A, Ghio S, Kintz A, Bassa C, Garrington S, Cuenca M, Otten M, Hogan G, Welch S, Morrison R, Harrison P, Wrigley N, Martorella M and Usoff J (2023), *"Large Baseline Bistatic Radar Imaging for Space Domain Awareness"*, Proceedings of the IEEE Radar Conference. [DOI] [URL]

[46] Violi V, Brizi D, Almansoori M, Banelli A, Vega F and Monorchio A (2023), *"Design Guidelines for Fishnet Frequency Selective Surfaces"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 655-656. [DOI] [URL]

[47] Yuan H, Brizi D, Cao Q and Monorchio A (2023), *"A Switchable Transmission/ Absorption/Reflection Frequency Selective Surface"*, IEEE Antennas and Propagation Society, AP-S International Symposium (Digest). Vol. 2023-July, pp. 135-136. [DOI] [URL]

Since January 2017, the RaSS Lab has been certified ISO 9001/2015 by the international and independent body DNV GL. The certification refers to the "Design and development of technology systems and services in telecommunications, radar and electromagnetism and related computer aids and the design and manufacture of RF and microwave equipment and subsystems" (Figure 4).

DNV

MANAGEMENT SYSTEM CERTIFICATE

Certificate no.: 211274-2016-AQ-ITA-ACCREDIA
Initial certification date: 19 January 2017
Valid: 20 January 2026 – 19 January 2029

This is to certify that the management system of

Consorzio Nazionale Interuniversitario per le Telecomunicazioni - Laboratorio Nazionale RaSS - Radar e Sistemi di Sorveglianza

Galleria G.B. Gerace, 18 Sesto Piano - 56124 Pisa (PI) - Italy

has been found to conform to the Quality Management System standard:

ISO 9001:2015

This certificate is valid for the following scope:

Design and development of technology systems and services in telecommunications, radar and electromagnetics and related computer aids. Design and manufacturing of radiofrequency and microwaves equipments and subsystems (IAF 34, 19, 33)

Place and date:
Vimercate (MB), 15 January 2026

MANAGEMENT SYSTEM CERTIFICATION ACCREDIA
00010

For the issuing office:
DNV - Business Assurance
Via Energy Park, 14, - 20871 Vimercate (MB) - Italy

Claudia Baroncini
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV Business Assurance Italy S.r.l., Via Energy Park, 14 - 20871 Vimercate (MB) - Italy - TEL: +39 039 68 99 905. www.dnv.it

Figure 4 – Lab RaSS ISO 9001/2015 DNV certificate.

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- INAF (Istituto Nazionale di Astrofisica), Italy
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- Leonardo, Italy
- Intermarine, Italy
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- FHR (Fraunhofer-Institute for High Frequency Physics and Radar Techniques, Dept. of Passive Sensor Systems and Classification), Germany
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- ONERA, France
- University of Birmingham, UK
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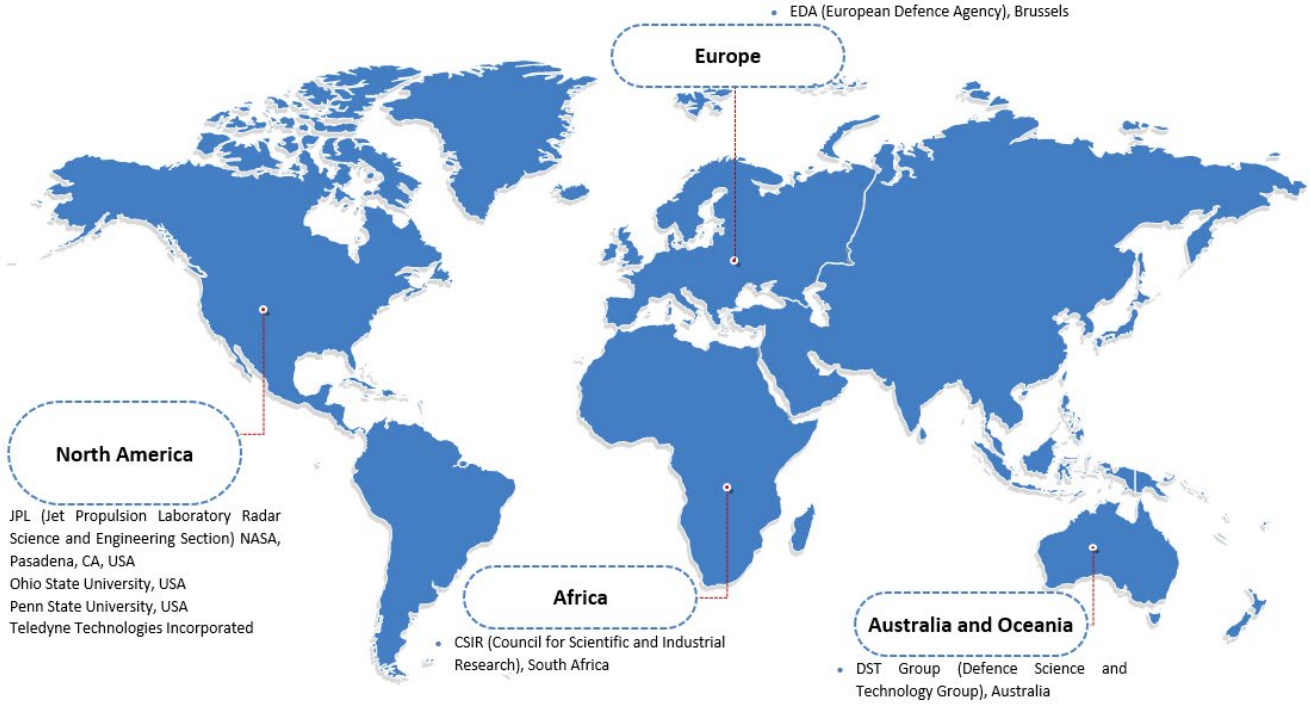
- NATO, Belgium
- Armasuisse, Switzerland
- EDA (European Defence Agency), Brussels



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- Penn State University, USA
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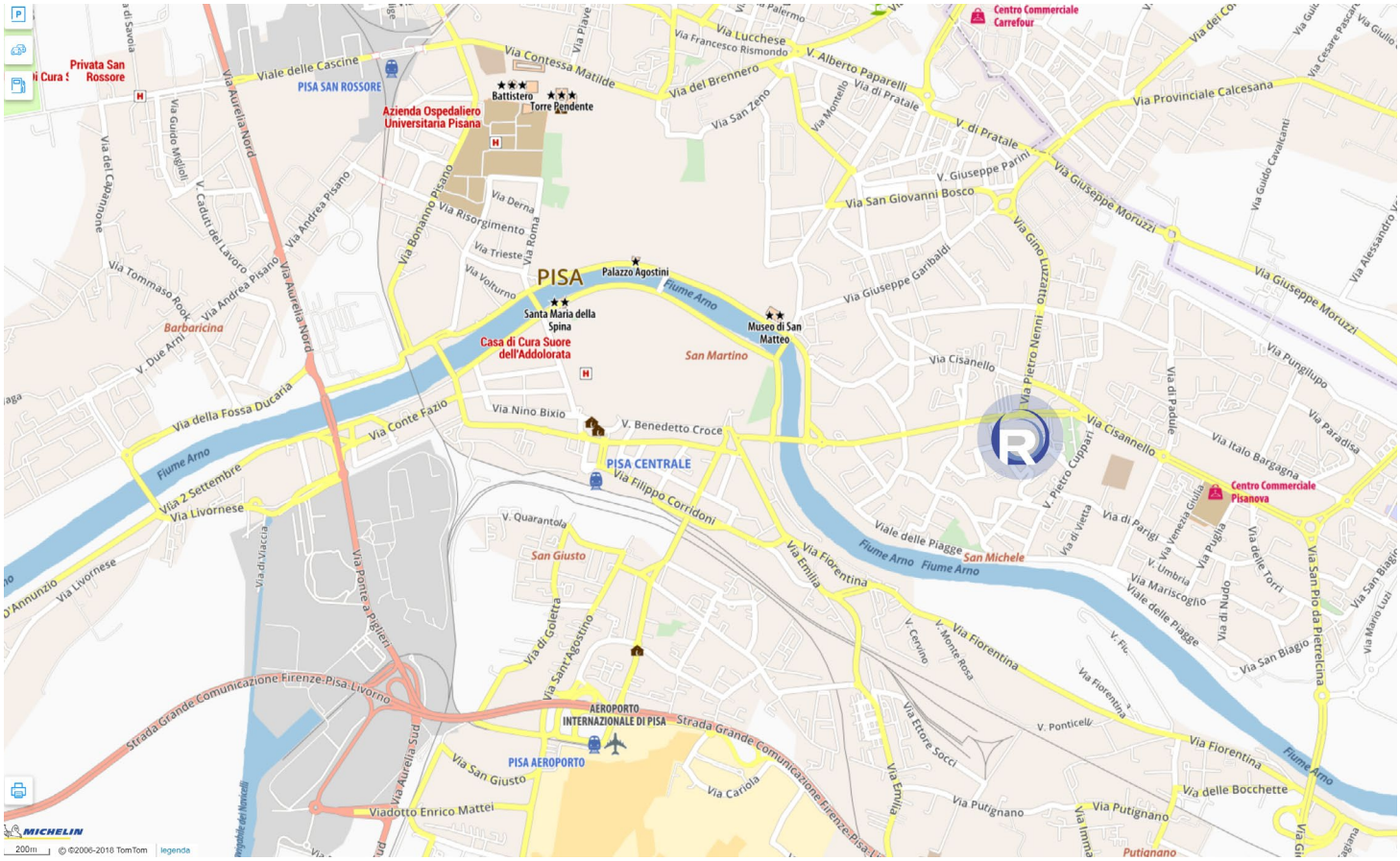

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